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## ERRATA.

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In the List of Errata, stiched up with No. 3 of Vol. XIII, in the last entry "coriacrous" should be "coriaceous."

On p. 444, "Wall. (under *Cheilanthes*), Cat. 72" should be within parentheses and "Hope" should be inserted immediately thereafter.

On p. 446, in 12th line from bottom, for "v" read "y" and for "*acrostioides*" read "*acrostichoïdes*."

On p. 446, in 8th line from bottom, for "2,000'" read "12,000.'"

On p. 448, in 10th line from top, "ft." should be "t.", and in 13th line from top "*Platigloma*" should be "*Platyloma*."

On p. 449, in 10th line from bottom, "8,000'" should be "9,000.'"

On p. 450, in the last line, for "longest" read "tallest."

On p. 453, in the middle of page, the Greek "i" (iota) should be inserted between "var" and "*subquinata*."

On p. 453, 18th line from bottom, for "*deltoids*" read "*deltoid*."

On p. 456, 2nd line from top, strike out the "period" between "Malay" and "Penins."

On p. 456, in 14th line from bottom, "65" should be "165."

On p. 459, in 11th line from top, "*Enwoodwardia*" should be "*Euwoodwardia*."

On p. 461, in 4th line from top, insert "Sikkim" between "some" and "specimens."

Page 522, line 24th from top, for "Sangunme" should be "Sangmwe."

Page 523, line 31st from top, for "quickly" should be "quietly."

Page 524, line 17th from top, for "Sgaing" should be "Tigaing."

Page 524, line 18th from top, for "Bhamo" should be "Katha."

On p. 627, last line but one, for "species" read "specimen."

On p. 628, 16th line from top, for "on" read "do."

Page 633, Para. III should appear at the end and not in the middle of the paper.

On p. 658, 6th line from bottom, insert " " after 6000'.

On p. 659, 2nd line, for "Collet" read "Collett."

On p. 659, 9th line from top, insert " " after 5000'.

On p. 659, 14th line from bottom, insert " " after 8000'.

On p. 660, 15th line from top, for "Dr. J. S. Stewart" read "Dr. J. L. Stewart."

On p. 661, 16th line from bottom, insert " " after "Valleys."

On p. 662, 4th line from bottom, insert "by" after "and."

On p. 663, 9th line from bottom, dele "." after "ab."

On p. 663, 7th line from bottom, for "tt" read "t."

On p. 665, 15th line from bottom, for "Huachnea" read "Huachuca."

On p. 666, 5th line from top, for "Huachnea" read "Huachuca."

On p. 668, 18th line from bottom, insert " " after "3—4000'."

On p. 670, 11th line from bottom, for "pinnæ" read "pinnæ."







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INDIAN DUCKS AND THEIR ALLIES.

BY E. C. STUART BAKER, F.Z.S.

PART IX, WITH PLATE IX.

*(Continued from page 620 of Vol. XII.)*

Genus FULIGULA.

Blanford unites *Fuligula* and *Nyroca*, and the difference between them is a very slight one, *viz.*, that whereas *Nyroca* has the sides of bill practically parallel, *Fuligula*, as defined by Salvadori and others, has the end decidedly wider than the base. Even this is only a matter of degree, as I have shown in the measurements of the bills of *N. bæri* and *N. africana*, and, but that I am following Salvadori's classification *in toto*, I should be inclined to take Blanford's, with which I agree personally. As restricted, there are only five species in the genus, and of these only two visit India, and of these again the Scaup only in a very few instances.

*Key to the Species.*

Head never crested, back and scapulars in adult not black...*marila*.

Head always more or less crested, and scapulars in adult

black, more or less sprinkled with whitish.....*fuligula*.

This key is admittedly a very weak one. In spite of the statement that *F. fuligula* is more or less crested *always*, having such very powerful support, the fact is that the head is not always crested, many young birds having no signs of a crest.

Mr. Finn has, however, pointed out to me a most useful point in the coloration of *F. fuligula*, and this is the wonderful *silky* or *satiny*

whiteness of the lower parts. Even where the white is not pure, the satin texture is always most apparent, and serves at once to divide the Crested Pochard from nearly all other ducks. Adults, of course, are easy to discriminate, and for them the above key stands good.

## (34.) FULIGULA MARILA.

*The Scaup.*

*Fuligula marila*.—Jerdon, "Birds of India," III, p. 814; Hume, "Str. Feath.," VIII, p. 115; *ibid.*, Cat., No. 970; Hume and Marshall, Game Birds, III, p. 272; Hume, "Str. Feath.," X, pp. 158, 174; Stoker, *ibid.*, p. 424; Barnes, "Birds of Bombay," p. 413; Salvadori, Cat. British Museum, XXVII, p. 355.

*Nyroca marila*.—Blanford "Avifauna of India," IV, p. 463.

*Description: Adult Male*.—Head, neck, upper part of the breast and of the back black; sides of the head and upper neck glossed with green; rest of the back and scapulars white, narrowly barred with black; rump, upper and under tail coverts black; lower breast, abdomen and sides white, the vent somewhat greyish, the sides with black barring; upper wing coverts blackish, finely vermiculated with white; secondaries white; forming the speculum which is bounded below by a blackish band, in some specimens more or less freckled with white, tertials blackish with a green gloss, the larger ones more or less finely dusted with whitish; primaries greyish-brown, from the fourth quill with a whitish area on the inner web, the tips black, the marginal under wing coverts greyish-brown, dusted with white, the remainder, as well as the axillaries, white; tail blackish, bill and legs light lead-grey, webs and nail of the bill blackish; iris yellow. Total length about 18 inches, wing 9.25", tail 2.9", culmen 1.8", tarsus 1.4". (Salvadori).

*Male*.—"Length 20.0"; expanse 32.0"; wing 9.0"; tail from insertion of feathers 2.75"; tarsus 1.42"; bill along ridge 2.0". The bill is light greyish-blue, or dull lead-colour, with the nail blackish; the iris rich yellow; the edges of the eyelids dusky; the feet pale greyish-blue, darker on the joints; the membrane dusky; the claws black. (Macgillivray).

*Adult Female*.—"Forehead, lores, and more or less of the chin white encircling the base of the bill; rest of head, neck, upper back and upper breast brown, the last mixed with white and passing into the

white of the abdomen, not sharply defined as in the male; back and scapulars vermiculated brown and white, flanks the same but with more white, rump, upper tail coverts and tail dusky-brown; wings as in the male but duller and browner." (Blanford).

"Length 18·0"; expanse 28·0"; wing 8·75"; tail 2·5"; tarsus 1·33"; bill along ridge 1·83".

"Bill as in the male but darker, the feet dull leaden-grey, with the webs dusky." (Macgillivray).

"Young male has the white at the base of the bill like the adult female, but it is a darker and richer colour." (Salvadori).

Hume's young male had the wing only 7·9", bill straight from base to tip 1·7", and at its greatest width ·87".

"The very young female is equally like the young *Nyroca*, but it has the chin, throat, a portion of the lores white, only a little speckled with rufous-brown (which white is not exhibited in any of my young White-eyes), besides the characteristic bill so much broader than those of young *Nyroca* of the same age and sex." (Hume).

The measurements of a young female were wing 7·1"; bill straight from base to tip 1·6", and at its widest part ·78".

*Young in down.*—"Crown, nape and upper parts uniform dark olive-brown; throat, sides of the head, and forepart of the neck yellowish-white; a dull greyish band across the lower neck, rest of the underparts dull yellowish, the flanks greyish-yellow; upper mandible blackish, tooth of the beak yellowish; under mandible yellow." (Dresser).

The Scaup is a duck of very northern latitudes, breeding in the Palearctic and Nearctic regions in the extreme north of Europe, Asia and America up to, if not beyond, N.-E. in Asia, lat. 70°. In the winter it extends south to the basin of the Mediterranean, Southern Russia and Asia Minor, and Central and South Central Asia as far south as Northern India, South China and Japan and Formosa, whilst in America it extends as far south, *vide* Salvadori, as Guatemala. In Africa it does not extend south at all, Von Heuglin and, after him, Seeborn record it from Abyssinia, but Salvadori says in the Catalogue most emphatically "not (to my knowledge) reaching Abyssinia." Even here the southern limits given are rarely attained, large numbers of birds remaining all the winter north of latitude 40°. The Scaup is only a very rare winter visitant to Northern India, and I can

find no other record of its occurrence outside those noted by Blanford, *viz.*, "Isolated occurrences have been recorded from Kashmir, Kulu, and Nepal in the Himalayas, and in the neighbourhood of Attock, Gurgaon near Delhi," and Karachi in the plains of India, and even Bombay. This last was recorded in our Journal by Mr. J. D. Inverarity, who shot a female on a small tank near Panwell on January 13th, 1884. "Col. McMaster is of opinion that one year, in January, he saw several birds of this species, on marshes and salt lakes between Chicacole and Berhampur in the Northern Circars (say, 190 N. Lat.), and the male is a bird that so experienced a sportsman could hardly mistake for any other species that could occur there." I do not know if Col. McMaster said that they were *adult* birds that he saw, if so, perhaps, probably in fact, he was not mistaken, but if they were the common form of the young bird found in India as a rule, he might very well indeed have been mistaken. It seems strange, too, that he should have seen *several* birds when they are of such rare occurrence. On the other hand, I think there is no doubt that a great many young birds are yearly missed owing to these being mistaken for young Pochards of other kinds. Possibly the most likely place for this bird to be met with in India would be the coast about the Gulf of Cutch and north to Kurachi, as the Scaup, by preference, is a sea bird. Such as are met with in India are doubtless 'moving on' in hopes of getting to some coast eventually. Even in China they wander further south along the coast, and are far more commonly met with there than they are inland. When they *are* met with inland it will be generally found that they keep to great lakes, such as Lake Baikal, Lake Balkasts, the Sea of Ural, etc. In these vast extents of water they can live, according to their wont, on the water altogether, neither taking to land or air, except in cases of emergency, and spending their time diving for food or resting asleep on it just as they would were they on the sea itself.

Although once well away on the wing the flight of the Scaup is fairly fast and strong, they are exceedingly slow and clumsy in getting off the water, their manner of so doing having been likened by various observers to that of the coot; that is to say, they rise very obliquely splashing noisily along the surface of the water for some yards before getting clear of it and, once clear, still taking some time to get up their

speed. On land they are perhaps even more awkward than on the water in commencing to fly, and it must be, indeed, severe pressure which can induce them to change their slow waddle into a quicker shuffle. They have the repute of being not wild birds and of being fairly easy of approach on the water and, when hard pressed, of frequently preferring to attempt escape by diving rather than by taking to flight. So great, however, are their diving powers that they are perhaps as difficult to bring to bag as are the wilder birds which more quickly take to wing. Wounded only it is as likely as not that the bird may escape, as it is almost impossible to follow its movements; and when it does appear on the surface it again disappears with such rapidity that it takes a gunner of some smartness to get a shot at it and finish it off. The food of the Scaup is everywhere chiefly of an animal character. Inland doubtless it feeds to a certain extent on water-weeds, etc., these being mainly such as grow at some depth and are obtained by diving; but even here shell-fish, frogs, insects, etc., form the greater part of its diet. When in its natural element on the sea, in creeks and estuaries or along the coast, it is almost an entirely animal feeder, subsisting on shell-fish, small fish and other marine small life.

Its name is derived from its habit of feeding on mussels, the beds on which the masses of shell-fish lie being known as mussel scaups or mussel scalps (Blanford and Newton), and in Norfolk I have heard both fresh and salt water mussels called scaups, though the term is usually applied more to the latter than the former. Hume, quoting Montague, says that "Both the male and the female have a peculiar habit of tossing up their heads and opening their bills, which in spring is continued for a considerable time, while they are swimming and sporting on the water, and they emit a grunting sort of cry."

Its flesh, as might be expected, is quite unfit, as a rule, for the table, and the most flattering terms I have known applied to it are Macgillivray's to the effect that "It is not thought much of for the table, its flesh being rather rank."

The Scaup is one of the most northern breeding of ducks, having been observed breeding, as already noted, at least as far north as Lat. 70°. As to its breeding within Indian limits, this, in spite of Hume's young bird being caught in Kashmir, is most unlikely ever to be found to be the case.

The description of the nest, as given by various writers, differs greatly: one says it is a scanty affair of grasses and weeds, &c., without any down in it at all—a rare thing this with ducks' nests—whilst others say that the nest, though of few materials and very roughly formed, is yet well lined with down and feathers, not only enough to form the lining itself, but sufficient to make a bed in which the eggs lie quite covered.

Its position also seems to vary very much: as a rule, it is placed close to water in a depression under cover of some sort, or else in amongst fairly dense vegetation. At other times—this it appears but rarely—in a hole in the ground, and sometimes in the open amongst stones where there is no cover. In the latter case, no doubt, it is in the bleaker parts where vegetation close to water is scant, and where also there is not much to interfere with the birds and their breeding arrangements. According to Dresser, “Not unfrequently several females deposit their eggs in the same nest; and Dr. Kruper states that in Iceland he once found twenty-two eggs in one nest. The eggs are deposited from the early part of June to the middle of July; and when the female commences to incubate, she sits very close, not leaving the nest until the intruder is close to it. I possess a nest and seven eggs of this duck, taken by Mr. Meves in Oland, on the 5th July, 1871. The nest consists only of grasses without any down as lining; and the eggs are uniform greyish stone-buff in colour, and vary in size from 2·45 by 1·67 to 2·5 by 1·77 inches.”

The only eggs I have ever seen were taken in Iceland on the 10th June, these are a dull café-au-lait, with a grey tinge. In shape they are rather broad, very regular ovals, and the texture of the egg is much like that of *Nyroca africana*, but not, I think, quite so soft or porous.

There is no gloss. Dr. Paul Leverkühn informs me that Mr. Baer, of Neisse in Silesia, found the Scaup breeding in Germany. Previously it had only been known to visit Germany in winter. Dr. Leverkühn himself obtained many specimens on the coast of the Baltic Sea.

(35.) FULIGULA FULIGULA.

*The Crested Pochard or Tufted Pochard.*

*Fuligula cristata*.—Jerdon, “Birds of India,” III, p. 815; Butler, “Str. Feath.,” IV, p. 31; *id.*, *ibid.*, p. 234; Ball, *ibid.*, VII, p. 232; Hume, *ibid.*, p. 496; *id.*, Cat., No. 971; Hume and Marshall, Game

Birds, III, p. 277 ; Hume, "Str. Feath.," VIII, p. 115 ; Vidal, *ibid.*, IX, p. 93 ; Butler, *ibid.*, p. 431 ; Reid, *ibid.*, X, p. 35 ; Davidson, *ibid.*, p. 326 ; Barnes, Birds of Bombay, p. 414 ; Hume, "Str. Feath.," XI, p. 347.

*Fulix cristata*.—Hume, "Str. Feath.," I, p. 265 ; David and Wendon, *ibid.*, VII, p. 93.

*Fuligula fuligula*.—Salvadori, Cat. British Museum, XXVII, p. 363.

*Nyroca fuligula*.—Blanford, Avifauna of India, IV, p. 463.

*Description: Adult Male*.—Whole head, neck, back, rump, tail, breast, wing coverts, under tail coverts and innermost flanks black. On the head there is a certain amount of green gloss on the sides, and the crest and nape have purple reflections ; the back, scapulars and more or less of the wing coverts have a very fine powdering of white, so fine as to often require careful looking for before being found, and never enough to have any influence on the prevailing tint ; primaries dark brown, the inner web of the first whitish at the base, fading into brown elsewhere, the white on each quill increasing in extent until in the innermost only the terminal half inch is dark. In all the quills the definition between white and brown is gradual, not abrupt, the two colours gradually blending ; outer secondaries white with black tips, inner secondaries black glossed with green. Abdomen white sharply defined from the breast but more or less mottled near the black flanks. Irides bright yellow ; bill deep slate, tipped black ; legs dull lead-colour.

"Length about 17" ; tail 2·1" to 3·0" ; wing 7·6" to 8·5" ; tarsus 1·5" ; bill straight from front to tip 1·52" to 1·75" at widest point 0·86" to 0·90" and at narrowest 0·65" to 0·70". Crest from 1·75" to 2·72".

"Males.—Length 16·6" to 17·2" ; expanse 27·5" to 30·3" ; wing 7·8" to 8·5" ; tail from vent 2·5" to 3·25" ; tarsus 1·3" to 1·4" ; bill from gape 1·35" to 2·0" ; weight 1lb. 8oz. to 2lbs. ½oz.

"In adults the bills vary from dull leaden to light greyish blue, the nail and extreme tip being black ; the irides golden-yellow ; the legs and feet vary like the bill : there is often an olivaceous tinge, especially on the tarsus, the joints have usually a dusky tinge, the webs vary from dusky to almost black, and the claws from deep brown to black. As a

rule the colours of the bill, legs and feet are rather duller and duskier in the female than in the male." (Hume).

*Adult female*.—Similar to the male but has the black replaced by brown, and the definition between the brown breast and the abdomen very much blurred and mottled. A bird given me from the Indian Museum, Calcutta, has the whole of the lower parts rufescent, and they are mottled everywhere with pale brown except on the very centre of the abdomen.

The colours of the soft parts are the same as in the male but generally duller.

"Length 15.2" to 16.75"; expanse 26.7" to 28.7"; wing 7.6" to 8.0"; tail from vent 2.6" to 3.0"; tarsus 1.2" to 1.4"; bill from gape 1.81" to 2.0"; weight 1lb. 5ozs. to 1lb. 12ozs." (Hume).

Crest about 1" to nearly 2", rarely more than 1.5".

A very fine young male in my collection is like the adult, but has the breast weakly defined, has no gloss on the head, and has a white face extending back fully half an inch from the base of the upper mandible. In this bird also the white feathers of the outer secondaries have black shafts, and have also a narrow black margin to the outer webs.

*Young in first plumage* closely resemble the adult females, but are paler brown, especially on the chin and throat, and have no metallic green gloss on the innermost secondaries; there are many white feathers at the base of the bill.

"Males in first nuptial dress have white margins to the feathers of the breast, a shorter crest, no green or purple gloss on the head; a small white spot on the chin." (Salvadori).

"Males in moulting plumage are intermediate in colour between males in first plumage and males in first nuptial plumage."

"Young in down are dark brown, shading into nearly white on the belly." (Seebohm).

Salvadori thus defines the habitat of the Tufted Pochard:—"Palearctic Region from the Atlantic to the Pacific; in the Ethiopian Region it extends as far south as Shiré, and apparently breeds in the high lakes of Abyssinia, in winter in South China, Japan and India, but not in Ceylon or Burma; accidental in the Malay Archipelago (Philippines and Borneo), and in the Polynesian Islands (Marianne Isle and Pelew Islands.)"

As regards its distribution in India Hume gives very full details. He writes: "Very rarely seen in the Himalayas, the Tufted Pochard is rather thinly distributed in the cold season in the Punjab and the Doab, is scarce in Rajpootana, more common in Rohilkhand and Oudh, and less so in the Central Provinces and Bundelkhand.

"In Sindh it is not very abundant; in Cutch more; in Kathiawar and Gujerat, in the Central India Agency, Khandesh and the Deccan fairly common.

"In Bengal, Cis-Brahmaputra, it has been noticed in many districts, but I believe it to be rather scarce there, though my information on the subject is scant. Damant records it, and some of Godwin-Austin's people procured it from Manipur; but I have no information of its occurrence east of the Brahmaputra, whether in Assam, Cachar, Sylhet, Tipperah, Chittagong or any portion of British Burmah. I do not doubt that it straggles into many of these, but the fact has yet to be ascertained.

"It occurs in places in very large flocks: in Chota Nagpur, the Northern Circars and the Nizam's dominions, straggling by the way at times into the Southern Konkan. It has been shot near Bellary, and certainly, though rare there, visits Mysore; but south of this I have heard of it nowhere in the Peninsula, except in the north of the Coimbatore district, nor has it yet been recorded from Ceylon. Here too, however, our information is very imperfect, and stragglers will probably turn up in many districts whence the species has not yet been noticed."

Then in a foot-note he says: "This species has not been recorded from Kashmir." Lately, however, in the *Asian*, in the same bag as that to which I referred in my last article as having been obtained by A. E. W. in Kashmir, two tufted ducks are recorded as having formed part of the bag. There can be little doubt that it occurs constantly but not in large number in that State. It is not common, but at the same time may be met with occasionally throughout Assam, Cachar, Sylhet and Chittagong. Mr. R. S. Routh, Superintendent of the Hill Section of the A.-B. Ry., shot two fine specimens on the 21st November, 1898, in a large tank in the station of Haflong, Cachar, and I have an immature male in my collection shot by one of my men in Cachar, as well as two young females. I have it recorded from Sylhet and

Assam also. Recently it has been recorded as having been shot in Burma, near Mandalay, and it will doubtless prove to occur sparingly throughout the northern half at least of that province.

This Pochard is one which essentially requires open water, and in preference it resorts to wide expanses of water of some considerable depth in the centre, though more or less weed and rush overgrown round the shores. Where such pieces of water are to be found the Tufted Pochard may be obtained in no inconsiderable numbers; at the same time it is unusual to find them in any but small parties, and pairs and single birds are more often to be met with than even such. Some times, however, they do consort in very large numbers, *vide* Hume, who says single birds or small parties may be found on almost any broad in which the water is tolerably deep in some places, but the huge flocks in which they love to congregate are only met with on large lakes, such as I have above referred to.

At the Manchar Lake I saw two enormous flocks. I have repeatedly seen similar flocks in old times at the Najjafgarh and other vast jhils in the Punjab, the North-West Provinces and Oudh, and I should guess that at the Kunkrowli Lake, in Oodeypore, there must have been nearly ten thousand, covering the whole centre of the lake.

Such flocks as these are, however, only to be met with in the provinces mentioned; here, in the Eastern Provinces, a flock of forty is very large, and about all we may expect to meet with.

Just as expert as are the rest of Pochards on or in the water, it excels the majority of these—perhaps not *N. baeri*—in getting away from it. It is said to rise with less fluster, noise and splashing than is caused by the rising of other Pochards, and also to get off the water more quickly and to get more quickly into its stride, if I may use such an expression. On land, however, feeble as are other Pochards, this, according to Finn, is worse still. He says in the *Asian*: “On land it moves more awkwardly than any other Pochard I know, hobbling as if lame in both feet.”

However abundant it may be, the Tufted Pochard does not, as a rule, form a very large proportion of the bag in a day's shoot. This is due to the difficulty, first in approaching the birds—for they are decidedly wild and shy—and secondly in getting a shot when once one has got within reach. If the bird does not escape at once by

diving, swimming, or flight, it is sure to dive before, at any rate, the sportsman has time to get a shot, and once it has seen him and had its first dive it is very problematical as to whether he will ever get a shot again. It is worth remembering, should one come across a flock in any large piece of water, Hume's maxim that Tufted Pochards will not leave the water they are on until after dark. He gives one of his usual graphic descriptions of a shoot in which Tufted Pochards played the principal part, and describes how, after a fusillade from ten guns, no more than 5 (!) birds were collected out of a huge flock of ducks diving about all round them.

Knowing their habits, however, he waited until he and his fellow-sportsmen were going over the same beat the next day and then, extending in a long line, they worked backwards and forwards, and this time the birds rising in front were, each beat, gradually forced to the end of the water. After arriving at this they had to fly back overhead, and in this way they were accounted for to the tune of over sixty birds. They are not to be often found on open tanks whose shores are free of jungle, nor on rivers; but I have once or twice seen pairs on the Megna, and at other times have met them on tanks absolutely free of all vegetation. The pair shot by Mr. Routh in Haf-long were on an artificial tank with no vestige of water-plant about it, as it had not then been a year in existence. Their cry is said to be the typical harsh grating "kir" or "kurr" of the Pochard family, but it is a silent bird on the whole and seldom indulges in voicifications of any sort.

Its food is almost entirely animal, much the same in fact as that of the Scaup, but it is far more a fresh-water bird and far less a sea bird, than is that duck, though common enough on the coast line, along the greater portion of its habitat. It is, of course, a poor article of food, though even here again tastes differ and some people say that it is not bad. Hume, who was particular about his table ducks, said that he had found some "good enough," and that some sportsmen had told him that they are *excellent*!

They feed principally during the day-time, but migrate and move from one place to another after sunset. They do not ever appear to have been found feeding on land, but should they ever do so, the probability is that they only thus feed during the night.

The Tufted Duck breeds, as far as we know, throughout the northern portion of its range and in some parts very far south. Thus it is known with comparative certainty to breed in some of the upland Lakes of Abyssinia, in Southern Europe in many countries, and in Central Asia. The nest is typically rather a slight affair made more of grass and bents and less of weeds, rushes and water plants than are most ducks' nests. The lining, which is generally very plentiful, is said by Dresser to be of "sooty brownish-black down, having dull greyish-white centres." The nest may be placed either close to water or actually at the edge, never, as far as I can learn from anything recorded, actually in the water itself. The water may be either fresh or salt, an inland lake, far from the shore, or an estuary or creek of the sea itself. As a rule the nest is placed amongst either grass or bushes, but sometimes quite out in the open, amongst stones, etc. This sort of situation is not, however, it would seem, as often selected by the Tufted Duck as it is by the Scaup, nor can I find any mention of its placing its nest in holes as does the latter bird.

Dr. Leverkhün sends me an interesting note on the breeding of this duck. He says, *in epistola*, "*Fuligula fuligula* is a very common bird on the great lakes of Hungaria, Slavonia, Germany and Bulgaria, and I have taken many of its nests during the month of May. The duck when frightened and leaving the nest covers the eggs with all the contents—which there may be at the moment—of her intestinal tractus; for the Oologist it is hard work to clean them afterwards.

"One nest I found was covered in, in a very beautiful manner, by the tips of the grass surrounding the nesting place; one would have said that this particular duck had known the art of sewing, so finely had she joined the grass helms together, probably with her bill."

The eggs only vary from six to ten in number, less therefore than many other ducks' clutches. Dresser says that the eggs are uniform pale olive, green or greenish-buff in colour, smooth and polished in texture of shell, and in size average about 2.3 by 1.65 inch. Wolley's egg figured by Hewitson is of exactly the same size.

Morris figures the egg as exactly like that of the Scaup but longer and proportionately narrower. In colour it is rather a bright pale buff.

As regards their breeding he says: "These birds breed along the stony shores of the sides of inland waters, among the cover

of vegetation, more or less thick, with which they are usually bordered.

“The receptacle for the eggs,—for it can hardly be called a nest,—is composed of stalks and grasses.

“The eggs vary in number from eight to ten. They are of a pale buff colour, with a tinge of green.

“The male bird leaves the female after she has begun to sit.”

Finn’s remark on the cross breeding of this bird is worth noting and remembering by sportsmen who get hold of birds beyond their power to discriminate.

“It breeds more freely in captivity than do Pochards in general, and in the London Zoological Gardens crossed in 1849 with the White-eye, the resulting hybrids continuing to breed either *inter se* or with the original parents for more than ten years—a fact to be remembered in dealing with doubtful Pochards, which should therefore, whenever possible, be submitted to some authority for identification.”

#### Genus CLANGULA.

The genus *Clangula* is a very small one, containing only three species of birds which range throughout the Northern Hemisphere. Of these three only one, *Clangula glaucion*, reaches India, and even this only occurs with extreme rarity. The most noticeable thing in this genus and one which at once separates it from all its closest allies is the position of the nostrils, which are rather nearer the tip than the base of the bill, the position being well shewn in the wood-cut in Blanford’s IVth Vol. of Birds. In many respects in its anatomy it closely approaches the Mergansers, and is a sort of link between them and the more typical ducks.

#### (36.) CLANGULA GLAUCION.

##### *The Golden-eye.*

*Clangula glaucion*, Hume, “Str. Feath.,” IV, p. 225 ; *id.*, *ibid.*, VII, pp. 441, 464 and 505 ; *id.*, Cat., No. 961 *bis* ; Hume and Marshall, Game Birds, III, p. 185 ; Reid, “Str. Feath.,” X, p. 85 ; Stoker, *ibid.*, p. 424 ; Barnes, “Birds of Bombay,” p. 413 ; Salvadori, Cat. Birds of British Museum, XXVII, p. 376 ; Blanford, “Avifauna of B. India,” IV, p. 464.

*Description: Adult Male.*—“Head and upper neck dark glossy green, the feathers on the crown and nape somewhat elongated ; chin

and throat black ; roundish white patch on the cheeks near the base of the upper mandible ; lower neck, breast, and underparts white ; on the sides of the vent the feathers have the bases slatey-grey, shewing through ; feathers of the flanks edged above with black, the longer ones on both webs ; back, rump, and upper tail coverts black ; inner scapulars black, the outer ones white, longer scapulars with a white band along the middle ; wings black, with a large white patch covering the central wing coverts and the outer secondaries ; the inner secondaries black ; under wing coverts greyish-black ; tail blackish-grey, bill bluish-black ; irides golden-yellow ; feet orange-yellow, the webs dusky. Total length about 18 inches, wing 8·9, tail 4, culmen 1·4, tarsus 1·45". (Salvadori).

"Bill black in the male. . . . The eyes are yellow and the feet yellow with black webs." (F. Finn.)

"The irides are bright yellow in the females and young males, reddish or orange-yellow in old males, white or very pale yellow in the quite young birds. The naked edges of the eyelids reddish-dusky ; the legs and feet vary from pale yellow in the young to intense orange in the old ; the colour is always bright and pure ; the webs (including that of the hind toe), nails, and a spot on each of the toe joints, black or dusky ; the bill of the old male is bluish or greenish-black, rather duskier and duller coloured in the old females and young, and occasionally in these latter, often in the former, and very rarely in the old males, with a larger or smaller yellowish-red or orange spot or bar near the tip of the upper mandible, which in some forms a terminal band at the tips of *both* mandibles, never, however, including the nail, which always remains black or dusky." (Hume).

*Female*.—"Head and upper neck hair-brown ; a dull white collar round the lower neck ; upper parts blackish ; mantle, scapulars and upper wing coverts with pale greyish edges ; breast greyish with the edges of the feathers whitish, lower parts white ; sides and flanks dull grey ; the feathers edged with white ; median wing coverts brown tipped with whitish, the greater ones white tipped with brown ; outer secondaries white ; the white on the wing is defined by the brown band at the tip of the greater coverts ; quills dusky brown ; tail dull greyish ; bill brownish-black, in some specimens the tip, except the nail, is yellow ; irides and legs and toes as in the male. Total length 17 inches ; wing 7·7 ; culmen 1·35." (Salvadori).

“The bill is blackish in the female and young, sometimes with a yellow patch at the tip.” (F. Finn).

“*Females*: Length 15·7 to 16·5; expanse 26·3 to 28; wing 7·5 to 8·25; tail from vent 3·0 to 3·4; tarsus 1·22 to 1·35; bill from gape 1·12 to 1·19; weight 1lb. 7oz. to 1lb. 14oz.” (Hume).

“Young in first plumage resemble adult females, but are duller in colour; the pale collar round the neck is much more obscure, the grey feathers on the breast have white margins.”

“*Males in first nuptial dress* have less white on the scapulars, the white on the hind lower neck is mottled with brown, as is also the white spot at the base of the bill.”

“*Males in moulting plumage* resemble adult females, except that they retain the white wing of the adult male.”

“*Young in down* are dark brown on the upper parts, and paler brown on the breast and flanks, shading into white on the throat and into pale grey on the belly.” (Salvadori).

This is a northern form of duck breeding in Northern Europe and Asia and in America from Maine and Canada northwards. In winter it migrates to Southern Europe and, rarely only, into extreme North Africa. In Asia it occurs as far south as Persia, China and Japan and, as a straggler, enters Northern India and Southern China. In America it wanders as far south as Mexico and Cuba.

The occurrence of the Golden-eye in India is only, as I have already said, as a straggler and a very rare one too, all the notes as to its occurrence in “Game Birds,” are that Sir A. Barnes got it on the Indus in Sindh nearly 60 years ago, and that Dr. Bonavia obtained a fine male about 1870, which was captured by fowlers near Lucknow.

After “Game Birds” was written, Hume evidently got other specimens, for in the British Museum are two specimens got by R. N. Stoker, which were presented by Hume with the rest of his collection. These two birds were obtained one at Hassanpur and one at Ghazi, both in the month of December. There is so little on record about this duck in India, and “Stray Feathers” is now so hard to get, that I reproduce the greater part of Stoker’s notes on his specimens.

“I have now to record shooting near Ghazi on the Indus a female Golden-eye (*Changula glaucion*). I saw one drake and four ducks, but unfortunately only succeeded in getting one of the latter.

"This measured : length 15·75 ; expanse 26·5 ; tail 3·66 ; bill from gape 1·66 ; weight 1lb. 5oz."

"The irides were a bright pale yellow ; the feet bright yellowish-orange, with dark blackish webs ; bill black at base and tip with a medial yellow band about 0·25 in width."

In the same letter, in a P. S., he continues :—

"Since this was written I have shot another Golden-eye, a bird of the year . . . A third bird, precisely like this second, was shot by an officer here, but hitherto the drake has resisted all our attempts to assassinate him."

"I showed the first bird to a very intelligent native at Ghazi and he assured me that they appeared there every year regularly, and that three years ago he shot one. I am certain that I shot a duck of this species some three years ago. It puzzled me at the time, but now I have no doubt what it was."

Then in a second letter Mr. Stoker again writes:—"Since I last wrote, I have succeeded in obtaining a fine drake Golden-eye, which I am sending you.

"There were four of them together in a little stream opposite the village of Hassanpur.

"The natives call them 'Burgee,' the 'bur' pronounced as in burrow. Burgee, I believe, only means patches of black and white.

"Mr. Barlow informs me that these ducks come to Ghazi every winter.

"This drake measured—wing 9·0. . . .

"We all said what a heavy bird, but it only weighed 1lb. 10oz., which is 6 oz. less than the lightest weight given by you for an adult male.

" . . . . . The stomach contained fish, weeds and sand."

"With this drake was procured a female, similar to those formerly sent. It was only wounded and was put in a cage and unfortunately was allowed to escape.

"We may now set down the Garrot or Golden-eye as a regular winter visitant to the Punjab portion, at any rate, of the Indus, and as Barnes procured it near the mouth of the Indus, it most probably occurs throughout the length of that river. But can it be confined to the Indus? Surely, if properly looked for, it will be discovered in the

Chenab and other Punjaub rivers. Is it purely a river duck with us? Or will it also occur in jheels? Other sportsmen in the Punjaub must help us to settle these questions."

"P.S.—My last Golden-eye is a young female, weight 1lb. 3oz. . . . It was seen with a *number* of others on a little pool. There were no other ducks about."

Thus Stoker seems to have got no less than five specimens, and a sixth was got by an officer whom he does not name. Barnes got one other and these are all we have recorded, none having been since met with, so that it looks as if Stoker's queries as to its regular appearance must be answered in the negative. In its actions and habits the Golden-eye seems to be very much like the Pochards. Like them, it is a wonderful bird on the water as well as in it, and what I have said of the Tufted Pochard and its predeliction for diving and swimming and, if possible, escaping by these means rather than by flight, would equally well apply to this bird. Like the Pochard, too, it is slow off the water and rises at an oblique angle with great splashing and commotion. Macgillivray says that it is capable of rising off the water at one spring with the help of a breeze, *i. e.*, probably with a strong head wind which getting under it would lift the bird at once.

Unlike the Pochards, however, it is credited with being fairly active on land, and the author just quoted says that they sometimes repose on spits of land.

As are the Pochards, so is this bird found alike on salt and fresh waters, but there is no doubt that it prefers fresh water to salt. It would seem that open waters are preferred to small enclosed pieces, and deep, clear water to shallow vegetation covered pools and swamps. This, of course, we should expect to be the case with a diving duck whose food consists, as the Golden-eye's does, almost entirely of animal matter procured by diving. It is said to feed on "testaceous mollusca, crustacea and fishes," also on water insects and grubs and, but not often, also on vegetable food, principally deep water weed-roots and similar articles.

Its flight is swift and strong, and Macgillivray says: "They fly with rapidity in a direct manner; their small, stiff, sharp-pointed wings producing a whistling sound, which in calm weather may be heard a considerable distance. . . ."

“The cry of this bird is a mere grunting croak and is never heard to any considerable distance; the epithet *Clangula* given to it by the earlier ornithologists had reference not to its voice but to the whistling of its wings.”

The number of the flocks seems to vary greatly; here in India no large ones are likely to be seen, but it will be noted that, even on the Indus, Stoker met with small flocks, not pairs and single birds, and where common it is said sometimes to assemble in flocks of some hundreds.

Normally the Golden-eye breeds in hollows in trees or, less often, in holes in the ground, in banks or rocks, but sometimes it makes a nest on the ground in the same manner as most other ducks. In the latter case the nest is usually rather scanty and ill-formed but with a thick lining. Dresser's remarks are the best I can find *re* the breeding of the Golden-eye and, though already quoted by Hume, I again reproduce part of them.

“In the north of Finland, in Sweden and in Norway, it nests in hollow trees, either near to or at some distance from the water, and very frequently in the nest-boxes which the peasants hang up for water-fowls to breed in. These are frequently hung up close to the peasants' huts; and even then the Golden-eye will nest in them. The bottom of the hollow tree or nest-box is neatly lined by the old bird with down; and on this soft bed the eggs, which vary in number from ten or twelve to seventeen or even nineteen, are deposited. When hatched the young birds are carried by the female in her beak down to the ground or to the water, one after another being taken down until the whole brood is taken in safety from the elevated breeding place, and I have been assured by the peasants that this always takes place in the dead of the night. The eggs of this duck are dull greyish-green, uniform in tinge and rather glossy in texture of shell, oval in shape, and in size average about 2·4 by 1·55 inch; and the down with which the nest is lined is sooty greyish-white, the tips of the down being rather darker than the central portion.”

It would seem that in the majority of cases the Golden-eye selects sites by fresh water for breeding purposes, but they also sometimes breed on or near the coast.

The British Museum eggs vary in length from 2·1" to 2·4" and in breadth between 1·55" and 1·75". Oates says that in colour they are a greyish-green of different shades.

I have two clutches of eggs of this duck in my collection, both of which I owe to the generosity of Herr Kuschel of Breslau. The first clutch, which are marked "Sarepta Sud Russland, 4th May, 1889," are the greenest ducks' eggs I have ever seen, quite a vivid stone-green, though the three vary a little, *inter se*, in brightness of tint and intensity of colour. The surface is very fine and close with an extremely smooth surface having a strong gloss. The shape of two of these eggs are very regular broad ovals, of the third a narrower oval with one end decidedly compressed and smaller than the other but not at all pointed.

These three eggs measure  $2.21'' \times 1.6''$ ;  $2.20'' \times 1.72''$  and  $2.12'' \times 1.62''$ .

The other three eggs are similar but less intensely green.

Morris says:—"The Golden-eye builds in the vicinity of lakes and rivers, giving a preference to the latter, particularly such as flow over falls and rapids. The Laplanders place boxes with holes in them in the trees in these localities, for the birds to build in, and thus procure the eggs, for the cotes are rare to be resorted to for the purpose of laying in.

"The nest is made of rushes and other herbage, lined with down. Mr. Hewitson found one in a hole in a tree, ten or twelve feet from the ground.

"The eggs are of a greenish hue and from ten to fourteen in number."

The egg depicted by Morris, however, is of a greenish stone-colour, the green tint by no means very prominent. It is also more pointed at the smaller end than in any egg I have ever seen.

#### Subfamily ERISMATURINÆ.

The one great distinctive feature of this subfamily is the remarkable tail, of which the 18 feathers are stiff and hard, very much as are the feathers of a Woodpecker's tail.

The subfamily contains four genera, *Thalassiomis* confined to South Africa, *Nomonyx* to Tropical America, *Biziura* which is only found in Australia, and finally *Erismatura* which is almost cosmopolitan.

The first three genera consist of but one species each, but *Erismatura*, the only genus in which we are interested, has no less than seven, one of which, *E. leucocephala*, extends into India.

This bird has, in addition to the remarkable tail, another feature almost equally remarkable, *viz.*, the swollen base to the bill which extends forward as far as the nostrils. The nail is also very small and is bent inwards; the wing very small, and the feet very large and powerful with the lobe to the hind toe very fully developed.

## (37.) ERISMATURA LEUCOCEPHALA.

*The White-headed or Stiff-tailed Duck.*

*Erismatura leucocephala.*—Hume and Marshall, Game Birds, III, p. 289; Hume, "Str. Feath.," VIII, p. 456; IX, p. 290; X, p. 158; Salvadori, Cat. "Birds of British Museum," XXVII, p. 442; F. Finn, P. A. S. B., 1896, p. 62; Sherwood, Journal, Bom. N. H. Soc., XI, p. 150; Blanford, "Avifauna of British India," IV, p. 466; Oates, "Game Birds," II, p. 374.

*Description: Adult Male.*—"Crown black; forehead, sides of the head including the space above the eye, chin and nape pure white; below this white the neck all round is black; lower neck and breast chestnut-red, with narrow blackish bars; back, scapulars, sides and flanks reddish-chestnut, more or less buffish and finely and irregularly vermiculated with blackish; upper tail coverts deep chestnut; under parts, below the breast, reddish-buffy-white; wings brown-grey, the wing coverts and secondaries finely vermiculated with buffy-white; under wing coverts grey, the central ones whitish; axillaries white; tail blackish; bill blue; iris dark brown; feet ashy brown, with the webs black. Total length about 18·5 inches; wings 6·5; tail 4·5; culmen 1·9; tarsus 1·3." (Salvadori.)

"Length about 18"; tail 3·5" (3" to 4·5"); wings 6·3"; tarsus 1"; bill from gape 19". (Blanford.)

*Females and young males* "have only the chin, lower cheeks, and a stripe from above the gape, running back from under the eye towards the nape, white, rest of the head black mixed with rufous; the upper tail coverts are like the rest of the upper parts, and the breast is dull rufous without black bars; otherwise the plumage resembles that of adult males. Some specimens are much more rufous than others." (Blanford.)

"Bill dull plumbeous; iris dark brown; legs plumbeous black." (Salvadori.)

*Young male.*—"Very similar in plumage to the old female, only somewhat more ruddy on the back." (Salvadori.)

*Young in down.*—"Brown-grey; upper part of the head and cheeks dark brown; a streak below the eye, from the base of the bill to the nape, throat and sides of the upper part of the neck dull greyish-white undulated with dusky; a whitish spot on each side of the rump, just below the wings; edge of the wing and under wing coverts whitish." (Salvadori.)

The White-headed Duck inhabits the countries surrounding the Mediterranean and extends thence into Western Central Asia and, according to Finsch, as far North as Southern Siberia and also, as a straggler only, into Germany and Holland, being over the greater portion of its range either resident or only locally migratory.

In India it is undoubtedly a very rare duck. When Hume and Marshall published the Game Birds of India, the only record of the Stiff-tailed Duck was the following:—"On the 20th October, 1879, Col. O. B. St. John, R. E., at that time Governor, I think, of Kandahar, shot a couple of ducks, of a type quite unknown to him, in the Jumeh river near Khelat-i-Ghilzai."

"These Ducks proved to be an immature pair of the White-headed Duck." Since this was written, however, there have been further rather numerous records of this duck. In *Stray Feathers* (in loc. cit.) are the following:—

Mr. Field writes of a bird sent to Mr. Hume, "I shot this bird on the 28th of October at the 'old nullah' about a mile from the Civil Station of Ludhiana, Punjab. It was sitting alone in a pool. I stalked up close behind some reeds and then shewed myself, expecting to see it fly. All it did was to cock its little stiff, thin-pointed tail, and swim off in a quiet way for some ten yards. Its appearance, whilst swimming with its tail up-turned, was most peculiar. I tried to frighten it into flying, but it would not rise, so I shot it while swimming."

Mr. Hume thought records of this bird would soon come to hand after this was written, and with reason for "Within a few months of this prediction, Mr. F. Field shot an immature bird of this species close to the Civil Station of Ludhiana. This was on the 28th of October,

1880." (The bird already recorded.) "On the 21st of January, 1882, Mr. Chill obtained an immature male of this species near the Najafgārh jheel (approximately Lat. 29° N. Long. 77° E.) and now, again, another near the same locality on the 28th October of the same year."

"Since this was written Mr. Lean of the 5th Bengal Cavalry informs me that he has just shot a duck of this species in the Philibheet district."

Again in the same Vol. of Stray Feathers appears a note by Mr. Chill, dated 8th February, 1883: "On the 27th of December last, I sent you in a tin box an *Erismatura leucocephala*. Since that I have managed to purchase two more of that species—one a cat took away—and the other I have got stuffed." These were apparently got near Faruknagar near Delhi.

About this time, February, 1883, Mr. Bomford also got a specimen on the Indus at Multan Keengurh.

From this time none are recorded until Lieut. Burke shot one at Halkote in February, 1891.

The next recorded specimen was not met with until almost exactly two years later, then in the Proceedings of the Asiatic Society of Bengal occurs the following note by Mr. Finn:—

"(*Erismatura leucocephala*). The present individual was sent to the Editor of the *Asian* newspaper by Capt. H. R. Davis, who stated (*Asian*, February 14th, 1896) that it was shot by Capt. E. D. White, 52nd Light Infantry, at Bettiah, near Hardoi, between Lucknow and Bareilly. It is in heavy moult, and quite incapable of flight, which considering the time of its occurrence is rather surprising, and almost looks as if the species might be somewhere resident within our limits."

It is mentioned in the list of birds in Mr. W. R. Laurence's recently published work on the "Valley of Kashmir," as having occurred in that country.

Yet again in 1896, but on December the 27th, Major J. C. P. Onslow, R. E., shot two, and Mr. H. B. Campbell one, of these ducks, in the Ganges Kadir, about 20 miles south of Kadir.

Next in the *Asian* of the 8th February, 1898, A. E. W. records having shot three stiff-tailed Ducks in Kashmir, in amongst a vast number of other birds shot at the same time.

Finally Finn, again in the columns of the *Asian*, says that twice to his knowledge this duck has been obtained in the Calcutta bazaar.

There is also a specimen in the British Museum obtained by General Kinlock in Peshawar. This, to the best of my belief, exhausts the list of the Stiff-tailed Duck's appearances within our limits.

Of the birds whose age is recorded only two would appear to have been adult birds, the male got at Peshawar and the female in Ludhiana.

It will be noted, also, that all the birds were obtained between the 20th October and the 8th February, and that whilst the bird shot at Hardoi in January was in heavy moult, none of the others, in so far as we know, appeared to have been moulting at all. Therefore, it is very doubtful whether this particular specimen had not been indulging in an abnormal moult. I do not consider it of any weight in reference to the bird being a resident or otherwise, all that we know at present pointing strongly to the fact that it is *not* resident. There is, however, no reason why this duck should not breed in Kashmir, which is quite far enough north, and it is to be hoped that any one working the water-breeding birds of that State will bear this in mind.

As regards its habits, we have very little on record as far as India is concerned. Finn notes: "In habits the Stiff-tail resembles a grebe rather than a duck. It is more ready to dive than to fly, swims low with its tail raised, and is said to be unable to walk, but this I doubt though I have only had a cripple to study. This bird resembled a grebe in its remarkable tameness."

Captain Sherwood writes in this Journal; "The bird was very little longer, if any, than a common teal, but much bigger and presented a stumpy appearance, very ugly and ungainly. The wings were hardly more than six inches in length. The birds were shot in deep water in a nullah which they refused to leave after being put up, and after a short swift flight they settled again."

These two brief notes agree well with what has been written on the bird as it shews itself in Europe. From this it would appear that whilst the bird is a wonderful swimmer and diver, it is almost helpless on land, and, though of very quick flight, is very loathe to take to wing, not rising until absolutely forced to do so, and then only flying for a

very short distance, after which it resettles and is then harder than ever to again get off the water.

It has, according to Maumann, the power of swimming in the water with only head and neck projecting, in the same manner as birds of the genus *Plotus* and the Cormorants do.

Most authors agree that it swims with its tail upright as observed by Finn, Chill, Field, and others in India, but Chapman and Buck in their "Wild Spain" give quite a different description:—

"The most extraordinary wild fowl we ever met with,—gambolling and splashing about on the water, chasing each other, now above now beneath its surface like a school of porpoises; they appeared half birds half water tortoises.....Presently the strangers entered a small reed-margined bight, swimming very deep, only their turtle-shaped backs and heavy heads in sight.....with small wing like a grebe, and long, stiff tails like a cormorant—the latter being carried under water as a rudder, is not visible when the bird is swimming."

It is a fresh water species, and, as far as I can ascertain, does not haunt coasts and salt water.

It breeds also inland on lakes and marshes and also on small ponds, placing its nest in amongst dense herbage at the edges and always well concealed. It is a typical Duck's nest, containing perhaps more wet weeds as rotten material in the base than do other ducks' but like them well lined with down which, in this case, is said to be pure white.

The eggs vary from six to ten, are a chalky white in colour, often much discoloured and stained, very large for the size of the bird and remarkable for their very rough surface, so rough indeed, is it that this egg is chosen to represent those having rough surfaces in the National collection of typical eggs.

A few eggs are said to have a very faint green tinge.

The length varies between 2·6" and 2·8" and the breadth between 1·95" and 2·05." Most eggs are almost perfect ellipses, a few having one end rather smaller than the other.

(To be continued.)

## THE FERNS OF NORTH-WESTERN INDIA.

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*Corrections in third instalment, published in Vol. XII.*

*On p. 621, line 7—for “Part III,” read “Part II concluded.”*

*In 14th line of p. 621, after “pair,” insert “of segments.”*

*On p. 622, 3rd line—for “chestnut, coloured,” read “chestnut-coloured.”*

*On p. 622, 5th line—for “elliptic, oblong,” read “elliptic-oblong.”*

*On p. 622, 8th line, for “ $\mu$ ” read “n.”*

*On p. 622, 12th line, insert a space between “55” and “Plate X”—Plate X is mine in this paper, not Beddome’s.*

*On p. 622, in last line of small print, “Hopeh” should ( I think ) be “Hupeh.”*

*On p. 622, 17th line from bottom, after “average,” insert “frond.”*

*On p. 623, in 2nd line from top, the letter “o” has dropped from the word “Beddome.”*

*On p. 624, in 6th line, at beginning of the parenthesis, insert—“A. Braun sub *Aspidium*.”*

*On p. 625, 13th line from bottom, insert “(*N. nemorale*)” after “species.”*

*On p. 627, 9th line, the semicolon after “speak” should be a “comma.”*

*On p. 628, in 10th line from bottom, “Subgems” should be “Subgenus.”*

*On p. 630, in 9th line from bottom, delete the comma after “species.”*

C. W. HOPE.



## THE FERNS OF NORTH-WESTERN INDIA,

Including AFGHANISTAN, the TRANS-INDUS PROTECTED STATES, and KASHMIR: arranged and named on the basis of Hooker and Baker's *Synopsis Filicum*, and other works, with New Species added.

By C. W. HOPE.

(Continued from Vol. XII, page 633.)

## PART III.—THE GENERAL LIST.

## Ord. FILICES.

Sub-Ord. I. GLEICHENIACEÆ, *Br.*

Genus 1. GLEICHENIA, *Sm.*

Sub-genus MERTENSIA.

1. *G. dichotoma*, Willd. ; Syn. Fil. 15. *G. linearis*, C. B. Clarke in C. R. 428. *G. linearis*, Burm., under *Polypodium*, Bedd. H. B. 4.

N.-W. P. : Kumaun—35-6000', S. and W. ; Davidson ; Askot, common 4-5000' Duthie ; 6000' Trotter ; 7500' MacLeod.

DISTRIB.—*Asia* : N. Ind. (Him.)—Nepal, Sikkim, and Bhotan 4-7000'. Assam—Dehing R. ; Khasi Hills 5000', "common." *C. B. Clarke* ; Sylhet. Centr. Prov.—Pachmarhi, *Duthie*. Centr. Ind., S. Ind. and Ceylon : mountains up to 6000'. Burma : Tenasserim, S. Andamans. Malay Penins. and Sumatra. E. Timor, *H. O. Forbes*, "an erect fern."

Scandent over other jungle, sometimes for several hundred feet, often rooting (*Clarke*). Probably the fern said to form, in Kumaun, jungle difficult to penetrate ; but see above as to the habit of the plant in Timor.

Sub-Ord. II. HYMENOPHYLLACEÆ.

Genus 2. HYMENOPHYLLUM, *L.*

1. *H. exsertum*, Wall. ; Syn. Fil. 58 ; C. R. 436 ; Bedd. H. B. 30.

N.-W. P. : *T. Garh.*—7-8000', P. W. Mackinnon ; *Brit. Garh.* 9000', Duthie ; Kumaun 6-8000', S. and W., Hope, Duthie, J. R. Reid, Trotter.

DISTRIB.—*Asia* : N. Ind. (Him.)—Nepal, Sikkim, and Bhotan. 4-9000', very common eastward. Assam—Khasi Hills 2-5500', common ; Manipur, *Clarke*, *Watt*. Centr. Provs., very common (Bedd.). S. Ind. : W. Ghâts, Madras Presidency. Burma : Tenasserim. Ceylon. China : Yunnan.

2. *H. polyanthos*, Sw. ; Syn. Fil. 60 ; C. R. 437 ; Bedd. H. B. 31.

N.-W. P. : Kumaun—Dwáli and Námik 8-9000', S. and W. ; Pindar Gorge 7-9000', Trotter.

DISTRIB.—"Widely diffused throughout the Tropics, and a little beyond them, both north and south" *Amer.* : from Cuba and Jamaica southward to Brazil, S. Chili, and Juan Fernandez. *Asia* : N. Ind. (Him.)—Sikkim and Bhotan 1000-12,000', abundant eastward. Assam—2-6000', "very common," *Clarke* ; Kohima 9000', *Clarke*. S. Ind. :

W. Ghats of Madras Presidency. Burma. Ceylon. Malay Penins. Java. N.-Zealand. Afr.: W. Trop.; Masc. Isles.

Genus 3. **TRICHOMANES**, *Smith*.

1. **T. Filicula**, Bory; Syn. Fil. 81. *T. bipunctatum*, Poir., C. R. 440; Bedd. H. B. 41.

PUNJAB: *Simla Reg.*—55-6000', Edgew., Hope, Gamble, Blanf., Trotter. N.-W. P.: *D. D. Dist.*—Mussooree 55-6000', frequent, Duthie, Mackinnons, Hope *Kumaun*.

DISTRIB.—*Asia*: N. Ind. (Him.)—Nepál, Sikkim, Bhotán 5000' and upwards: common eastward. Assam—Khasi Hills 2-5000' and upwards, common; Manipur, *Watt*. S. Ind.—All the W. forests of Madras and Bombay Presidencies up to 8000'. Burma. Nicobar Isles. Ceylon. Malay Penins. Tonkin. Java. Borneo. Formosa. Japan. China. Polynesia. *Afr.*: Fernando Po, Natal, Cape Colony, and Masc. Isles.

This fern, in N.-W. India at least, is often slightly white-powdered, when dried, and generally highly aromatic, the scent being like that of some umbelliferous plant. My specimens, collected at Simla in 1871, are still fragrant. It grows in sheets or sods on rocks and tree trunks, just as *Hymenophyllum Tunbridgense* does in Europe, the creeping rhizomes and the roots being matted together. Specimens collected by Mr. G. Mann in the Khasi Hills of Assam, at 5000', are large and stiff, up to 5 inches long.

2. **T. pyxidiferum**, L.; Syn. Fil. 81; C. R. 140; Bedd. H. B. 42.

N.-W. P.: *T. Garh.*—Bok. Mt. 9-10000', Duthie; *Kumaun*—Pindar 8000'; Strachey 1856, in Herb. Hort. Calcutta.

DISTRIB.—*Amer.*: From Mexico and W. Ind. southward to Brazil and Peru. *Asia*: N. Ind. (Him.)—Sikkim. Assam—Khasi Hills and Cachar. E. Bengal—Chittagong 0-1500', common. S. Ind. Forests (*Bedd.*). Burma. Nicobar Isles. Malay Penins. (6 in. l.) Borneo. New Caledonia. *Afr.*: Angola, Cape Colony, and Masc. Isles.

Mr. Clarke says there is no Himalayan example of this at Kew, except a scrap from Levinge, said to be from Dárjiling. I possess a specimen collected and given to me by Levinge in 1871. There is a specimen, from the Victoria Falls, Dárjiling, 6500', collected by Levinge, and presented by me, I think, in the Saharanpur Herbarium; and in Mr. Gamble's herbarium I find a sheet from the Tista Valley, Dárjiling district, 1000', No. 5052, collected by him in Sept. 1873; another sheet, collected by him Dárjiling 7500., No. 7216, Oct. 1879; and a third, No. 8054, Dárjiling, May 1880. There is, therefore, no doubt that this species is found in the Himalaya, and that it extends to the westward of the Ganges, for the plant got by Mr. Duthie in Tehri Garhwál has the distinctive broadly winged or bell-mouthed tube enclosing the fruit. Some specimens from Eastern India are much larger and stiffer than those just mentioned.

## Sub-Ord. III. POLYPODIACEÆ.

Genus 4. **ONOCLEA**, L., Sw., Mett., Hook.

## Sub-genus—STRUTHIOPTERIS, W.

1. **O. orientalis**, Hook. ; Syn. Fil. 46 ; C. R. 434. *Struthopteris orientalis*, Bedd. H. B. 20.

N.-W. P. : *D. D. Dist.*—Jaunsar—Lokandi Hill, 8-8500', Duthie 30-4-1894, Gamble 6-1894.

DISTRIB.—*Asia*. : N. Ind. (Him.)—Sikkim, Lachen 12,000' *Hook fil.*; 9000' *Elwes* ; *Levinge*, 12,000'. Assam—*Simons* ; Khasia—*Jerdon*, *Mann*. W. China. Japan—Hakodadi.

This is new to N.-W. India : the station was discovered first by Mr. Duthie, who informed me at the time. I have a specimen from Mr. Gamble, collected by him in the same locality, later.

Genus 5. **WOODSIA**, Br.

## Sub-genus—EUWOODSIA.

1. **W. hyperborea**, R. Br. ; Syn. Fil. 46 ; C. R. 434 ; Bedd. H. B. 20.

AFGHAN. : *Kuram Valley*—Shendtoi Hills 10,500', *Aitch.*, No. 983, 9-7-1879.

KASHMIR : *Sind Valley*—75-8000', *Levinge*, once collected ; *Masjid Valley* : 12-13,000' ; *Tajwas Nala*, near Sonamarg 9-10,000' ; *Liddar Valley*, Sonsal Nála 13-14,000' ; *Liddar Valley*, above Kainmal, 12,000', Duthie 1893.

PUNJAB : *Kullu*—near summit of Rotang Pass, *Edgew.* 171, in *Herb. Hort. Kew* named *W. Ilvensis*, R. Br., on same sheet with Scotch and Norwegian specimens.

N.-W. P. : *British Garh.*—near Kuári Pass, 11-12,000', Duthie 1885 ; *Kumaun*—Kutti Valley 12-13,000', Kutti Yangti Valley 14,000', Duthie 1886.

NEPAL W. : *Nampa Gádh*, 12-14,000', Duthie 1886.

DISTRIB.—*N. Amer.* : Canada, in high northern latitudes, to the Saskatchewan River : not in the U. S. A. *Europe* : Norway, Sweden, Russia, frequent ; Brit. Isles—N. Wales, Scotland, rare ; French and Swiss Alps ; Tyrol ; Spain—Pyrenees ; Corsica and Sardinia ; Carinthia ; Silesia. Scarce in Central and South Europe ; though locally abundant in a few spots. *Asia* : Ural Mts., the Amur and Manchuria, Mongolia and China.

Duthie's specimens from Kashmir, No. 13148 especially, and Nos. 13226 and 14127, are very woolly ; but they do not warrant the rehabilitation of Hooker's *W. lanosa*, because the specimens on which Hooker founded that species are all undoubtedly *Gymnogramme Andersoni*, Bedd. Duthie's specimens have all distinctly the indusium of *Woodsia*, and neither the shape nor the colour is that of *G. Andersoni*, to which Baker in his Summary of New Ferns, 1891, refers *W. lanosa*. Duthie's British Garhwal, and one of his Nepal specimens are more glabrous than the normal. I have also a glabrous plant, got by Duthie in Kumaun, with fronds larger than usual, and elongated pinnatifid pinnae, which may be a new species.

Sub-genus—PHYSEMATIUM.

2. **W. elongata**, Hook. ; Syn. Fil. 47 ; C. R. 435 ; Bedd. H. B. 22.

PUNJAB : *Chamba State*—Ravi Valley 11,000', McDonell ; *Simla Reg.* 8-10,000' ; Gamble, Collett, Hope, Bliss ; *Kullu*, Trotter.

N.-W. P. : *T. Garh.* 9-10,000', Lev., Duthie, Herschel, Mackinnons ; *Brit. Garh.* 7-12,000' Mrs. Fisher ; Duthie ; *Kumaun* 7-10,500' S. and W., Davidson, Duthie, Trotter, MacLeod.

DISTRIB.—*Asia* : N. Ind. (Him.), Sikkim, 7-12,000', frequent.

This fern grows to a much larger size than is stated in the books. The Syn. Fil. gives a span to 1 ft. as the length ; Clarke—9 in. l. : 1—1½ in. br. ; and Beddome—1 ft. × 1-1½ in. I have a frond collected by the Mackinnons in T. Garhwál which, were it complete at the apex, would be about 18 in. l. by 2½ in. br., without the stipe ; and I find a note of having seen in their collection a frond nearly two feet in length.

Genus 6. **SPHÆROPTERIS**, Wall.

1. **S. barbata**, Wall. ; Syn. Fil. 49. *Peranema cyatheoides*, Don, C. R. 435 ; Bedd. H. B. 22.

N.-W. P. : *Brit. Garh.*—7-9000', P. W. Mackinnon, April, 1881, Mrs. Fisher.

DISTRIB.—*Asia* : N. Ind. (Him.), Nepál, Sikkim, Bhotán, 6-10,000', plentiful eastward. Assam—Khasi Hills, 45-6000, plentiful. Manipur. S. Ind.—Annamallay Hills, 6000'.

This plant is new to the westward of Nepal, and, so far as I know, has not been collected in the N.-W. Himalaya by any one but Mr. Mackinnon and Mrs. Fisher. A specimen of Wallich's in Kew from Nepál is named *Aspidium spectabile*.

Genus 7. **DICKSONIA**, L'Hérit.

Sub-genus—PATANIA, Presl.

1. **D. scabra**, Wall. ; Syn. Fil. 54 ; C. R. 436. *Dennstedtia scabra*, Bedd. H. B. 24.

PUNJAB : *Simla Reg.*—5-6500', Edgew., Gamble, Blanf., Trotter, Bliss.

N.-W. P. : *D. D. Dist.*—4500' (and upwards ?), Herschel, P. W. Mackinnon, and Hope ; *T. Garh.* 45-5000', Hope ; *Kumaun*, "No. 14, 16-6-49," in Herb. Hort. Saharanpur ; near Naini Tal, Hope, 1861 ; 6500', MacLeod, 1893.

DISTRIB.—*Asia* : N. Ind. (Him.)—Sikkim, Bhotán (4-8000'), common eastward. Assam—Khasi Hills 4-6000', common. Burma and Malay Penins. generally, very common, Bedd.

New to the westward of Kumaun, I think.

2. **D. appendiculata**, Wall. ; Syn. Fil. 54 ; C. R. 436. *Dennstedtia appendiculata*, Bedd. H. B. 26.

N.-W. P. : *Brit. Garh.*—Upper Ganges Valley 5000', P. W. Mackinnon, April, 1881 ; *Kumaun* 5-10,000', Edgew., S. and W., Duthie, Trotter, MacLeod.

DISTRIB.—*Asia* : N. Ind. (Him.)—Nepál, Sikkim,

New to the westward of Kumaun. British Garhwál specimens were given to me by Mr. Mackinnon soon after collection.

Genus 8. **DAVALLIA**, *Smith*.

Sub-genus—**LEUCOSTEGIA**, *Presl*.

1. **D. membranulosa**, Wall. ; Syn. Fil. 91 ; C. R. 442. *Leucostegia membranulosa*, Bedd. H. B. 50.

N.-W. P. : *Kumaun*—Mohargiri Pass 6500', S. and W., 1848 ; Davidson 1875 ; Duthie 1884-86 ; 4700' ; Hope 1890, "6-10,000'" ; MacLeod 1893.

DISTRIB.—*Asia* : N. Ind. (Him.)—Nepal, Sikkim, Bhotán (4-10,000'). "Assam" in Herb. Hort. Sahar (ex Herb. Hort. Cale.) *D. Assamica* on ticket.

I cannot see the nearness to *D. multidentata* which Mr. Clarke sees. *D. membr.* is bi-pinnatifid to a winged rhachis : *D. multident.* is tri-pinnatifid to a winged rhachis in all the specimens I have seen but one ; in other words, a frond of *D. membran.* a pinna of *D. multident.* The exception is a frond collected by Levinge, Darjiling, 7000', 1879, given by me to the Herbarium of the Imperial Forest School, Dehra, which is truly lanceolate, and measures only about 8,  $\times$   $3\frac{1}{2}$ " st.  $3\frac{1}{2}$ ". *D. multidentata* is, I think, a more coriaceous plant than is *D. membranulosa*, and dries of a darker colour. A striking feature of *D. membranulosa* is the small glistening involucre, which seems very persistent. This is not mentioned by any of the authorities I cite. In this respect *D. membranulosa* is like *D. assamica*, Baker.

2. **D. immersa**, Wall. ; Syn. Fil. 91 ; C. R. 443. *Leucostegia immersa*, Bedd. H. B. 51.

PUNJAB : *Chamba*--Dalhousie, McDonell ; *Simla Reg.*—Simla, Collett, Bliss, rare.

N.-W. P. : *D. D. Dist.*—Mussooree 6-7000', Herschel, Mackinnons, Hope, A. Campbell ; Dehra Dun 2600' ; Hope ; *Kumaun*, S. and W., Davidson 5-8000', Duthie 47-5000', Hope 47-5000', Trotter 75-8000'.

DISTRIB.—*Asia* : N. Ind. (Him.)—Nepál, Sikkim, Bhotán 3-6000', plentiful Assam—Khasi Hills 4-5000', common. Bengal—Parasnath Mt. (summit), Hook fil., *Dr. J. J. Wood*, 1880. N. Manipur, *C. B. Clarke* 5500', Watt 6000'. S. India—Madras Presidency, W. Mts. "very abundant in Coorg, growing on trees" (Bedd.) Malay Penins., Java.

The authors of the *Synopsis Filicum* say this *Davallia* is peculiar in having the rhizome developed beneath the surface of the soil, but Beddome says that in Coorg it grows on trees. Clarke says—"rhizome much underground, and there without scales ; the tips above ground with chestnut lanceolate-acute scales." At Mussooree the fern grows on rocky ground or on rocks, and I have seen it in Kumaun on rocks. Down in the Dehra Valley (Dun) it grows on precipitous sandstone rocks, and I noted—"rhizome creeping on rocks, but burying itself in crevices where possible."

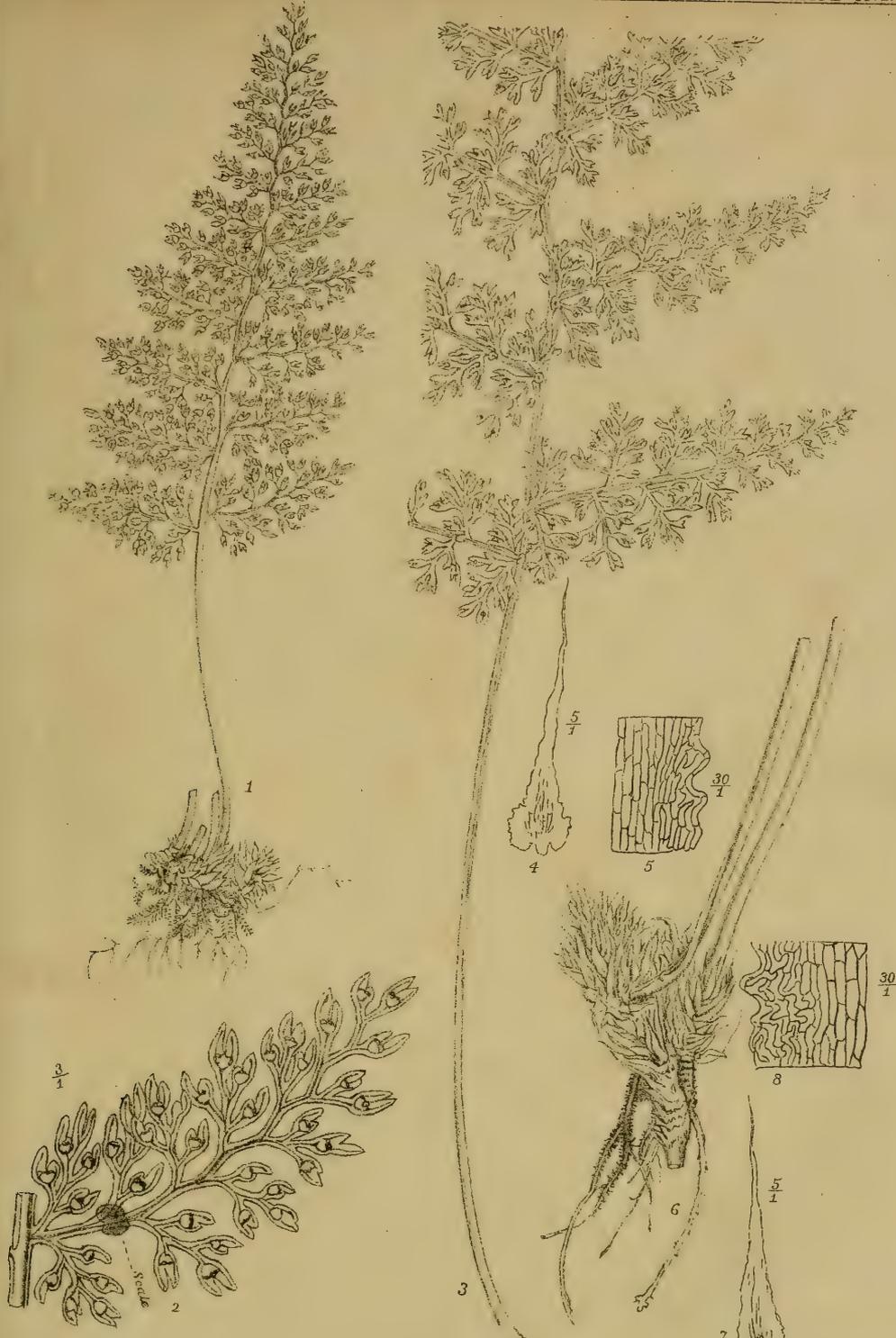
3. *D. Clarkei*, Baker, in Hook. Ic. t. 1625; Syn. Fil. 91. *D. dareæformis*, Levinge MS.; C. R. 443. *Leucostegia Hookeri*, Moore, under *Acrophorus*, Bedd. H. B. 52.

PUNJAB: *Chamba* 10,300', J. Marten 1898, *Simla Reg.*—Hattu and Bághi Road, Bliss, 22nd Sept. 1890; "Sirmur 9-11,000', T. T.", in Herb. Hort. Kew. (Another ticket for same specimen bears—"Hattu 8/49.")

N.-W. P. D. D. *Dist.*—Jaunsar, Cháchpur, Peak, 10,500', Gamble 1898.

DISTRIB.—*Asia*: N. Ind. (Him.), *Simla Reg.* 9000', very rare; Sikkim, Bhotán, 5-12,000', Hook. fil. et Thoms., Clarke, Levinge, Gamble, rare.

I detected this among Mr. Bliss's ferns sent to me for inspection by Mr. Trotter, and pronounced it to be *D. Clarkei*, Baker, from reading Beddome's description of *Leucos. Hookeri*, Moore, but I had not my Sikkim specimens (from Levinge) at hand to compare it with. I sent Mr. Bliss's plant home to Mr. Levinge, who, in returning it, wrote—"The *Davallia* you sent me is certainly *D. Clarkei*, identical in all respects, rhizome, scales, indusium, &c., with my Sikkim specimens. It is quite different from *D.* (or *Polypodium*) *dareæformis*. *D. Clarkei* is very rare in Sikkim, only once or twice found I believe." Clarke in the 'Review' says that *D. dareæformis* is frequent, both in the Himalaya and Khasi hills; but in a subsequent paper (Journ. Linn. Soc. Bot. Vol. XIX, 291) he says that Levinge united ferns of two different genera in one species. *Polypodium dareæforme*, Hook., is I believe quite common in the Khasi Region, and I have never seen an involucre on it. I gather that Levinge inclined to agree with Beddome that *P. dareæforme* might be a *Leucostegia* nearly allied to *D. Clarkei*. The indusium of *D. Clarkei* is very broad, and quite persistent. In Gamble's plants, some collected by himself in Sikkim, and afterwards kept in cultivation at Darjiling, I see large, broad beautifully orange-red scales scattered over stipe and rachises. The locality, variously called "Sirmur, 9-11,000'" and "Hattu," where Thomson got the specimen in the Kew Herbarium, is doubtful; but, as the hills of the Sirmur Territory, south of Simla, are not so high as 9-11,000', I think Hattu Mt., eastward of Simla, the summit of which is 10,500', must be the real habitat, and Mr. Bliss's discovery of the plant at a lower level on that mountain 41 years later, confirms this view. Anyhow, eleven degrees of longitude separate the Punjab and the Sikkim habitats. Large specimens of *D. Clarkei* from N.-E. India are very like *Asplenium ternifolium*, Don, in shape and cutting. After the above was sent to press Mr. Duthie sent me large and beautiful specimens collected in Chamba by Mr. J. Marten, in a quite young state; and about the same time Mr. Gamble gathered rhizomes of the plant in Jaunsar from which the young fronds of 1898 had not yet sprung up.



J. N. Fitch del.

DAVALLIA CLARKEI Baker.

A. C. Mukerjee lith.

1. Frond with rhizome, natural size.
2. Pinna of No. 1  $\times 3$ .
3. Portion of a large frond, young state.
4. Scale from stipes of No. 3.
5. Cells of central portion of No. 4, enlarged about 30 diam.
6. Rhizome and base of stipes from another frond.
7. Scale from do.  $\times 5$ .
8. Cells of central portion of No. 7 enlarged about 30 diam.



[I have struck out of this list *Davallia pulchra*, Don, as I find that the common low-level, arboreal fern I and other collectors have been calling by that name is *D. pseudocystopteris*, viz.—No. 4, *infra*. I do not think *D. pulchra* grows to the westward of Nepal, though it seems to be very common in the N.-E. Himalaya and Assam (in the Khasi Hills at least), and on the Western Mts. in S. India, and also in Tenasserim and Ceylon.]

4. **D. pseudo-cystopteris**, Kunze Bot. Zeit. 1850, 68. "Fronde humile, submembranacea, rigidula, olivacea, glabra, breviter oblonga, acuminata, tripinnatifida (s. quadriplinata); pinnis petiolatis, patentibus, oblique ovato-oblongis, obtusiusculis, inferioribus remotis; pinnulis primariis petiolatis, subrhombicis, obtusis; secundariis subsessilibus, oblique oblongis, pinnatisectis, segmentis e basi cuneato falcato-lanceolatis, longe acuminatis, acutissimis, subbifidis, basi mono-sorophoris; indusio magno, ovato, acuto, membranaceo; stipite brevi, tenero; rhachi universali subflexuosa, versus apicem marginata, partialibus alatis, flexuosis; rhizomate . . . . . *Cystopteris Davallioides*, Kze. in litt. 1842."

"Himalaya, aus den Sendungen Fieldings, von Moricand mitgetheilt."

*D. pulchra*, Don, var. *pseudo-cystopteris* (sp.), Kze., C. R. 444. *Leucostegia pseudocystopteris*, Bedd. H. B. 54.

PUNJAB: *Chamba*—6000'; *Kangra Vy. Dist.* 7000'; *Manāi State* 5500'; *Simla Reg.* 5-8000', "very abundant on trees" (Blanford).

N.-W. P.: *D. D. Dist.*—Mussooree and vicinity 5-7000', everywhere clothing the branches of the oak trees; *T. Garh.* 5000'; *Kumaun* 4500—11,000'.

DISTRIB.—*Asia*: N. Ind. (Him.)—Nepal, Sikkim and Bhotān up to 11,000'. Assam—Khasi Dist. 3-6000', common.

The plant from the localities enumerated above is the common low-level arboreal *Davallia*. Specimens differ from each other in texture and cutting, correspondingly, perhaps, to the age and degree of fertility of the plant; but I do not think any of them are *D. charophylla*, Wall., which has been assumed to be *D. pulchra*, Don (an older name), and which is common from Nepal eastward to Assam and Burma, and in South India and Central Ceylon. I have had great difficulty in determining what this plant is, but probably it is Kunze's plant, which, there are reasons to believe, was collected in the Simla Region. His description, which I have quoted above, is defective in that he could say nothing about the rhizome; and I cannot see that the indusium (in my material) is large, as he said it was, but it appears on young and undamaged specimens "ovate, acute, membranaceous." As I found that no type specimens of Kunze's plant existed in the Kew or British Museum Herbaria, I

asked Mr. Gustav Mann to inquire for them in Germany, and his reply, received on the 4th January, 1898, gave me the clue I wanted. Mr. Mann found that there is a type sheet, of two specimens, in the Botanic Museum, Leipzig, and he sent me a pen and ink sketch tracing of the larger of the specimens, and copies of Kunze's two tickets belonging to it. The older ticket bears—" *Cystopteris davallioides*, Kunze, in litt. ad Moricand, 4/43; species insignis *Leucosteyeis affinis*, Presl. Himalaya Fielding, Ex herb. Moricand, 4/42." The newer ticket bears—" nunc—*Davallia* (Leuc.) *pseudocystopteris*, Kze. = *chaerophyllum*, Hook. Sori et indusia in apice nec in decursu venæ; ita que *Davallia*." Mr. Mann has written on the tracing—" Rhizome there is none, and the lower part of the stipe is also wanting. The frond is lanceolate as shown in this tracing. The sori are not ripe in this specimen, and no sporangia developed, the indusia are distinctly pointed ( $\Delta$ ): the ultimate segments very acute and, as well as the other cutting, just like that on a specimen collected by Blanford, 16-8-1885, on Summer Hill, Simla, 7000'." The tracing shows a lanceolate frond 8" l. by 2 $\frac{3}{4}$ " br., the lowest pair of pinnae slightly shorter than the two next pairs, but broader. On getting Mr. Mann's letter I recollected that some of my N.-W. Himalayan specimens which I had been calling *D. pulchra* had indusia "ovate, acute," though very small, and I found I had been overlooking Kunze's description of the indusium. I turned up my specimens, and verified my recollection. In immature specimens the ovate, acute, membranaceous indusium is quite distinct, but when the sori develop and ripen the indusium is pushed back and shrivels, and the true shape is not seen; and, also, specimens get damaged in the press. Mr. Mann, in his letter to me, says that the ultimate segments of Kunze's type specimen are perhaps a little longer than those of a Mussooree specimen he has from me, but that otherwise the cutting is exactly the same. He also writes—"The remark '=*chaerophyllum*, Hook.,' on Kunze's label was written by Kunze, but, as seems to me, at a later date. There is a second sheet of *D. pseudocystopteris* in the Botanic Museum, Leipzig, which has written on the label '*Davallia chaerophylla*, Wall. Herbar. Sprengelianum, 17260, ab ipso!' but not written by Kunze. This specimen is put together with the above type sheet in the same wrapper; it is the common Indian form of *pseudocystopteris*, with deltoid frond." The usual shape of frond of the plant I identify as *D. pseudocystopteris* is certainly deltoid, or at least sub-deltoid, but I have a lanceolate frond on the same rhizome with deltoid fronds. The rhizome is of course creeping and branching, and it appears to have broadly ovate scales, peltately attached, not adpressed, smaller than the similar scales of the next species, *D. Beddomei*; they are, however, rarely present in my material. Underneath the scales the

rhizome appears to be covered with a detachable skin or bark, somewhat wrinkled or striated. It is desirable that specimens of this plant should be collected at various stages of growth, to show the rhizome scales and the indusium distinctly.

It will be observed that Kunze at first called this plant *Cystopteris davallioides*, but finding it was a *Leucostegia* in everything but the shape of indusium, finally named it *D. (Leuc.) pseudocystopteris*, the name being evidently suggested by the shape of the indusium, which, however, does not seem to have its base inserted under the sorus as in *Cystopteris*. Further examination may show that this plant, from the shape of the indusium, deserves to be put in a separate genus, or sub-genus, as much as other *Davallias* do.

5. *D. Beddomei*, n. sp. Plate I. (see Part II., p. 527).

PUNJAB : *Chamba*—J. Marten, 1898.

Sub-genus MICROLEPIA, Presl.

[Kumaun is given by Clarke, in his 'Review,' as a habitat for *D. (Micro.) marginalis*, Wall., and also for *D. calvescens*, Wall., which he places as a variety of that species ; but as there is a mistake in the citation of Wallich's catalogue number by Hooker in the *Species Filicum* which he follows, he thinks the locality "Kumaun" may be a mistake. Beddome has copied Clarke without any such reservation. Hooker did not give Kumaun as a habitat for *D. villosa*, Wall., which is placed as a synonym of *D. marginalis* in the *Synopsis*, but only Nepal : he gave Kumaun as a habitat for *D. calvescens*, Wall., which he considered a distinct species. On his type sheet of *D. villosa*, Wall., Cat. 244, in the Calcutta Herbarium, Wallich wrote—"Legi in *Napalia*, 1821." The entry in the original catalogue in Calcutta is of this specimen only ; and Dr. Prain has shown me that there was no subsequent entry. I have seen no specimen of either of these ferns, collected in modern times in Kumaun, or the westward of it. Mr. Clarke seems to have been misled by two sheets in the Kew Herbarium without tickets, but marked on the sheets by Sir W. J. Hooker—" *Davallia calvescens*, Wall., Cat. 2683, Kumaun, Wall." This is not warranted by the entry in the catalogue. The distribution of the species, or of both species, is *Asia*. *Nepal*, *Wallich* ; *Assam*—*Khasi Hills*, *Griffith*, *Mann* ; *Mikir Hills*, *Simons*, *N. Manipur*, *Clarke*. *Tonkin*, *Balansa*. *Formosa*, *Wilford*.]

Sub-genus MICROLEPIA, Presl.

6. *D. Wilfordii*, Baker ; Syn. Fil. 98. *D. rhomboidea*, Hook. 2nd Cent., t. 48, not *Wall.*

"Caudice gracili elongato repente atro nitidissimo fragili, stipitibus sparsis 3-4 uncias longis stramineis nitidis basi ebeneis, frondibus 6-8 uncias longis

oblongo lanceolatis acuminatis tenui-membranaceis pallide viridibus pinnatis, pinnis patentibus inferioribus remotis subnuciam longis rhombeo-subtriangularibus longe petiolatis profunde pinnatifidis subpinnatisve oblique obovatis inequaliter lobatis, sterilibus serrulatis, venis subflabellatim dichotomis apice soriferis, involucri orbiculari-cuneatis membranaceis apice erosa solummodo libera lobulis fundium marginis conformibus, rhachibus gracilibus subflexuosis, pinnis supremis sublanceolatis."

Mr. Baker's description is :—

"53 *D.* (Micro.) *Wilfordii*, Baker; rhizome creeping; *st.* 4-6 in. l., slender, naked, flexuose; *frond* 6-9 in. l., 2-3 in. br., lanceolate, tripinnatifid; lower *pinnæ* deltoid, stalked, about 1 in. l.,  $\frac{1}{2}$  in. br., cut down to the rhachis below with broadly ovate-rhomboidal sharply toothed *pinnules*; texture herbaceous; *rhachis* and both surfaces naked; *sori* 2-6 to a pinnule, apical in the teeth.—*D. rhomboidea*, Hook. 2nd Cent., t. 48, *not Wallich*. *Microlepia Wilfordii*, Moore.

HAB.—Japan; gathered by both Messrs. Wilford and Oldham."

KASHMIR: "Boniar Nala—5,000'; wet place," J. C. McDonell, June, 1897.

DISTRIB.—Asia: China—M. Tsien Mts., *Faber*, 1885; Manchuria, between Mukden and Tung-che-Shien, *H. E. M. James*, 1886; Peking Mts., *W. Hancock* 1880: "In shady glens by streams, along with *Cystopteris fragilis*"; *Dr. Bretschneider*, "Flora Pekinensis, 1880 (?). Korea—Am-nok River, Pbyingan Province, 1884. Japan—Hakodadi, *C. Wilford*, No. 1037, 1859; Yokohama, *R. Oldham*, 7/61, No. 99, "on rich moist banks on the hillsides"; *Maximovicz*, *Iter. Sec.*, 1862, *F. V. Dickens* 11. Yokohama and Bukenje, *Jas. Bissett*, 1887 (?), Yokohama, *Maries* (from Veitch, 1880), *Hancock*, 144, 1885; "Japan," *Faurie*, Nos. 812 and 4223; Japan—Mt. Akagi 1888, from Science College, Imperial University, Japan (Jap. Wō renshida).

This plant seems to be more common in Japan and N.-E. China than was known when Sir W. Hooker described it. I cannot find that Moore did more than name it. But there is no record from the westward of the Peking Mountains except Mr. McDonell's discovery of it in Kashmir in 1897. The species seems to be terrestrial, judging from Oldham's and Hancock's remarks above quoted, as well as from McDonell's specimens, one of which reached me with fine micaceous sand adhering to the thin creeping rhizome. The cutting and texture are like those of *D. (Leuco.) immersa*, Wall., but the frond is narrow, and the sori are much smaller and apical.

In reply to an inquiry as to habitat, and for further material, Mr. McDonell wrote, in November, 1899, that this is a terrestrial species: he found it growing in a shady glen, close to running water. There was very little of it, and he has not been to the place since.

7. *D. platyphylla*, Don.; Syn. Fil. 99; C. R. 446. *Microlepia platyphylla*, Bedd. H. B. 66.

N.-W. P.: *T. Garh.*—Near Mussoorie 4,000', Mackinnons, 1879.

DISTRIB.—*Asia*: N. Ind. (Him.) Nepal to Bhotan 3-5,500', plentiful in Sikkim. Assam—Khasi Hills 3-4,000'. North Manipur, 5,500', *Clarke*, 3,000', *Watt*. Upper Burma, 4,800', *Genl. Gatacre*, 1889. S. India—Madras Presy., throughout W. Mts. up to nearly 6,000'. Ceylon. China—Yunnan, *Hancock*, 1893.

A specimen gathered in Tehri Garhwal by the Messrs. Mackinnon was given by them to me in 1880 or 1881. The plant is unmistakeable. That appears to be the only known gathering west of Nepal. *D. lonchitidea*, Wall. Cat. 240, is a synonym.

8. *D. hirta*, Kaulf. ; Syn. Fil. 100. *D. polypodioides*, Don. ; C. R. 447. *Microlepia speluncea*, var. *B. hirta* (?) ; Bedd. H. B. 68.

N.-W. P. : *Brit. Garh.*—5,000', P. W. Mackinnon, 1881 ; *Kumaun*—Ramganga R. 2,600', S. and W., 1848, Sarju-Ganga Valley 5,000', MacLeod 1893.

DISTRIB.—*Trop. Amer. Asia*: N. Ind. (Him.), Sikkim, Bhotan. Assam—Khasi Hills. Bengal—Chittagong, 3-5,000', abundant. Manipur, 1,000—4,750'. S. Ind.—Madras Presy.—W. Mts. Bombay Presy.—*Herb. Dalzel* ; N. Canara, 2,400', W. A. Talbot. Ceylon. Malayan and Polynesian Isles. China. Japan.

I pass lightly over this subject, being of opinion that the group comprising *D. strigosa*, *D. hirta*, *D. speluncea*, *D. polypodioides*, *D. flaccida*, &c, requires further study in the field. But I think the specimens from the westward of Nepal, above cited, come under *D. hirta*, Kaulf.

Sub-genus—STENOLOMA, Fée.

9. *D. tenuifolia*, Sw. ; Syn. Fil. 102. *D. chinensis*, Sw., C. R. 449. *Stenoloma chinensis*, Sw., Bedd. H. B. 70.

PUNJAB : *Simla Reg.*—Simla, 5,000', Blanf. Trotter 6,5-7,800', Bliss.

N.-W. P. : *T. Garh.*—4-5,000', Duthie ; *Kumaun*—Bagesar, 3,000', S. and W., 1848 ; Hawalbagh and Dwarahath "1849" ; in *Herb. Hort. Sahar.* ; 6-7,000' Davidson, Trotter.

DISTRIB.—*Asia*: N. Ind. (Him.)—Sikkim, Bhotan 1-7,000', plentiful eastward. Assam—Khasi Hills 1-3,000', common. Cent. Prov., India—Pachmarhi, *Duthie*. S. Ind.—Madras Mts. ; The Deccan 3-6,000'. Ceylon. Japan. Polynesia, common. *Afr.*—Mascareen Islands.

Genus 10.—CYSTOPTERIS, Bernh.

1. *C. fragilis*, Bernh. ; Syn. Fil. 103 ; C. R. 450 ; Bedd. H. B. 70.

AFGHAN : Griffith. *Kurram Valley*—Peiwar Kotal 8,000', Collett ; 13,000' Aitch. 1879, Harsukh 1894 ; Ishkashin in *Badakshan*, Dr. Giles 1886.

TRANS-IND. STATES : *Baraul*—Ziarat—many stations 4,5-11,000', HARRIS ; Mirga Hills, *Gatacre* ; *Chitral*, F. E. Youngusband 1894 ; *Hindu Kush* (or Pamirs), Dr. Alcock, with the Pamir Boundary Commission, 1895.

KASHMIR : *Gilgit*, *Baltistan*, *Deosai*, *Gulmarg* and *Kilán*, *Shayuk Valley*—Ladakh 7-14,000', many collectors.

PUNJAB : *Hazara*, *Chamba*, *Kullu*, *Lahaul*, *Kungra Valley*, *Simla Reg.* 7-12,000'.

N.-W. P. : *T. and Brit. Grdh. Kumaun* 10-16,000', common.

NEPAL, W. : 10-13,000', Duthie.

DISTRIB.—*N. Amer.*: Arctic and Temperate Regions; California and Mexico. *S. Amer.*—"Whole length of Andean Chain." *W. Ind.* *Europe*: Everywhere from Iceland and Novaya Zemlya and Spitzbergen in the Arctic Regions to Spain, Sicily, Cyprus, and the Caucasus. *Asia*: Lebanon, Persia, Kurdistan, Siberia, Manchuria, Kamschatka, Thibet, N. China; *N. Ind.* (Him.), Sikkim. Australasia. *N. Zeal.* *Sandwich Isles.* *Afr.*—Madeira Fernando Po, Abyssinia, S. Afr.

[*Cystopteris suedetica*, *A. Br. and Milde*: Syn. Fil. 103, has been found in the Chumbi Valley, Thibet, by Sir George King's collectors.]

2. **C. montana**, Link.; Syn. Fil. 104; Bedd. H. B., Supp. 15.

KASHMIR: "In woods above Gulmarg, about 9,000', not higher, August 1877," Aitch. in Herb. Hort. Kew; Bangas—Muzafarabad—Inayat, Duthie's Collr. 21-7-97 (Saharanpur Herb.)

*N.-W. P.*: *Kumaun*—near Rálam Glacier 13,000', No. 3647; near Ráma—Dhauli Valley 12-13,000'; *Byáns*—Kutti Valley 13-14,000'; above Nabbi 12-13,000', No. 3647, Duthie 1884.

NEPAL, *W.*: Opposite Buddhi Village 10-12,000'; Nampa Gádh 11-12,000', No. 6247, Duthie 1886.

DISTRIB.—*N. Amer.*: East side of Rocky Mts.; Labrador; Canada *W.* *Europe*: Mts. of Scandinavia, Scotland (very rare), and Centr. Europe. *Asia*: Kamschatka.

This fern was sent to Kew, with other plants, by its discoverer in Kumaun, Mr. Duthie, but that Indian habitat is not given in Mr. Baker's paper, "A Summary of the New Ferns which have been discovered or described since 1874," published in the "Annals of Botany," Vol. V. No. XVII, although new habitats of other old species are mentioned. Beddome, though he did not include the species in his Handbook, has entered it in the Supplement to that work, published in 1892, and has quoted the description given in the *Synopsis Filicum*, but he has given as the only Indian locality "Kashmir," without mentioning the collector's name. Mr. Duthie sent me Kumaun and Nepal specimens soon after he collected them, and I know that he has never found the plant in Kashmir. Beddome has possibly entered Kashmir as the Indian habitat on the strength of Dr. Aitchison's specimen mentioned above.

I may be pardoned for mentioning that I have an old acquaintance with *C. montana*, for, when on an excursion in Perthshire, conducted by the late Professor J. H. Balfour, in 1856 I think, I discovered a station for the plant on Ben Lawers, on which mountain, in 1836, it had been found for the first time in Scotland by Mr. W. Wilson, but where it had not since been gathered for long. I have read with interest that lately new stations for this fern have been discovered on the border between Perthshire and Argyllshire, and even in Dumbartonshire. It is a 'far cry' from Central Europe eastward to Kashmir.

(To be continued.)

THE MOTHS OF INDIA.  
 SUPPLEMENTARY PAPER TO THE VOLUMES IN  
 "THE FAUNA OF BRITISH INDIA."

SERIES II, PART I.

BY SIR G. F. HAMPTON, BART., F.Z.S., F.E.S.

(With Plate B.)

The following paper commences the 2nd series of supplementary papers on India Moths, in which I propose to include an abstract relating to Indian species taken from the volumes on the "Moths of the World," published by the British Museum, where will be found coloured figures of all species not figured elsewhere; the 1st volume deals with the *Syntomidae*, the most specialized family of the Noctuid branch of the *Lepidoptera*; the 2nd volume includes the sub-families *Nolinae* and *Lithosiinae* of the *Arctiidae*, and will be followed by the sub-family *Arctiinae*, then the families *Agaristidae* and *Noctuidae*. The genera are placed in the order adopted in those volumes, and the keys to the species will give the order which should be followed, the numbers attached to them referring to those in the "Fauna of India" volumes and the supplementary papers, the abstracts thus forming classifications and keys to the families which should, I think, be of use to Indian collectors now that our knowledge of the subject is considerably advanced.

SATURNIADÆ.

29 a. SALASSA OLIVACEA. Oberth. Et. Ent. xiii, p. 44, pl. 10, f. 107 (1890).

♂. Head and thorax red-brown; abdomen black-brown; pectus and ventral surface of abdomen olive-brown, some white hair on the tibiæ. Forewing dark brown irrorated with olive-yellow scales; the ocellus elliptical with black and thin narrow bluish-white ring; the sinuous postmedial line with small hyaline striæ, an indistinct dentate subterminal line, with the area beyond it strongly irrorated with olive-yellow. Hindwing dark brown; irrorated with olive-yellow, the costal half greyish to the subterminal line; a sinuous antemedial line; the ocellus with narrow black ring beyond the bluish-white ring; the postmedial line strongly incurved to costa, then sinuous; an indistinct subterminal dentate line with the area beyond it strongly irrorated with olive-yellow. Underside of both wings irrorated with white.

♀. Abdomen and wings with the ground-colour red-brown.

*Habitat*.—Manchuria; Tibet, Yatong. *Exp.* 120 mill.

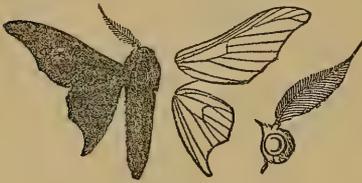
EUPTEROTIDÆ.

Genus CLENORA.

*Clenora*, Swinh. A.M.N.H. (7), iii, p. 109 (1899).

Type. *C. engonata*.

Proboscis absent ; palpi minute ; antennæ short, bipectinate, the branches



*Clenora engonata* ♂  $\frac{1}{2}$

long, rapidly decreasing to before apex which is simple ; tibiæ without spurs ; the tarsi tufted with hair ; frenulum present. Forewing elongate, narrow, the costa strongly arched towards apex which is much produced, the termen angled at middle ; vein 2 from middle of cell ; 3 from long before angle ; 5 from middle of discocellulars ; 6 shortly stalked with 7, 8, 9, 10 ; 7 from beyond 9 ; 11 free. Hindwing with the tornus produced to a long acute point ; vein 2 from middle of cell ; 3, 4, from angle ; 5 from below angle of discocellulars ; 6, 7 very shortly stalked ; 8 from the cell near base and strongly arched.

Very close to *Gunda*, Wlk., but with the frenulum present.

47a. **Clenora engonata**, Swinh. A. M. N. H., (7), iii, p. 109.

♂. Head, thorax and abdomen dark red-brown ; thorax suffused with deep chocolate and irrorated with grey. Forewing dark red-brown suffused with black except towards inner margin and termen and irrorated with black ; two yellow points on inner margin before middle and one towards tornus ; two indistinct postmedial lines formed of grey scales angled below costa and not extending below vein 4 ; traces of a similar subterminal line waved below vein 4 ; a fine yellow terminal line and points on the veins. Hindwing dark red-brown with the tornal point yellow.

*Habitat*.—Karwar. *Exp.* 42 mill.

68. EUPTEROTE UNDATA. Insert (syn.) *E. crinita*, Swinh. A. M. N. H. (7), iii, p. 108.

A form like *nigricans* but without the yellow collar ; hindwing with some yellowish before the postmedial line and a prominent yellow crenulate subterminal line.—Karwar.

#### SPHINGIDÆ.

96a. *CYPA KINDERMANNI*, Led., Verh. Zool.-Bot. Ges. Wien, II, p. 22 (1852).

Head, tegulæ and patagia grey, head tinged with brown ; thorax olive-brown above ; abdomen grey dorsally tinged with brown. Forewing olive-grey ; a little pink at base of inner margin ; a curved whitish subbasal line ; an antemedial red-brown line strongly angled outwards below vein 2 and meeting the medial line which is angled inwards, the area between the two lines being filled in with red-brown suffusion from cell to inner margin ; a sinuous grey postmedial line angled inwards on vein 5 and defined on inner side by darker olive ; a red-brown patch on termen extending down to vein 3 and bounded above by a white line from apex, dentate on vein 7 ; a rufous patch at tornus. Hindwing pale red-brown, usually largely suffused with pink, the inner area

pale or tinged with pink; a diffused rufous antemedial line and slightly sinuous grey medial and postmedial lines with a more or less prominent dark patch with blue-grey mark on it towards tornus; the cilia white. Underside of forewing with the basal half crimson except the costa; hindwing crimson, with blackish patch near tornus with two blue-grey lines on it.

*Habitat.*—C. Asia; Persia; Kandahar; Chitral. *Exp.* 80-90 mill.

106a. *AMBÜLYX PÆCILUS*, Roths. Nov. Zool., v., p. 604 (1898).

♂. Head sap green; antennæ and a band between their bases whitish; thorax sap green coming to a point on metathorax, the outer parts ochreous-grey; abdomen ochreous-grey with dorsal green bands. Forewing ochreous-grey, the inner margin tinged with purplish; traces of an antemedial green line; a medial green band diffused on outer side, running out to an acute angle in submedian fold, where it is connected with tornus by green suffusion, the area beyond it tinged with fuscous except an ochreous-grey triangular patch on termen and a wedge-shaped green patch on apical part of costa, with a curved white line below it from apex to costa beyond middle. Hindwing ochreous-grey; a crimson patch from base to beyond middle not reaching costa or inner margin and emitting a spur towards apex; a grey band from vein 3 to tornus traversed by a dark line, with a dark patch before it on inner area and diffused green on its outer side; cilia of both wings green at base, pale at tips. Underside of forewing suffused with crimson on basal half except towards costa, the rest of both wings pale yellow-green with some grey on termen.

*Habitat.*—Murree. *Exp.* 80 mill.

\* 117a. *AMPELOPHAGA HARTERTI*, Roths., Iris, vii, p. 299 (1894).

"Forewings greenish-ash-grey with a small indistinct stigma in the cell and an angulated rust-red patch one-fourth from the outer margin. Hindwings blackish-brown. Head, thorax and abdomen grey. Underside rusty brownish-grey with the red patch very pronounced."

*Habitat.*—Assam, Margharita. *Exp.* 89 mill.

137. *THERETRA VELATA*, var. *albomarginata*, Roths. Nov. Zool., i, p. 78. (Pl. B, fig. 14.)

Forewing with more or less strongly developed white costal fascia.

138a. *CHÆROCAMPA HYPORHODA*, n. sp. (Pl. B, fig. 12.)

♂. Head, thorax and abdomen bright red-brown; shoulders and outer edge of patagia with grey-white stripe; pectus and ventral surface of abdomen pinkish; legs streaked with ochreous-white. Forewing bright red-brown, the costal edge ochreous-white, the base and basal half of inner margin grey; the basal half of subcostal and median nervures streaked with grey; a black discal point; an indistinct oblique grey medial band from cell to inner margin; traces of three oblique waved postmedial lines; a terminal grey band with waved inner edge attenuated to a point at apex and expanding below apex. Hindwing brown tinged with red towards termen and inner

margin; the cilia white towards tornus. Underside bright pink; wings with two indistinct curved lines just beyond middle and greyish terminal band with waved inner edge.

*Habitat*.—Karwar (Davidson). *Exp.* 50 mill. Type in B. M.

184a. MACROGLOSSA GLAUOPLAGA, n. sp. (Pl. B, fig. 13.)

♂. Dark brown tinged with greyish; palpi white below; pectus pale brown pencilled with dark brown; abdomen with orange and black lateral patch on 1st three segments, then orange-brown at sides with lateral black and white tufts, the ventral surface pale and dark brown with some black points. Forewing with obliquely curved antemedial dark brown band; bisinuate medial and two postmedial lines, the last waved towards costa; a grey patch on costa from 1st postmedial line to apex with very irregular lower edge; traces of a waved subterminal line. Hindwing blackish with rather narrow orange band from middle of costa to tornus; cilia orange towards tornus. Underside greyer brown; forewing with rufous discal patch and several indistinct minutely waved lines. Hindwing with three medial waved lines and orange patch on inner area.

*Habitat*.—Sikkim 2,000' (Pilcher). *Exp.* 46 mill. Type in B. M.

187. MACROGLOSSA BENGALENSIS. Insert (syn.) 185. *M. belia*.

#### NOTODONTIDÆ.

212. HAPIGIA OBLIQUA is from Trinidad and Venezuela.

224a. GARGETTA VIRIDIGRISÆA. Dudgeon, J. Bomb. N. H. Soc., xi, p. 626. (Pl. 1, fig. 3.)

♂. Antennæ bipectinate with long branches, the apical part simple. Forewing narrow with slight fold at base of vein 1 on underside but without tuft.

Vertex of head and base of tegulæ whitish. Forewing suffused with fuscous and the markings obscured. Hindwing whitish suffused with brown.

♀. Fuscous-brown, base of antennæ and collar black-brown; thorax suffused with greenish-grey. Forewing suffused with grey-green to beyond middle; a short waved black subbasal line followed by a less prominent waved line diffused towards costa; a slightly waved antemedial line with diffused waved line on its inner edge; orbicular and reniform rather indistinct, figure-of-8-shaped, with whitish outline; an indistinct highly dentate medial line bent outwards round cell; a more prominent dentate black postmedial line bent outwards at vein 5, with some blackish spots beyond it and patch on inner margin; subterminal and terminal series of small blackish lunulate spots. Hindwing uniform fuscous-brown.

*Habitat*.—Sikkim 1,800'; Ceylon. *Exp.* 56 mill.

225b. GARGETTA FERREOPICTA, n. sp.

♀. Pale brownish-grey; head and thorax red-brown. Forewing irrorated with dark rust-red; a subbasal black point below the cell; the antemedial

line acutely angled below costa, then erect and followed by dark rust-red patches on costa and vein 1, and two dark points on median nervure; a medial somewhat oblique series of four black striæ; a diffused rust-red patch on discocellulars with black discoidal lunule defined by grey on it and with traces of a line from it to costa and inner margin; two postmedial series of black points connected by an indistinct highly crenulate line, with a wedge-shaped, rust-red patch beyond it on costa and a diffused band from vein 5 to inner margin; a sinuous sub-terminal series of dark spots on a white line; a terminal series of points. Hindwing with darker band on terminal area, broad at costa, narrowing to torsus.

*Habitat.*—Ceylon, Trincomalee. *Exp.* 58 mm. *Type*—In B. M.

229c. EUTORNOPERA QUINQUESTRIATA, n. sp. (Pl. B, fig. 21.)

♂. Head and thorax ochreous and dark red-brown; abdomen ochreous dorsally tinged with brownish. Forewing ochreous suffused with dark red-brown except a patch on costa near base, the submedial interspace, and streaks beyond the cell above vein 5 and on apical part of costa; two short antemedial obliquely-placed white streaks in cell; a short streak in upper angle of cell, a longer streak beyond the cell on vein 3, and an oblique streak from beyond upper angle of cell to apex; a medial red-brown point above vein 1; an obscure postmedial series of points excurved below costa, then oblique, and with another series on their inner side; a series of points just inside termen, those below apex and at middle developed into spots, and the two points between them on white spots. Hindwing pale yellow.

*Habitat.*—Sikhim, 7,000 feet (Pilcher). *Exp.* 44 mm. *Type*—In B. M.

236c. PYDNA ATRIVITTATA, n. sp. (Pl. B, fig. 1.)

♂. Head, thorax and abdomen olive-brown, the last tinged with grey except at base and extremity. Forewing olive-brown, the terminal half paler; a black-brown fascia on median nervure from near base to well beyond middle with a pale ochreous streak above it on vein 4, and a leaden-grey streak above it in and beyond cell; a leaden-grey streak on basal part of vein 1; an indistinct ochreous discoidal spot; an indistinct fuscous line from middle of costa angled beyond cell and reaching middle of inner margin; the postmedial line represented by three indistinct series of points from costa to the fascia, where they are joined by an oblique streak from apex, and by an oblique line from the fascia to inner margin; a terminal series of points. Hindwing fuscous-brown, the cilia ochreous. Underside fuscous-brown.

*Habitat.*—Sikhim, 7,000 feet (Pilcher). *Exp.* 48 mm. *Type*—In B. M.

257a. FENTONIA DISCOSTICTA, n. sp.

♂. Purplish-brown; palpi and frons black-brown. Forewing with the base ochreous, with a grey-edged black line reaching to below cell, and followed by a rufous line reaching vein 1; three indistinct waved antemedial lines; a small prominent black discocellular spot; a grey and blackish

lunulate postmedial line strongly incurved and with ochreous on its inner edge from costa to vein 5, two rufous points before it on costa, and with several obscure lunulate dark lines beyond it. Hindwing uniform red-brown. Underside paler, forewing with the costa yellowish with some rufous points towards apex.

*Habitat.*—Khásis. *Exp.* 46 mm. *Type*—In coll. Elwes.

259a. FENTONIA FERRIFUSA, Dudgeon, Journ. Bomb. Nat. Hist. Soc., 1897, p. 634.

♂. Head, thorax and abdomen black-brown, head and collar mixed with grey. Forewing grey suffused with dull ferruginous, especially a patch on costa before apex; a black streak from base below median nervure to an obliquely curved line from base of costa expanding into a diffused black patch on inner margin; a wedge-shaped ferruginous antemedial mark from costa; an indistinct curved postmedial series of black points; a terminal series of points. Hindwing grey-brown.

♀. Thorax and abdomen grey.

*Habitat.*—Sikkim, 1,800 feet. *Exp.* ♂ 30, ♀ 36 mm.

264a. STAUROPOUS VIRESCENS, Moore, P. Z. S., 1879, p. 404.

♂. Head and thorax yellow-green; palpi ochreous, blackish at sides; antennæ with the branches rufous; pectus and legs below ochreous; abdomen pale ochreous irrorated with fuscous, a large dorsal tuft on first segment of green and metallic yellow and black scales, some green on dorsum at extremity, the anal tuft whitish. Forewing yellow-green irrorated with a few black scales; a brownish patch at base of inner margin; a series of four small yellowish and black antemedial spots angled below the cell, then oblique, two yellowish points beyond them; a dark discoidal point; a postmedial line formed by small yellowish spots with dark edges, oblique from costa to vein 4, then retracted to below end of cell and again oblique; a subterminal series of small blackish and yellow spots bent inwards to costa and a terminal series. Hindwing dark brown; the costal area yellow-green with indistinct dark medial, postmedial and subterminal lines. Underside of forewing pale yellow suffused with dark brown except towards margins, of hindwing uniform pale yellow.

*Habitat.*—Sikkim, 1,800 feet. *Exp.* 40 mm.

265. STAUROPOUS VIRIDESCENS, del. *S. virescens*.

293a. NOTODONTA PICTA, n. sp.

♂. Head and thorax dark brown; abdomen paler brown. Forewing dark red-brown variegated with pinkish, the apical third purplish-fuscous; traces of a dark sinuous antemedial line from cell to inner margin; the reniform and some marks below angle of cell pinkish, a yellow line with fine black edges arising from middle of vein 2, below which it is dentate, excurved below vein 1, then almost parallel to inner margin to near base; a black postmedial line excurved from costa to vein 2, where it is bent inwards, followed by a

curved yellow line with fine black edges; some yellow on termen below middle. Hindwing pale yellow-brown.

*Habitat.*—Khásis. *Exp.* 46 mm. *Type*—In coll. Elwes.

298a. *HYPERÆSCHRA TRICHOSTICHA*, insert (syn.) *Stauropus clothus*, Swinh., A. M. N. H. (7), iii, p. 100.

Forewing with some white on orbicular and lower part of reniform.

*Habitat.*—Karwar.

306. *APELA DIVISA* is from Trinidad.

Nos. 309, *Spatalia costalis*, and 311, *Spatalia albifasciata* belong to the 2nd group with longer branches to the antennæ.

311a. *SPATALIA LATICOSTALIS*, n. sp. (Pl. B, fig. 15).

♂. Dark rufous-brown. Forewing with the costal half of wing to median nervure creamy white with an olive shade in end of cell and pinkish shade on costa above it; a purple-brown and reddish apical patch, the veins and interspace below it streaked with brown; the inner half of wing purplish-brown with three obscure waved pale and dark antemedial lines and double post-medial line; a highly crenulate subterminal line. Hindwing fuscous-brown.

*Habitat.*—Khásis. *Exp.* 50 mm. *Type*—In B. M.

317a. *ICHTHYURA TRANSECTA*, n. sp. (Pl. B, fig. 20).

♀. Fuscous-brown, head and medial part of collar black. Forewing irrorated with fuscous; a pale oblique subbasal line bent outwards on median nervure; a pale oblique slightly sinuous antemedial line; a pale oblique line across apical area angled below vein 4, then inwardly oblique and sinuous to inner margin; a dark brown patch on apical area leaving the costa and margin pale brown and with an irregularly dentate edge, crossed by an obscure dark sinuous line in continuation of the sinuous part of the post-medial line and a subterminal series of dark specks.

*Habitat.*—Sikhim, 1,800 feet (Dudgeon). *Exp.* 40 mm. *Type*—In B. M.

#### SESIADÆ.

355a. *SCIAPTERON TRIZONATA*, n. sp.

♂. Black frons and inner side of palpi white; some white scales on neck; tegulæ blue-black; shoulders with orange spots just behind head and in front of wings; fore tarsi white; abdomen with slight dorsal band on 1st segment, a complete band on 5th segment, and subdorsal bands on terminal segment, wings hyaline, the veins and margins black. Forewing with the margins broadly black; a broad oblique band at discocellulars. Hindwing with discoidal bar.

*Habitat.*—Sikhim, 2,000 feet (Pileher). *Exp.* 24 mm. *Type*—In B. M.

363a. *ICHNEUMENOPTERA CERULIPÈS*, n. sp.

♂. Head and thorax black, palpi yellow, black above towards tips; frons white at sides; legs yellow and black, hind tibiæ and tarsi metallic blue above; abdomen greenish-black, the 2nd, 4th and 5th segments fringed with white scales, the ventral surface yellowish; wings hyaline, the veins and

margins black. Forewing with the margins rather broadly black; a discoidal bar; the termen rather broadly black, with a slight hyaline streak projecting into it between veins 7 and 8.

*Habitat*.—Sikhim, 2,000 feet (Pilcher). *Exp.* 22 mm. *Type*.—In B. M.

378a. TRICHOCEBOTA UNIVITTA, n. sp.

♂. Bluish-black; abdomen with a few orange scales; traces of bands on 5th and 7th segments. Forewing with the terminal area tinged with golden cupreous; a narrow hyaline streak in cell. Hindwing hyaline, the veins and margins narrowly black.

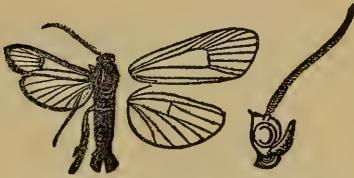
*Habitat*.—Sikhim, 7,000 feet (Pilcher). *Exp.* 24 mm. *Type*.—In B. M.

Genus LEPIDOPODA, nov.

Proboscis fully developed; palpi upturned to above vertex of head, roughly scaled in front; antennæ of male ciliated, of female simple; mid-tibiæ clothed with rough hair; hind tibiæ and 1st two joints of tarsi with thick fringes of hair. Forewing with all the veins present, 7·8 stalked. Hindwing with veins 3·4 stalked; 5 absent; 6 from close to upper angle of cell.

383a. LEPIDOPODA HETEROGYNA, n. sp.

♂. Head, thorax and abdomen black; frons bronze colour; palpi in front, sides of frons and a ring round neck white; shoulders and extremities of patagia with some yellow scales; coxæ white; the base of hind tibiæ above, the spurs and underside of tarsi of all the legs white; abdomen with some white hair at sides at base, the segments edged with yellow



*Lepidopoda heterogyna*, ♂  $\frac{3}{2}$ .

and white scales; wings hyaline, the veins and margins black; forewing with fiery orange on outer side of discoidal bar and a few scales near apex; the subcostal and median nervures orange on underside; hindwing with cilia of inner margin white.

♀. Palpi and antennæ orange, the latter blackish above at tips; the ring round neck yellow; fore-legs with the outer side of coxæ, the tibiæ and tarsi fiery orange; mid and hind legs with the tibiæ and tarsi banded orange and black; (abdomen wanting) the lateral tufts at base tipped with orange. Forewing with an orange streak above inner margin, the orange on discocellulars and below apex more prominent. Underside of forewing with the veins and margins fiery orange except towards termen, the orange below apex prominent; hindwing with the veins near costa and end of cell fiery orange.

*Habitat*.—Cuddapah, Pullampet, 500 feet (W. H. Campbell). *Exp.* ♂ 22, ♀ 24 mm. *Type*.—In B. M.

SYNTOMIDÆ.

- A. Hindwing with veins 6·7 coincident.
- a. Hindwing with vein 4 absent.
- a<sup>1</sup>. Hindwing with veins 3 absent ..... 3. *Ceryx*.
- b<sup>1</sup>. Hindwing with veins 3 absent.
- a<sup>2</sup>. Hindwing with vein 5 from lower angle of cell.
- a<sup>3</sup>. Forewing with vein 9 absent..... 1. *Psychotoë*.
- b<sup>3</sup>. Forewing with vein 9 present.
- a<sup>4</sup>. Forewing with vein 3 from close to angle of cell; 4·5 stalked..... 4. *Trichæta*.
- b<sup>4</sup>. Forewing with vein 3 from well before angle of cell; 4·5 usually from cell.
- a<sup>5</sup>. Wings sparsely clothed with hair-like scales ..... 2. *Callitomis*.
- b<sup>5</sup>. Wings clothed with scales and usually with hyaline patches... 5. *Syntomis*.
- b<sup>2</sup>. Hindwing with vein 5 from well above angle of cell ..... 6. *Eressa*.
- b. Hindwing with vein 4 present ..... 7. *Dysauxes*.
- B. Hindwing with veins 6·7 not coincident..... 8. *Euchromia*.

Genus PSYCHOTÖE.

466. PSYCHOTÖE DUVAUCELI, Boisd.

Genus CALLITOMIS.

- A. Abdomen with a yellow band on each segment ... 464. *multifasciata*.
- B. Abdomen with yellow bands on 1st and 5th segment ..... 462. *syntomoides*.
- C. Abdomen ochreous, without bands..... 463. *leucosoma*.

Genus CERYX.

- Ceryx*, Willgrn., Wien, Ent. Mon., vii, p. 140 (1863)..... *Type.*  
*anthraciformis*.
- Syntomoides*, Hmps., Moths, Ind., 1, p. 209 (1892) ..... *imaon*.

Section I. Antennæ of male, bipectinate.

- A. Abdomen of male with yellow bands on basal and penultimate segments..... 406. *diptera*.
- B. Abdomen of male with basal yellow band only..... 407a. *ginorea*.

CERYX DIPTERA, Fabr. Syst. Ent., p. 555 (1775).

*Sphinx atereus*, Stoll, Pap. Exot. iv., p. 240, pl. 400, fig. A.

*Syntomis incipiens*, Wlk, xxxi, 68.

*Psychotoë brachypecten*, Hmps., Ill. Het., ix, p. 61, pl. 157, f. 23.

Section II. Antennæ of male minutely serrate or simple.

- A. Abdomen with seven bands in ♂, six in ♀ ..... 445. *cherra*.
- B. Abdomen with four bands ..... 404. *hyalina*.
- C. Abdomen with two bands—
  - a. Abdomen with lateral yellow spots... 403a. *semicincta*.
  - b. Abdomen without lateral yellow spots.
    - a<sup>1</sup>. Hindwing with narrow terminal black band ..... 402. *godarti*.
    - b<sup>1</sup>. Hindwing with broad terminal black band extending nearly to cell..... 401. *imaon*.

CERYX CHERRA, Moore, Lep. Atk., p. 12 (1879).

*Syntomis quisqualis*, Swinh., A. M. N. H. (6), xiv, p. 441 (1894).

CERYX HYALINA, Moore, Lep. Atk., p. 13 (1879).

*Syntomis volans*, Swinh., Trans. Ent. Soc. 1890, p. 173, pl. 6, f. 6.

CERYX GODARTI, Boisd. Mon. Zyg., p. 115, pl. 7, f. 3 (1829).

*Syntomis libera*, Wlk., xxxi, 78 (1864).

*Syntomis fytchei*, Moore, P. Z. S., 1871, p. 246, pl. 18, f. 3.

*Syntomis cupreipennis*, Butl., Journ. Linn. Soc. Zool., xii, p. 347 (1876).

This may be an extreme form of *imaon*.

CERYX IMAON, Cram., Pap. Exot., iii, p. 94, p. 248, E. (1780).

*Syntomis fusiformis*, Wlk., vii, 1595 (1856).

„ *approximata*, Wlk., xxxi, 79 (1864).

„ *sargania*, Butl. Trans. Ent. Soc., 1879, p. 4.

„ *artina*, Butl. Journ. Linn. Soc., Zool., xii, p. 347 (1876).

„ *mota*, Swinh. Trans. Ent. Soc., 1891, p. 134.

Genus TRICHLÆTA.

Section I. Hindwing with veins 3 and 5 on a long stalk ..... 436. *tigrina*.

Section II. Hindwing with veins 3 and 5 from cell or very shortly stalked ..... 465. *teneiformis*.

Genus SYNTOMIS.

Section I. Antennæ of male bipectinate, of female serrate.

A. Abdomen with crimson basal band.

a. Hindwing hyaline with the veins and margins black.

a<sup>1</sup>. Frons, white ..... 460. *pectoralis*.

a<sup>1</sup>. Frons, black ..... 461. *thoracica*.

b. Hindwing black with small hyaline spots between veins 2 and 5..... 461b. *phenicozona*.

B. Abdomen with orange bands.

a. Wings with the markings pale yellow; abdomen with two bands and lateral spots ..... 451. *ochreipuncta*.

- b.* Wings with the markings hyaline;  
abdomen with seven bands in male,  
six in female ..... 452*a.* *actea*.

SYNTOMIS PECTORALIS, Wlk. 1. 133 (1854).

*Hydrusa basirufa*, Swinh. Cat. Het. Mus. Oxon. p. 51 (1892).

Section II. (*Hydrusa*) Antennæ of male serrate, of female simple.

A. Abdomen with seven orange bands in male, six in female.

*a.* Forewing with the veins black with orange streaks  
below costa and on inner margin.

*a*<sup>1</sup>. Abdomen with the anal segment  
black ..... 425. *diaphana*.

*b*<sup>1</sup>. Abdomen with the anal segment  
orange above ..... 452. *baicea*.

*b.* Forewing with the veins golden  
yellow ..... 453. *era*.

*c.* Forewing without yellow streaks .. 440. *huebneri*.

B. Abdomen of male with six orange bands. 449. *serrata*.

425. SYNTOMIS DIAPHANA, insert (syn.) *Syntomis vitreata*, Herr.—Schaff.  
aussereur Schmett., f. 267 (1855).

440. SYNTOMIS HUEBNERI, insert (syns.) *Nacليا cingulata*, Wllgrn. Wien.  
Ent. Mon., iv, p. 39 (1860). *Buthisia sangaris*, Wllgrn. Wien. Ent. Mon.,  
vii, p. 139 (1863). *Hydrusa pyrrhoderia*, Meyr, P. Linn. Soc. N. S. W. (2), i,  
p. 777 (1886). *Syntomis frustulenta*, Swinh. Cat. Het. Mus., Oxon., p. 44 (1892).

Section III. (*Syntomis*). Antennæ simple in both sexes.

A. Abdomen with the bands cupreous-red ..... 442. *passalis*.

B. Abdomen with the bands orange.

*a.* Wings with the markings orange, not hyaline.

*a*<sup>1</sup>. Abdomen with an orange band on each  
segment ... ..... 441. *wimberleyi*.

*b*<sup>1</sup>. Abdomen with orange basal patch and  
band on 5th segment ..... 441*a.* *flaviguttata*.

*b.* Wings with the markings mostly hyaline.

*a*<sup>1</sup>. Abdomen with an orange band on each  
segment.

*a*<sup>2</sup>. Abdomen with the extremity orange.

*a*<sup>3</sup>. Frons white ..... 434. *vitreata*.

*b*<sup>3</sup>. Frons yellow.

*a*<sup>4</sup>. Wings with yellow patches in inter-  
spaces of terminal area ..... 435. *submarginalis*.

*b*<sup>4</sup>. Wings without yellow patches on  
terminal area.

*a*<sup>5</sup>. Wings yellowish hyaline ..... 432. *sladeni*.

*b*<sup>5</sup>. Wings hyaline white ..... 433. *grotei*.

|                                                                                                                                         |      |                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------|
| <i>c</i> <sup>3</sup> . Frons black; antennæ yellow.....                                                                                | 437. | <i>chlorocera</i> .                 |
| <i>b</i> <sup>2</sup> . Abdomen with the extremity black.                                                                               |      |                                     |
| <i>a</i> <sup>3</sup> . Wings yellow hyaline.                                                                                           |      |                                     |
| <i>a</i> <sup>4</sup> Forewing with the terminal black band<br>dentate above vein 5; hindwing with<br>it not dentate at vein 2 .....    | 430. | <i>newara</i> .                     |
| <i>b</i> <sup>4</sup> Forewing with the terminal black<br>band not dentate at vein 5; hindwing<br>with it dentate at vein 2.....        | 429. | <i>fervida</i> .                    |
| <i>b</i> <sup>3</sup> . Wings hyaline white.                                                                                            |      |                                     |
| <i>a</i> <sup>4</sup> Forewing without black bar across<br>submedian interspace.                                                        |      |                                     |
| <i>a</i> <sup>5</sup> . Abdomen greenish-black; forewing<br>without hyaline streak between<br>veins 4 and 5..... ..                     | 424. | <i>masoni</i> .                     |
| <i>b</i> <sup>5</sup> . Abdomen purplish-black; forewing<br>with hyaline streak between veins 4<br>and 5.....                           | 426. | <i>melæna</i> .                     |
| <i>b</i> <sup>4</sup> Forewing with black bar across sub-<br>median interspace.                                                         |      |                                     |
| <i>a</i> <sup>5</sup> . Frons orange.                                                                                                   |      |                                     |
| <i>a</i> <sup>6</sup> . The hyaline patches occupying<br>most of wing; forewing with<br>elongate patches between veins 2<br>and 5. .... | 438. | <i>luteifascia</i> .                |
| <i>b</i> <sup>6</sup> . The hyaline patches reduced to<br>spots; forewing without spots<br>between veins 2 and 3 .....                  | 439. | <i>berinda</i> .                    |
| <i>b</i> <sup>5</sup> . Frons black.....                                                                                                | 443. | <i>formosa</i> .                    |
| <i>b</i> <sup>1</sup> . Abdomen with five orange bands.                                                                                 |      |                                     |
| <i>a</i> <sup>2</sup> . Frons white .....                                                                                               | 423. | <i>divisa</i> .                     |
| <i>b</i> <sup>2</sup> . Frons orange.                                                                                                   |      |                                     |
| <i>a</i> <sup>3</sup> . Wings hyaline with the veins and margins<br>black.....                                                          |      | <i>compta</i> .                     |
| <i>b</i> <sup>3</sup> . Wings black with hyaline patches .....                                                                          |      | <i>pentazonata</i> .                |
| <i>c</i> <sup>1</sup> . Abdomen with four orange bands.                                                                                 |      |                                     |
| <i>a</i> <sup>2</sup> . Frons, tegulæ, patagia, and patches on<br>thorax white .....                                                    | 427. | <i>albifrons</i> .                  |
| <i>b</i> <sup>2</sup> . Frons white; tegulæ and patagia black ...                                                                       | 422. | <i>quadrifascia-</i><br><i>ta</i> . |
| <i>c</i> <sup>2</sup> . Frons and patches on tegulæ and patagia<br>orange .....                                                         | 421. | <i>flavifrons</i> .                 |
| <i>d</i> <sup>1</sup> . Abdomen with orange bands on 1st and 5th<br>segments,                                                           |      |                                     |

- $\alpha^2$ . Abdomen with lateral orange spots between the bands.
- $\alpha^3$ . Forewing with yellowish hyaline markings occupying the greater part of wing..... 417. *gelatina*.
- $\beta^3$ . Forewing with the hyaline markings not yellowish.
- $\alpha^4$ . Forewing brown with oblique series of hyaline markings between base of inner margin and costa beyond middle 418. *extensa*.
- $\beta^4$ . Forewing black with hyaline spots between veins 3 and 5:
- $\alpha^5$ . Tegulae and patagia yellow ..... 420. *thasiana*.
- $\beta^5$ . Tegulae and patagia black ..... 419. *lucina*.
- $\beta^2$ . Abdomen without lateral orange spots.
- $\alpha^3$ . Neck with an orange ring.
- $\alpha^4$ . Colour black.
- $\alpha^5$ . Forewing with hyaline spot above vein 6, the spots large ... ..... 412. *cyssea*.
- $\beta^5$ . Forewing without hyaline spot above vein 6, all the spots much reduced.
- $\alpha^6$ . Hindwing without spot above vein 2, the spot below the cell, moderate and rounded..... 414. *insucta*.
- $\beta^6$ . Hindwing with specks above vein 2, the spot below the cell narrow and bar shaped ..... 416. *albapex*.
- $\beta^4$ . Colour brown..... *elongata*.
- $\beta^3$ . Neck without an orange ring.
- $\alpha^4$ . Metathorax with an orange patch.
- $\alpha^5$ . Hindwing with the hyaline patch becoming bright orange on inner margin ..... 410. *sperbius*.
- $\beta^5$ . Hindwing without orange on inner margin..... 403. *hydantina*.
- $\beta^4$ . Metathorax without orange patch.
- $\alpha^5$ . Wings with the spots large, size large..... 411. *bicincta*.
- $\beta^5$ . Wings with the spots minute, size small..... 413. *minor*.
- $c^2$ . Abdomen with ventral yellow band on 5th segment ..... 409. *unifascia*.

SYNTOMIS FLAVIGUTTATA, n. sp. (Pl. B, fig. 2.)

♂. Blue-black; antennæ white at tips; pectus with orange spots; abdomen with orange dorsal spot on 1st segment and a band on 5th segment. Forewing with elliptical orange spot below base of cell: a quadrate spot in end of cell; an oblique elliptical spot below vein 2, and spots above veins 3, 4 and 6. Hindwing with orange patch below and beyond the cell extending to near termen, its outer edge angled above vein 2.

*Habitat*.—Chitral, Jhela Drosh (Capt. S. W. Harris). *Exp.* 28mm.

*Type*—In British Museum.

442. SYNTOMIS PASSALIS, insert (syn.) *Syntomis latreillii*, Boisd., Mon. Zyg., p. 117, pl. 7, f. 5 (1829).

434. SYNTOMIS VITREA, insert (syn.) *Syntomis polyzonaat*, Hmps., Trans. Ent. Soc., 1895, p. 283.

424. SYNTOMIS MASONI, insert (syn.) *Syntomis davidi*, Poug., Bull. Soc. Ent. Fr., (6), iv, p. cxxxvi (1885).

426. SYNTOMIS MELÆNA, insert (syn.) *Syntomis andersoni*, Moore, P. Z. S., 1871, p. 244, pl. 18, f. 1. Anderson's researches in W. Yunnan, p. 926, p. 81, f. 4.

423a. SYNTOMIS COMPTA, Wlk. Char. Undescr. Het., p. 89 (1869), Hmps., Cat. Lep. Phal., B. M., 1, p. 99, pl. v, f. 1.

♂. Head and thorax black; frons, tegulæ, patagia and patches on thorax, pectus, and legs orange; abdomen greenish-black with five orange bands; wings hyaline, the veins and margins black. Forewing with orange streaks below costa and above inner margin; the interspaces between veins 5 and 6 black; the terminal band expanding towards apex and slightly above vein 2. Hindwing with the costa and inner margin orange; the terminal black band expanding towards apex and dentate below vein 2.

*Habitat*.—Sikhim; Khâsis. *Exp.* 38 mm.

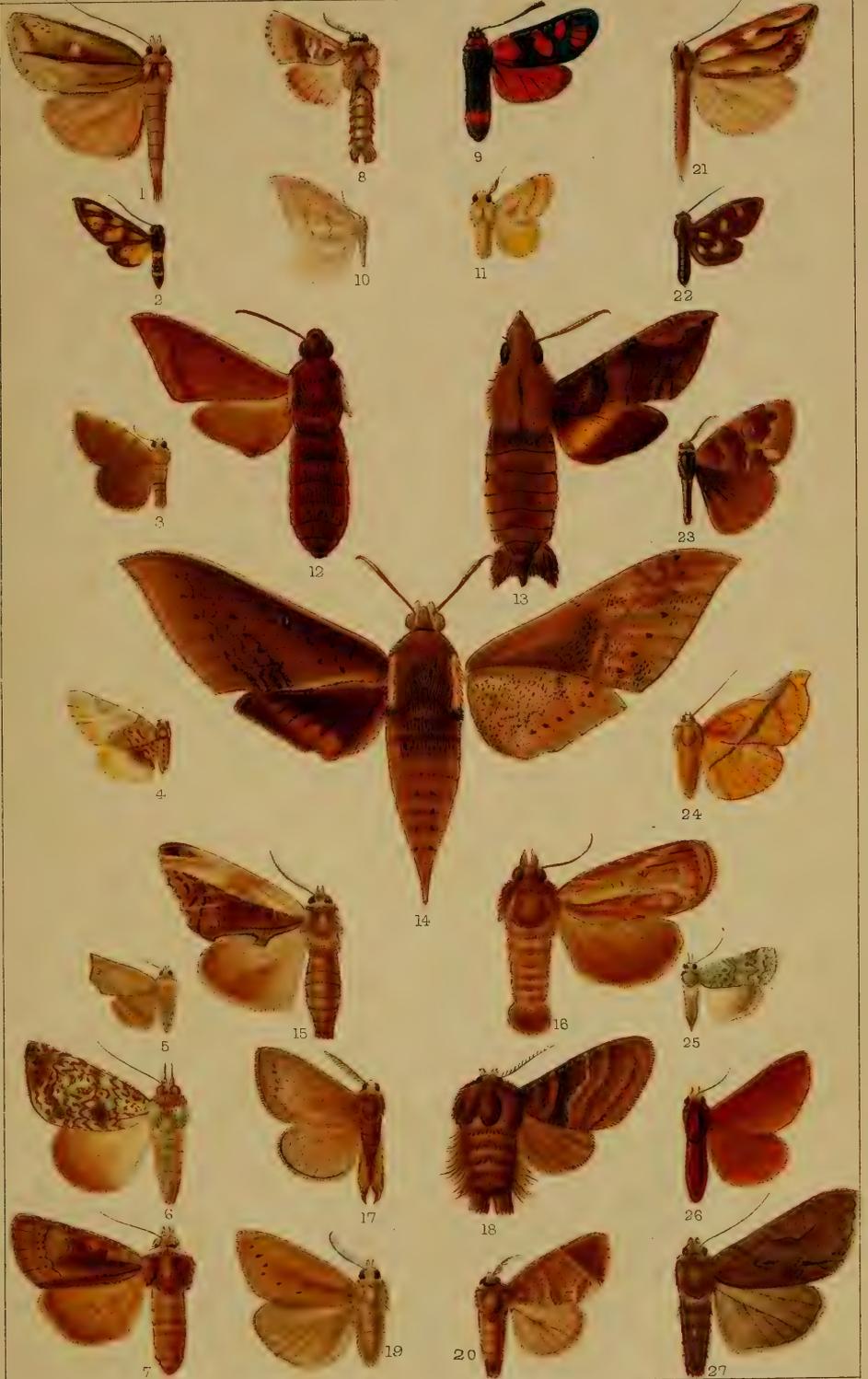
423b. SYNTOMIS PENTAZONATA, Hmps., Cat. Lep. Phal., B. M., 1, p. 99, pl. 3, f. 27 (1898).

Black with a slight purple gloss; frons, tegulæ and large spots on patagia orange; thorax with lateral orange spots; antennæ white at tips; tarsi with the 1st joint white; abdomen with five orange bands. Forewing with quadrate yellowish hyaline spot below base of cell; an oblique patch below vein 2, extending nearly to termen; a spot above vein 6, and small spot above 7; two large spots between veins 3 and 5; cilia white below apex. Hindwing with hyaline spot below the cell becoming orange towards inner margin; a postmedial spot between veins 2 and 5.

*Habitat*.—Burma, N. Khyen Hills. *Exp.* 30-36 mm.

418a. SYNTOMIS ELONGATA, n. sp.

♂. Grey-brown; frons and back of head orange; antennæ white at tips; tarsi with the 1st joint white; abdomen with orange dorsal patch on 1st segment, and band on 5th. Forewing with quadrate hyaline spot in end of cell; a small spot below base of cell and bar-shaped spot below the





middle of it; points above bases of veins 2, 3 and 6; an orange spot on termen just below apex. Hindwing with small hyaline spot below the cell.

A specimen from Canara is much browner; the hyaline spots larger, especially those below the cell and above veins 2, 3 and 6; hindwing with small spot above base of vein 3.

*Habitat.*—Canara (S. N. Ward); Travancore, Pirmád, 3,500' ft. (H. G. Place). *Exp.* 42 mm. *Type*—In British Museum.

412. 415. SYNTOMIS CYSSEA, insert (syns.) *Zygæna collaris*, Fabr., Ent. Syst. 3. 1, p. 388 (1793).

*Syntomis cuprea*, Prittw., Stett. Ent. Zeit., xxviii, p. 277 (1867).

410. SYNTOMIS *atkinsoni*, insert *Zygæna sperbius*, Fabr., Mant. Ins., II., p. 103 (1787).

## EXPLANATION OF PLATE B.

- |                                                          |                                         |
|----------------------------------------------------------|-----------------------------------------|
| 1. <i>Pydna curvittata</i> .                             | 15. <i>Spatalia laticostalis</i> .      |
| 2. <i>Syntomis flaviguttata</i> .                        | 16. <i>Triorbis aureovitta</i> .        |
| 3. <i>Euproctis flavicosta</i> .                         | 17, 18. <i>Metanastria fia</i> ♂ ♀.     |
| 4. <i>Cemptochilus furcifera</i> .                       | 19. <i>Lælia calamaria</i> .            |
| 5. <i>Eublemma subangulata</i> .                         | 20. <i>Ichthyura transecta</i> .        |
| 6. <i>Ancra viridipicta</i> .                            | 21. <i>Eulornopora quinquestriata</i> . |
| 7. <i>Agrotis dereciota</i> .                            | 22. <i>Artona flavipuncta</i> .         |
| 8. <i>Arbela watsoni</i> .                               | 23. <i>Orgyia senica</i> .              |
| 9. <i>Zygæna rubricollis</i> .                           | 24. <i>Cemptochilus sinuosa</i> .       |
| 10. <i>Drepana undulifera</i> .                          | 25. <i>Plotheia virescens</i> .         |
| 11. <i>Altha obliquifascia</i> .                         | 26. <i>Clisiocampa vulpes</i> .         |
| 12. <i>Charocampa hyporhodâ</i> .                        | 27. <i>Cucullia poliorhiza</i> .        |
| 13. <i>Macroglossa glaucoplaga</i> .                     |                                         |
| 14. <i>Theretra velata</i> , var. <i>albomarginata</i> . |                                         |

(To be continued.)

LES FORMICIDES DE L'EMPIRE DES INDES  
ET DE CEYLAN.

PAR AUGUSTE FOREL.

PART VI.

3me Sous Famille PONERINÆ.

Tableau des Genres (chez l'ouvrière).\*

|                                                                                                                                                                                                                                                                         |                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| Arêtes frontales très rapprochées entre elles, presque verticales, ne recouvrant nullement l'insertion des antennes; corps plus ou moins cylindrique; thorax convexe, sans sutures. Pas de cerci chez le ♂. Segment post-pédiculaire de l'abdomen petit, resserré ..... | ( <i>Cerapachii</i> )—17†       |
| Arêtes frontales écartées ou rapprochées; dans ce dernier cas elles se dilatent en avant en une lame oblique ou horizontale, recouvrant en partie l'insertion des antennes. Toujours des cerci chez le ♂ .....                                                          | 1                               |
| 1. Pédicule articulé au 1er segment de l'abdomen proprement dit suivant toute sa largeur et sa hauteur. Tibias postérieurs munis de deux éperons.....                                                                                                                   | ( <i>Amblyoponii</i> )—2        |
| Pédicule en forme d'écaille ou de noeud, fortement resserré à son articulation avec l'abdomen .....                                                                                                                                                                     | 4                               |
| 2. Funicule épaissi en massue vers l'extrémité ...                                                                                                                                                                                                                      | <i>G. Myopopone</i> —Roger.     |
| Funicule filiforme. Mandibules allongées et étroites.....                                                                                                                                                                                                               | 3                               |
| 3. Mandibules plus ou moins élargies en spatule à l'extrémité .....                                                                                                                                                                                                     | <i>G. Mystrium</i> —Roger.      |
| Mandibules plus ou moins pointues à l'extrémité ...                                                                                                                                                                                                                     | <i>G. Amblyopone</i> —Erichson. |
| 4. Mandibules linéaires, parallèles, articulées près du milieu du bord antérieur de la tête, armées à leur extrémité parfois dilatée, de deux ou trois grandes dents ....                                                                                               | ( <i>Odontomachii</i> ) 5       |
| Mandibules articulées vers les angles antéro-latéraux de la tête .....                                                                                                                                                                                                  | ( <i>Ponerii</i> ) 6            |
| 5. Fossettes antennaires confluentes en arrière. Pédicule surmonté au sommet d'une longue épine aiguë ...                                                                                                                                                               | <i>G. Odontomachus</i> —Latr.   |

\* Tout en le modifiant selon mes opinions, j'ai utilisé le tableau générique d'Emery (Annal. ac. ent. belg., XL, 1896, p. 176.) restreint aux genres de l'Inde.

† Ce groupe est placé par M. Emery dans les *Dorylinae*. Il m'est impossible de me ranger à cette opinion, malgré certaines affinités dont je ne découvre pas. A mon avis les caractères dits biologiques ont autant de valeur que les caractères dits morphologiques. En réalité il n'y a pas de différence biologique sans différence morphologique correspondante; seulement nous ne voyons pas toujours cette dernière, mais cela ne diminue en rien son importance. Les *Dorylinae* sont un groupe biologique. Du reste leurs ♀ aptères et aveugle sont certes un caractère morphologique assez important.

- Fossettes antennaires non confluentes. Pédicule ordinairement en écaille ou en noeud ..... G. *Anochetus*—Mayr.
6. Tibias moyens courts, avec deux éperons simples; Tibias postérieurs avec un éperon pectiné et un éperon simple; suture méso-métanotale nulle sur le dos..... G. *Centromyrmex*—Mayr.
- Eperons des tibias moyens conformés comme ceux des tibias postérieurs ..... 7
5. Mandibules longues et étroites, fortement convergentes dès la base (lorsqu'elles sont fermées), puis parallèles, armées en dessous d'une forte dent ..... G. *Harpegnathos*—Jerdon.  
Mandibules autrement conformées ..... 8
8. Onglets pectinés. Epistome avancé en triangle. Mandibules linéaires (S. G. *Leptogenys* s. str.) ou triangulaires (S. G. *Lobopelta*, Mayr.) ..... G. *Leptogenys*—Roger.  
Onglets simples, dentés ou fendus..... 9
9. Epistome dentelé. Pronotum avec une proéminence ou dent de chaque côté ..... G. *Odontoponera*—Mayr.  
Epistome autrement conformé ..... 10
10. Epistome plat, limité par une suture plus ou moins effacée. Tégument mat et couvert d'une pubescence pruineuse grise..... G. *Platythyrea*—Mayr.  
Epistome limité en arrière par une suture nette ..... 11
11. Arêtes frontales écartées, divergeant plutôt en arrière. Une épine aux hanches postérieures ..... G. *Ectatomma*—Sm., (S. G. *Stictopnena*—Mayr.)  
Arêtes frontales convergeant en arrière et ordinairement très rapprochées l'une de l'autre à leur extrémité postérieure, dilatées en lobe horizontal en avant ..... 12
12. Pédicule armé en arrière de deux épines ou dents. Epistome avancé en avant en triangle ..... G. *Diacamma*—Mayr.  
Pédicule inerme..... 13
13. Epistome prolongé en lobe, pointe ou dent en avant, au milieu ..... G. *Belonovelta*—Mayr.  
Epistome inerme ..... 14
14. Côtés de la tête comprimés. Episternite des côtés du mésothorax séparé de l'épimérite par une suture marquée. Occiput tronqué derrière..... G. *Ectomyrmex*—Mayr.  
Côtés de la tête arrondis, non comprimés; épisternite du méso-thorax non séparé de l'épimérite..... 15
15. Antennes sans massue distincte ..... G. *Ponera*—Latr.  
Antennes à massue de 4 articles ..... 16

16. Mandibules étroites, à bord terminal armé de cinq dents... *G. Cryptopone*—Emery.  
Mandibules livéaires, armées de deux dents séparées à leur bord interne, aiguës et courbées à l'extrémité..... *G. Myopias*—Roger.
17. Abdomen resserré entre chaque segment; pygidium impressionné ou bifurqué .....*G. Sphinctomyrmex*—Mayr., (*S. G. Eusphinctus* Em.  
Abdomen resserré seulement après le segment post-pédiculaire. 18
18. Antennes de 10 articles ..... *G. Ooceræa*—Rog.  
Antennes de 9, 11 ou 12 articles ..... 19
19. Pas d'yeux. Antennes de 9 articles. Massue d'un seul article ..... *G. Syscia*—Roger,  
Des yeux. Antennes de 11 ou de 12 articles. Massue de 2 ou 3 articles ..... 20
20. Yeux grands, situés en avant des côtés de la tête ..... *G. Lioponera*—Mayr.  
Yeux petits, au milieu, ou derrière le milieu des côtés de la tête..... *G. Cerapachys*—Sm.

1ère TRIBU AMBLYOPONII.

1er Genre MYOPOPONE—Roger.

*M. castanea*—Smith.

= *M. rufula*—Roger.

♀. L. 9 à 11 mill. Caractères du genre. Mandibules étroites, dentées, mais assez courtes. Epistome échancré, bidenté. Antennes de 12 articles. Yeux très petits. Mésonotum très court. Onglets simples.

Luisante, d'un brun rougeâtre, lisse avec des points grossiers dispersés, rares sur l'abdomen. Quelques stries devant, sur les côtés de la tête, ainsi que sur les côtés du thorax et du pédicule.

Var. *maculata*, Roger. L. 8; 5—9 mill. Une tache oblongue, jaune sur les tibias médians et postérieurs. Couleur châtain, avec les pattes plus claires.

Ceylan (Simon), Ceylan, Nicobares (d'ap. Roger), Birmanie (Fea), Thaung-yin Valley, Birmanie (Bingham) ♀.

♀. L. 14 mill. Occiput strié en long. Le pronotum dépasse devant le mésonotum, et forme une partie du dos. Le mésonotum a devant deux sillons convergents et derrière un sillon médian, comme chez certains ♂. Ailes enfumées de brun roussâtre. Du reste comme la ♀.

2me Genre MYSTRIMUM, Roger.

*M. camilleæ*, Emery.

♀. L. (sans les mandibules) 3, 3 à 4, 5 mill. Testaté, opaque. Tête et thorax réticulés—ridés. Une pubescence composée de poils jaunâtres,

courbés et squamiformes est dispersée sur tout le corps. Les quatre derniers articles des antennes légèrement plus épais que les autres. Yeux très petits. Mandibules fort épaissies au bout.

Bhamó, Birmanie (Fea).

3me Genre AMBLYOPONE, Erichson.

Subgen. *Stigmatomma*, Roger.

Je ne puis trouver les caractères indiqués par M. Emery (deux rangées de dents aux mandibules ; tête mate et densément ponctuée) comme suffisants pour rétablir le genre *Stigmatomma*. La *S. Emeryi*, Saunders, du Maroc a la tête luisante, et les dents des mandibules sont très variables. Les espèces connues de l'Inde appartiennent toutes au S. G. *Stigmatomma*, ayant deux rangées de dents aux mandibules.

Tableau des ouvrières.

- |                                                                                                              |                             |
|--------------------------------------------------------------------------------------------------------------|-----------------------------|
| Yeux ayant plus de 100 facettes. L. 8 mill .....                                                             | <i>A. Rothneyi</i> nov. sp. |
| Yeux ayant de 35 à 40 facettes.....                                                                          | 1                           |
| 1. L. 3, 3 mill. Sculpture plus grossière. Pédicule mat. Angles antérieurs de la tête non proéminents .....  | <i>A. Bellii</i> , nov. sp. |
| L. 6 à 6,5 mill. Pédicule luisant. Sculpture moins grossière. Angles antérieurs de la tête proéminents ..... | <i>A. Fea</i> —Emery.       |

Liste des espèces du genre *Amblyopone*.

1. *A. (Stigmatomma) Bellii*, nov. spec.

♀. L. 3, 3 mill. Mandibules obliquement striées, terminées par une dent lisse très recourbée et très longue. Sur la moitié terminale de leur bord interne une double rangée de 5 à 6 dents recourbées en arrière. Vers la base des dents obtuses. Tête presque carrée, aussi large que longue, à côtés fort convexes, avec les angles antérieurs à peine marqués. Palpes de 2 et 3 articles. Deux dents proéminentes, une de chaque côté du dessous du bord antérieur de la tête. Bord antérieur de l'épistome sans dentelures, droit, mais imprimé derrière. Aire frontale très étroite, élevée. Les yeux, situés en arrière du milieu des côtés de la tête, ont de 35 à 40 facettes. Les scapes dépassent à peine les 3/5 de la distance de leur racine au bord occipital. Ce dernier un peu concave. Funicules lentement épaissis vers l'extrémité ; avant dernier article plus large que long, ceux de la base plus longs que larges, les autres aussi longs que larges.

Mésnotum petit et court, mais fort distinct, et non recouvert par le pronotum. Suture méso-métanotale peu distincte. Le thorax fortement rétréci au mésnotum. Face déclive du métanotum obliquement tronquée ; les côtés obtusément bordés ; en haut, elle n'est nullement bordée. Le noeud du pédicule est distinctement transversal, légèrement plus large que long.

Tête, thorax et pédicule mats, densément, irrégulièrement et assez grossièrement réticulés ridés, avec de fines stries courtes et parfois de fines réticulations au fond. Souvent un point piligère au fond des réticulations. Sur le

pédicule et les côtés du thorax, les réticulations s'espacent et forment de grosses fossettes espacées à point piligère au milieu. Premier segment abdominal (après le pédicule) mat devant, assez densément et irrégulièrement ponctué ou réticulé-ponctué; les autres lisses, luisants, à points piligères. Scapes densément ponctués, subopaques. Jambes luisantes, abondamment ponctuées. Epistome strié en long.

Pilosité dressée courte, fine, roussâtre, assez abondante partout, plutôt oblique sur les tibias et sur les scapes. Pubescence fine, roussâtre, assez abondante partout, sans former nulle part de duvet.

Noire. Pattes, antennes, mandibules et extrémité de l'abdomen brunes. Extrémité des tarsi et des mandibules roussâtre.

Kanara (Bell).

2. *A. (Stigmatomma) Rothneyi*, nov. spec.

♀. L. 8, 0 mill. Mandibules et antennes comme chez la *Bellii*, mais les scapes sont un peu plus longs et les funicules un peu plus grêles, moins épaissis vers l'extrémité. Tête rectangulaire, plus longue que large, à côtés moins convexes, avec les angles antérieurs marqués, subdentiformes. Bord occipital plus tranché, concave. Yeux plats, grands, ayant de 100 à 120 facettes, situés aux  $\frac{3}{5}$  postérieurs des côtés de la tête. Le bord antérieur de l'épistome est légèrement convexe et très indistinctement crénelé, imprimé derrière.

Thorax comme chez la *Bellii*, mais la face déclive, tronquée du métanotum est distinctement bordée latéralement et subbordée en haut, sauf au milieu. Vu de dessus, le pédicule est plus rétréci derrière et aussi long que large ou même légèrement plus long.

Epistome strié en long. Tête mate, densément et assez finement réticulée-ridée, avec des fossettes espacées plus grossières portant un point piligère au milieu. Thorax et pédicule subopaques, densément ponctués ou réticulés-ponctués, un peu luisants dessus. Abdomen luisant, avec des points piligères épars, un peu plus abondants sur le 1er segment. Scapes et pattes ponctués.

Pilosité et pubescence comme chez la *Bellii*, mais jaunâtres, un peu plus fines et un peu plus longues. Plus de poils aux tibias et aux scapes.

D'un brun noirâtre. Tous les bords articulaires ou suturaux du corps d'un brun roussâtre. Pattes, antennes, mandibules, lobe des arêtes frontales et extrémité de l'abdomen d'un rougeâtre terne.

Barrackpore (Rothney).

Cette espèce se distingue surtout par ses grands yeux.

*A. (Stigmatomma) Fea*, Emery.

♀. Antennes à funicule à peine renflé. Angles antérieurs de la tête proéminents. Bord antérieur de l'épistome muni de 7 à 9 denticules. D'un brun foncé; tête et thorax mats, la première grossièrement réticulée, le second densément ponctué. Abdomen ponctué, assez luisant.

Je ne connais pas cette espèce, mais elle est plus petite que les précédentes et diffère de la *Rothuayi* par ses yeux de 35 facettes seulement et de la *Bellii* par sa sculpture, sa taille, les angles de la tête, l'épistome, etc.

Carin, Axinii Ghécù, 1,400 à 1,500 mètres, Birmanie (Fea).

Quelques ♂ très probablement d' *Amblyopone* ne peuvent être honnêtement décrits sans les ♀ un les ♀ correspondantes.

2<sup>me</sup> TRIBU ( DONTOMACHII.

4<sup>me</sup> Genre ODONTOMACHUS, Latr.

Tableau ds ouvriers.

Tête et thorax entièrement, densément et finement striés et d'un mat soyeux. Bord interne des mandibules sans ou presque sans denticules ; leurs dents apicales courtes et fortes, la préapicale largement tronquée. Corps robuste. L'horax faiblement échancré. Epine du nœud du pédicule distincte de ce dernier. Occiput échancré, son sillon distinct.

L. 9 à 11 mill..... *O. hæmatodes*, L.

Au moins l'occiput luisant. Sculpture plus grossière (sauf chez une variété du *monticola*) et moins dense. Thorax plus fortement échancré entre le mésonotum et le métanotum. Epine du pédicule sortant d'un rétrécissement insensible du nœud, sans limite distincte. Bord interne des mandibules denticulé .....

1

1. Côtés de la tête et de l'occiput luisants, finement chagrinés ; ce dernier avec quelques rares stries. Derrière de l'occiput lisse. Bord interne des mandibules muni de 7 à 8 denticules, inégaux. Dent préapicale large et largement tronquée, aussi large que longue : les deux autres assez étroites. Occiput échancré, à sillon très superficiel. Métanotum à stries transversales très grossières. Pronotum à stries circulaires. D'un brun rougeâtre foncé ; thorax brun-noir ; pattes, antennes et mandibules d'un jaune rougeâtre. L. 11 à 12, 5 mill..... *O. monticola*.

Occiput lisse et luisant, sans ponctuation. Stries du thorax faibles et fines, effacées sur la pronotum .....

*O. monticola*, Em. v  
*Longi*—n. var.

Occiput très lisse et très luisant. Sillon occipital plus marqué, mais peu profond .....

2

2. Plutôt robuste. L. 11 à 12 mill. Occiput assez large, fortement échancré, formant deux lobes distincts, avec de gros points enfoncés épars. Mandibules avec 3 ou 4 denticules à leur bord interne. Dent préapicale très large et très largement tronquée, aussi large que longue ; les deux autres assez

étroites. Côtés de la tête luisants, avec de faibles réticulations et stries effacées, aussi dans les fossettes latérales. Thorax grossièrement et transversalement strié. Brunâtre. Pattes, antennes, joues et mandibules rougeâtres ... *O. monticola*---  
 Emy. r. *punctulatus* nov. st.

Grêle. L. 10 à 11, 5 mill. Scapes dépassant l'occiput. Occiput allongé, étroit, faiblement échancré, lisse et luisant (parfois avec quelques stries effacées). Mandibules avec 5 ou 6 denticules au bord interne, à dents apicales étroites et longues, la préapicale tronquée, 2 ou 3 fois plus longue que large. Côtés de la tête lisses et luisants. Tibias très amincis à leur base. Thorax très échancré. D'un roux jaunâtre; abdomen jaune brunâtre; pattes et antennes testacées. (Couleur brune. var. *obscurior* nov. var.)..... *O. rivosus*; Sm.

Liste des espèces du Genre *Odontomachus*.

1. *O. hæmatodes*, L.

Madras (Rothney), Ceylon (Ris, Rothney, Yerbury), Cochin (Rothney), Travancore (Ferguson).

2. *O. monticola*, Emery.

Carin Ghecù, Carin Ascini Chebà, 600 à 1,400 mètres (Fea).

Var. *Longi*, n. var. ♀. L. 10 à 10, 5 mill. Couleur du *rivosus* de Sumatra, d'un rouge jaunâtre, avec l'abdomen d'un brun jaunâtre. Occiput tout à fait lisse et luisant, sans ponctuation. Mais il diffère surtout du type par ses stries faibles et fines du thorax qui est luisant. Sur le dos du pronotum les stries sont presque effacées; le milieu est luisant et presque lisse.

Assam et Garo Hills, Assam (Long).

*O. monticola*, Emery, r. *punctulatus*.

Race *punctulatus*, nov. st. ♀ (voir tableau). Un peu plus petit que le *monticola* typique, il en diffère surtout par sa forte échancrure occipitale qui divise l'occiput en deux lobes fort distincts. Le sillon occipital est plus profond. La couleur est d'un brun plus foncé. Du reste les dents des mandibules et la forme générale, sauf pour l'occiput, sont bien celles du *monticola*.

Assam (Miss Pennington).

4. *O. rivosus*, Sm.

Siam frontier (Fulton), Burmah (Binglam), Bangkok (Sigg).

Les exemplaires de Birmanie et de Siam sont plus foncés que ceux de Sumatra et de Singapore, bruns et en général aussi plus petits (v. *obscurior*, n. v).

5<sup>me</sup> Genre ANOCHETUS, Mayr.

Tableau des ouvrières.

|                                                                                                 |   |
|-------------------------------------------------------------------------------------------------|---|
| Mandibules armées de deux longues dents apicales seulement                                      | 1 |
| Mandibules armées de deux dents apicales et d'une troisième dent intermédiaire subapicale ..... | 2 |
| 1. Pédicule conique ou avec une épine un peu obtuse. L. 6, 5                                    |   |

- mill. Bord interne des mandibules avec 2 denticules... *A. Nietneri*—Roger.
- Pédicule atténué au sommet, mais sans cône. Bord interne des mandibules avec 10 à 13 forts denticules. L. 7 à 7, 5 mill. (à 8 d'ap. Emery). Tibias et scapes plus poilus que chez le *Risii* ..... *A. princeps*—Emery.
2. Pédicule conique, élevé, prolongé en dent ou épine mousse. Bord interne des mandibules très faiblement denticulé. Dent subapicale des mandibules très petite et située très près de l'extrémité de la dent inférieure..... *A. Risii*, nov. spec.
- Pédicule squamiforme, sans trace de cône. Métanotum bidenté. Epistome convexe devant, non échancré. Yeux éloignés de la fossette antennaire. D'un jaune rougeâtre. L. 4, 8 à 4, 9 mill. .... *A. longifossatus*—Mayr.
- Comme le précédent, mais les yeux très petits (20 facettes) et la tête fortement ponctuée..... *A. myops*—Emery.
- Pédicule squamiforme sans trace de cône. Métanotum inerme. 3
3. Premier segment de l'abdomen (après le pédicule) entièrement lisse et luisant jusqu'à sa base, sauf les fins points piligères ordinaires dispersés ..... 4
- Premier segment de l'abdomen ayant au moins à sa base de gros points enfoncés, rapprochés, qui sont un peu en fossettes et lui donnent un aspect inégalement sculpté..... 5
4. L. 5, 5 à 5, 8 mill. Ecaille assez épaisse, presque aussi épaisse au sommet qu'à la base. Côtés de la tête jaunâtre avec une grande tache brune dans la fossette qui sépare l'œil de l'angle occipital ..... *A. Madarászi*—Mayr.
- L. 6 à 6, 5 mill. Ecaille très épaisse, allant en s'épaississant du sommet à la base ce qui lui donne un aspect légèrement conique de côté. Tête d'un rouge jaunâtre uniforme comme le thorax ; abdomen brun. *A. Sedilloti*—Emery, var. *indicus*, nov. var.
5. Yeux grands, un peu plus larges que la partie élargie des mandibules ..... 6
- Yeux plus petits, plus étroits que la partie élargie des mandibules. Ecaille mince..... 7. *A. punctiventris*—Mayr, et ses races.
6. L. 7 mill. Tête, thorax, pédicule et premier segment de l'abdomen fortement sculptés et mats. Ecaille fort épaisse. *A. orientalis*—André, et var. *kanariensis*, nov. var.
- L. 4, 5 mill. Côtés de la tête, occiput, vertex et écaille (sauf quelques fines stries sur les côtés de cette dernière) lisses et luisants. Ecaille mince ..... *A. Yerburyi*, nov. sp.
7. L. 3, 6 à 3, 8 mill. Thorax densément ponctué ou réticulé-ponctué et subopaque, ridé transversalement sur la face

- déclive du métanotum. Abdomen luisant. Base du premier segment avec de gros points enfoncés nombreux. D'un rouge jaunâtre. Pattes, antennes et mandibules testacées, abdomen brunâtre ..... *A. punctiventris*, i. sp., Mayr.
- [L. 3, 8 à 4 mill. Un peu plus grêle; métanotum plus étroit, à face déclive un peu concave et bordée. Ecaille un peu plus épaisse au sommet. Sculpture plus forte. Thorax densément réticulé-ponctué et mat. Couleur plus foncée. Nouvelle Guinée ..... *A. punctiventris*, r. *oceanicus*—Emery.]
- L. 4 à 4, 5 mill. Plus robuste que la race *oceanicus*. Métanotum plus large et moins bordé. Ecaille plus large, plus épaisse en bas et plus mince en haut, où elle est un peu courbée en avant. Sculpture du thorax très dense et très grossière; sur le pronotum, devant, les réticulations sont entremêlées de rides arquées, concaves en arrière (c'est aussi le cas chez *oceanicus*). Les yeux sont situés sensiblement en avant du milieu des côtés de la tête; chez *oceanicus* à peine ..... *A. punctiventris*, r. *Taylori*, nov. st.
- L. 4, 8 à 5, 2 mill. Encore plus robuste, thorax plus large, métanotum bordé ..... *A. punctiventris*, r. *rudis*, Emery.

Liste des espèces du Genre *Anochetus*.

1. *A. Nietneri*, Roger.  
Ceylan (Nietner).
2. *A. princeps*, Emery.  
Tcibodas, Java (Beccari); Thagata, Tenasserim. (Fea).
3. *A. Risii*, nov. spec.

♀ (voir tableau). Voisine du *princeps*, cette belle espèce en diffère encore par l'extrémité très proéminente du bord interne des mandibules (avant les dents apicales): cette extrémité porte une forte dent courbée, dirigée en avant et en dedans. En outre les yeux sont plus grands, l'occiput est moins profondément excavé et le mésonotum faiblement convexe, sans arête (chez le *princeps* il a devant une arête transversale élevée). Pilosité dressée assez éparsée sur le corps, les pattes et les scapes. Front strié en long; métanotum grossièrement ridé en travers; quelques vagues rides sur le dos du mésonotum et le cou du pronotum. Tout le reste lisse et luisant. D'un rouge un peu brunâtre; abdomen d'un jaune brunâtre; pattes, antennes et mandibules testacées. Mandibules longues comme les  $\frac{3}{4}$  de la tête.

Récolté par le Dr. F. Ris au Victoria Pic, près de Hong Kong; nid sous une pierre.

4. *A. myops*, Emery.

Palon, Birmanie (Fea).

C'est avec doute que j'ai intercalé dans le tableau cette espèce qui m'est inconnue en nature. Mayr n'en parle pas dans la description si détaillée de

son *longifossatus*, et Emery ne parle pas des caractères de l'épistome, des fossettes antennaires et des arêtes frontales qui distinguent le *longifossatus*. Les différences des yeux et de la sculpture que j'ai cru pouvoir tirer des descriptions sont peu sûrs.

5. *A. longifossatus*, Mayr.

Filawewa, Ceylan (Madarász).

6. *A. Madarászi*, Mayr.

♂. L. 4 mill. ; longueur d'une antenne 3, 5 mill., d'une aile aussi 3, 5 mill. Mandibules rudimentaires, sans dents, formant un petit triangle dont la pointe est dirigée droit en avant, et qui ne peuvent se croiser au milieu, étant trop courtes. Premier article du funicule globuleux. Les yeux occupent à peu près tout le côté de la tête. Bord postérieur de la tête droit. Thorax robuste, plus large que la tête, avec deux sillons convergents au mésonotum et un scutellum proéminent. Métanotum formant une seule convexité médiocre. Le pédicule forme, vu de côté, un petit cône bas et obtus. Valvules génitales extérieures longues et étroites.

Tête et thorax fortement ponctués et subopaques ; métanotum rugueux. Abdomen et pédicule luisants, à points piligères. Pilosité courte et médiocre ; pattes et scapes sans poils dressés. D'un noir un peu brunâtre sur les côtés du thorax. Abdomen brun, avec le bord des segments jaunâtre. Pattes et antennes d'un jaune brunâtre sale. Ailes hyalines, finement pubescentes.

Orissa (Taylor), Kanara, ♀ ♂ (Bell), Kalawewa, Ceylan (Madarász).

7. *A. Sedilloti*, Emery.

Tunisie, près de Gabès (Sédillot).

Var. *indicus* nov. var. ♀. Un peu plus grand que le type (6, 2 à 6, 5 mill.). Suture méso-métanotale plus obsolète que chez le type. Un peu moins pubescent que le *Sedilloti* de Tunisie, et de couleur un peu plus claire. La sculpture de la tête, en particulier la ponctuation, est aussi encore un peu plus faible. L'écaïlle est un peu moins amincie en haut (moins en cône, vue de côté). Toutes ces différences sont trop faibles pour constituer autre chose qu'une variété locale.

♀. L. 7 mill. Ocelles très petits. Pronotum plus long que le mésonotum. Ce dernier petit, presque plan, bordé de deux carènes qui convergent en arrière. Métanotum subcubique, ridé en travers. Pronotum en partie strié et ponctué ; mésonotum mat irrégulièrement ponctué. Ailes subhyalines. Du reste comme l'ouvrière.

♂. L. 4, 5 à 5 mill. Tout à fait semblable au ♂ du *Madarászi*, mais le mésonotum n'a pas de sillons convergents. Pédicule un peu plus haut. Valvules génitales plus grosses. D'un noir brunâtre ; derrière de l'abdomen brun. Pattes et antennes testacées. Les ailes hyalines et glabres ont les nervures et la tache marginale assez pâles ; elles ont deux cellules cubitales

et une cellule radiale fermée (ce qui n'est pas visible sur les exemplaires à ailes chiffonnées du *Madarássi*).

Bombay, Poona ♀, ♀ (Wroughton), Coonoor (Daly), Guzerath (Wroughton), Bhavnagar et Vehar Lake, près de Bombay (Rothney), Ahmednagar, ♀, ♀, ♂ (Pater Heim), Karwar, Kanara (Aitken).

8. *A. orientalis*, André.

Cochinchine (d'après André).

*R. A. kanariensis*, nov. st.

♀. L. 6 à 6,7 mill. Tête, thorax et pédicule entièrement mats (peu luisants chez l'*orientalis*). Une pilosité dressée d'un jaune roussâtre abondamment et également répartie sur tout le corps, les antennes et les pattes (chez l'*orientalis* elle est blanchâtre, très oblique et presque nulle sur la tête et l'extrémité de l'abdomen). Tête densément striée-ridée ; les stries divergent en arrière et leur intervalle est réticulé-ponctué. Thorax densément, fortement et irrégulièrement réticulé rugueux ainsi que le pédicule et les  $\frac{2}{3}$  antérieurs du 1er segment abdominal. Quelques rides en outre sur la face déclive et les côtés du métanotum. Le tiers postérieur du 1er segment abdominal est strié en long chez certains exemplaires (Kanara), plutôt ponctué et luisant chez d'autres (Madras). Le reste de l'abdomen est lisse, luisant et ponctué. Chez l'*orientalis* typique le thorax (sauf le pronotum rugueux) est ridé. L'écaille, fort épaisse, aussi épaisse en haut qu'en bas, est légèrement, mais distinctement avancée (acuminée) à son bord supérieur antérieur ; la pointe mousse que forme ainsi ce bord est dirigée en avant. (André n'indique rien de semblable pour l'*orientalis*).

D'un brun noirâtre ; mandibules, antennes, pattes, joues, épistome et arêtes frontales rougeâtres. Hanches et cuisses brunes chez les exemplaires de Madras. Chez les exemplaires de Kanara, le thorax, l'écaille, les hanches et les cuisses sont rougeâtres.

Les exemplaires de Madras constituent une variété (*obscurior*) un peu différente et plus grande (6,5 à 6,7 mill.), tandis que ceux de Kanara n'ont guère plus de 6 mill.

Kanara (Wroughton) ; Madras (Rothney, var. *obscurior*).

9. *A. Yerburyi*, nov. sp.

♀. Ressemble beaucoup à la race *Taylori* du *punctiventris*, mais en diffère par ses grands yeux, sa taille un peu plus svelte et sa sculpture plus faible. Chez le *Taylori* les articles 3 à 6 du funicules sont à peine plus longs que larges, chez le *Yerburyi*  $1\frac{3}{4}$  fois plus longs que larges. Les scapes atteignent ou dépassent un peu le bord occipital. Le thorax est rugueux (irrégulièrement réticulé), avec quelques rides concaves en arrière, devant le pronotum ; métanotum ridé en travers. Ecaille mince, lisse et luisante, base du 1er segment abdominal avec de gros points ou fossettes abondantes, mais lisse dans leurs intervalles. Sur le corps une pilosité courte, médiocrement

abondante, d'un jaune roussâtre. Tibias et scapes sans poils dressés. Mandibules longues comme un peu plus de la moitié de la tête, sans dentelures à leur bord interne. Dent subapicale moyenne. D'un brun de poix ; thorax parfois d'un brun roussâtre. Tête d'un jaune rougeâtre. Antennes, mandibules et pattes testacées.

Ceylan (Yerbury, Madarász).

10. *A. punctiventris*, i. sp., Mayr.

♀. L. 4 mill. Thorax large. Pronotum aussi long que le mésonotum ; tous deux luisants et abondamment ponctués. Le mésonotum a deux carènes latérales convergeant en arrière. Scutellum lisse et luisant. Métanotum fortement ridé en travers. Ecaille échancrée au sommet. Ailes manquent.

Calcutta et Nuddea District (Rothney), Calicut (Rothney), Orissa ♀ (Taylor), Barrackpore (Rothney), et Ahmednagar (Pater Heim).

Race. *A. Taylori*, nov. st.

♀. Forme un passage entre le *punctiventris* et en particulier sa race *oceanicus* de Nouvelle Guinée et le *rudis*. La couleur varie du brun foncé au rouge jaunâtre ou brunâtre. Les pattes, les antennes et les mandibules demeurant d'un jaune sale. Bord interne des mandibules inerme, tranchant. Taille et aspect du *Yerburyi*, la tête étant ordinairement plus claire, comme chez ce dernier. Ecaille souvent un peu échancrée au sommet. Voir du reste le tableau.

Coonoor (exemplaires foncés), Belgaum et Poona (exemplaires clairs), récolté aux trois endroits par M. Wroughton.

Race. *A. rudis*, Emery.

M. Emery a déjà soupçonné avec raison que cette forme pourrait n'être qu'une race du *punctiventris*. Le fait est maintenant hors de doute, le *Taylori* constituant le passage.

Mandalay, Birmanie (Fea).

3<sup>me</sup> TRIBU HARPEGNATHII.

6<sup>me</sup> Genre HARPEGNATHOS, Jerdon.

= *Drepanognathus*, Smith.

Tableau des ouvrières.

L. 18 mill. Tête et abdomen noirâtres. Thorax et pattes roussâtres (d'après Jerdon) ..... *H. saltator*—Jerdon.

L. 16 à 18 mill. Entièrement d'un noir brunâtre, avec les mandibules, l'épistome (sauf une tache brune au milieu), les arêtes frontales, les funicules, les deux extrémités des scapes, les segments postérieurs de l'abdomen, les pattes (sauf une bande ou ligne brune longitudinale de chaque côté des cuisses et des tibias) d'un testacé plus ou moins jaunâtre ou rougeâtre. Abdomen mat, densément et très finement réticulé-ponctué. Sur son 1er segment, en outre, de grosses fossettes allongées. Articles 3 à 7 du funicule moins de 3 fois plus longs que larges..... *H. venator*—Smith.

L. 14, 5 à 17 mill. D'un roux ferrugineux clair, avec l'abdomen brun, les pattes, les antennes et les mandibules testacées. Abdomen lisse et luisant, avec de gros points enfoncés sur son 1er segment, dont la base est en outre finement réticulée. Articles 3 à 7 des funicules plus de 3 fois plus longs que larges ..... *H. cruentatus*—Smith. Chez les trois espèces, la tête, le thorax et le pédicule sont profondément et grossièrement réticulés-ponctués.

Liste des espèces du genre *Harpegnathos*.

1. *H. saltator*, Jerdon.

Malabar, Tellicherry et Mysore (d'après Jerdon). Comme cette espèce n'a jamais été retrouvée depuis Jerdon et que cette région est précisément celle d'où Pou reçoit le *H. cruentatus*, Sm., j'incline fortement à penser que les deux espèces sont synonymes et que Jerdon aura décrit un exemplaire dont la tête était particulièrement foncée.

Il faut cependant attendre un plus ample matériel pour trancher définitivement la question. Si j'ai raison, l'espèce devra prendre le nom de Jerdon.

2. *H. venator*, Smith.  
= *H. rugosus*, Mayr (var).

♀. Identique à la description que Mayr donne de son *H. rugosus*, et identique à l'ouvrière. Mais le 1er segment abdominal a de longues fossettes au lieu des rugosités indiquées par Mayr. Ocelles vers le milieu de la tête. Yeux atteignant les articulations mandibulaires. Pronotum assez grand, prenant sur le dos du thorax autant de place que le mésonotum qui est petit. L. 18 à 20 mill.

♂. Ailes avec 2 à 3 cellules cubitales, deux cellules discoïdales et une cellule radiale fermée. Mandibules assez rudimentaires. Antennes longues, filiformes, avec le 1er article du funicule court, aussi large que long. Epistome grand, en trapèze. Aire frontale très grande, triangulaire. Les antennes sont insérées derrière l'aire frontale, à côté des arêtes frontales qui sont très courtes, très rapprochées et situées tout-à-fait derrière l'aire frontale. Mésonotum avec deux forts sillons convergents. Palpes maxillaires d'au moins cinq longs articles. Pygidium terminé en longue pointe aiguë.

Les caractères précédents sont ceux du genre et sont tirés en partie du *cruentatus* ♂ (pour les ailes spécialement).

L. 10 mill. Mandibules larges à la base, puis se terminant en une pointe assez longue, grêle, étroite, atrophiée, dirigée en avant. Tête en rectangle arrondi, plus large que longue. Yeux plutôt moins gros que chez la ♀. Devant le scutellum, entre lui et le mésonotum, une concavité courte, bordée de deux arêtes et fortement striée au fond. Lisse et luisant, sauf le thorax qui est grossièrement rugueux, ponctué ou ridé (en long sur le métanotum). Sur la tête quelques rides très éparses, surtout derrière les ocelles, où des rides plus fortes font deux petites arêtes longitudinales. Une pilosité fine et jaunâtre abondante sur les pattes, moins abondante ailleurs. Peu de

pubescence. Le 1er segment de l'abdomen proprement dit est pyriforme et forme presque comme, un 2me noeud de pédicule ; l'abdomen est un peu resserré après le segment suivant ! Pris avec les ♀ et la ♀.

Thorax et pédicule d'un noir brunâtre. Tête et 1er segment pyriforme de l'abdomen proprement dit d'un rouge jaunâtre. Reste de l'abdomen d'un jaune un peu rougeâtre. Pattes et antennes d'un testacé très pâle.

Dehra Dun. ♀, ♂ (Smythies), Khasia Hills, Assam, ♀, ♂, ♀ (Smythies), Assam (Lindgren), Madras (d'après Smith).

Var. *rugosus*, Mayr. Mayr a décrit sous le nom de *H. rugosus* une ♀ sans ailes de Hong Kong dont la description correspond à tous égards, même dans les plus fins détails de couleur, aux ♀ d'*H. venator* que je possède, mais le premier segment de l'abdomen a des rugosités au lieu de fossettes allongées. Comme ces deux genres de sculpture passent souvent de l'un à l'autre en cet endroit, je considère le *H. rugosus* comme simple variété du *H. venator*.

### 3. *H. cruentatus*, Smith.

♀. Diffère de la ♀ du *venator* par les mêmes caractères que l'ouvrière (voir tableau). L. 17 mill. Ailes manquent. Thorax comme chez le *venator* ♀. Une ♀ de Ceylan a une tache ferrugineuse sur le 1er segment de l'abdomen proprement dit. L'autre de Travancore est au contraire plus foncée.

♂. (caractères génériques, voir *venator* ♂). L. 9, 5 mill. Mandibules très courtes, rudimentaires, en triangle assez large, sans pointe prolongée. Tête aussi longue que large, fortement rétrécie derrière les yeux et allant en se rétrécissant jusq'u' à l'articulation occipitale. Concavité devant le scutellum plus courte et plus large que chez le *venator*. Face déclive du métanotum fortement bordée d'une arête (faiblement chez *venator*). Premier segment de l'abdomen proprement dit après le pédicule, pyriforme, allongé, comme chez le *venator*, mais pas de rétrécissement après le segment suivant. Une petite carène médiane derrière l'occiput.

Lisse et luisant. Métanotum, pédicule (à noeud allongé comme chez le *venator* et l'ouvrière) et une partie des côtés du mésonotum grossièrement rugueux (réticulés ou ponctués). Quelques fossettes ou rides vagues et éparses sur le reste du thorax. Pilosité comme chez le *venator*. D'un roux brunâtre ; pédicule plus foncé. Abdomen brun. Pattes et antennes d'un testacé très pâle. Ailes hyalines à nervures et tache marginale fort pâles.

Poona (Wroughton), Kanara (Bell, avec une araignée mimétique, le *Salticus plataloides*, Cambr.), Travancore (Ferguson), Ceylan, ♂ (Yerbury), Ceylan ♀ (Sarrasins frères), Hong Kong (d'après Smith).

Je ne crois pas faire erreur en rapportant ce ♂ au *cruentatus*. Je doute par contre de la patrie " Hong Kong " indiquée par Smith qui indique tout à côté Madras pour le *venator*. Tous les *venator* que j'ai reçus venaient du nord et des régions montagneuses et tous les *cruentatus* du sud et de l'ouest. Smith n'aurait-il pas transposé la patrie des deux espèces ?

(To be continued.)

SUPPLEMENTARY NOTES ON THE *COCCIDÆ* OF CEYLON.

By E. ERNEST GREEN, F.E.S., GOVERNMENT ENTOMOLOGIST.

WITH PLATES A—G.

*(Read before the Bombay Natural History Society on 16th  
January, 1899.)*

Since the publication of the first part of my work on the "*COCCIDÆ* OF CEYLON," new species have come to light, belonging to genera already dealt with in that earlier part. I propose to notice these additions in a series of supplementary papers to be published, from time to time, in the *Journal of the Bombay Natural History Society*.

Before commencing a description of the newly discovered species, I wish to draw attention to my earlier remarks on the preparation of specimens for the microscope, (*vide* "*Coccidæ of Ceylon*," Part I, p. 11). I have there advocated the use of glycerine media in the place of canada balsam. Later experience shows several serious disadvantages attending the use of glycerine in any form. Slides mounted and sealed in England, when taken to Ceylon, were completely spoiled. The contents of the cells expanded and burst their bonds; the medium exuding over the slide and collecting dust and dirt, from which it is impossible to free the mount without injury to the specimen, the cover glass being now quite loose. A further disadvantage is that the stain will not remain fixed in this medium, but is gradually dissipated, leaving the object practically colourless. My present plan, which I have found entirely satisfactory, is to stain the object deeply, in an aqueous solution of Weigert's Fuchsin (acid): destain to required intensity in alcohol: remove the object to Oil of Cloves, which arrests any further loss of stain. The object is now mounted in canada balsam, the colour counteracting the high diffractive effect of this medium. When once the balsam is dry the slides can be repeatedly cleaned without fear of shifting either the object or the cover glass.

A question of etymology may be also briefly noted here. The late Mr. W. M. Maskell, shortly before his regrettable death, remarked to me that the construction of the terms *CONCHASPINÆ* and *DIASPINÆ* was wrong. He held that the roots being *CHONCHASPIS* and *DIASPIS* the derivatives should be *CHONCHASPIDINÆ* and *DIASPIDINÆ*, respectively. The distinction may appear to be purely academical, but a proper grammatical formation of the terms used in nomenclature should always be considered.

Genus *ASPIDIOTUS*.*ASPIDIOTUS TRILOBITIFORMIS*, Green. (Pl. A, fig. 1.)

Male puparium smaller and narrower than that of the female. Colour clear brown to brownish-white: usually situated on upper surface of leaf. Length 2mm.

Adult male (emerged 26th October) pale creamy white, tinged with lilac : head fuscous : notal plates fulvous : apodema reddish. Form normal. Terminal joint of antenna with 3 knobbed hairs, 1 at apex and 2 at side. Foot with 4 digitules. Genital sheath dilated at extremity (fig. 1).

The ordinary food plant of the species proves to be *Nothopegia Colebrookiana*.

M. D'E. de Charmoy has recently described what I can only consider to be a variety of *trilobitiformis*, under the name of *Asp. darutyi*, ('Revue Agricole', July, 1898). It occurs on 'Mango' in Mauritius. The only appreciable difference is in the colour of the female puparium which is almost pure white.

ASPIDIOTUS THEÆ, Mask., var. RHODODENDRI, n. var. (Pl. A, figs. 2, 3).

*Asp. theæ* Mask. 'Ind Mus. Notes,' Vol. II, p. 59.

*Asp. theæ*, "Trans. N. Z. Instit." 1891, p. 1.

*Asp. theæ*, Do. Do. 1892, p. 207.

Female puparium very dark chocolate-brown, almost black, but concealed by a greyish coating composed of the tomentose hairs of the leaf upon which it rests. Form approximately circular, the outline often affected by a prominent vein of the leaf ; flattish. Pellicles thin, yellowish, usually quite concealed. Secretory part stout, compact and hard. Diameter 2.50mm.

Male puparium whitish, median area tinged with brown. Pellicle yellow. Form oblong, rather narrow and elongate. Pellicle close to anterior extremity. Length 1.82 mm. Breadth 0.75mm.

Adult female (fig. 2) with a well defined transverse furrow behind the prothoracic segment. Form oblong : median area (mes- and meta-thorax) broadest. Division of segments defined by transverse thickened lines. Margin rather deeply incised at junction of segments. Body hard, chitinous and polished, retaining its shape after death. On the cephalic area are several indefinite irregularly circular translucent patches besides some thickened bands. Anterior spiracles with conspicuous group of parastigmatic glands. Pygidium (fig. 3) with a reticulated median dorsal patch with clearly defined boundaries. Numerous conspicuous oval dorsal pores, with thickened rims, in irregular series. Eight prominent lobes—as in *theæ* : the median pair broad, indistinctly notched near the extremity of both inner and outer edges : other lobes very narrow, spatulate, the fourth pair notched on the outer edge. Squames narrow : each with three points at extremity : extending as far as lobes : situated in the space between the lobes only, none outside the last lobe. Circumgenital glands in four crowded groups with numerous orifices, the upper groups largest. Anal aperture very small, situated at lower extremity of reticulated patch.

Length 1.25 to 1.75mm. Breadth 1.0 to 1.25mm.

Adult male not observed.

*Habitat.*—On leaves of *Rhododendron arboreum*, Nuwara Eliya. The male scales forming conspicuous spots on the dark green smooth upper surface of the leaf. Female scales situated in the angles formed by the midrib and lateral veins: often completely concealed beneath the tomentose hairs of the leaf.

The variety *rhododendri* differs from typical *theæ* principally in the nature of the puparium, which, in the present form, is stouter, flatter, and of a deeper colour. Also in its habitat, *theæ* occurring on the stems and twigs of the plant, while *rhododendri* is found only on the leaves. It differs from *trilobitiformis* in the much stouter and darker puparium: in the form of the adult female, (being broader and less pointed posteriorly): and in the proportionate size of the lobes. In *trilobitiformis* the lateral lobes are not much smaller than the median pair: while, in both typical *theæ* and var. *rhododendri*, the median lobes are very broad and the lateral lobes very narrow. In all three forms there are normally 8 distinct lobes (3 lateral lobes on each side of the median pair). In Prof. Cockerell's drawing of *trilobitiformis* ("San Jose Scale and its nearest Allies," U. S. Depart. of Agric., Div. of Entom., Tech. Series, No. 6, p. 11) the outer lateral lobes are omitted. These particular lobes are rather fragile, and in many examples are more or less broken.

ASPIDIOTUS DICTYOSPERMI, Morg., var. ARECÆ, Newst. (Pl. A, fig. 4.)

*Asp. dictyospermi*, Morg., "Ent. Mo. Mag." Aug. 1889, p. 352.

*Diasp. pinnulifera*, Mask., "Tran. N. Z. Instit.," 1890, p. 4.

*Asp. dictyospermi*, var. *arecæ*, Newst., "Ent. Mo. Mag.," Aug. 1893, p. 185.

Female puparium pale reddish-brown or orange-brown: circular: almost flat: exuvix subcentral, first pellicle with a circumscribed raised median area bearing a central boss and raised ring which, in fresh specimens, are covered with white waxy matter: ventral scale represented only by a thin film which remains attached to the plant. Length 1 to 1.87mm.

Adult female pale yellow: of normal form: spiracles without parastigmatic glands. Pygidium rather pointed; with six lobes, median pair largest, second and third pairs decreasing in size, all of same form, apex rounded, inner edge longest, outer edge with a small notch (fig. 4). Squames small, with irregularly fimbriate extremities. Immediately beyond the outer lobes are two (sometimes three) marginal prominences, each bearing a conspicuous narrow lanceolate process serrated on its outer edge, besides a long spine-like point: a third marginal prominence usually bears two long serrated points. There are ten club-shaped incrustations, one from the inner edge of each lobe, one from the outer edge of the median lobes, and one half-way between the second and third lobes. Conspicuous oval pores on the dorsal surface, in definite linear series, two series on each side. Circumgenital glands in four groups, with few orifices; upper laterals usually 4, and lower laterals 2 only. Length about 1 mm.

Male (either scale or adult insect) not observed in Ceylon. Newstead describes the male scale as being of the same colour and structure as that of the female.

*Habitat*.—In Ceylon, on *Cycas revoluta* (Kandy): on stems of cultivated rose trees, on leaves of 'Kina,' *Calophyllum* sp. (Pundaluoya): and on Ivy leaves (Watagoda).

This species can be readily distinguished from all others by the remarkable lanceolate processes on the margin of the pygidium, which however are not easily seen except in a stained preparation.

The type was described by Morgan from Demerara. The variety *arecæ* was received by Mr. Newstead from the same locality. The species occurs also in India, on the Tea plant.

ASPIDIOTUS FIGUS.

I am informed that the specific name should be accredited to Ashmead, (instead of to Comstock, as quoted in Part I of the "Coccidæ of Ceylon"). At the time of publication of my earlier part, the male scale of this species had not been observed in Ceylon. I have since found it abundantly on leaves of *Rhododendron arboreum* in Nuwara Eliya.

ASPIDIOTUS ORIENTALIS, Newstead.

*Asp. osbeckiæ*, Green, "Coccidæ of Ceylon," Part I, p. 47, pl. VII.

I now believe that the insect to which I gave the name of *osbeckiæ* is identical with *A. orientalis*, described by Mr. Newstead from Madras (Indian Museum Notes, Vol. III, No. 5).

I have since found the same species on the stems of *Atylosia candollii* in Pundaluoya.

ASPIDIOTUS TRANSPARENS, Green.

*Asp. transparens*, Green (part), "Catalogue of Coccidæ," Indian Museum Notes, Vol. IV, No. 1, 1896.

Ex-error, *A. lataniæ*, Sign., "Coccidæ of Ceylon," 1896, p. 49.

There has unfortunately been a double mistake in my determination of this insect, which has greatly confused the nomenclature.

Firstly I confused two distinct species (*transparens* and *destructor*) under the one name. And secondly I re-determined the (two) insects as *lataniæ* of Signoret. I have since been enabled to examine type specimens of Signoret's *lataniæ*, which has convinced me that the Ceylonese form is quite distinct. It will therefore revert to one of its earlier names. The name *transparens* was originally applied by me ("Insect Pests of the Tea Plant") to the species occurring on Tea, which I now find to be identical with the *destructor* of Signoret. But in my "Catalogue of Coccidæ" the insect now under consideration was included under the name *transparens*, which name may therefore be conveniently retained.

The description of the supposed *lataniæ* in my "Coccidæ of Ceylon" was drawn up chiefly from the present species: but the yellow variety of the male, represented on Pl. VIII, is that of *destructor*.

The following corrections for typical *transparens* may be noted.

The median lobes are scarcely tricuspid; but are usually notched on the outer edge only, though there is sometimes a slight emargination on the inner edge close to the extremity. The median are as long as or slightly longer than the lateral lobes.

There are a few very inconspicuous dorsal pores, communicating with some of the filiform spinneret ducts. The squames and spines are as in *destructor*, though the dorsal spine at base of median lobes is not quite so long as in that species.

*Habitat*.—On *Dalbergia championii*, on *Mesa indica*, and on several unidentified plants.

ASPIDIOTUS DESTRUCTOR, Signoret. (Pl. B, fig. 5.)

*Asp. destructor*, Sign., "Essai," 1869, p. 129, (94).

Do. "Indian Museum Notes," Vol. III, No. 1, pp. 7, 67.

*Asp. transparens*, Green, "Insect Pests of the Tea Plant," 1890, p. 20.

Do. (part), "Catalogue of Coccidæ," Indian Museum Notes, Vol. IV, No. 1, 1896.

*Asp. latanicæ*, Sign. (part), "Coccidæ of Ceylon," 1896, p. 49.

Upon a re-examination of the material described in my "Coccidæ of Ceylon," Part I, under the name of *Asp. latanicæ*, Sign., it becomes evident that two distinct species have been included under the one name. By external examination alone the two insects are indistinguishable: and even the microscopical characters do not, at first sight, show any wide divergence. But the two forms may be separated by the size of the median lobes, which in *destructor* are small and conspicuously shorter than the first lateral lobes: while in *transparens*, (for by this name the second species must now be known), the median lobes are larger and project beyond the others.

As *destructor* has not previously been recognised from Ceylon, a detailed description of the species is appended.

Female puparium very pale yellowish, almost colourless: transparent, showing the form of the sublying insect and eggs. Pellicles very pale clear yellow. Form circular: very flat: smooth, or very finely wrinkled in a radiating direction. Diameter of scale averaging 1.75 mm.

Male puparium similar to that of the female, but smaller and more oval. Size  $1 \times 0.75$  mm.

Adult female rounded in front, tapering and pointed behind. Body flattish. Colour pale yellow: margin of pygidium tinged with rufous. Antenna consisting of the usual small tubercle and curved hair. Spiracles without parastigmatic glands. Pygidium (fig 5.) with six lobes, the median pair shortest and dark coloured. All the lobes rather narrow, notched on the outer edge: the two lateral lobes constricted at base and situated on the marginal prominences. Squames longer than the lobes, fimbriate: 2

between the median, 2 lateral of the median, 3 lateral of the second, and about 7 lateral of the third lobe on each side : these last rather broad, sloping and fimbriate on their outer edge. Spines in the usual positions : the dorsal spine immediately lateral of the median lobes very long, projecting beyond the squames : the others quite small. Spinneret ducts numerous and conspicuous, both filiform and trumpet-shaped : some opening directly on to the margin, others by rather inconspicuous oval dorsal pores. Circumgenital glands in four groups. Examination of a long series, from different plants, shows the upper laterals to average 9 (with a range of 6 to 14) : lower laterals 5 (ranging from 3 to 9). The upper laterals have always the larger number of orifices. In one abnormal example the glands were broken up into ten distinct groups in such a manner that it was impossible to assign them to their normal positions. Occasionally an isolated orifice stands in the position of a median group, and in one instance a distinct group of 4 was observed in the median place. Anal aperture distant from margin by about three times its longer diameter. Total length averaging 0.75 mm. Adult male of normal form. Bright yellow, with reddish apodema. Foot with 2 digitules (1 on claw and 1 on tarsus). Terminal joint of antenna with 3 knobbed hairs (1 at apex and 2 at side). Length 0.75 mm.

*Habitat*.—On numerous shrubs and plants, including Tea, Pepper, *Alocasia*: *Psychotria* : *Manihot* sp. (Ceara Rubber) : *Loranthus* : *Mæsa indica*, &c. Altogether a very widespread species, almost omnivorous.

ASPIDIOTUS EXCISUS, Green.

Occurs also on a species of *Ipomea*, in the Rambukkana district.

ASPIDIOTUS AURANTI, Maskell.

This species seems to me to be distinctly on the increase. I have lately seen orange and lime trees very badly infested by this pest. It also affects the stems of cultivated roses, both in Ceylon and India.

ASPIDIOTUS CAMELLIÆ, Signoret.

Found also commonly on *Grevillea* and "Sappoo" (*Michelia champaca*).

ASPIDIOTUS CYDONIÆ, Comstock.

I am now, after examination of type specimens from the Vienna Museum, of opinion that the Ceylonese examples previously assigned by me to *cydoniæ*, are the true *lataniæ* of Signoret. I have stated my reasons for this opinion in a recent number of the "Entomologist's Monthly Magazine," (No. 116, second series, August, 1899). It is possible that the American examples of *cydoniæ* may also eventually be referred to *lataniæ*.

Genus ODONASPIS, Cockerell.

ODONASPIS INUSITATUS, Green.

Taken also on Bamboo in the Udagama district, October, 1898.

Prof. Cockerell has proposed the name *Odonaspis*, as a subgenus of *Aspidiotus*, for several species so far confined to various kinds of bamboo, usually concealed beneath the leaf-sheaths or actually embedded amongst

the tissues of the plant. I am inclined, with Prof. Cockerell, to consider that the characters of the group are of a nature to warrant generic rank.

The structure of the puparium conforms to that of *Aspidiotus*, though the male scale is usually rather more elongate, with the pellicle quite at the anterior extremity. The female has often a horny derm, the margin of the pygidium being particularly dense. There are no squames and, instead of the normal lobes, there are usually chitinous expansions of the margin.

The adult male has not yet been observed.

The genus at present contains *secretus*, Ckll., *inuitatus*, Green, and *bambusarum*, Ckll. I have now to add a fourth species, also occurring on bamboo.

*ODONASPIS CANALICULATUS*, n. sp. (Pl. B, figs. 6, 7, 8, and Pl. C, fig. 9.)

Female puparium (fig. 6) very dense and compact: irregularly circular: black: pellicles yellowish, the second often concealed beneath the black secretory layer. From the surface proceed numerous curling white filaments, which give to the scale a slightly hoary appearance. Diameter 1.50 to 1.75 mm.

Male puparium (fig. 7) elongate: outline often sinuous: both pellicle and secretory area black, the pellicle situated at anterior margin. Length 1.50 mm. Breadth 0.50 mm.

Adult female of normal form: broadest across metathorax.

Early adult (fig. 8) pale yellow, with reddish pygidium. Older examples more uniformly suffused with reddish-fulvous, and strongly chitinised. Spiracles each with a crowded group of parastigmatic glands. Segments well defined. Pygidium (fig. 9) without definite lobes, but with a continuous irregularly serrate or dentate chitinous expansion of the margin. A broad median cleft, and deep indentations at the junctions of the suppressed segments. The marginal expansion is marked off from the body of the pygidium by a narrow denser zone which follows the outline and extends inwards at the junctions of the segments. Squames absent. A fine but rather long spine, situated dorsally, on each side of the median cleft. Other spines at intervals, placed ventrally. From the median cleft proceeds a conspicuous cylindrical canal, extending upwards almost to the centre of the pygidium, where it terminates in a brush of small tubular ducts. No circumgenital glands. Both surfaces closely dotted with minute circular pores with thickened rims. Anal aperture near the base of the pygidium. Length 1 to 1.50 mm. Breadth 0.87 to 1 mm.

Adult male unknown.

*Habitat*.—Concealed beneath the sheathing bracts at base of branches of various kinds of bamboo. Pundaluoia: Nuwara Eliya. This species is well marked by the median canal opening on to the extremity of the pygidium: a character which I have not seen in any other member of the subfamily, and which had suggested the specific name of the insect.

## Genus AONIDIA.

## AONIDIA BULLATA, Green.

In my original description of the female puparium, I suggested that the first (or larval) pellicle is probably dislodged during the globular development, of the anterior part of the scale. Examination of further material shows that this actually takes place. The early female scale is very similar to the male puparium : but the white secretory area is more extended behind. After the moult, the globular expansion of the anterior parts of the insect raises the larval scale and finally dislodges it completely.

Adult male pale lilac, head darker : meso and meta-notal plates and legs pale fulvous : apodema reddish-brown. Form broad and depressed : genæ widely expanded : genital sheath nearly half length of body. Antennæ 10-jointed : half length of body : 10th joint with one terminal and one lateral knobbed hair.

Foot with 4 digitules.

The food-plant of the species proves to be *Nothopegia Colebrookiana*.

Since the publication of the first part of the "Coccidæ of Ceylon" five more species belonging to this section have been discovered : all of them new to science.

## AONIDIA SPATULATA, n. sp. (Pl. C, Figs. 10, 11, 12, 13.)

Female puparium (fig. 10) hemispherical, consisting chiefly of the enlarged second pellicle, which completely encloses the adult insect. Median area exposed, castaneous-brown or blackish-brown, highly polished : marginal area broadly covered with pale reddish-yellow secretion. First pellicle usually missing in fully developed examples : in the earlier stages (fig. 11) it can often be found still partially attached. Diameter 0.75 mm.

Male scale (fig. 12) circular : flattish : pellicle central. Colour reddish-yellow, pellicle pale clear yellow. Diameter equal to that of female, 0.75 mm.

Adult female much smaller than in previous stage, completely concealed within the second pellicle. Outline almost circular. Anterior parts rather dense. Mouth large and conspicuous.

Extremity of pygidium (fig. 13) truncate, as in *bullata*. Lobes eight : the median pair represented by narrow chitinous bands on the margin ; 2nd, 3rd and 4th pairs bluntly conical. Between the lobes are some remarkable spatulate processes, dilated at the extremity : 2 between the median lobes, 2 lateral of the median, and 3 lateral of each of the other lobes, the outermost ones usually bi-capitate. No circumgenital glands. Length 0.50 mm.

Adult male not observed.

*Habitat*.—On upper surface of leaves of *Psychotria thwaitesii* ; Pundaluoya.

A very small and inconspicuous species, but quite unique in the remarkable marginal characters of the pygidium.

Mr. Newstead has suggested the name *Gymnaspis* for a new genus to contain his *G. æchmeæ* and my *Aonidia bullata* : founding the separation from

*Aonidia* on the absence of the larval pellicle and superposed secretion. I am not quite convinced of the necessity for this separation. The species described above forms a link between typical *Aonidia* and *Gymnaspis*. I consider that the absence of the larval pellicle is an accident due merely to the hemispherical form of the second pellicle, combined with its highly polished surface, which offers no hold to the larval skin. The absence of a secretory area is no doubt partly due to the same causes. There is originally a complete layer of the usual secretory matter, which is subsequently ruptured by the upward development of the second pellicle, and may gradually fall away. In the case of *spatulata* the secretion persists as a broad marginal zone. The characters of the several species of *Aonidia*,—especially as represented in Ceylon,—are so varied that a subgenus might almost be created for each one. At present, as their number is still so small, and as they are undoubtedly united by general structure, they may be conveniently included in the original genus.

AONIDIA CRENULATA, n. sp. (Pl. D, Figs. 14, 15.)

Female puparium (fig. 14) circular, moderately convex.

Dull pale reddish or yellowish-brown, with darker zones caused by the transmitted colour of the sublying pellicle. First pellicle elevated, sub-central; yellow, median area blackish. Second pellicle almost completely occupying the puparium, castaneous-brown, concealed beneath the fulvous secretory covering. Above the posterior extremity is a distinct pale semilunar mark, rendered more conspicuous by a blackish suffusion immediately above it. This mark might be supposed to define the position of the pygidium of the second pellicle, but does not in reality correspond with it. A similar false pygidium is noticeable in the puparium of *Parlatoria aonidiiformis*. Diameter 1 mm.

Male puparium similar in size and colour to that of female, but flatter and slightly oval.

Adult female creamy white, tinged with lilac in older examples: irregularly circular. The pygidium, in advanced stage, withdrawn into the abdominal region: the extremity without true lobes, but with a series of remarkable floriated processes, 12 on each side (fig. 15), corresponding to the dilated processes in *spatulata*. There are small chitinous thickenings of the margin at the base of some of the processes (about 3 on each side) that may perhaps represent the suppressed lobes. Total length of insect about 0.50 mm.

Adult male not known.

The extremity of the second pellicle resembles that of an adult *Parlatoria*, with broad fimbriate squames and semilunar pores between the lobes.

*Habitat*.—On upper surface of leaves of *Memecylon umbellatum*, in the Royal Botanic Gardens, Peradeniya, near Kandy.

AONIDIA MESUÆ, n. sp. (Pl. D, Figs. 16, 17, 18).

Female puparium (fig. 16) circular: reddish-brown, with a paler zone marking the position of the second pellicle: secretory area covering and

FIG. 1.



FIG. 2.

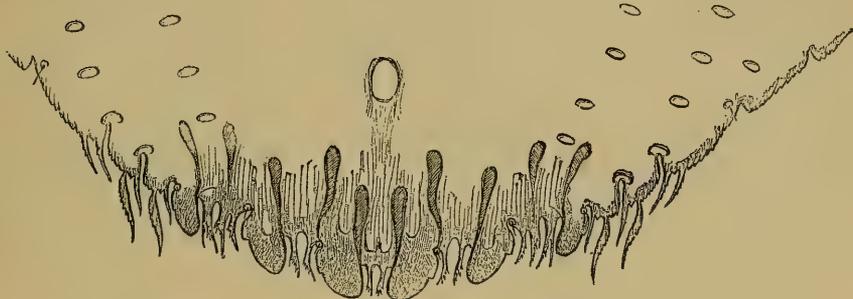
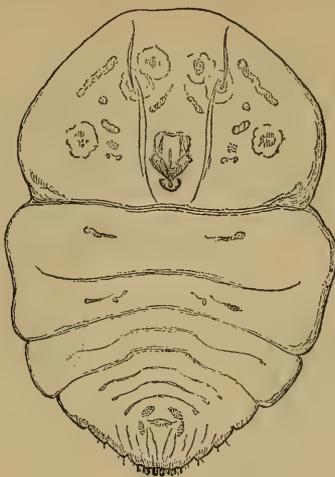


FIG. 4.

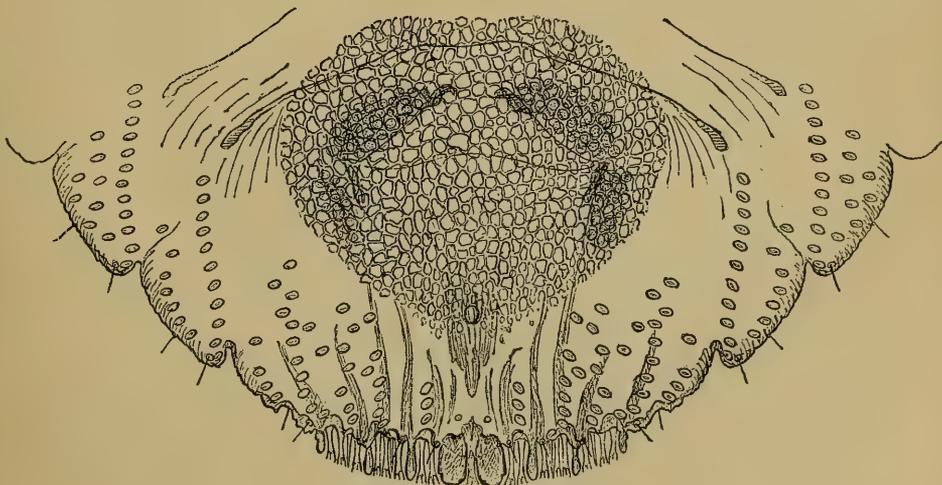


FIG. 3.

THE COCCIDÆ OF CEYLON.

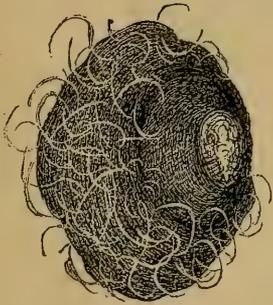


FIG. 6.



FIG. 7.

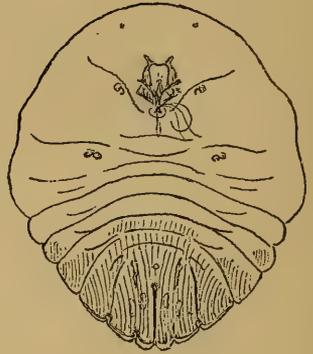


FIG. 8.

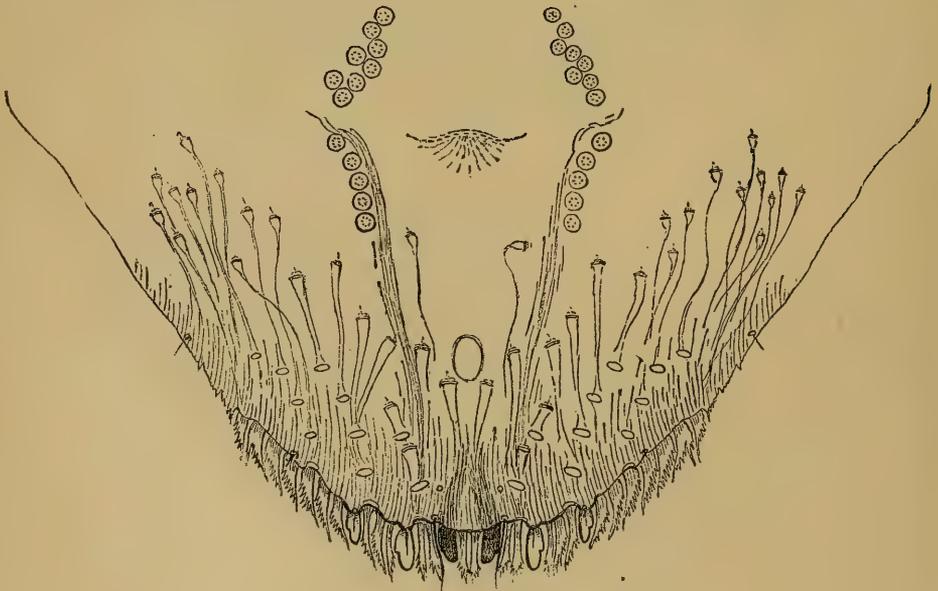


FIG. 5.

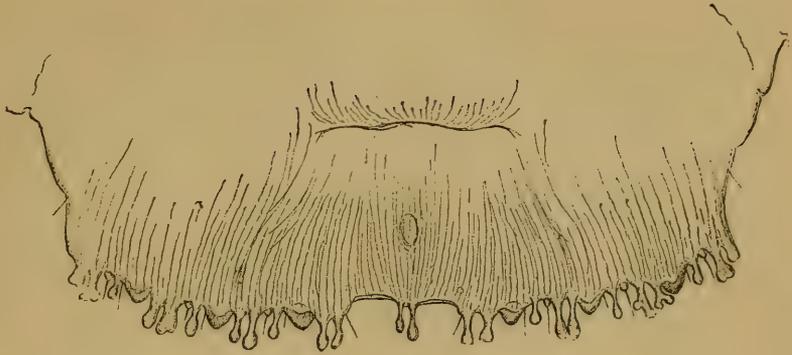
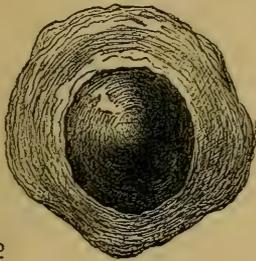
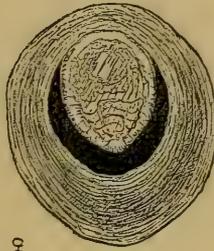


FIG. 13.



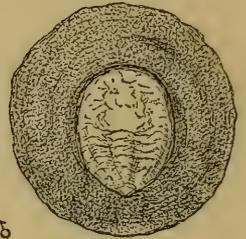
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FIG. 10.



40

FIG. 11.



5

FIG. 12.

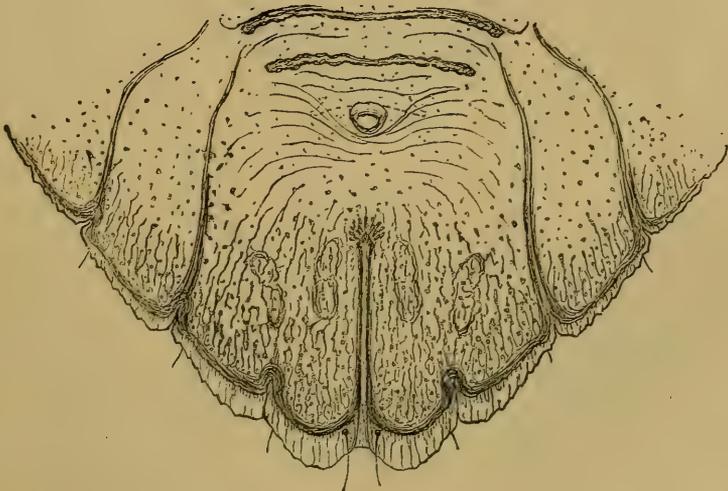


FIG. 9.



FIG. 13.

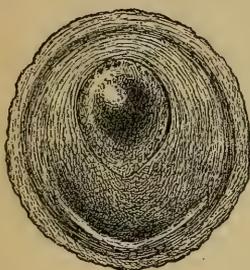


FIG. 14.

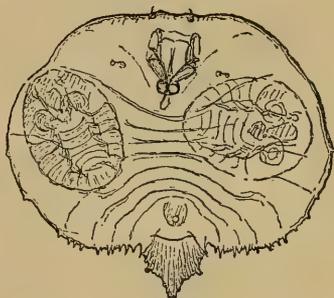


FIG. 17.

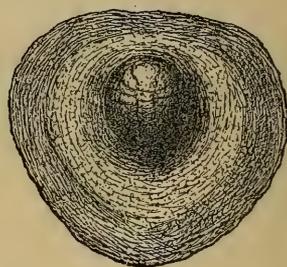


FIG. 16.

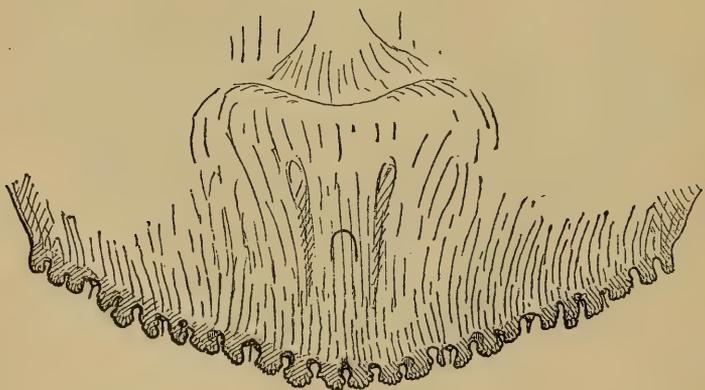


FIG. 15.

extending beyond the second pellicle. First pellicle exposed, blackish, strongly convex, subcentral. Second pellicle completely enclosing the adult insect, with a median convex area corresponding with the position of the larval pellicle. Extremity of second pellicle with six distinct chitinous lobes followed by about five irregular marginal prominences, and from 3 to 5 stout spiniform squames in each interlobular space. Diameter of second pellicle 1 mm. Diameter of complete puparium 1.25 mm.

Male puparium similar in size and form to that of the female, but without the pale zone.

Adult female (fig. 17) of normal form, somewhat laterally expanded. Antenna consisting of the usual tubercle, with one very small and one longish stout hair. Mouth parts large and conspicuous, situated close to the anterior margin. Spiracles without parastigmatic glands. The body usually contains two large embryos. Margin of abdominal segments fringed with longish pointed processes, each bearing on its summit a short tooth-like spine. Pygidium (fig. 18) prominent, rather sharply triangular: margin very irregular. It is difficult to determine which, if any, of the prominences constitute the true lobes, only two of them being constant in form and position, namely a large wedge-shaped process on each side, situated about half-way between the apex and the base. The anal aperture, enclosed in a conspicuous chitinous plate, is situated at a considerable distance above the genital opening. Length 0.60 mm. Breadth 0.75 mm.

Adult male not observed.

*Habitat*.—On the upper surface of leaves of the 'Iron-wood Tree' (*Mesua ferrea*), in the Royal Botanic Gardens, Peradeniya. The puparia of both sexes are intermingled and placed in a single row along each side of the midrib of the leaf.

#### EXPLANATION OF PLATES A, B, C, D.

##### PLATE A—

- Fig. 1. *Aspidiotus trilobitiformis*; genital sheath of adult male.  
 „ 2. *Aspidiotus theæ*, var. *rhododendri*; adult female, ventral view.  
 „ 3. „ „ „; pygidium of adult female, dorsal view.  
 „ 4. *Aspidiotus dictyospermi*, var. *arecæ*; pygidium of adult female, dorsal view.

##### PLATE B—

- Fig. 5. *Aspidiotus destructor*; pygidium of adult female, dorsal view.  
 „ 6. *Odonaspis canaliculatus*; female puparium.  
 „ 7. „ „; male puparium.  
 „ 8. „ „; early adult female, ventral view.

PLATE C—

- Fig. 9. *Odonaspis canaliculatus* ; pygidium of adult female, dorsal view.  
,, 10. *Aonidia spatulata* ; female puparium.  
,, 11. " " ; puparium of early adult female, showing first pellicle.  
,, 12. " " ; male puparium.  
,, 13. " " ; pygidium of adult female, ventral view.

PLATE D—

- Fig. 14. *Aonidia crenulata* ; female puparium.  
,, 15. " " ; pygidium of adult female, ventral view.  
,, 16. *Aonidia mesuæ* ; female puparium.  
,, 17. " " ; adult female, ventral view.  
,, 18. " " ; pygidium of adult female.

(To be continued.)

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM  
AND BHUTAN.

BY G. C. DUDGEON, F.E.S.

WITH NOTES BY H. J. ELWES, F.Z.S., F.E.S., &C.,

AND

ADDITIONS BY SIR GEORGE F. HAMPSON, BART., B.A., F.E.S., &C.

PART VII.

*With Plate II.*

(Continued from page 658 of Volume XII.)

Family THYRIDIDÆ.

Genus ADDÆA, Wlk.

762. *A. trimeronalis*, Wlk.

Sikhim, 1,800 feet. Two specimens of this curious little species were taken by me at Punkabaree at light. It has hitherto only been procured in South India, Ceylon, and New Guinea. My specimens were obtained in September and December.

Genus STRIGLINA, Guen.

763. *S. scitaria*, Wlk.

Sikhim and Bhutan, up to 4,000 feet. A common species. A large form is found in both localities which has a straight dark brown erect line from the upper third of the oblique line on the forewing to the outer angle; this form is considerably larger than the ordinary one, one specimen in my collection measuring 43 mm. It occurs from May to August.

764. *S. glareola*, Feld.

Sikhim and Bhutan up to 4,000 feet. Equally common, occurring from May to August. This was named *S. decussata*, Moore, in the "Moths of India," but Sir George Hampson has recently pointed out that Felder's name has precedence.

Genus DIXOA, Hmps.

765. *D. albatalis*, Swinh.

Bhutan, 2,500 feet. One specimen of this was obtained by me at light at Fagoo in September; superficially it is somewhat similar to *R. multipunctata*, Moore, but the striations are finer and closer, and the forewing has veins 7, 8, 9 and 10 stalked.

## Genus RHODONEURA, Guen.

766. *R. obliquialis*, Warr.

Sikkim and Bhutan, 4,000—7,000 feet. Not common. I have seen it settled on leaves in the day time below Pasheteng and Richila, and have taken it in September and October. (The female, which is apparently undescribed, is larger than the male, and has rusty markings on the hindwing.—*H. J. E.*)

766a. *R. mollis*, Warr.

Sikkim and Bhutan. I have one specimen taken in the latter locality in May.

767. *R. acaciussalis*, Wlk.

Sikkim and Bhutan, 1,800—2,500 feet. The typical form, which is ochreous-white with the nervules on the exterior portion of both wings salmon-coloured and the medial and sub-basal areas irrorated with velvety black or brown, is rarer than the white and pink form which has no trace of the dark markings, and has the pink striations on the underside of the hindwing differently disposed. Of the former I have only two specimens which I took at light in May and August, one in Sikkim and the other in Bhutan. The pink form (*R. strigatula*, Felder) seems to me to be distinct, and occurs rather more frequently in May, July, August, and September. Mr. Elwes remarks that the two insects seem distinct, and that the pink form was separated in his collection by Snellen.

768. *R. multipunctata*, Warr.

Sikkim and Bhutan, 1,800--3,000 feet. This species is extremely variable in the position of the markings, especially on the hindwing. I have one female measuring 46 millim. which has the sub-marginal row of dots obsolete and the post-medial row of striations double, forming a chain-like band. I have taken it from May to August.

771. *R. nevina*, Moore.

Sikkim and Bhutan, 3,000 feet. Much less common than the last. I have taken it in September, October, and November. (I took this at Rissoom, 6,400 feet, in August.—*H. J. E.*)

773. *R. bastialis*, Wlk.

Sikkim and Bhutan, up to 3,000 feet. A common species attracted to light. My specimens were obtained in May, June, July, October, November, and December.

773a. *R. polygraphalis*, Wlk.

Sikhim and Bhutan, up to 2,500 feet. At the beginning of the rains this delicate little insect may be seen in numbers sitting on the upper surface of leaves with its wings outspread and its legs thrown forward so as to raise its forewings completely off the leaf surface. It occurs in June and July. Mr. Bell has sent me a specimen from Kanara, which is exactly like the Sikhim specimens in my collection.

773b. *R. argentalis*, Wlk.

Bhutan, 3,000 feet. I obtained one specimen of this distinctly marked species in September, which I described as a new species, but which Sir George Hampson recognised as *R. argentalis*.

774. *R. myrsusalis*, Wlk.

Sikhim and Bhutan, up to 5,000 feet. Specimens vary with regard to the number of hyaline spots on the forewing. I have taken it in March, May, June, July, and August.

775. *R. myrtæa*, Drury.

Sikhim and Bhutan, 1,800—2,500 feet. Rather scarce. Occurs in June and September. I have not seen the form *fenestrata*, Moore. (A specimen in my collection, so named by Sir George Hampson, is from Kurseong, *Charlton*.—*H. J. E.*)

778. *R. nitens*, Butl.

Bhutan, 3,000 feet. I obtained one specimen in September at light. Mr. Bell has sent me one also from Kanara, which is exactly similar.

779. *R. pallida*, Butl.

Sikhim and Bhutan, up to 3,000 feet. I have taken only four specimens of this species in June, July, and September at light.

780. *R. glaphyralis*, Hmpsn.

Sikhim and Bhutan, 2,500 feet up. I imagine that the elevation at which this insect is most prevalent is about 4,000 feet, but my specimens were obtained at 2,500 feet in Bhutan. It is very distinct, being of a bronzy colour with pale yellowish patches on both wings. My specimens I took at light in August and September.

780a. *R. atristrigulalis*, Hmpsn.

Bhutan, 2,500 feet. The type of this was taken by me at light, and is now in the British Museum collection.

781. *R. exusta*, Butl.

Sikhim. I do not know this species. (A single specimen from Möller's collection is so named by Sir George Hampson.—*H. J. E.*)

782. *R. emblicalis*, Moore.

Sikhim; Bhutan, 2,500 feet. I have only obtained this on two occasions. A specimen in my collection was taken at light in July, Dr. Pilcher obtained it at 2,000 feet in October.

782a. *R. furcifer*, Hmpsn., Jour. Bo. Nat. His. Soc. (ined.)

Sikhim, 1,800 feet. Two specimens taken at P'unkabaree at light in June. Sir George Hampson says that the specimen I sent him for examination is exactly similar to ones from Bhutan, Bali, and Queensland, in the British Museum collection.

786. *R. reticulata*, Moore.

Sikhim and Bhutan, 2,000--7,000 feet. This is a common species, especially at the higher elevations. It is extremely variable in the markings of the forewing. My specimens were obtained at light in May, June, and August. (I took this at Darjeeling in July. Two specimens ex. coll. Möller named *extensa*, Warr., a name which I do not find in Sir G. Hampson's catalogue, seem to be different.—*H. J. E.*)

787. *R. fasciata*, Moore.

Sikhim. I do not know this. Not in British Museum. (A single specimen from Möller in my collection was so identified by Snellen and agrees fairly well with Moore's figure.—*H. J. E.*)

789. *R. alternata*, Moore.

Sikhim (*Atkinson*). I have not seen a specimen. (I have two which agree with the types in Moore's collection.—*H. J. E.*)

790. *R. oligosticha*, Hmpsn.

Sikhim. I cannot make out this species, though what I have identified as *R. subcostalis* may be referable to it. (I have only one specimen of this, the type not in perfect condition. I think it may be a variety of the last or perhaps of the next which I have only from the Khasias. Anyhow, these three species seem very nearly allied.—*H. J. E.*)

791. *R. subcostalis*, Hmpsn.

Sikhim. I have one specimen taken in June, which I think may be this species.

795. *R. striativena*, Hmps.

Sikhim and Bhutan, 1,800—2,500 feet. I have taken three of this species at light in April and May.

797a. *R. intimalis*, Moore.

Sikhim. I took one specimen at Punkabaree, 1,800 feet, in January. Dr. Pilcher's specimens in the British Museum were taken at 2,000 feet in July and October. The fore and hind wings are strongly excised below their apices.

798. *R. rufareta*, Hmps.

Sikhim, 1,800 feet; Bhutan, 2,500 feet. I took this species at light in June and July.

799. *R. hypoxantha*, Hmps.

Sikhim. I have never seen this alive, but I believe that it is obtained in the lower valleys near Singla. Native collectors often bring in a good many. My specimens were obtained in July and August. (I have never taken it, but have specimens from Möller's native collectors, dated April.—*H. J. E.*)

800. *R. tristis*, Hmps.

Sikhi. I do not recognise this. (This species, which, like the last, has differently shaped wings from typical *Rhodoneura*, is certainly a distinct species. It must be fairly common, though probably very local, as I have seven specimens from Möller's collection without date or exact locality.—*H. J. E.*)

## Genus HYPOLAMPRUS, Hmps.

801. *H. munda*, Warr.

Sikhim, 1,800 feet. This is placed in the last section of *Rhodoneura* in the "Moths of India," but the neuration shows that it belongs to this genus; vein 8 and 9 of the forewing being stalked. The antennæ of the male are bipectinate, and the costal margin of the forewing is slightly excised. I have eight specimens taken by me at Punkabaree at light in July, August, September, and October.

802. *H. striatalis*, Swinh.

Bhutan, 2,500—3,000 feet. I took two specimens at light in May and August at Fagoo.

803. *H. obscuralis*, Hmps.

Sikhim, 1,800 feet. Three specimens taken at light at Punkabaree in May, June, and July.

804. *H. lobulatus*, Moore.

Sikhim. I do not know this species. (I have one specimen taken by myself at Rangiroon, about 5,000 feet, in July, which Snellen has identified with Moore's figure and two others from the Khasias, which agree with it. Either the figure in Lep. Atk., pt. 7, fig. 12, is a very bad one, or I have a different species which is very distinct from anything else in my collection.—*H. J. E.*)

804a. *H. fimbriatus*, Warr.

Sikhim. I obtained one specimen in August which is now in the British Museum.

806. *H. subrosealis*, Leech.

Sikhim, 1,800 feet; Bhutan, 2,500 feet. I took two specimens of this, one at each of the above localities in June.

807. *H. angulalis*, Moore.

Sikhim, 1,800 feet; Bhutan, 2,500 feet. Eight specimens which I took at light at both localities in May, June, August, and September. It has the cilia of both wings pure white at the excisions.

## Genus CAMADENA, Moore.

809. *C. vespertilionis*, Moore.

Sikhim and Bhutan, 2,500 feet up. I have only taken this species on two occasions; one in my collection, a male, was procured in July at light. The female is much browner than the male. (Two specimens from Möller's collection are dated 26th May, evidently it is a rare insect in Sikhim.—*H. J. E.*)

## Genus CAMPTOCHILUS, Hampsr.

761. *C. reticulatum*, Moore.

Sikhim, 1,800 feet up. I have taken five specimens at this elevation in April, July, September, and October, and have one specimen from Dr. Pilcher's collection taken at 2,600 feet in August.

## Genus HERDONIA, Wlk.

*H. osacesalis*, Wlk.

Sikhim and Bhutan, 1,800—4,000 feet. There are two very distinct forms of this species found in Sikhim, which I can hardly persuade myself are one species. Sir George Hampson, however, assures me that intermediate forms occur in China and elsewhere. The typical form which is not the one figured in "Moths of India," according to Sir George Hampson, is a large insect expanding as much as 55 n.m.,

the forewing has all the brown markings which are present in the other form replaced by pale buff ones and the apex pure white, the hindwing with the sub-basal bands parallel to the medial and postmedial ones, not curved. The other form, which is the one figured, is a smaller insect (my largest measures 38 mm.) with the forewing distinctly marked with reddish-brown and the apex darker brown. The hindwing has the sub-basal band extending down the anal margin towards the medial band nearly meeting it, and the postmedial band distinctly curved. The antennæ of the male are pectinated on one side only, and vein 10 of the forewing is present. I have nine of the large form and six of the small one, all taken at light in May, June, July, August, and September.

Genus *DYSODIA*, Clemens.

811. *D. ignita*, Wlk.

Sikhim and Bhutan, 1,800—4,000 feet. Occurs commonly from April to August. The male has a long erectile white fan-tuft arising from the origin of the hind tibia and extending the whole length of the same; the lower extremity of the tibia has a short dark brown tuft. Out of 12 specimens in my collection, this is the only male, apparently, as none of the others have similar white erectile tufts on the hind tibiæ.

812. *D. viridatris*, Wlk.

Sikhim. I have only seen this in Dr. Pilcher's collection. It is probably rare. (I have two from Sikhim which appear to be quite distinct from Bangalore specimens and agree fairly with the description of *Eutelia siccifolia*, Moore, the type of which is in Dr. Standinger's collection.—*H. J. E.*)

813. *D. albifurca*, Hmps. n.

Sikhim. I do not know this. (A small distinct species of which I have two only, the types, from Möller's collection.—*H. J. E.*)

Genus *GLANYCUS*, Wlk.

814. *G. insolitus*, Wlk.

Sikhim and Bhutan. Rare at low elevations. I have twice taken it myself during the day, once at Badamtam and once at Fagoo in May.

815. *G. tricolor*, Moore.

Sikhim. I have only one in my collection without date. Sir George Hampson and Mr. Elwes regard this as the male of *G. insolitus*, Wlk.,

in spite of their great difference in appearance. This will probably turn out to be the case when further observation has been made.

Genus *HYPERTHYRIS*, Leech.

816. *H. aperta*, Leech.

Sikhim. I have not obtained this. (The only two specimens I have ever seen from Sikhim were taken by Möller's native collectors in May.—*H. J. E.*)

Genus *HERIMBA*, Moore.

691. *H. atkinsonii*, Moore.

Sikhim and Bhutan. A day-flying insect, occurring in May and September. (I never took it in Sikhim, where it must be local, but have specimens from Bernardmyo, in Upper Burma, taken at about 6,000 feet.—*H. J. E.*)



West, Newman, chromo.

New or little known Heterocera from Sikkim & Bhutan.



## THE HETEROCERA OF SIKHIM AND BHUTAN

## EXPLANATION OF PLATE II.

1. *Cucyparis prunifera*, Swinhoe, ♂,  $\frac{1}{1}$ .
2. *Leocyma pilcheri*, Hampson, ♂,  $\frac{1}{1}$ .
3. *Bryophilula excurvata*, Hampson, ♂,  $\frac{1}{1}$ .
4. *Erastria niveiguttata*, Dudgeon, ♀,  $\frac{1}{1}$ .
5. *Bryophilula obliquifascia*, Hampson, ♂,  $\frac{1}{1}$ .
6. *Perciana fuscobrunnea*, Hampson, ♂,  $\frac{1}{1}$ .
7. *Perciana rectilineata*, Hampson, ♀,  $\frac{1}{1}$ .
8. *Erastria distigmata*, Hampson, ♀,  $\frac{1}{1}$ .
9. *Eurois chalcoclora*, Hampson,  $\frac{1}{1}$ .
10. *Lithosia chrysophleps*, Hampson, ♀,  $\frac{1}{1}$ .
11. *Nola lativittata*, Moore, ♀,  $\frac{3}{2}$ .
12. *Thosea postornata*, Dudgeon,  $\frac{1}{1}$ .
13. *Selca ruficosta*, Hampson, ♀,  $\frac{1}{1}$ .
14. *Mitochrista melanolepia*, Hampson, ♀,  $\frac{1}{1}$ .
15. *Mitochrista nigriradiata*, Hampson, ♀,  $\frac{1}{1}$ .
16. *Mimeusemia basalis*, Walker, ♀, var.  $\frac{1}{1}$ .
17. *Macrobroclis metaxantha*, Hampson, ♀,  $\frac{1}{1}$ .
18. *Euproctis flavicosta*, Hampson, ♂,  $\frac{1}{1}$ .
19. *Selca nigra*, Hampson, ♀,  $\frac{1}{1}$ .
20. *Oreta olivacea*, Dudgeon, ♂,  $\frac{1}{1}$ .
21. *Nola nigrisparsa*, Hampson, ♀,  $\frac{3}{2}$ .
22. *Melanographia tympanistis*, Hampson, ♂,  $\frac{1}{1}$ .
23. *Prodenia syntictis*, Hampson, ♂,  $\frac{1}{1}$ .
24. *Nola tenebrosa*, Hampson, ♀,  $\frac{3}{2}$ .
25. *Nola punctilineata*, Hampson, ♀,  $\frac{3}{2}$ .
26. *Nola microphasma*, Butler, ♂,  $\frac{3}{2}$ .
27. *Nola marginata*, Hampson, ♂,  $\frac{3}{2}$ .
28. *Nola laticincta*, Hampson, ♂,  $\frac{3}{2}$ .
29. *Dialithoptera gemmata*, Hampson, ♂,  $\frac{3}{2}$ .
30. *Pisara seminiigra*, Hampson, ♂,  $\frac{3}{2}$ .
31. *Pisara mediozonata*, Hampson, ♂,  $\frac{3}{2}$ .
32. *Pisara argentescens*, Hampson, ♀,  $\frac{3}{2}$ .
33. *Pisara argentisparsa*, Hampson, ♂,  $\frac{3}{2}$ .

## NOTES ON SOMALILAND.

BY CAPTAIN P. Z. COX.

## PART. I.

*(Read before the Bombay Natural History Society on 16th January, 1900.)*

“Où y revient toujours ! We come with hearts grown fonder,  
“Back to the life which each of us loves best.”

Thus did the students in “The Artist’s Model” apostrophize their old Studio in the Quartier Latin ; and it was with sentiments very much akin to theirs that I contemplated the pleasant prospect of returning to Somaliland once more.

It is difficult to say exactly what there is about “The Horn of Africa,” as it has been sometimes called, which seems to endow it with such a peculiar charm for all who have once made its intimate acquaintance. In the first place, no doubt, a man is generally attracted thither by the glowing reports of some friend of the Big Game shooting to be had there, but the mere acquisition of duplicate shikar-trophies is hardly sufficient to account for sportsmen returning there time after time when they might be equally well exploring fresh fields. It is not, I think, that Somaliland possesses any one particular attribute unshared by other localities ; more probably it is the sum-total of its qualities as a country to sojourn in, which makes it so attractive—its perfect climate, once the traveller is quit of the arid maritime plain ; the undeniable comforts of camel transport ; the cheery character of the native ; and last but not least, the infinite variety of animal life and scenery which is ever present to the vision. Kashmir and the Himalayas generally, I always used to think, were hard to beat ; there you have the scenery and the climate, but the eyes may have to rest content with scenery unadulterated for days together ; animal life is not in evidence to the same extent and in the same variety as it is in Somaliland.

The Natural History of the country was, I imagine, originally held to lie within the “sphere of influence” of this Journal, partly because, as an offshoot of the Aden Agency, the Protectorate appertained to the Bombay Presidency for administrative purposes, and partly no doubt, as being a favourite hunting resort for sportsmen from India—many of them members of our Society.

The first of these reasons cannot be said to exist any longer, for the Bombay Presidency and the Somali Protectorate have recently severed their anomalous official connection, and the political infant, somewhat forlorn and badly nourished hitherto—the natural result, perhaps, of being put out to nurse at birth, has now thrown off the cloak of her Cinderella childhood and has been called upon by the maternal Government in London to figure among her sister Protectorates of the African Continent as a self-supporting term in our vast Imperial system.

The second, and more sentimental reason, I am happy to say, still exists, and so long as Somaliland survives as a hunting-ground for Indian shikaris, I trust that no apology is needed for presuming that she retains her position within the pale of the Society's interest, at any rate by courtesy, if no longer of right. It is in this belief that I venture to record the following impressions dealing with the present conditions of sport and the experiences of a recent expedition; in the hope that they will not be unwelcome to readers of the Journal who have shot in the Protectorate in days gone by or contemplate doing so in the near future.

To one who had known the country and the people intimately a few years ago, alike in the jungle and at the ports, the return to old haunts and familiar faces had a peculiar interest, and one was naturally quick to notice the changes which the march of time and civilization and the advent of a new régime had wrought in the aspect of affairs generally. Changes there were many, but it is only my province here to touch upon such as have affected the conditions of sport, or the character and habits of the Somali,—more especially the class from which followers for hunting expeditions are usually recruited.

In former days, when the stream of sportsmen was not quite so continuous as it is now, intending visitors used generally to enlist the good offices of the British officials on the coast in arranging for the purchase of camels, or for the disbursement of funds, as required, to the "chef de caravan" deputed to undertake it. This form of assistance was readily accorded in time past, but latterly the ever increasing influx of shikari parties has made even such friendly help too great a tax upon the officials' time, and the Administration has consequently found it necessary to inform inquirers that it can no longer be afforded. Mahomed Hindi, too, the worthy old Hindustani merchant at Berbera, who was always ready to undertake any odd jobs in the way of agency for sportsmen, has recently joined the majority, and at present the traveller who contemplates an expedition and has not a reliable man of his own acquaintance on the spot, must entrust his preliminary *bundobast* to that enterprising Aden firm, Messrs. Cowasjee Dinshaw Brothers, who have recently deputed a Parsee representative to Berbera, especially for buying camels and supplies for sporting expeditions, on commission. This arrangement has its advantages, the chief of them being that funds can be lodged with the Agent, and men paid off in the jungle, or supplies requisitioned from the Coast, by cheque on Berbera; one is thus saved the great inconvenience of carrying to the interior a quantity of cash in rupees. On the other hand the system necessarily entails some increase of expenditure, seeing that the Commission Agent, not being a Somali, or a connoisseur of camels, has to employ a "dhal," or middleman, to purchase for him, and thus the commission of each has to be included in the price eventually charged to the sportsman.

The Berbera "Travellers' Bungalow," for into such has the bungalow formerly occupied by the Royal Engineer Officer on Military Works duty, now been converted, is another new departure, and a great boon it is during the trying day or two necessarily spent at the coast, when travellers are fitting out for or returning from expeditions to the interior. On disembarking at Berbera one need no longer be bothered with the pitching of tents or by anxiety for the welfare of the inner man, but can give undivided attention to the thousand and one details that have to be seen to, and that with all the more energy from the comforting knowledge that a spell of punkah and a cool drink are at any moment within reach.

From the lofty point of view of national principle, it is no doubt a gratifying thought that, as Britons, we do endeavour to maintain an open door policy as regards hunting grounds in odd corners of the Empire, and that any accredited sojourner in our territories in search of sport, be he Jew or Gentile, can look for the same measure of courtesy and assistance from the local representatives of Her Majesty as is extended to any of her own subjects. This fact is, I know from experience, by none more appreciated than by the Nimrods of divers nationalities who nowadays flock in such numbers to Somaliland. But from the less exalted and more personal stand-point from which I am writing, that of the sportsman of limited means, to whom money is a more or less serious consideration (and I think I may presume that at all events the majority of my readers fall within this category)—there is a striking reverse to the shield, which cannot but force itself upon our notice. This very open door policy, these praiseworthy efforts to eliminate difficulties and make everything plain-sailing for the traveller in general, have a somewhat discomfoting trend for us in particular. They mean on the one hand the rapid sophistication of the Somali, and on the other the attraction to the country of a class of sportsmen which will, in the inevitable course of things, eventually elbow us out, and oblige us to seek fresh fields for our energies elsewhere.

As for the native, (I mean the more or less enlightened coast Somali) he watches each shake of the local kaleidoscope with an appraising and critical eye; he sees each new creation in turn, the Travellers' Bungalow, the professional Commission Agent, the registered Chef de Caravan, take shape before him, and hugs himself contentedly as he hastens to the sea-shore to welcome to his hunting grounds the latest type of the genus Nimrod, more than ever replete with the almighty dollar, who will pay and ask few questions and be regally lavish with his baksheesh. In his service the son of the soil quickly grows wise and waxes fat; he preserves indeed a lingering regard for the old master with whom he used to hunt on primitive lines, and even uses his name affectionately as a peg to hang his shikar yarns upon; but change him for the more up-to-date article—Allah forbid! why should he? On the contrary, he greets the new-comer joycously, and runs up prices in the

local live-stock market to suit his capacious purse. And after all, one cannot blame the Somali for gathering rosebuds while he may, and, personally, I grudge him his harvest less than any other Oriental within my ken, for he has such gentlemanly ideas of disposing of it. Burton calls him "avaricious"; grasping, he may be, but he has none of the hoarding instincts of the miser. He loves money it is true, but he loves it to spend, and for what it can give him, and, most of all, for the dignity which it brings him. Dignity is everything to a Somali. When he has to a certain extent become sophisticated, and has sown the usual crop of wild oats, all his feelings seem to centre themselves upon this point in his character. His first aim, when he has reaped plentifully from one or two successful expeditions to the interior, is to fit himself out with a dignified position in his small social world; to buy more camels or perhaps a new wife, so that he may fill his quiver and become a power in his clan. When he has improved his status to this extent, and probably augmented his little property by raiding his neighbours, he is ready again to take a spell of service when it offers, but as he gets older he likes to do this in a gentlemanly way and in a suitable position. During this middle phase of his career, *i. e.*, while his family and his flocks are increasing, he turns his spare attentions to religion, and essays to increase his importance by the acquisition of a little odour of sanctity. To this end he picks up a smattering of extracts from the Koran, and prays, with absent-minded glibness, the orthodox five times a day; believing, I think, that his labours in this direction work off any little venial sins that he may have committed during the gleanings of his harvest; and as he spreads his prayer-mat or tells his beads, he strokes his chin with smug complacency, and thanks Allah and the Prophet that he is what he is. If he has no ultimate chance of becoming a registered "Headman" (in which case there is no limit to his ambitions), he retires comparatively early into private life, and reverts to pastoral and predatory pursuits. I think if a number of Somalis of the better type were asked what was the Ultima Thule of their ambitions, nine out of ten would reply that it was to have plenty of live-stock (more especially camels), and a sufficiently numerous male progeny to constitute a "Rer" or clan of fighting-men, bearing, and so perpetuating, its own distinctive name. But I am getting off the track and beginning a disquisition on Somalis in general. We were speaking of the effect of civilization on the coast Somali: let us now take stock of the modified type of sportsman which the same civilization attracts. He is a man who does not see why he should not get his sport and his pleasure with the maximum amount of comfort and the minimum of trouble to himself, and when he finds that by the mere matter of paying accordingly he can almost reduce the pastime to a question of "I touch the button, you do the rest," so much the better; he is willing to pay. How far this latter principle has begun to pervade the sport as well as the photography of to-day, will be believed when I mention

that there was quite recently in Somaliland a shooting party of six or seven guns organized, it would seem, on the "personally-conducted tour" system, by a well-known caterer for the tastes of the travelling public.

The members of the party apparently had no further care than to pack up their carpet-bags and transport themselves and their guns to the rendezvous. At the end of the sea journey they were met by the contractor's representative, who handed to each a ready-made caravan, completely equipped with stores, camels, followers, and shikarries, and "every requisite" for a successful expedition. The several parties were then distributed singly or in couples about the country, and on getting back to the Coast at the end of the period contracted for, they simply returned the balance of their paraphernalia to the contractor's "man on the spot," and took the first ship home with their spoils. They were thus saved a good deal of time and much bother, and I have no doubt paid well and willingly for economy of the one and immunity from the other. All of them, as far as I know, were good sportsmen, and had no other wish than to play the game; and one member of the party, who was on three months' leave from England, told me that he had only approached the contractor a few hours before leaving London and that he could not possibly have carried through the trip at all, in the short time at his disposal, had he been obliged to make his own *bundobast*. As it was, he had had a delightful two months in the country, during which, by dint of hard work and fortune's favours, he had made a most comprehensive little bag, including specimens of nearly all the big game of the country.

Our own ideas on the subject may not be altogether in harmony with those of the participators in the enterprise, but there are two ways of looking at most things, and I have simply mentioned the circumstance as a sign of the times. The idea, however, opens up a vista of further possibilities in the same direction, and for us I think it points the moral that when a happy hunting ground has reached a stage in its existence when the enterprising but vandal attention of the Tourist Agent is directed to it, it is a hint to us to think of turning our energies and attentions elsewhere.

But let not my croaking dishearten any reader who may be planning an expedition to Somaliland in the near future. There is yet time before the débacle, and there is still plenty of game, in spite of reports to the contrary—but I would urge him to go soon. Large bags of lions cannot be made as of old, I admit, but they are by no means scarce, and, as regards other game there seems little diminution; consequently there is no reason why any sportsman, who does not aim at making a very long bag, should not pick up specimens of everything he wants in the way of big game during three or four months spent in the country. Only, if he would save himself time and expense, let him realize the importance of making his arrangements and

getting his camels collected some weeks beforehand, in order that at the last minute he may not be at the mercy of "rings" in the local market.

My present sojourn in the country was undertaken under unusually pleasant auspices. H. H. The Gaikwar of Baroda had commissioned an old friend of mine, Dr. Donaldson-Smith, a traveller well known to European Geographers for an excellent piece of exploration which he carried out in Central Africa some four years ago, to lead an expedition to Somaliland for the purpose of making collections in various branches of natural history for the new State Museum at Baroda, in which the Maharajah takes a lively and liberal interest. I was fortunate enough to obtain permission to take leave and accompany the expedition, and my companion and I accordingly arranged to rendezvous at Aden, he starting from London and I from India. Things did not open very well for me, as on arrival at Aden, a few days too early for the tryst, I was landed unexpectedly with two unfortunate fellow-travellers of the gentler sex, one of them the partner of my joys and sorrows, on the quarantine island in the harbour. Only those who have partaken of the hospitality of Flint Island can form any idea of what it is like. Short commons on occasion I rather welcome, it corrects the system and reduces the weight. Absolute discomfort, when there is any reason for it, I can put up with; but close confinement under the most unpleasant conditions, and semi-starvation within hail of plenty, were, I admit, hard to bear with becoming composure, and must have been infinitely more so to my fellow-sufferers. However, the dreary days of quarantine came to an end at last, and in the meanwhile my shooting companion, accompanied by a taxidermist, had arrived from England; but so also had six gallant officers, likewise bound for Somaliland and burning to get under way, making nine of us all told. The presence of so many sportsmen almost reminded me of the rush for ground in Kashmir at the beginning of the season, and had I been one of that other six I might have been somewhat exercised thereby, but with the comforting knowledge that we had plenty of time before us, and that there was no need to compete for ground with anybody, we took things leisurely and let them get ahead, for it was no part of our present plans to make a large bag of big game in general or one species in particular. What we contemplated was to visit the habitat of each species in turn, according as season or circumstances made convenient, and while obtaining one or two good specimens of each, to exploit the locality generally for birds, butterflies, *et hoc genus omne*, moving on when additions to the collection began to get too few and far between.

I do not propose to give any continuous narrative of our progress, the mere itinerary of such an expedition would differ little from a dozen others and would have no interest for the general reader, but I will chronicle such incidents and unscientific natural history notes as may seem worth recording under the head of the species to which they refer,

## THE AFRICAN ELEPHANT.

*(Elephas africanus.)*

The shooting of elephants within the circumscribed area known as the "Aden Reserve" is now absolutely prohibited, and as regards the rest of the Protectorate, for some time past the imposition of heavy dues on ivory brought out of it has served in some measure to check their extirpation, but the stable door was not really shut until the horse had been stolen,—sufficient steps were not taken in the first instance to put a stop to the indiscriminate and unsportsmanlike slaughter of them that for some time went on.

Elephants are wanderers at all times, and more than usually so in Somaliland, where food and water are scarce, and where they have to go long distances in search of both one and the other; and in the course of these wanderings there are still one or two herds, I am glad to say, which ring the changes at certain well-known water-holes in the Protectorate. I fear, however, that the Anglo-Abyssinian Demarcation Treaty has, indirectly, numbered their days, and that in another five years there will not be an elephant on this side of the Shebeyli River. Some of my readers may be aware that the boundary laid down by that agreement transferred from the British to the Abyssinian sphere a large slice of the Gadabursi country in the S.-W. corner of the Protectorate, including the tract known by Somalis as "The Barrowa." This Harrowa is a long shallow valley, heavily forest clad, running from west to east and surrounded by hills and broken highlands—an ideal sanctuary for game, and as such all the elephants in the country seemed to look upon it, either when fleeing from the snare of the hunter or when driven back by the approaching heat and consequent scarcity of food and water, from their wanderings towards the Coast. The outskirts of this valley are frequented by the villages of Ughaz Nur, an old Sultan of the Gadabursi tribe, who gave the Coast Administration in days gone by a good deal of anxiety owing to his intrigues with the Abyssinians, whose bands of marauding soldiery he was supposed to pass surreptitiously over the border, and allow to levy blackmail upon his weaker brethren, or to shoot down elephants. While his country was under our influence, however, it was possible, to some extent, to check the wholesale slaughter of these grand brutes by putting moral pressure upon him, and by seeing that rifles did not get into his hands, but now that, by the arrangement of 1897 above mentioned, both he and his country have passed under the sway of the Lion of Judah, the Harrowa valley must surely soon cease to be the blessed retreat to the Somali elephant that it has been in the past. In fact, when in the vicinity, at Jifa Medir, a few weeks ago, I heard that the same old Chief's son, Aysa (to whom I remember I took a great fancy when he piloted myself and a friend during a short shooting trip in the Harrowa some five years ago, and whose perfect knowledge of the jungles made him an invaluable as he was a pleasant companion), had obtained through the Abyssinians a large bore elephant gun, of French manufacture; and that

accompanied by a posse of Abyssinian sepoy, he spends his days shooting down the elephants for their scanty ivory. I did come across one herd on our present expedition, when on a short excursion by myself to the Marar Prairie, where I was looking for Hartebeest. They were on their way southwards from the water-holes of Gebili, in the Protectorate, which they had, I heard, been frequenting for some time past. There was no tusker among them, so they were spared any attentions from me, but the Somalis, who used the same water-holes (which at that dry season were frequented by the flocks of villages for 20 miles round), said that when this herd came to water they were absolutely defiant of human beings, and that natives had to retire and wait till it pleased the elephants to depart, as nothing would move them till they had leisurely finished their "wash and brush up." Poor beasts! long may they maintain their present independent attitude and immunity from persecution.

#### THE RHINOCEROS.

(*Rhinoceros bicornis*.)

Rhino are still fairly plentiful as you get well into the Haud—the waterless belt running right across the Protectorate from west to east. I even heard of one or two stray beasts near Bura, at the entrance to the Dolbahanta country, but I think that is the extreme limit of their distribution towards the N, and E. I have never heard of one in the Reserve, and they do not seem to cross the Haud northwards, but become more plentiful as you get further south.

In the case of the elephant his ivory is his ruin, and a fine pair of tusks must ever be a coveted prize to sportsman and savage alike, but the Rhino, fortunately for him, is not so valuably furnished, and thus enjoys comparative immunity from persecution. The non-professional hunter should ordinarily be content with two or three good specimens, and the Somali does not pay him much attention. True, he likes the skin for making whips and shields, but he does not appreciate him as an article of food, and I do not think the destruction under the former head amounts to anything very considerable, so that in Somaliand at all events the Rhino should survive long after the elephant has become extinct.

As an item in the list of big game he sometimes affords sufficient excitement, as he habitually charges when wounded, and not infrequently when unwounded and entirely without provocation; but on the whole he would appear to be much less formidable than the elephant, and more easily brought to bag, if bullets be at all properly placed. On this subject I am going to propound a mild heresy. Most authorities recommend the shoulder shot, or the lung shot, as being the most efficacious for the Rhino, and this is what one would naturally expect; but for quickly putting one of the tribe out of action, try the centre of the belly, the lower down the better. I should not presume to suggest the experiment from my own *limited*

acquaintance with the animal ; but Dr. Donaldson-Smith gave me the hint as the result of very extended experience with troublesome Rhinos under divers conditions, and though I was sceptical on the subject at first, my doubts were ere long removed by a somewhat disastrous encounter ; the manner of which seems worth recording, whether as demonstrating what to avoid in one or two details incidental to the quest of *Rhinoceros bicornis* or as furnishing a good example of the red-letter days which occasionally, and generally so unexpectedly, figure in the log-book of a hunting-trip such as ours. The events of the two days in question were not entirely furnished by the Rhino, but I may as well give the whole of them : —

On the 8th March, I had tracked up a pair of lions and eventually bagged one of them. After taking off the skin I left the carcass of the slain where it fell, and that night tied up a bait hard by, in the shape of an old broken-down camel, in case the male should haply return to see what had become of his mate.

March 9. Donaldson-Smith and I were up with the lark, and went down to see if the camel which we left out last night had been killed. Yes, good luck to it, it had ; not much, however, of the carcass had been eaten, only one hind-quarter ; but on the other hand the remains of my lioness of yesterday had been taken away, and from a cursory examination of the tracks round the kill more than one lion seemed to have been at work. I had had my "day out" yesterday, so we had arranged before starting out that D. S. should take the shot to-day, if we came up with a lion together, and we now proceeded to take up the track of the animal that had dragged the lioness's carcass away, D. S. taking his gun-bearer, Abdi, with him, and I my Midgan boy Mahomed. The track led us through patches of high sun-bleached grass with intervals of bare, sandy ground between, and an occasional mimosa bush, and we had not gone more than half a mile when Mahomed suddenly stopped and pointed ahead, and at the same moment I saw the lion peering at us over a high tussock of grass, with his head and left shoulder exposed, about 50 yards away. I was on the left of the Midgan and could have had an easy shot, but Donaldson-Smith could not see him distinctly from where he was, and had to shuffle behind Mahomed, who was between us, towards me, before he could get a clear view of him. He had just done so, and was raising his rifle to fire, when the Midgan, who had hitherto remained in a squatting position, for some unaccountable reason stood up right in front of him, obliging him to bring the rifle down again ; and at the same instant the lion whisked round and vanished like magic in the grass. We were both too disgusted for words. On going up to the spot where we had seen him, we found no sign of the carcass of my lioness, but by following up the original trail we soon discovered it under a dense bush among the high grass, about 100 yards away. The lion had evidently heard us and had left his gruesome meal to come and see who the

intruders were. We continued to track for some way but his spoor showed that he was going at a canter and we came to the conclusion that having been twice disturbed by human beings within the last 24 hours he would in all probability go for a long distance, especially as the day was yet young and the weather cool; so we decided to try our luck with a fresh lion, and after delaying a few minutes to extract the "lucky bones" (which I forgot yesterday) from the lioness's carcase, we returned to the kill, intending to pick up one of the other tracks. There was such a maze of footprints round the dead camel that we took some time to unravel it, but in the end we found to our chagrin that all the tracks had been made by the same lion, who must have prowled round and round for some hours before he finally hardened his heart and tackled the camel. Judging from the direction from which he had come, the size of his tracks, and his appearance, I had no doubt that he was the mate of the lioness I shot yesterday, returned to make a cannibal meal off the carcase of his late consort, whose flesh he evidently found more to his taste than that of the emaciated camel that he had first killed. So much of the latter remained that we thought the lion would in all probability return again to-night for another repast, and so turned our attentions to a fresh Rhino track which we had come across while tracing back the spoor of the lion; but after following it a short distance, D. S., who was out for the first time, after being laid up for a week with a strained back, began to feel that he had had enough, and was obliged to return to camp, leaving me to try my luck with the Rhino. I took his gun-bearer Abdi and my Midgan boy with me, and told my Arab camelman to follow our tracks with my riding camel, keeping a quarter-of-a-mile or so behind. It was not long before I came on fresh droppings, and a few minutes later it became obvious that the Rhino had winded us for he turned down wind, and the tracks showed that he was going at a trot. Soon after 11 o'clock, Abdi being then on the track, we heard the cracking of a twig close by, and pulled up to listen, and a moment later I caught sight of a swaying, yellow mass, showing above a clump of high grass, beneath the shade of a low overhanging mimosa bush, about 20 yards ahead. It was evidently the upper half of the Rhino's back, yellow with the sandy soil in which he had been rolling, and I thought I could make him out, standing almost facing me, with his near shoulder exposed, and his head, which I could not see, turned away to his right. Presuming that he must have seen and heard us, as we had him, I aimed at the point of the shoulder and fired. There was a violent commotion in the grass; he seemed to be trying to spin round, and I gave him the other barrel in much the same place, thinking that if he charged I could take my "Paradox" from Abdi, who was by my side; but when I turned to do so, there was no Abdi; he had done the vanishing trick, and at the same moment out burst the Rhino, puffing like a steam-engine, and coming stright for me. There was no time to reload,

and I felt that I was in for "beans" of sorts, but providentially the beast changed his mind at the last moment, swerved off to the right of me, and disappeared in the grass. I felt positive about my first shot and fairly so about my second, and so did not think he would go far, but it was impossible to see a dozen yards ahead owing to the height of the grass, and the only thing to be done, therefore, was to pick up the track again. I accordingly proceeded to collect the rest of my party and found the two of them hiding behind a big tussock of grass and endeavouring to squeeze themselves into mother earth, like a couple of wounded quail. When we had first come in view of the Rhino, the boy Mahomed was behind me and had no weapon with him, so that he had every right to make himself scarce, but I thought Abdi might have waited to give me the "Paradox," and altogether I was not in the best of tempers, but after giving him a piece of my mind, in terms more forcible than polite, I hastened to resume the trail. But, alas, there was not a vestige of blood, and the beast had gone clean away. It was two mortal hours before we got in touch again, and during that time my boys were continually impressing on me that there was no blood and that we should never see the Rhino again: but having no doubt whatever in my own mind about his being wounded, these insinuations only served to nettle me and put me on my mettle, and made me the more determined not to stop without another interview; and so we trudged silently along. It was 2 o'clock before we came up with him again, Mahomed Midgan being on the trail at the time and I close on his heels, in the same heavy grass and bush jungle as before. There had been no sign to show that we were getting near and the trail apparently went straight forward, when, as we came up level with a small gap in the grass, to the left of our general direction, we suddenly saw the Rhino standing there, waiting for us. He charged out instantly, passing within a few feet of me and making for the Midgan, who on seeing him had darted away to the right. Neglecting, from force of habit, I think, my comrade's recent counsel about the vulnerability of the Rhino's belly, I gave the latter a bullet in the shoulder as he passed me, and this caused him to pull up and turn his attention to me, but he had just given me time to dodge behind a friendly sapling, and evidently lost sight of me, for he began tearing round in circles, as if he knew not whom to devour. While employed in these gyrations he raised such clouds of dust from the loose red loamy soil under foot, that it was impossible to see him at all distinctly, but during one lucid moment I did manage to make him out dimly and got in another shot; and then the devil must have possessed me, for I again aimed at the shoulder. This time he did stumble, but was up again in a moment, and I lost sight of him in a whirlwind of blinding dust. Suddenly there was a report from Mahomed's direction, and a moment later I heard the Rhino rattle past through the grass behind me, in the direction from which

we had come, but I could see nothing. The Midgan had been carrying my Paradox gun loaded, and presuming that he had fired it in self-defence, I thought no more about it, and on hearing the beast pass me, jumped up and started in pursuit. After going some 200 yards, I met Abdi and my camel man just emerging from cover, and they told me that the Rhino had broken back in their direction, and had fallen to his knees as he passed, but that he had quickly recovered himself and gone on again. I fully expected therefore to find him *hors de combat* at no great distance, and we were just beginning to pick up his track when we heard loud groans coming from behind us, and then I bethought me of Mahomed Midgan and the shot I had heard. We ran back as quickly as we could in the direction from which the sounds were coming, and there we found the boy lying on the ground with a heavy mimosa bush on the top of him, groaning and looking very sorry for himself. He was soon extricated from the thorns, and on further examination I found that little or no damage was done; he was bruised and scratched, and evidently a good deal shaken, but happily no bones were broken. According to his story, when he first saw the Rhino and darted aside to my right, he had reached but flimsy cover, and after my second shot he was endeavouring to better himself by making for a large mimosa bush close by, when the brute caught sight of him and came for him instantly. He had just reached the bush when he was overtaken, and the Rhino brought him and the mimosa over together and at the same moment the "Paradox," which he was carrying on his shoulder, was knocked up into the air by the animal's horn and fell to the ground beside him. From this moment the boy was saved any further attentions from his assailant, who now proceeded to pound the gun with his feet, or horn, eventually exploding one barrel. Such was the boy's version of what had happened. On picking up the gun out of the sand, I found with infinite disgust that it was completely out of action. The barrels had been first bent almost double, close to the fore end; one cartridge had afterwards been discharged, and the bullet had torn open the barrel at the bend. But for this, I might somehow have straightened the barrels and used the gun for shot, but, as it is, it is absolutely useless—a good gun which I could ill spare. However, it was no time for sad reflections. A few minutes later I had Mahomed safely mounted upon my riding camel, and telling the camel-sycc to bring him along in our wake, I and Abdi hurried after the Rhino.

The travelling was now easy enough; there was plenty of blood, both on the track and high up on the grass, and when we got to a little clear ground we found that his off shoulder must be broken, as he was going on three legs and dragging the other. One would hardly have expected him to go far in this condition, but nevertheless on he went, mile after mile, hour after hour, and showed no signs of stopping. At 4 o'clock we were many miles from camp, and all more or less beat, having been going hard since the early morning; so I thought it best to knock off for the day. Accordingly we made

tracks for home, getting in just before dark, tired and hungry. When I told Donaldson-Smith the events of the day, he at once remarked, "Why didn't you aim for the belly? If you had only done that at the second meeting, you would have had no more trouble." I cursed myself for my perversity, and promising to take his advice on the morrow, I turned in early, after giving orders for two camels to be ready at daybreak with a couple of days' food for myself and four men. Next morning I was up betimes, and started off with my little lot to the place where we had left off tracking the night before, Donaldson-Smith lending me his '577, taking 7 drams, which he guarantees to be a "rhino stopper," and begging me to take his advice and aim for the middle of the belly, low down. The sun's hateful majesty was very much in evidence yesterday, and I expect touched me up, as I had a bad head on waking up, and so determined to ride my camel until the tracks became fresh. I took Mahomed Midgan up behind me. He was very stiff after his shaking of yesterday, too much so to walk with us; but he asked to be allowed to accompany me on the camel, so as to be in at the finish, a request which I thought showed very proper feeling! I also took his dog along with me thinking he might be of use. It was marvellous how the Rhino had plodded on. He had come to a standstill once or twice during the night, but had never lain down, and was still going. One or two checks in the high grass brought us to noon. It was then about time to give the baggage camels a rest, as they had been out 5 hours and it was very hot and sultry, so I halted them for an hour, and had forty winks myself, for which I felt much the better, as it took away my head trouble which had been very bad all the morning. About 1-30 we got on the trail again. It soon led us into very heavy cover, high grass with clumps of tangled creeper thicket, in which it was impossible to see a dozen yards ahead—just the place in fact for a wounded Rhino to take sanctuary in. It was very difficult to keep the track, or move at all quietly, but Abdi was in form to-day, and we struggled along with as little crashing of branches as possible. The dog Jenaada too came in useful in this labyrinth; he did not help us with the tracking, but he kept running on ahead and returning to us, and I thought he would very likely give us warning when we were coming to close quarters. We had been going thus for about an hour, when a violent sneeze hard by told us that our friend was wide awake and had winded us. We could see nothing on account of the dense cover, and in a moment all was still again, but Jenaada heard the sound too, and ran off enquiringly to our left front to see what it was. He soon returned, however, and from the direction to which he faced, and the way he sniffed the air, we had little doubt that the Rhino had broken back. We could not follow directly as it was impossible to get through the network of undergrowth that intervened, so I had to go back about 100 yards on our track, and then work round through a little clearing to my right, hoping thus to get a view. As a matter of

fact I met the beast face to face, and he instantly put his head down and came for me, but a shot from the '577 as he came on, made him swerve off to my left, and then, remembering at last my comrade's advice, I let him have the left barrel in the belly, as he presented his broadside. This seemed to crumple him up altogether; he slowed down at once, stopped after a few yards, stood quivering for a moment, and then sank on his knees and in a minute was *hors de combat*. On my going up to my gallant quarry, the reason for all the trouble he had given was apparent. The two shots which I had fired at our first meeting (when, as I say, I felt positive I was shooting at the point of his near shoulder) were nicely placed in the right buttock! The second two bullets, fired at our second interview, when the Midgan was hurt, were both fairly in shoulder, but a little too far forward. The shoulderblade was shattered to pieces, but in spite of that he had travelled at least 15 miles, and had died game at the end of it. The caravan, which was not far off, came up on hearing my shots, and we were soon all at work on the carcase. I only wanted the head, but the boys were bent on taking slabs of skin for whips and shields, so that it was 5 p.m. by the time we had finished—too late to get back to headquarters. Moreover, I thought the carcase might have feline visitors during the night, so we made a small zereba close by, and spent the night *sub jove*.

Thus ended a sufficiently exciting tussle with a plucky foe, and I gathered one or two useful hints from it. First and foremost—always keep your second barrel in reserve till you see whether you are to expect a charge or not, and secondly—if you can get him broadside, the belly shot is more immediately effective than the shoulder, unless of course you are using a very powerful rifle; the reason probably being that in this part of the Rhino's anatomy there is such a number of nerves and blood-vessels that a bullet planted therein causes him a violent shock to the system.

On his 16 months' journey to Lake Rudolph, a few years ago, Dr. Donaldson-Smith found Rhino in many places a perfect pest. They would frequently rush out at members of his caravan, walking innocently along a jungle path, and would even charge through the line of camels; a camel on one occasion, too stupid or too lethargic to get out of the way, being disembowelled by one. Several of his retainers too were more or less damaged by them during the expedition; but it seems difficult for a Rhino to use the point of his horn with good effect against a fallen man, and the injuries among his party were invariably limited to a severe bruising and shaking. The Doctor on these occasions found that the belly shot never failed to bring up a Rhino, and his encounters with the species became of such frequent occurrence that familiarity at length bred contempt, and when the trusty '577 was at hand, a charging Rhino became a matter of little concern—rather of pleasurable excitement.

( *To be continued.* )

## SOME HINTS FOR BEGINNERS ON COLLECTING AND PRESERVING NATURAL HISTORY SPECIMENS.

BY E. COMBER.

(Read before the Bombay Natural History Society on 16th January, 1900.)

### INTRODUCTION.

In offering the following paper to the members of the Society, let me at once explain that I do not in any way lay claim to originality for the information contained therein: for, in attempting the task, it has essentially been my endeavour to gather together in a simple and practical form, the experience of the best authorities, and which has mostly been published already in some form or another. In so doing I have tried to supply what I have often felt to be a want of a very large number of members of the Society, who have not made a *special* study of Natural History in any of its various branches, but yet who take a general interest in the work done, and in the articles published in our journal, by those who have studied and collected specimens of some group or special section.

For proof of the valuable additions to Indian Biology by many members of the Society, one need only refer to the pages of our journal, which continually contain papers setting before the scientific world the results of their researches and the additions to our knowledge of the animals and plants that are found in the country.

Compared, however, with the total number of our members, these 'workers' are few indeed, and the field of their investigations must necessarily be to a great extent limited to the neighbourhood in which their ordinary vocations in life place them; for in a country like India there are not many who can devote more than a certain portion of their spare time to the study of Natural History, while still pursuing those duties that provide them with a means of livelihood. How many others, however, are there who, while taking, as I say, an interest in the general subject of our work, have never attempted to help to any practical extent, and yet are often placed in peculiarly favourable positions for doing so?

It is to appeal to and assist this section of our members that I have tried to collect in as small and convenient a space as possible, the advice of practical naturalists as to the collection and preservation of specimens illustrating the different branches of Indian Zoology, in the hopes that by so doing I may in some degree, encourage those who have the opportunities to add their quota, however small it may be, to our researches.

I do not think that many of us realize the fields, in almost every branch of Natural History, that are still open to practical field workers; for we are all inclined to be somewhat overcome by what appear at first sight full and detailed descriptions of each species that are given in the many works that have been published, and it is only when one comes to work in detail with

N O T I C E.

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THE attention of members is particularly drawn to the requirements of the Society with respect to specimens and skulls of small mammals, prepared in accordance with the directions contained in Mr. Comber's paper, and it is hoped that such members, as are in a position to do so, will respond to this appeal.

H. M. PHIPSON,

BOMBAY, *March* 1900.

*Honorary Secretary.*



such descriptions of a species and its life history, that the defects and omissions in it often become apparent.

We have much still to learn of even our commonest animals, both vertebrate and invertebrate, and plants, not only by the additions of many important details, concerning those already recognized and described, but also in the direction of hitherto unknown species, and that something towards filling these gaps may be contributed by almost any one who will take the trouble to give a helping hand, has, time after time, been proved by the work of our members, who, in a number of instances, have only developed the taste for such research comparatively late in life, and who had previously had no special training in the subjects that they turned their attention to.

Nearly every one sometime or other in his life experiences a fascination for forming a collection of some kind, whether it be butterflies, birds' eggs, postage-stamps, or old coins, prints or pottery. Nor is this inclination peculiar to certain nations, for it is common, I believe, to all the races of the world in some form or another, and we may too, perhaps, even trace it in the habit of the Bower-birds of having their little museum of stones, shells, &c., which are arranged about the curious 'bowers' that they build, apparently, for their recreation. This desire to make a collection generally attracts the schoolboy in some form, and, as he has not the facilities for satisfying it in other ways, his collection generally takes the shape of butterflies, birds' eggs, or stamps. In many instances it is only a passing phase, especially as regards objects of Natural History, for his opportunities of pursuing it are often few when he leaves school and is tied down to work in some large town with only a fortnight or a month's holiday a year. When the phase is resuscitated or developed later in life it more generally takes the form of a collection of objects of Art, and although these are in most cases obtained by purchase, a collector often devotes a large amount of time and trouble in searching for and obtaining his treasures. This devotion of time and trouble is often, it would appear, wanting in the man who still retains from his boyhood a fancy for the study of Natural History, and although he may notice anything that strikes him as peculiar and out of the common among the birds and beasts and insects around his bungalow or when out on his shooting trips, and occasionally communicates the same for publication in the very interesting "Miscellaneous Notes" of our journal, he seldom takes the trouble to start a collection of any kind, even though he may to some extent realize the special opportunities that surround him.

As the late Sir William Flower wrote: "The value of all knowledge depends a great deal upon the amount of labour and time spent in acquiring it. The easy method of which we make too much boast in the present day—hand-books, pictures, lectures, well-arranged public museums, &c.—have their drawbacks and snares as well as their advantages. They are all helps if properly used, but they will not supersede, and nothing will ever supersede, the down-

“right hard personal work by which all solid lasting knowledge must be gained. The value of making a collection of any kind of specimens about which you wish to know something is that you are forced to spend time and thought over them, carefully to prepare them and compare them, to arrange and name them.”

Then again a collection is of special value in that it forms a permanent record—if properly cared for—of a portion of the knowledge acquired in the making of it, and further than that, it is more than anything else a means of encouraging its owner to extend the permanence of that record of his knowledge by written notes, either on the labels of his specimens, or in a separate note-book, which he will probably be able to publish in some form for the benefit of his fellow-workers, whereas they would otherwise in all likelihood have been trusted to the tender mercies of his memory alone. Wonderful as the human mind may be, it can never be thoroughly relied upon to reproduce its recollections in their identically original form, and absolute accuracy of facts is one thing that science insists on, though unfortunately in only too many instances it fails to secure it. The very great importance of facts recorded on the spot cannot be exaggerated, for they are in many ways of more value to science than all the rich stores of the most retentive memory, and as a proof and illustration of recorded facts there is nothing so useful as a collection.

The question of what to collect will possibly present itself in many instances to those to whom this is addressed and who may be willing to assist in a practical way the work of the Society. This of course can only be decided by personal inclination and surrounding circumstances ; but, as I said before, it is with a view to helping members to come to a decision on this point that I have attempted this paper, by putting directly before them in a handy form a few facts of the present state of our knowledge under the different heads with which the work of the Society is connected, followed in each instance by a few simple and practical instructions as to the preparation and preservation of specimens in their most useful form.

In doing so I have had recourse to the advice contained in the most recent and authoritative publications to which access could be had, but of far more importance than anything that any book can teach, has been the personal assistance and advice of Messrs. E. H. Aitken, E. L. Barton and H. M. Phipson, without whose aid—gained by practical experiences in the field and in the Society's Museum—I could never have carried through, nor would I ever have attempted, the task that I set myself.

#### CLASS MAMMALIA.

The first class to which we must direct our attention is that of the Mammals, they being of course the most highly developed and conspicuous of all vertebrate animals.

They can for our present purpose be most conveniently divided into two sections, *viz.* : the large and the small Mammals : for, as far as the preparation

of specimens is concerned, this division comes natural, as the forms contained in each require mostly the same treatment, with the medium-sized ones intermediate in treatment.

On the subject of

*Large Mammals* there is not very much that comes within the scope of the present paper ; for, in the first place, they have always attracted a large share of the attention of naturalists and sportsmen, with the result that our knowledge of them has reached a state that leaves comparatively little, so far as concerns those that are indigenous to this country, for the work of the ordinary field naturalist. In the pursuit of many of them for the purposes of sport, we shall always have opportunities, and no lack of workers, of adding to our knowledge of their life history and habits, while the study of their anatomy and their relationships to one another to be deduced therefrom, must always be the work of the specialist more than of the field naturalist.

The second reason that prevents my going into details of any length in connection with the larger Mammals is the impossibility of attempting, within the limits of a paper, even the very roughest sketch of how to skin a large animal correctly, and in such a way that would enable the specimen to be properly mounted. No amount of written instructions can ever convey the knowledge necessary for the successful accomplishment of this, which can only be gained by actual experience and experiment under the tuition of a practical taxidermist. I do not mean to say, of course, that it is impossible for any one to acquire from the written advice of others, what will be sufficient to enable him to take the skin off a bear or a tiger in a way that will allow of its being dressed subsequently for the purpose of forming a beautiful rug in the proud sportsman's bungalow which will be a joy to him for ever ; but it is a task that I cannot attempt. In the first place this is not primarily addressed to the sportsman, but to the naturalist, and secondly, we are not in the habit of hunting alone in the jungles of India ; and even if we may at times be called upon to tackle the skinning ourselves of some large animal, the way to go about the operation will be very much better learned by watching and assisting others performing it on previous occasions. A treatise on the subject of the proper preparation of skins for mounting purposes fills a book, and has already done so on many occasions, and to anyone who has a fancy for such works, I cannot do better than refer to such works. That there are men who take an interest in the artistic, mounting of larger mammals is instanced by several beautiful cases in the Society's rooms, which were prepared entirely by one of our members—Mr. E. L. Barton—whose splendid work in this direction is too well known to most of us to require any expression of admiration from me.

At the same time there are many ways in which Indian sportsmen can help the cause of Natural History and also add to their own pleasure in the chase by taking the trouble, something more than most of them possess, as a rule, of

properly preserving their trophies, and I am glad to be able to quote a note written by Mr. Barton, when kindly looking over the draft of this paper. He writes:—"A sportsman should always study Natural History and learn a few of the ordinary ways of preserving specimens and trophies in the field. By so doing he will find much more pleasure in the sport, and will know that what he kills is not wasted through ignorance. How many beautiful skins are spoiled and afterwards thrown away simply through not having a little proper attention paid to them at first? The skinning is probably left to be done by the men without any supervision, and there are very few natives who, without any instructions, will skin a tiger's head so that it can be set up decently. Many a man who shoots his first tiger looks on it with pride and would gladly pay down a large sum to have the head set up as a trophy, but he has not the least idea how to set about its preparation, so leaves it to his men, and the thing turns out a failure. I remember some years ago a large tiger skin being sent down to the Natural History Society to be cured; the fresh skin had been laid out flat in a large tin-lined wooden case about 8 feet by 7 feet, no preservative of any sort had been put on the skin, and the case was about four days on the journey to Bombay, and was a mass of corruption when received. In the letter that came with the box it stated that the skin had been put in perfectly fresh and in perfect condition so that there could not be any excuse for its not being properly set up! One may imagine the sportsman's feelings when told the state it was in on arrival and that it had to be buried. And this was his first tiger!"

For the benefit of anyone who wishes to follow Mr. Barton's advice, let me recommend a book on "Taxidermy" by Mr. W. T. Hornaday, who, for a number of years, was chief taxidermist of the U. S. National Museum at Washington, and whose most interesting experiences of field work in India and other countries are related in his "Two Years in the Jungle." The former of these two books is one that should undoubtedly be in the hands of every field naturalist, for it will be found to cover in detail a great part of the subject of this paper, and of course far more besides.

While on the subject of books that deal with the section that we are now considering, I may here mention two others, *viz.*, Mr. W. T. Blanford's lately published volume on the Mammalia, forming one of the series of the "Fauna of British India" that he is editing, and secondly Mr. G. P. Sanderson's "Thirteen Years among the Wild Beasts of India," which will for many years yet remain a standard work of its kind.

Apart, however, from the actual operation of removing the skin successfully, a few notes on its temporary preservation until it can be handed over to the 'dresser' or taxidermist, may possibly be of some assistance to those who have not had the practical experience, and who have not by them some such book as 'Taxidermy' referred to above, which treats of the subject at length. Before removing the skin, however, there is one operation to perform, and one

which is too often overlooked or only carried out in a most careless fashion. This is the recording of the—

*Measurements* of the specimen. Until lately, almost every one has gone about this in his own particular way, with the result that the records are in many instances utterly valueless for purposes of comparison. The measurements that may be taken can of course be extended to an almost unlimited extent, but for all practical purposes the following will generally suffice, arranged in the order of their importance. They should, in the case of large animals, be recorded in feet and inches, being taken with an ordinary tape-measure—or better still with a steel-tape, which is not so liable to stretching or damage—and written down on the spot.

(1). *Length of the Head and Body*.—For taking this measurement the animal should be laid on its side, and the body, neck and head straightened out as much as possible. Then measure in a straight line from the tip of the nose to the root of the tail. To enable this to be done accurately it will generally be of assistance to set up perpendiculars with sticks at the two extreme points of measurement.

(2). *Height at the Shoulder*. This is always a difficult measurement to take from a dead animal, but with a little practice it can be done with reasonable accuracy. With the animal still lying on its side, set up a perpendicular stick at the highest point of the shoulder and measure in a direct line from this to the sole of the foot, the latter being held in the natural position as if the animal were standing on it, and the leg quite straight.

(3). *Length of Tail*.—With the tail held down, measure from the angle below the root of it to the extreme end *without the hair*.

(4). *Girth behind Forelegs*.—This measurement should be taken at the point where the girth of a saddle touches a horse, and is absolutely necessary if the skin is going to be pegged out for drying, so that in doing so it may not be exceeded. It can be supplemented by other similar measurements such as the girth of the flank and forearm.

(5). *Length of Skull*.—In the case of a tiger, if the skull is not going to be preserved, measure it along the ridge or occiput, and also its greatest circumference. These measurements are generally a good indication of the size of the beast.

In connection with the measurements reference may here be made to the desirability of also recording the—

*Weight* of an animal whenever it may be possible, and though a scale, capable of doing this in the case of an animal of any considerable size, is not of course commonly part of the camp equipment—quite apart from the fact that the same will often be miles away—the result can at times be attained by weighing it piecemeal on, say, a 50-pound scales, after it has been skinned and cut up.

Let us now turn our attention for a while to the *Treatment of the Skin* after it has been removed from the carcase. The first thing is to carefully clean the inside as much as possible of all remaining pieces of flesh and fat. That

being done, there are two methods of preserving it, each of which may at times prove the most convenient. These are by drying it with suitable preservatives, or by putting it in 'pickle.'

*Dry Process.*—This is the system most generally adopted, and usually most convenient from the point of view of easy transport. Firstly, any holes or cuts that have been made by bullets or knives should be carefully sewn up. If it is a whole skin, it should then be pegged out either on the ground in the shade, or on a board, if one of suitable size be available, with the hair side downwards, using nails or pegs that will damage the skin as little as possible. In pegging a skin out, care should be taken not to stretch it beyond the measurements that have been taken, for it is most difficult to bring it back to its proper dimensions, if it has been overstretched and so dried. It is not absolutely necessary that the skin be pegged out for drying, but, if time allow, it is advisable to do so, as it enables the preservative to get at all parts of it better and dry evenly.

Into every part of it is then rubbed a mixture consisting of four parts powdered burnt alum and one part of saltpetre, special attention being paid to the lips, ears, feet and other fleshy parts. When this has been thoroughly rubbed in, sprinkle the skin regularly all over with the mixture and then leave it to dry, at the same time watching it carefully, in case any part of it shows signs of requiring a further application of the alum. It should also be beaten each day with a stick, as in some places white ants may come up out of the ground and play havoc with the underneath part of the skin. When thoroughly dry, the skin will by this means be preserved from decomposition, but it is further necessary to protect it from the attacks of insects, especially in tropical climates, the most destructive of which is a small beetle about a quarter of an inch long, whose generic name is *Dermestes*. This is best done by a free application of spirits of turpentine to the hair side of the skin, with which too the inside should be sprinkled. We have now only to fold up the skin carefully, hair outwards, to a convenient size for packing, when it only requires inspecting occasionally to see that no parts become tainted.

The second or

'Pickle' Process is sometimes useful owing to its simplicity and the avoidance of any such delay as waiting for the skin to dry, which may at times be inconvenient. This naturally applies mostly to the rainy season when it may be almost impossible occasionally to dry a skin properly. Many taxidermists, too, prefer a 'wet' skin for purposes of mounting.

The 'liquor' or 'brine' is made as follows, quoting Mr. Hornaday: "For every gallon of water put in  $\frac{3}{4}$  lb. of alum (1 pint) and 1 $\frac{3}{4}$  lbs. of salt (about 1 quart), and heat the liquid to the boiling point, stirring occasionally, so that the salt and alum will dissolve. Then pour it into a wooden, earthen, or glass vessel, or a tank lined with lead (for zinc or galvanized iron will not answer), and when it is cool, or even milk warm, it is ready for use."

The 'brine' can most conveniently be contained in tubs or barrels with air-tight tops and the skin has then to be simply immersed in this 'bath,' care being taken to keep it spread out as much as possible, so that the liquor can get at all parts and folds, and for the first few days it should be moved about to ensure this. It can then be folded up tight and packed away at the bottom of the bath so as to leave room for the treatment of other skins.

It must be remembered that the bath will gradually lose its strength and more salt must be added after a time to keep it up to the proper standard. At the same time it will of course get dirty with grease and blood, when a fresh mixture must be made. Skins can be kept for years in this pickle if the mouth of the receptacle be kept properly closed, but for the purpose of preservation a few days will suffice. Whenever the time comes to remove specimens from the bath, they should be thoroughly cleansed in fresh cold water.

But it is not only the skins of large mammals that form the trophies of the sportsman and naturalist, for the—

*Skulls* and *Skeletons*, or at any rate the former, are worthy of his care, and may even on some occasions be the only part that he can attempt to preserve.

So far as the skull is concerned the process is not a difficult one. Having separated the head at the first cervical vertebra, the skull should be roughly cleaned of the flesh and soft parts, and then soaked, washed, and rubbed in cold water so as to remove as much blood as possible. It can then be dressed with thin arsenical soap, or better sprinkled with dry arsenic as the former may prevent its coming absolutely white when it is eventually cleaned, but remember that alum should never be put on a skull or skeleton. It should then be hung up in the shade and wind so that it will dry quickly.

A skull may also at times be conveniently cleaned by immersing it in a tank or running stream when one is handy, not forgetting at the same time to secure it to the shore in some way. What flesh, &c., is not removed by the inhabitants of the water, will in a few days be sufficiently decomposed to allow of its being easily scraped off, and the arsenic can then be applied.

It is of course hardly necessary for me to mention that if boiling is resorted to as a means of cleaning a skull it is impossible to ever make the specimen white, as the greases of the flesh permeate the bone and can never be removed.

Of the preparation of rough skeletons, I can hardly attempt to treat with any degree of success in the space at my disposal, and the subject is so fully dealt with in 'Taxidermy' already mentioned, that any one wishing to take up their preparation cannot do better than refer to it for the information.

Before leaving the large mammals, I think it only right to specially mention the order—

*Cetacea* or *Whales*, dolphins and porpoises, which Mr. Blanford describes in the preface to his 'Mammalia' as "the order with which, at the present time, our acquaintance is most imperfect."

The opportunities for the study of such marine animals are, of course, not given to many of us, but still there may be some of our members who 'go down to the sea in ships,' who may be able to help in this direction.

#### SMALL MAMMALS.

When we come to the smaller animals of the great class Mammalia—chiefly comprising the orders *Insectivora*, *Chiroptera* and *Rodentia*—we have at once a far greater scope for the attentions of the ordinary collector. Although many of our most eminent Indian naturalists have in days gone by done a vast amount of work on them, it is only of comparatively recent years that a really systematic and complete investigation of the representatives of these orders in all parts of the world has been undertaken by zoologists at home.

They have in this been ably backed up by many collectors in different countries, but their efforts have not as yet received the support that they deserve from India.

One thing that has been found to be absolutely essential for the successfully study of these orders is the necessity of large ranges of specimens from different localities, without which it is impossible to arrive at any satisfactory conclusions as to the distinctions of species and their varieties.

Now a very large number of our members can help in this work with the expenditure of a comparatively small amount of time and trouble to themselves, and with a view to encouraging this help, the Society has now arranged to seriously undertake a collection of skins, and of course skulls of the smaller mammals inhabiting this country, confining it for the present to those say not larger than a squirrel. The reason for limiting it to this is the difficulty of properly storing and taking care of larger specimens.

Under the circumstances, I think the best thing that I can do is to quote in full, the directions that have been drawn up by Mr. Oldfield Thomas of the British Museum (Nat. Hist.) for *Preparing Small Mammal Skins*, for, even with these simple instructions, almost 'any schoolboy' or, with very little tuition, the 'cook's mate' can skin a rat with sufficient skill to make a presentable specimen after a little practice.

[I]. With the freshly killed carcass before you, write the label. This should bear a number, locality, altitude above sea, sex, date, and the following measurements in inches taken in the flesh: (1), length of head and body; (2), of tail without end hairs; (3), hind-foot without claws; and (4), ear from notch at base to tip. In the case of the first two measurements, the body should be straightened out as much as possible, and the tail bent upwards at a sharp angle, and the measurements should then be taken from a point in the angle. The label should also have on its back any notes that may strike you about the place where the specimen was caught.

It is important that the positions of the different items and the direction of the writing (away from the thread) should be exactly as in the example, so that skins from different sources may all be similarly labelled.

FRONT.

|     |                 |                  |
|-----|-----------------|------------------|
| No. | (Date).....     | (Sex).....       |
|     | (Name) {        | .....            |
|     |                 | .....            |
|     | (Locality)..... |                  |
|     | (Altitude)..... | (Collector)..... |

BACK.

|     |                    | (Measurements). | (Notes.) |
|-----|--------------------|-----------------|----------|
| No. | Head and body..... | inches.         |          |
|     | Tail.....          | "               |          |
|     | Hind Foot.....     | "               |          |
|     | Ear.....           | "               |          |

A supply of these labels can be had on application to the Honorary Secretary of the Society.

[II]. Open the skin by cutting down the belly from the breast-bone to the anus; first push one and then the other knee through the opening, and cut through the legs at the knee joints; clear off the chief muscles of the leg-bones, and separate away the skin from the body all round the tail; then holding the skin at the base of the tail firmly between the finger and thumb nails, or in the fork of a cleft stick, pull out the vertebrae from inside with the forceps; then gradually turning the skin inside out, skin it up over the body, shoulders, and head, separating the fore-limbs at the elbow joint, and taking great care not to cut it in passing over the eyes; skin it entirely off over the mouth, cutting carefully round the lips. Throughout the operation plenty of fine sawdust will be found of great assistance in keeping the hands, and consequently the fur, dry and unsoiled.

[III]. Clean the inside of the skin from blood, fat, &c., and then brush it all over with arsenical soap, being especially careful that the insides of the limbs get some put on them. Do not put any poison, and, especially, no powdered arsenic on the outer, furry side of the skins. But pepper, naphthaline, or camphor may be used to keep off moth from the skins when travelling.

[IV]. Turn the skin back right side out and fill the cavity of the body with cotton wool, putting it in as far as possible in one piece, or the skin may be reversed over the wool by putting the forceps up the furry side of the skin from the tail end, and grasping the wool-body through the mouth. (In tropical

climates a few drops of carbolic acid or other disinfectant may be put on the wool to keep off insects.) Take care just to fill out the skin without overstretching it, and try to get all your skins filled out to about the same degree. Take a piece of straight wire long enough to extend from the front end of the belly opening to the tip of the tail, sharpen, if necessary, one end of it, and wind round it enough cotton wool to fill out the skin of the tail, then brush it with arsenical soap and push the pointed end down to the extreme tip of the tail skin, and fit the near end into the belly, packing it round with the wool of the body. Put a small piece of wool into the empty skin of the arms and legs. Then stitch up the opening down the belly.

[V]. If at all oily or greasy, the fur may be cleaned by being wiped with a rag dipped in benzine, and then having fine sawdust gently rubbed into it, this being afterwards brushed out when dry.

[VI]. Lay the skin on a board or piece of cork, draw out the fore paws forward and pin them down to the board by a pin passed boldly through the middle of the paw. Take care that they are pinned as close into the sides of the neck or head as they possibly can be, in order to prevent their claws catching in other skins when all are packed together in boxes. Similarly pin back *soles downwards*, the hind feet by the sides of the tail. It is of considerable importance that neither fore nor hind feet should project laterally outwards, nor should curl up in drying, and that the fingers and toes should be kept close together and parallel, not spread out sideways.

[VII]. As the skin dries, try to get the face to assume as natural a shape as possible, and the ears to stand up in an erect position. Tie the label on to the ankle before pinning the skin down.

[VIII]. Disarticulate the skull from the trunk, label it with a corresponding number to that on the skin, and then let it dry. In a dry climate this may be done almost without any cleaning, and even in a wet one, if the skull be dropped into some sawdust artificially dried, little cleaning need be done; at most the eyes, brain, and tongue may be taken out, but, in cutting out the last, great care must be taken that the delicate bones behind the palate are not injured. In a general way, try and do as little to the skull as the climate will admit of, although, of course, it must not be allowed to become rotten. Drying naturally or artificially is the best, and arsenic or other chemicals should not be put on it, insects being kept off by well-fitting tin boxes, and the use of a little naphthaline or other disinfectant in the box. Fly-blown skulls should not be dropped in the same box with drying skulls.

[IX]. Pack the skins up carefully in small boxes when they are dry, with enough wool rolled round them to prevent their shaking about; do not roll them up separately in paper unless the exigencies of travel make this course absolutely necessary. It is a good plan to have with you an ordinary cork-lined insect box, in which the pieces of cork can be pinned for travelling. When the skins are partly dry they can be taken off the separate pieces of

cork, and pinned close together in the box, where they can safely travel and dry at the same time.

[X]. Bats should be pinned out just like other animals with their wings closely folded up on each side of the body, in such a way as not to hide the fur of the belly. The thumbs should be made to point inwards or backwards, not outwards. One or two specimens of each species should also, if possible, be preserved in spirits.

These directions Mr. Thomas follows with a note as to what are specially wanted, which he describes as "Generally all small mammals, *however common*, so long as they are not domesticated, or inhabitants of houses, *i.e.*, squirrels, rats, mice, shrews, moles, bats, weasels, stoats, &c. &c. Do not be afraid of sending too many of the same sort, if carefully prepared and labelled as above described. . . . Series of skins representing the different seasons are always of interest."

The skins can of course be treated in other ways just as those of larger animals are, and the "pickle" bath already described will sometimes in their case be found the most convenient when the time cannot be spared to prepare them as nice specimens by the dry process. Then, when the collector has more time on his hands, they can be gone through carefully and made up into specimens. In this way, too, a certain amount of time and trouble may be saved by only selecting a good series of each of the commoner species for making into specimens. The procedure as regards the "setting," &c., will be just the same as described above for a fresh skin.

A third way of treating small mammals is by preserving them, as alluded to by Mr. Thomas in the case of bats, in *spirit*, and the advantage of this is of course that there is no skinning to be done. This in some instances must be a consideration to the busy collector who can only give a very limited amount of time to such work, but, on the other hand, it has the disadvantage that, if so preserved, they can *never* be turned subsequently into dried specimens, and for the purposes of scientific investigation, the latter are found to be much the most reliable so far as the smaller mammals are concerned. However, in the case of rare species at any rate, it is always advisable to preserve one or two specimens in spirits. The process is simple in the extreme. The spirit is simply ordinary methylated spirits, such as is used for burning in small lamps. A few incisions must be made in the abdominal region, so that the spirit may be able to thoroughly penetrate those parts. Then the whole animal is immersed in the spirit, which can be contained in any suitable receptacle, and the mouth of course kept tightly closed to prevent evaporation. The specimen must be given plenty of room at first, so that it may become thoroughly impregnated.

For the purpose of labelling it is as well to note that the usual paper label can be used, only the entries thereon must, if it is going into spirits, be made with an ordinary *lead pencil* instead of with ink,

On the subject of the *capture* of small mammals, I need not say very much, for individual circumstances will mostly indicate the best means. Traps will, of course, generally be the most successful, especially in the case of nocturnal terrestrial animals, and there are any number of suitable patterns obtainable. Those that do not injure the skin with powerful rows of jagged teeth will naturally serve the purpose best, and pitfall traps, made out of a glass, or metal jar or a common "chatty" sunk in flush with the ground, are not only simple but often very successful.

In the case of bats, however, the circumstances are somewhat different, and as there is a large field for the advancement of our knowledge of them, they are worthy of a special line. In spite of the ninety odd Indian species included in Blanford's 'Mammalia' our knowledge of their geographical ranges is by no means complete, and there are evidently still a large number of species with which we are not yet acquainted, as instanced in Mr. Wroughton's recent paper in our Journal. And if this is so in the case of the neighbourhood of Bombay, how much more likely is it to be of the more out-of-the-way districts.

Their nocturnal aërial habits preclude their capture by trapping, and have at the same time prevented the extension of our knowledge of their life history in comparison with terrestrial mammals. One has consequently to resort to shooting them after they leave their resting places, and come out to procure their breakfast as the shades of evening fall. This in itself is a form of 'shikar' that can provide a lot of amusement even if it is not 'sport,' for a bat is by no means an easy mark, for even the man whose friends relate that he is practically never known to miss a snipe; and then, again, when the bat is 'downed,' there is the little job before you of finding him. A bat, that with its wings extended in flight, appears a fine big beast, is like a very insignificant screw of brown paper or dirty rag when on the ground.

Bats can also be caught very successfully with a large butterfly net, when they are hawking near the ground. If the first sweep of the net misses, the bat will generally turn and follow it, attracted by the eddy it makes in the air; or they may be caught in their sleeping places. Caves, deserted temples, cellars and powder magazines in old Maratha forts, are favourite haunts. Rare specimens might sometimes be secured by the simple expedient of shutting the doors and windows whenever a bat comes into the house at night.

*(To be continued.)*

## FISHING IN INDIAN WATERS.

## PART V.—KARACHI.

BY F. O. GADSDEN, R. I. M.

*(Read before the Bombay Natural History Society on 16th January, 1900).*

I have repeatedly heard it stated that few places exercise a more depressing influence upon the new-comer than does Karachi; but as yet I have never been able to find out the real reason for this. Partly, I think, it must be that the new arrival expects too much in the way of scenery; he has been picturing to himself the gorgeous beauty of the sub-tropical foliage, and here he arrives upon India's strand at a place where there is little or no vegetation, and where everything looks dry, dusty, and parched, hence his disappointment; but, at the same time, few places that I know of grow upon one so rapidly, and so strongly, as does this self-same arid desert-looking town, and were I condemned to live out here altogether in the plains or on the coast, I think I should choose Karachi. Karachi itself has no harbour proper; one part, or rather suburb, of the town extends down towards the seashore, but the seaport for Karachi consists of two small hamlets, called respectively, Manora and Keamari.

The harbour is nothing more than a narrow arm of the sea, which in the course of time (aided by the effects of a small stream which runs in at the head) has been cut out of the soft sandy ooze by tidal effect, and which of late years has been enlarged and the efforts of nature materially assisted by constant dredging and by judicious banking in of the sea tidal water, so as to confine it to the deeper parts.

Manora is but a small collection of houses on the left as you enter, and consists only of the forts, lines for the garrison and officers' houses, a few small houses for the pilots, and, lastly, the Indian Government Telegraph workshops and quarters for the employés, with church and school. These all stand upon a narrow spit of sandy deposit which runs out to sea, and which gradually rises seaward, until where the lighthouse stands, it assumes a fairly respectable appearance, about 150 ft. high, and this eminence, which is of soft sandstone, which has here cropped up is curiously like a miniature Gibraltar, and is crowned by the lighthouse. Going on past Manora, and still on your left, you come to a series of tidal creeks where the sand and mud are present in about equal quantities, and where there is a rough growth of mangrove, and where the ground, from being so low and so often under water, is little else than a permanent swamp; but there is a beautiful sandy ridge on its sea face which slopes down to the shore in a perfectly lovely beach.

This swamp and the creeks which run through it are the resort of quantities of curlew, large and small, of the flamingo, and numbers of plover, godwits and waterfowl generally are to be found here, more especially in the

cold weather. On the other side of the sand ridge, as I have said, there is a beautiful beach, one that would make the fortune of any sea-side town in England; and here, on a silvery moonlight night, it used to be a favourite custom, when I was much younger, for a few of us to ask the girls to come out for a ramble after dinner, and going along the beach we used to look for and try and turn turtle. In those good old days, and I am referring now to some twenty years ago, the turtle were fairly numerous and many and many a merry evening have I spent after them; but the fortifications have since then been extended, the turtle have been somewhat disturbed, or are, perhaps, better educated, and I am told that there are nothing like the number seen now that there used to be. Harking back now to the entrance of the harbour, to the right or south side, as the vessel enters, one sees three or four ragged islets standing half-a-mile or so away from the channel, and these were our happiest hunting grounds. But of this more later on. Then, as you go up the harbour you come to the groin, which has only been built in comparatively late years to influence the set of the tides, and to help the scour from silting up the harbour. The end of this groin also marks another first class fishing spot, to which I will also refer later on; while the groin itself runs right up to Keamari, where the wharves have been built, and where all the large cargo steamers go alongside to discharge. The harbour is nowhere more than three-quarters of a mile broad, and it is about three to three and-a-half miles in length, but in the season (and the season somehow or other seems to stretch into nearly all the year round) there is most excellent sport to be had with one or other of the numerous species of fish which inhabit this harbour.

I have mentioned that Karachi at first appears to have a depressing effect, and that the cause of this is, in a measure, due to the fact that there is not much vegetation, and, consequently, very few forms of bird life were ordinarily to be seen; in fact if one excepted the common crow and a few fish hawks and terns there were hardly any. Yet one had only to go a short distance inland and in the cold weather first rate shooting was to be had among black partridge, floricane, bustard, hare, snipe and teal and duck innumerable, and then it was that one realized what a wonderful land this really is.

Bleak and barren with a stunted vegetation and a very limited rainfall, you could never expect leafy Devonshire-like lanes with high moss-covered banks for your pedestrian rambles, nor did you ever come across wayside inns with honey-suckled arbours, kept by a jolly-looking host and his buxom dame in which to refresh the inner man; but wild stretches of sandy moorland, covered with prickly thorn bushes, are from a sporting point of view a *not* altogether disagreeable substitute.

These are some of the charms and advantages of Karachi; and when all this shooting is there for you, absolutely free, one can readily understand how, to a poor man fond of this sort of thing, Karachi would naturally be a

pleasant place. Out here many men, in fact nearly everyone, shoots, and not many men fish; and so it was in those days. If you had asked ninety-nine men out of a hundred what fishing there was to be had about Karachi, they would probably have replied in that cocksure manner peculiar to Englishmen—"Fishing? Why none!" And yet if they had only taken the trouble to think a little about it, that same common sense which distinguishes our countrymen would probably soon have convinced them that they had made a mistake.

It is altogether against nature to suppose that this land, which teems with life throughout, from the very highest forms down to the lower grades of reptiles, should contain waters barren of fish life, nor, in fact, is it so. The Indian waters everywhere are just as prolific as the lands, and wherever the lower forms of fish life abound there will be found also the higher forms, in the shape of the more voracious and piscivorous species, which live and thrive upon their weaker brethren, and which, to the angler and the sportsman, are the objects of continual solicitude. Karachi is no exception to this general rule. Its placid and sheltered waters are the home of many of the smaller species of fish and crustaceans, and, as a natural consequence, are, in due season, the haunt and resort of many of the more predacious varieties. The one oftenest met with, and the one with which I intend to associate this place, is a fish well known out here under numerous names. Locally it is known as "dangara;" in Bengal it is called "begti," better known to Europeans perhaps as "nair" or "cock up;" and recognised by science as *Lates calcarifer*.

It hath been said by them of old time that the "bahmin" and the "dangara" are inseparable, and that where you find the one, you will most assuredly find the other. Since they are both estuary fish, I am not prepared to deny that there may be places where both are found together, but my own experience does not lead me to think that it is necessarily, or even often so. In Bombay, where the bahmin at certain times love to congregate, it is rarely that one catches a "dangara" when bahmin fishing; and *per contra*, in Karachi and in Cochin, which are the two best places I know of for "dangara," bahmin are certainly not common. I do not know that I have ever caught a bahmin in Karachi, though I have caught most fish there, and the reason for this, in my opinion, is that the tidal stream in Karachi Harbour is never strong enough to suit the dashing "Indian salmon," nor is the bottom of a sufficiently rugged and rocky nature to induce this fish to haunt the spot. But to return to the "dangara." He is a large and powerful fish of the family *Percidae*. Deep in the body, and with large scales of a handsome dark golden bronze colour, he is the personification of strength combined with pertinacity; he loves the entrance to back-waters and creeks, and is generally found feeding on a rising tide. On nearly all the muddy banks of the creeks about here, also in the upper waters of Bombay Harbour, and

again down on the creeks and back-waters about Cochin, and, in fact, wherever a tidal creek has long sloping muddy banks, there is to be found oftentimes in incredible numbers, a curious looking little creature, or rather a newt-like little fish (*Periophthalmus kalreuteri*), which is amphibious, and which lives more than half its time out of the water basking on the slimy muddy banks. When disturbed it wriggles along, flopping its eel-like tail, and with the aid of its pectoral fins hops back down into the water. You will see them sometimes in thousands lying on the mud just at the water line with a rising tide, or swimming about with only just their curious prominent eyes above water, and as the water rises, so do they creep further and further up the bank and at times they are found quite inland among the grass and roots of trees. These appear to be the favourite food of the "dangara," and though a shy fish they will venture into the very shallowest water in search of them.

Continuing my remarks on that curious little creature or rather a newt-like little fish (*Periophthalmus kalreuteri*) they appear to be the favourite food of the dangara and are the very best and deadliest bait that can be used, but your success with dangara will depend entirely upon your hitting off the time of tide and choosing the localities known to be affected by both the dangara itself and by the small mud fish that it is so fond of. Right opposite the pier at Keamari on the swamp before mentioned, and near the old Quarantine Hospital for small-pox, several of these creeks debouch, and right in the eddies and backwaters caused by the rising tide at the very entrance to these creeks is, I think, the best place I know. The dangara is a curious fish. He takes the bait in a very quiet manner. No rush, no fuss, but at the same time no nonsense; he just gulps it in and lies quiet, and many a time you will think that you are fast in the bottom instead of fast in a fish. Then, as likely as not, he will begin to move quietly away, and the bigger the fish the quieter will be the whole proceeding; but if you think that you are going to have matters all your own way, you will very soon and very suddenly be undeceived. As he moves away you tighten up your line for a minute or so to see if the hook be home, and as likely as not you will rouse his anger by this proceeding, and then he is off, not a lightning-like rush like the bahmin's, but an absolutely irresistible movement through the water which you had better not try to stop or else a smash-up is inevitable. They also make much longer runs at a time, when once started, than do most large fish, and I have had very moderate-sized fish go out with 200 yards without a stoppage, and then had to follow them, but they seldom make more than one long run, and if you can keep on terms with them until that is finished the chances then are distinctly in your favour. I one evening caught eight fish, the largest about 18½ lbs., and every fish ran well at first and took not less than 100 yards of line, but I got every fish that night, though it was dark and I seldom saw anything of the fish until it was near enough to net.

Dangara run very large at times. I personally have never caught one over 27 lbs., but I have seen them repeatedly much larger. One that was brought for sale by some natives on to the ship I was then serving in weighed  $84\frac{1}{2}$  lbs., and another that by some mistake found its way into one of the dry docks in the Government Dockyard, Bombay, only last year, when a vessel of the Indian Marine was being undocked, and which was eventually caught and killed when next the dock was pumped out, weighed 61 lbs.

Both these were extremely handsome fish. Dangara, I have come to the conclusion, feed best by night, and a clear moonlight night, with a quickly rising tide rushing into the narrow creeks and stirring up the mud, is the best. On such a night, if you are in a boat, and keep quiet, you will hear them all around you, breaking the surface of the water with a sullen sounding plunge, and simply wallowing along in the mud, chasing the small mud fish, and throwing themselves up on to the mud in a frantic endeavour to seize some particularly active member. They feed, of course, in the day too, but the water must be thick. They have a very large, round, and powerful eye, and must be able to see better in the thicker water than most fish, and being able to see so well themselves, they use the thick and dirty water as a screen by means of which they can approach their prey without being seen. Though they live in thick and dirty water, and as a rule prey upon mud fish, they have no muddy flavour about themselves, and are, when well cooked and quite fresh, a most delicious fish for the table. Their flesh lies in thick, flaky strips, and is very rich. Taken all round, they are one of the best fish we have out here, both for the table and for sport, but they must be eaten quite fresh; their flesh soon decomposes, and then, besides being soft and unpalatable, is positively unwholesome. When fishing for them I have at different times tried many baits—prawn, hermit crab, and small mullet—but where I could get the small mud fish, I found nothing else would come up to it. One need never be at a loss for them; they are nearly ubiquitous, very easily caught and easily baited, and if properly put on to the hook they live a long time. They remind one somewhat of an English gudgeon and their antics on the bank, as they go about on the mud with a curious hop, skip and a jump sort of wriggling motion, is very comical. Further back I have mentioned two places in the harbour as being good spots. The one was at the end of the groin and the other was near some rocky islets near the southern end of the harbour. At the first mentioned place (and the stranger will easily recognise it by looking for the last of the stone pillars which run out from the end of the groin, and which has partially collapsed) there is some excellent sport to be had with a grey sea perch (*Chrysophrys berda*). These fish run from  $\frac{3}{4}$  lb. to  $3\frac{1}{2}$  lbs. in weight, and it is extraordinary at times how many can be caught in a very short time. They are a very decent-looking silvery-scaled fish, with a purplish hue in their scales, very fair for the table, except that they have a tremendous lot of bones.

The principal fun in catching these fish consists in the fact that they are provided with an excellent set of teeth, that they generally manage to bite through any ordinary tackle, and even when you get them into the boat it is quite an open question, by the time you have the hook clear of the fish, which of the two of you has come off best, what with his spiky dorsal and ventral fins and his particularly sharp teeth, which he will certainly embed in your fingers on the slightest provocation. I have at different times caught hundreds and have hardly been able to use my fingers, some times for days afterwards, and have enjoyed myself immensely at seeing my chums green at this game being taken in in the same way.

You want for this sport a medium light rod, fine line, and best of all a very fine single wire trace with a long fine shanked hook. Bait the best I know is a piece of the body of a shrimp. The fish are naturally shy, and as they are in clear water see everything, so that the wire must be fine if you wish to succeed. On the other hand, their jaws are so powerful and their teeth are so sharp that it must be something tough and strong. Guts would be of no use, and I have many a time lost my fish before I could get him into a net simply by his biting through the wire. Natives get very excited over this fishing, and think no end of themselves if they have managed to get a good haul. One peculiarity of this fishing is that you can see nearly every fish as he comes up to your bait and so far you are never taken by surprise.

While on the subject of this fish, I would note that there is another place where they can be got, and where the average size of the fish is generally larger. About three-quarters of a mile straight out to sea from the light-house there is a bank with about 6 fathoms of water, and here, sometimes, the fish are to be had in great numbers. The local fishermen all know the places and a stranger cannot help noticing the different fishing boats at anchor, and their occupants busily engaged. He has only to join this merry throng and take his chances along with the rest. Sometimes it happens that the perch is not at home, and then one is very likely to catch nothing but young sharks or dog fish. The native fisherman almost invariably uses shrimp and whitebait. They take a handful of the latter, squash it all up, and put this paste round a piece of coral or rough stone, fix it with a slippery hitch just above their baited hook, and lower the whole carefully into the water. When the line has reached the bottom, they give it a jerk, the hitch that they have made comes adrift, the stone falls away with the ground-bait, and they are all clear with their baited hooks for whatever may come. It is a very effective way of ground-baiting, and they seem never to do much without it. I have had many good days in both places, but if one goes to the outer ground you should go in a larger boat as being safer. I, personally, often went in a fisherman's

boat with him, but one disadvantage lies in this, the boats are ancient and for years have been used for fishing purposes, and every crevice and corner is stuffed with the accumulations of years of fisherman's garbage, and the odour that exudes is awful. This, added to a bit of a jump or swell, is very often the last straw, and I have suffered from mal de mer in these boats, when otherwise I should never have had even a suspicion of a head.

Down by the rocky islets afore-mentioned there is in the hot weather some of the prettiest fly fishing to be had that I have ever come across out here. On the southernmost of the islets is a broad, flat, rocky ledge, and we used in the old days to go down there, take a small tent, or sometimes only a piece of canvas to rig up for a shelter, have our servants with us to get breakfast ready, and then and there begin to fish. The most favourite flies were a March Brown and a very large Red Spinner. Our takes consisted of mullet, some garfish, a curious looking fish, which I have long since recognised as *Megalops cyprinoides*, and which has a good deal of the look of a herring about it; and occasionally a deeper thinner looking fish, something like a perch, which I have never been able to identify; and on one or two occasions we have had, as a great piece of luck, a small "hilsa" (*Clupea ilisha*). The majority of the fish we caught were either mullet or the *Megalops*, and many a dozen have I had of these. Sometimes a shoal of them would be swimming past slowly, and as long as they remained within reach they would take. No amount of hooking fish would disturb the others, they simply held on the even tenour of their way, and as long as they were within reach it was all right. This fishing was best in the latter part of the hot weather, and, as far as I know can only be had in the hot weather. A friend of mine, now a Major R. E., was out one day, and laying down his rod for a few minutes, with the flies in the water, was surprised when he came to recover his line to find that he had something quite out of the way on; after a short time of careful playing, during which, whatever he had on would only move in a sluggish manner, he managed to reel up and eventually land a very beautifully marked and exceptionally large crayfish, while his line had been left in the water the flies had sunk to the bottom, and the crayfish prowling around had probably been struck with the novelty of a red spinner in such a situation, and had promptly annexed it. The fish had fairly taken the fly and gorged it, and could not possibly have got away except by a break. Talking of hilsa, it is hardly fair to pass over this fish altogether, although from an angler's point of view, it is almost worthless, being very seldom taken on a hook at all, but the hilsa is such a well known fish out here, that a few words concerning it may not be out of place. It is a sea-fish, which, annually, like the British *Salmonida*, ascends the rivers for spawning purposes. In appearance it is like the chad, never attaining any great size,

an adult averages, I believe, under  $1\frac{1}{2}$  lbs. They assemble in the early part of the rains at the mouths of the larger rivers, and when the floods come down they run up extraordinary distances inland for spawning purposes. It is as an article of food that it is so highly prized. Far and away the most delicious fish we have, its flesh resembles that of a herring with a flavour of salmon thrown in and is very rich and satisfying. Its only drawback is that you cannot put the smallest morsel into your mouth without being almost choked with bones. It is marvellous where the bones come from, and though very small and as flexible as hairs, it is impossible to swallow them. It is said, but I do not believe it, that it is possible to carve a hilsa in such a way that the flesh can be got without bones, though I have never seen it done; but in spite of this it is a treat to get one fresh. At the mouths of the larger rivers the netting of hilsa is a regular industry, and they are picked and salted and put up with tamarind, and preserved in many ways, and there is an enormous sale for them. Modern civilisations, however, in the shape of engineering works, such as dams, dykes, etc., built across rivers for the sake of utilising the water for irrigation, has interfered largely with this fish. They can no longer get the same run up the rivers for spawning, and as they cannot spawn in the sea water, the consequence is that they are decreasing in numbers rapidly, and, if this goes on, in some rivers it is only a question of a few years and they will be extinct. I believe that attention has been drawn to this lately and that steps are being taken to assist the fish in their migration up-stream.

The case of the hilsa out here and the case of the salmon in the British Isles is very similar.

It is time for me to wind up. I am afraid, as it is, that I have taken up too much of your valuable space, but the fact is that it is nearly impossible to deal curtly with the capabilities of a fishing station like Karachi, and to confine oneself to a single species of fish. Old memories come back of good days and heavy baskets amongst different sorts of fish, and as the object of these papers is to put before your readers what they might look forward to and expect if ever their lines were cast out here, I must perforce be forgiven if I have entered rather fully into details.

## THE GREAT INDIAN SPIDERS.

*The Genus Pœcilotheria : its Habits, History, and Species.*

By R. I. FOCOCK, of the British Museum of Natural History.

WITH A PLATE.

Part 1.—*Observations on the Habits and History of the Genus.*

THE Genus *Pœcilotheria* is a representative of that great and almost cosmopolitan group of spiders which was formerly included under the comprehensive title *Mygale*—a term which is still to be found in many recent text-books of zoology and also in popular works on natural history, where special reference to them is made on account of their size and alleged propensity for killing and eating small birds. The truth on this point appears to be as follows :—

Madame Merian, who was one of the first to make known the existence of these large spiders, although stating that the species she observed in Surinam feeds mostly on ants, asserted that they also take young humming-birds from their nests when the supply of insects runs short ; and this description is accompanied by a coloured figure of a spider devouring one of these birds. The accuracy of this observation was subsequently confirmed by Mr. Bates, and who also gave illustration of the destruction of a small bird by one of these great spiders. A similar story accompanied by another figure is told in 'The Illustrated Natural History' by the late Rev. J. G. Wood. Thus from the small substratum of fact established by Madame Merian arose the wide-spread and sensational belief that the staple article of food of these spiders consists of small birds. As a matter of fact, there is no doubt that they feed almost entirely upon insects ; but they will certainly also kill and devour any living animal they are powerful enough to overcome. In support of this statement and of those made by Madame Merian and Mr. Bates it may be added that during his stay in Borneo Mr. A. Everett captured a specimen of the species I have described as *Phormingochilus tigrinus* in a bird's nest, where it had killed the young bird ; and that the specimen of *Pœcilotheria* described below as *P. regalis* and figured in the accompanying plate was when captured, devouring a small rat which presumably it had killed.

Apart from diet, these large spiders differ somewhat in mode of life. Most of them live on the ground beneath stones or in deep burrows which are excavated in the soil and lined with a layer of silk, to prevent the in'all of loose particles of earth or sand. Others, again, are found in trees, where they spin a light silken domicile either between forked branches, or in the hollow trunk, or in leaves rolled up for the purpose. The species of *Pœcilotheria* are now known to be tree-living forms. Colonel Yerbury, for instance, tells me that in Ceylon he discovered *P. fasciata* on trunks of trees, where they spin a light web in the angle formed by a projecting branch ; and a specimen of a species closely allied to *P. regalis* that was sent from the Thanà district in the Bombay Presidency by Mr. A. G. Edie fell off a tree when i

was struck with an axe ; lastly, the specimens of the three S. Indian species recorded below were captured in the stakes of timber cut in the forests for fuel.

In addition to their great size, a feature in which they are scarcely surpassed by any spider in any country, the species of *Pacillotheria* are remarkable for their varied colouring. The upperside of the body and limbs is ornamented with blotches and stripes of brown and grey ; and since it is now known that the spiders live on trees, there can be no doubt that this type of coloration subserves the purpose of concealment, since it must harmonize very closely with the pattern of a tree-trunk overgrown with patches of grey lichen and moss. But the colouring of the lower side is startlingly different from that of the upper, and is quite unlike anything that is to be met with in the spiders allied to *Pacillotheria*, though coloration of a similar kind is known to occur in many species of the families *Lycosidæ*, *Heteropodidæ*, &c. This coloration in most species is of a deep chocolate-brown or black tint on the lower side of the thorax, abdomen, and coxæ, while the legs are nearly white or lemon-yellow, beautifully slashed with black bands and tipped with hairy pads of iridescent hue. It is at first sight puzzling to account for the existence of such colours on the lower surface of a spider, where under ordinary circumstances they cannot possibly be seen. But it is known that when molested these animals rear themselves on their hind legs and brandish the fore pairs and palpi in the air, adopting, in fact, a position in which the colours are plainly displayed to view. Some of the other spiders mentioned above belonging, *e. g.*, to the *Heteropodidæ*, which, although small as compared with *Pacillotheria*, are yet of considerable dimensions, are known actually to turn on their backs when molested. Taking these facts into consideration, and remembering that black and white or black and yellow stripes constitute the badge with which Nature, for purposes of protection, has endowed poisonous inedible animals, so that they may be at once recognized by their foes and let alone—remembering, too, that these spiders possess poison-glands of large size and are armed with irritating bristles, I have no hesitation in ascribing the unusual coloration of the under surface to the category of warning characters. They also possess a method of self-advertisement, which no doubt subserves the same end, in the form of a stridulating-organ lodged between the mandible and the palp, and consisting of vibratile club-shaped rods and of bristles which set them a-sounding.

During 1898 the British Museum received from Mr. H. R. P. Carter\* representatives of three new species of *Pacillotheria* ; and since the British Museum has examples of all the known species of this genus, I hasten

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\* I gladly take this opportunity of expressing my great obligation to Mr. Carter, who, upon learning that the National Collection was in want of these spiders, kindly wrote to his friends in S. India, and used his influence to such good purpose that I am now able to add three fresh species of this genus to the faunistic lists of India.

to describe these three new forms, together with one from Ceylon, and to give a brief recapitulation of the history of the genus and of the habits of the species, so that those willing to avail themselves of the opportunity of collecting material of this group may know where to search for specimens, and may learn what has been ascertained up to the present time of the species. It is hoped, too, that they may be able to determine the specimens they procure, and, particularly, may be brought to realize that in all probability many more specific representatives of this genus exist than have hitherto been discovered, so that the trouble of collecting even in localities where these spiders have already been found will be well repaid by results.

Apart from the chance that it offers of bringing new species to light, the acquisition of fresh material will teach us a great deal about such matters as the variations to which these spiders are subject as they pass from the young to the adult condition, and of the differences that obtain between the two sexes both before and after maturity.

For example, out of the four species that are here recorded from S. India, we only know the two sexes in one instance, that is to say, in the case of *P. regalis*. Of the others, *P. vittata* is represented in the British Museum collection by a single male, *P. metallica* by a single female, and *P. formosa* by several females but no male. Again, the alleged Penang species *P. striata* is also only known from the female sex. This is true as well of the Ceylon species *P. ornata*, although fortunately in the case of the remaining two species from this island, namely, *P. fasciata* and *P. subfusca*, we possess examples of both sexes. And since, owing to the great sexual differences that spiders present, our knowledge of a species is very incomplete until both male and female have been captured, it is clear that much still remains to be accomplished in the case of more than half the species that have been established.

Judging of the species of *Pacilotheria* of which the males and females are known, it may be asserted with regard to specimens of the former sex that they resemble the females in the coloration of the lower surface of the body and limbs, but that the upper surface is much more uniformly tinted, the pale bands and patches being far less clearly defined. They also resemble the females in the development of the femoral fringes on the legs; but they differ strikingly from them in the much smaller size of the body and the relatively much greater length of the limbs, and also, as in the case of all spiders, by the presence of the so-called palpal organ on the tarsal segment of the palpus or short limbs of the first pair. This is the intromittent organ of the male, and in *Pacilotheria* takes the form of a horny pear-shaped structure with three sharp crests running spirally round its narrow apical portion.

The earliest known species of the genus *Pacilotheria* was described by Latreille as *Mygale fasciata*, and was based upon the figure of a large spider

named *Aranea maxima ceilonica*, published in Seba's 'Thesaurus,' vol. i., pl. lxxvii. The true *fasciata*, therefore, is a Ceylonese species.

C. Koch, who was practically the first to dismember the old genus *Mygale* of Latreille and Walckenaer, in 1850 gave to this Ceylon spider the generic name *Scurria*. Unfortunately this name had three years earlier been applied to a mollusk, and since it is against the rules of zoological nomenclature for the same name to be used for two distinct animals, Simon in 1885 proposed *Pæcilotheria* to replace *Scurria* of C. Koch.

Up to 1885 the genus *Pæcilotheria*, with its supposed single species *fasciata*, was considered to be peculiar to the island of Ceylon. In that year, however, Simon recorded the occurrence of the species from Ramnad, in the Madura district of S. India (Bull. Soc. Zool. France, 1885, p. 58. Touching the accuracy of this determination, it is permissible to have doubts; nevertheless the discovery that the genus is not confined to Ceylon was important. No one, however, seems to have suspected the existence of more than one species of *Pæcilotheria* up to 1895. Early in that year I worked out the material of this genus contained in the British Museum, with the result that two well-marked, sharply defined species of the genus were found to occur in Ceylon, another in S. India, and a third in the island of Penang\*. These species were briefly described in the February number of the 'Annals.' The discovery of two species in Ceylon of course raised the whole question as to which of the two was the genuine *fasciata*. The two species seem to be equally common in the island, and it was quite certain that specimens of both species were preserved in the various collections in Europe and were passing under the name *fasciata*.

Reference, however, to Seba's original figure, imperfect in many respects though it be, shows that the pattern of the upperside of the abdomen in the original *fasciata* consists of a pale longitudinal band surrounded by a narrow dark brown border, whence narrow stripes of the same colour run on to the sides of the abdomen very much as is shown in the case of *P. regalis* in the accompanying plate. This type of coloration is very noticeable in one of the Ceylonese species, but not so in the other. To the former, therefore, I restricted the name *fasciata*, and described the latter as a new species *subfusca*. The most striking differences between the two, however, do not consist so much in the pattern of the abdomen and carapace, as in that of the underside of the legs, the femoral segments of which are beautifully banded black and yellow in *fasciata*, which in *subfusca* they are of a uniform chocolate-brown tint. The other two species that were described in that paper, namely, the one from Penang and the one from S. India, have the femora banded somewhat as in *fasciata*, and two out of three from S. India and the one from Ceylon established in the following pages are similarly coloured, while the fourth more nearly approaches *subfusca* in having the femora unstriped.

\* For correction of this locality see note on p. 132.

## Part 2.—Descriptions of the Species.

(1) *Pæcilotheria fasciata* (Latreille), (Pl. A, fig. 2.)

*Maygale fasciata*, Latreille, Nouv. Diet. d'Hist. Nat., xv. p. 304 (1803); also Hist. Nat. Crust. et Ins., vii. p. 160 (1804), &c.; Walckenaer, Hist. Nat. des Aranéides iv. I, with fig. (1806); Hahn, Monographie der Spinnen, pl. i. (1820); id. Die Arachniden, ii. p. 65, fig. 157 (1834); C. Koch, Die Arachniden, ix. p. 41, fig. 717 (1842).

*Scurria fasciata*, C. Koch, Uebersicht des Arachnidensyst, pt. v. p. 74 (1850).

*Pæcilotheria fasciata*, Simon, Bull. Soc. Zool. Fr., 1885, p. 38; Pocock, Ann. & Mag. Nat. Hist. (6) iv. p. 171. \*

Loc. Ceylon (Trincomali, Kandy).

The Museum has specimens of this species merely ticketed "Ceylon." The only example with exact localities are an adult male and a young female from Kandy (*Col. Yerbury*), and an adult male from Trincomali (*P. Bassett Smith*).

For the sake of comparison I append measurements † of an adult female and male example of this species :—

♀. Total length 46; length of carapace 24, width 20; length of first leg 77, of second 67, of third 55, of fourth 67; patella and tibia of first 28, of fourth 23; protarsus of fourth 17.

♂. (from Kandy). Total length 35; length of carapace 16·5, width 13·8; length of first leg 66, of second 57, of third 47, of fourth 60, of palp 31·5; tibia of fourth 13·8; protarsus of fourth 16·5, of first 15.

\* In the above list no attempt has been made to give a complete quotation of the references to this species. The works that are cited are those that contain the original references to the name, those that contain figures of the species to which the name "*fasciata*" has been applied and those that contain changes in the nomenclature of the genus. Nor must the inclusion of these references under one heading be taken as evidence that I consider as conspecific all the spiders that have been referred to *fasciata* by the various authors cited above. They may all belong to the same species, but the published figures and descriptions are not sufficiently accurate and detailed to carry conviction on the point.

† In this and all cases the length of the leg is taken from the base of the femur to the tip of the tarsal claws, and does not include the trochanter and coxa.

The leg measurements must, however, in certain cases be used with caution, for, as compared with the carapace, these appendages are longer in smaller (younger) than in larger specimens; in other words, with increase of size the carapace increases in length more rapidly than the legs. The total length in the table of measurements includes the carapace and abdomen, but not the jaws (mandibles). The length of the abdomen, however, is of little importance, since in living specimens it varies greatly in size in accordance with the full or fasting condition of the spider, and in Museum specimens in accordance with the method of preservation whether in a dry state or in alcohol. Since the carapace is not subject to these alterations, the relative size of two spiders may be estimated by the length of this plate, which may be taken as the standard in Arachnoid mensuration.

(2) *Pæcilotheria subfusca*, Poc.

*Scurria fasciata*, Ausserer, Verh. z.-b. Ges. Wien, 1871, p. 199, & (not *fasciata*) Latr., C. Koch, &c.).

*Pæcilotheria subfusca*, Pocock, Ann. & Mag. Nat. Hist. (6) xv. p. 171 (1895).

Loc. Ceylon (Peradenia, Pundaloya).

As in the case of *P. fasciata* the British Museum has many specimens of this species from Ceylon, but only four of these have a definite locality. These are an adult male (type) and female from Pundaloya (*E. E. Green*), and a pair of females from Peradenia (*Freeman coll.*).

Ausserer failed to identify this species from want of material wherewith to check the constancy of the differences between it and *P. fasciata*. The latter was known to him only from the female, and his example of this species was a male. The colour variation between the two he regarded to be of a sexual nature.

The following are the measurements in millimetres of the adult female collected by Mr. Freeman at Peradenia, and of the adult male obtained by Mr. Green at Pundaloya:—

♀. Total length 48; length of carapace 25, width 21; length of second leg 67, of third 58, of fourth 69; patella and tibia of second 25, of fourth 25; protarsus of fourth 17.

♂. Total length 31; length of carapace 15, width 13; length of first leg 61, of second 56, of third 48, of fourth 60; tibia of fourth 14; protarsus of fourth 16, of first 13.3.

(3) *Pæcilotheria vittata*, Poc.

*Pæcilotheria vittata*, Poc., Ann. & Mag. Nat. Hist. (6) xv. p. 172 (1895).

Loc. S. India or Ceylon (*Mr. Fanshawe's coll.*)

A single male example only is known.

This specimen presents the following measurements in millimetres:—

Total length 34; length of carapace 17, width 15.2; length of first leg 72, of second 63, of third 57, of fourth 66; protarsus of fourth 18, of first 17.8; tibia of fourth 15.

(4) *Pæcilotheria striata*, Poc.

*Pæcilotheria striata*, Poc., Ann. & Mag. Nat. Hist. (6) xv. p. 172 (1895).

Loc. Penang (*Hardwicke coll.*).

One specimen only of this species is known. The locality assigned to it is, perhaps, erroneous, since no spider resembling a *Pæcilotheria* has been taken in Penang by any collectors of recent years. Nevertheless, until this particular species is discovered elsewhere, which up to the present time has not taken place\*, there are no conclusive reasons for rejecting the authenticity of the label on the type specimen.

The measurements of the type specimen are as follow:—

Total length 45; length of carapace 25, width 21.5; length of first

\* For correction on this statement, see note on p. 132.

leg 85, of second 72, of third 59, of fourth 74; patella and tibia of first 31, of fourth 26; protarsus of fourth 19.

(5) *Pæcilotheria regalis*, sp. n. (Pl. A, figs. 1-1 b.)

*Colour* :—Head-shield or *carapace* covered above at the sides with grey hairs, tinged here and there with yellow, its middle third occupied by a pair of sinuous longitudinal bands which start on each side of the ocular tubercle and pass backwards to the posterior margin, uniting with each other for a short distance midway between the ocular tubercle and the thoracic fovea. *Abdomen* ornamented above with a broad whitish-yellow band, with its sinuous lateral edges bordered with deep blackish-brown, sides of the upper surface pale mouse-brown, and furnished with chocolate-brown obliquely transverse stripes, which pass from the black edging of the median band to the deep chocolate-brown colouring of the lower surface; lower surface of abdomen and the epigastric area in front of the generative fold deep chocolate-brown or black, but behind the epigastric fold there is a broad transverse yellowish-red band passing right across the abdomen from side to side and embracing the posterior breathing-organs. *Mandibles* dirty greyish-brown above, black below towards the tip. *Palpi* greyish-white above, brownish on the upperside of the femur and tarsus, with black lines on the tibia and patella; lower and inner sides of femur deep velvety black; patella white below, with a brown spot on each side; tibia whitish below, tinted with brown in the middle, with a large brown patch on each side.

*Legs* brown, variegated with grey; the extremities of the segments greyish-white, a pair of lines of white spots on the tibiæ; tarsi with two pairs of reddish-brown spots—one pair at base, one at apex; coxæ and trochanters pale above; lower and under sides of femora, patellæ, and tibiæ of first and second legs bright lemon-yellow, of third and fourth pairs bluish-white; the femora and tibiæ ornamented with a broad blackish-brown band in the distal half, but with only a very small brownish spot or stripe at the base of the inner side; these bands are narrower than the pale area at the base of the femora, but thicker than that at the tip; patella also with a brown stripe or spot at the tip, the stripe on patella of third and fourth very narrow; base of protarsus of third and fourth bluish-grey.

*Carapace* shorter than patella and tibia of first leg, almost equal to those of second, exceeding those of fourth; patella and tibia of fourth less than of second.

Femora of *palp* fringed externally and internally; femora of first and second leg also fringed externally and internally at the apex; the trochanters of the first and second legs also fringed in front.

*Measurements in millimetres*.—Total length 53; length of carapace 25, width 21; length of first leg 75, of second 65, of third 55, of fourth 67; patella and tibia of first 28, of fourth 23.5; protarsus of fourth 15.8.

*Loc.* Arkonam in the North Arcot District of the Madras Presidency. Taken in timber brought from the Eastern Ghats (*H. R. P. Carter*).

The type of this species is a fine adult female example which Mr. Carter brought alive from India and deposited in the Zoological Gardens at Regent's Park. Unfortunately the animal did not long survive the journey to London. I am much indebted to Mr. Arthur Thomson, the head keeper, for the pains he took in the preservation of the specimen and for bringing it to the British Museum, at Mr. Carter's request, when it was thoroughly dried.

The species much resembles the Ceylonese *P. fasciata* in the colouring of the body and limbs, but may be at once distinguished as from all the other known species of the genus by the presence of the broad reddish band on the lower side of the abdomen. It further differs from *fasciata* in the breadth of the bands on the lower side of the legs and the presence of the fringes of hairs on the femora of the palpi and front legs. In both of these respects it approaches the Penang species *P. striata*. *P. striata*, however, is a longer-legged form, having the carapace shorter than the patella and tibia of the fourth leg, &c. (Compare measurements of the types.)

The British Museum possesses a dry example of what appears to be a male, specimen of this species from Koorg (*Mr. Macgilligan's coll.*). It presents the following measurements:—

Total length 32; length of carapace 17·5, width 15·5; length of first leg 73, of second 63, of third 52·5, of fourth 65; protarsus of first 16·3, of fourth 17·2; tibia of fourth 14·5.

We also have an immature and badly preserved female specimen from the Nilgiri Hills (*E. W. Oates*), and a very much rubbed adult female from Dahanee in the Thana district, North Konkan (*A. G. Edie*).

(6) *Pacilotheria formosa*, sp. n.

*Colouring* of the upperside of trunk and limbs much like that of *P. regalis*; the brown bands on the thorax much wider and spreading more over towards the margins; the pale band on the upperside of the abdomen less noticeably lobate posteriorly, with the brown band that circumscribes it and the brown stripes that radiate from it less clearly defined; there is also a larger pale area of the extremities of the tibiæ and protarsi of the legs, and the upper sides of the tarsi of the legs are not distinctly spotted; the lower sides of the legs and palpi are strongly striped, but the tibia of the palp is entirely brown beneath, and the legs are much more of a uniform dirty white, the anterior pairs being only tinted with yellow, and the posterior pairs without the bluish tinge; the dark stripes, too, are blacker and narrower; there is, moreover, a largish black patch on the inner side of the anterior femora at the base, and there is no white distal band on the lower side of the femora of the third and fourth legs, or, at all events, at most a very narrow one spreading down from the dorsal side; and the bands on the patella of the third and fourth legs are

broader than in *P. regalis*. Finally the lower side of the abdomen is entirely chocolate-brown, without a pale band.

*Legs* of first and second pairs shorter than in *P. regalis*, the carapace being as long as the patella and tibia of the first leg and longer than those of the second by the grey spot on the protarsus; patella and tibia of fourth a little longer than of second; femora and trochanters of palpi and anterior legs not, or at all events only very slightly, fringed.

Stridulating-organ on maxilla consisting of a short cluster of two rows of longer and shorter clavate bristles, with usually two or three strong black tooth-like ridges removed a little distance from the distal end of the cluster.

*Measurements in millimetres of type specimen*.—Total length 54; length of carapace 26, width 21; length of first leg 69, of second 61, of third 54, of fourth 65; patella and tibia of first 26, of fourth 23; protarsus of fourth 16.

*Loc.* Kadiampatti and Mullapúram, in the Salem District, Sheveroy Hills (*H. R. P. Carter* and *H. C. West*). Taken in stacks of locomotive firewood.

This species differs from *P. regalis* in the characters pointed out in the diagnosis. It resembles *P. fasciata* in the absence of the femoral fringes of hair, these being the only species with banded legs in which these fringes are not developed. It, however, differs entirely from *P. fasciata* in the much whiter colour of the lower side of the legs; the much greater width of the black femoral bands, and the uniform chocolate colour of the lower side of the tibia of the palp. It is also a much shorter-legged species than *P. fasciata*, a species in which the carapace is considerably shorter than the patella and tibia of the first leg.

That this species is not based upon females of the S.-Indian species already described as *P. vittata*, which might perhaps be suspected from the fact that the two somewhat resemble each other in the whitish colour of the underside of the anterior femora, is shown by the absence of the femoral fringes, which are highly developed in *P. vittata*, by the pale colour of the under surface of the tibia of the palp in *P. vittata*, this segment being uniformly chocolate-brown in *P. formosa*, by the presence in *P. formosa* and the absence in *P. vittata* of a dark basal patch on the inner side of the anterior femora, and by the darker colour of the underside of the femora of the third and fourth legs in *P. vittata*.

(7) *Pecilotheria metallica*, sp. n. (Pl. A, fig. 3.)

*Colour* of carapace and abdomen much as in the other species, but the dark bands on the carapace more widely separated mesially and the pale band on the abdomen much less distinct and traversed by a darker stripe; upperside of legs and palpi tolerably uniformly coloured and becoming darker towards the extremities, showing faint metallic lustre; tarsi not spotted above;

protarsi with a thin brown stripe; tibiæ with very indistinct lines of yellow spots; lower side of palpi entirely deep brown, with faint metallic blue lustre; lower side of anterior legs blackish-brown, with strong metallic blue lustre, and a large orange-yellow patch on the under and inner sides of the base of the tibia; third and fourth legs uniformly coloured below, with a similar but smaller tibial spot and much less metallic blue tint; lower side of abdomen uniformly chocolate-brown.

*Carapace* shorter than patella and tibia of first leg, a little longer than those of second and fourth leg; patella and tibia of fourth a little longer than of second.

*Measurements in millimetres.*—Total length 52; length of carapace 23·5, width 20; length of palp 37, of first leg 65, of second 59, of third 52, of fourth 64 (all measured from base of femur); patella and tibia of first 25, of second 22, of fourth 23; protarsus of fourth 15.

*Loc.* Near Gooty, 257 miles from Madras. A single female specimen taken in the engineer's bungalow on the north-west line of the Madras Railway, and sent to Mr. H. R. P. Carter by Mr. H. C. West, chief engineer.

This species may be easily recognized by the uniformity of the colouring of both the upper and under sides of the legs and body, by the metallic lustre of the under surface of the legs, and the single orange-yellow patch on the tibiæ.

(8) *Pæcilotheria ornata*, sp. n.

*Colour* very like that of *P. fasciata*; femora of anterior legs yellow, with a black basal internal patch as in *fasciata*, but with the stripe in the distal half of the segment much broader; femora of third and fourth legs whitish below, as in *fasciata*, but with the distal black stripe very broad on the third leg, and broader than the pale basal portion, and on the fourth leg as broad as the basal pale portion. In *fasciata* the black stripes on these femora are narrow, much narrower than the pale basal portion.

Further differing from *P. fasciata* in possessing, like the Indian species, a thick fringe of hairs along the outer side of the femora of the first and second leg, and in a lesser degree of the third leg. In the examples of *fasciata* known to me these fringes are not present.

*Measurements in millimetres.*—Total length 46; length of carapace 19, of first leg 64, of second 58, of third 49, of fourth 61; patella and tibia of first 24, of fourth 21; protarsus of fourth 15.

*Loc.* Ratnapūra, S. Ceylon (*Rev. J. Burrows*).

The differences between this species and *P. fasciata* have been sufficiently dealt with in the description. In most of the characters in which it differs from *P. fasciata* it approaches *P. striata*, but has the femoral stripes much narrower, and possesses a black patch on the inner side at the base of the anterior femora, which is absent in *P. striata*.

Table for the Determination of the known Species of Pœcilotheria, based upon Females.

- a. Femora\* of legs a uniform dark colour beneath and on the inner side, not striped black and white or black and yellow ; (anterior femora not fringed).
  - a<sup>1</sup>. Legs and palpi conspicuously banded on their upper sides, the lower and inner sides of the palpus and of the first and second legs showing a conspicuous yellow spot on the apex of the femur, the basal half of the patella and at both ends of the tibia, the spot on the base of the tibia occupying barely one-third of the length of the segment ; third and fourth legs similarly banded, but with smaller spots ; legs without strong metallic blue reflections below..... *subfusca*, Poc.
  - b<sup>1</sup>. Legs and palpi scarcely noticeably banded above, the lower side of palpi uniformly dark coloured ; lower side of legs similarly dark coloured, but with a large orange-yellow spot at the base of the tibia and extending over nearly half its length ; legs (especially the anterior two pairs) with strong metallic blue reflection below..... *metallica*, sp. n.
- b. Femora of legs whitish or yellow beneath and on the inner side, the first and second pairs, and usually the third and fourth also, with a conspicuous black stripe on the distal half beneath ; (femora fringed or not).
  - a<sup>2</sup>. Lower side of abdomen with a broad reddish transverse band behind the genital fold ; (femora of palpi and anterior legs fringed ; anterior legs lemon-yellow beneath, with broad black stripes ; posterior legs bluish-white, with broad stripes ; no internal basal spot on anterior femora)..... *regalis*, sp. n.
  - b<sup>2</sup>. Lower side of abdomen a uniform chocolate-brown or black, without a broad reddish band behind the genital fold.
    - a<sup>3</sup>. Tibia of palpus a uniform deep chocolate-brown beneath ; (lower side of legs whitish ; the anterior femora with inner basal patch and broad distal stripe ; femur of third leg at most weakly banded, of fourth not banded below ; their segments on the anterior legs without fringes) ..... *formosa*, sp. n.
    - b<sup>3</sup>. Tibia of palpus pale beneath, with at most traces of black patches extending inwards from the sides of the segments.
      - a<sup>4</sup>. Femora of legs without well-developed fringes ; black stripes on the lower side of anterior femora narrow, also very narrow on femur of third leg, and absent on

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\* The legs of spiders consist of seven segments, named as follows from base to apex :— coxa, trochanter, femur, patella, tibia, protarsus, tarsus. In the palpus (the small front leg) the protarsus is absent.

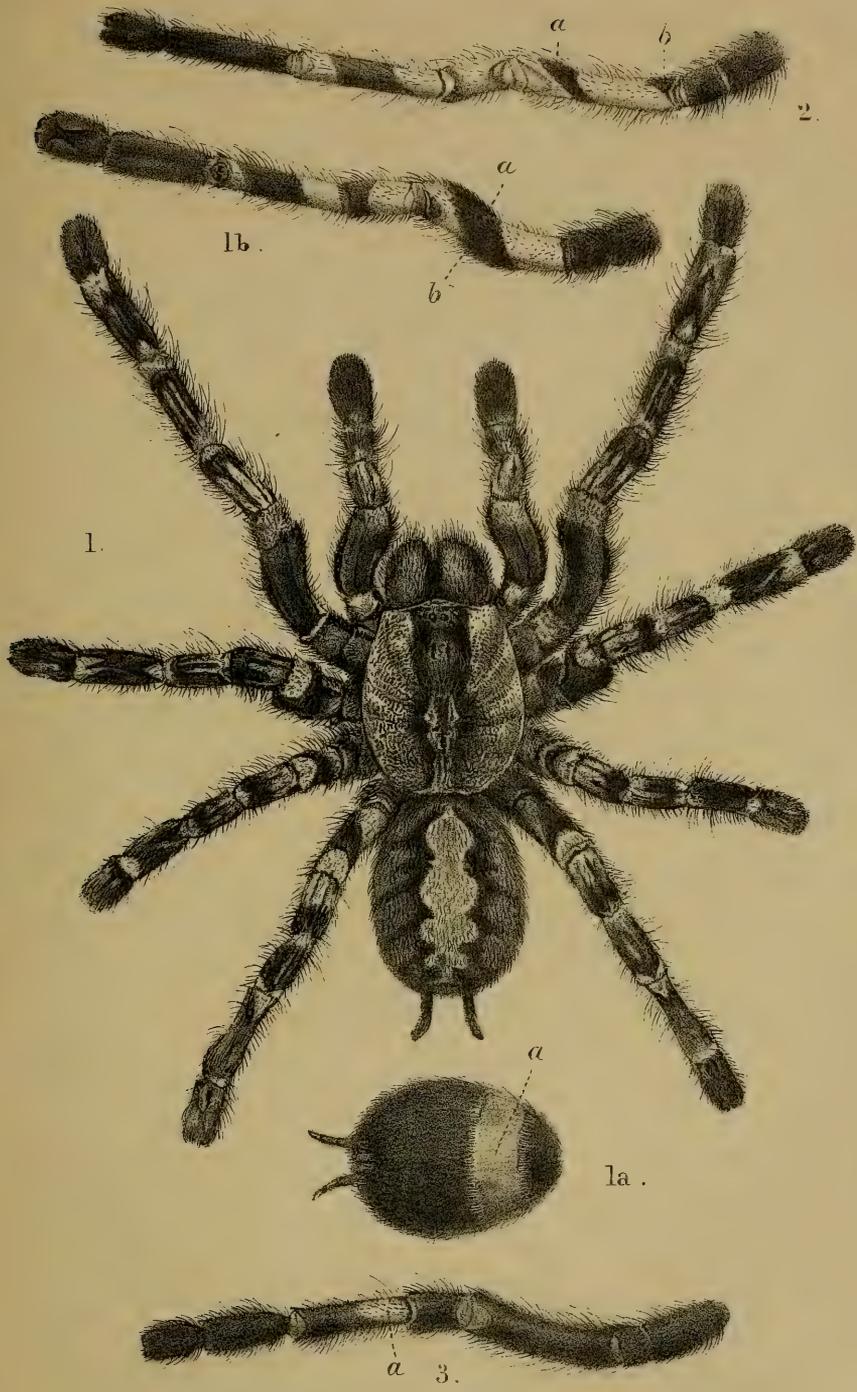
- lower side of femur of fourth (with a basal spot on inner side of anterior femora; anterior legs lemon-yellow, posterior bluish-white) ..... *fasciata*, Latr.
- b*<sup>4</sup>. Femora of legs with well-developed fringes; black stripes on lower side of femora of all the legs very broad as compared with *fasciata*.
- a*<sup>5</sup>. With a distinct black basal spot on inner side of femora of first and second pairs; black band on inner side of anterior femur only about half the width of the lemon-yellow basal portion..... *ornata*, sp. n.
- b*<sup>5</sup>. Without a distinct internal basal patch on the anterior femora; black band on lower side of anterior femur almost as wide as brownish-yellow basal portion of segment ..... *striata*, Poc.

The males may be determined as follows, neglecting for the present certain differences in the structure of the palpal organ, which are easy to detect and figure, but difficult to describe:—

- a*. Lower side of femora brown, not banded; (femora of palpi and of first and second legs not fringed either externally or at the apex internally) ..... *subfusca*, Poc.
- b*. Lower side of femora of first and second legs yellow or white, with a conspicuous black stripe near the distal extremity.
- a*<sup>1</sup>. Femora of palpi and of first and second legs with at most a small external fringe; black stripe on femora of legs narrow; a black patch at the base of these segments on the inner side; (anterior femora lemon-yellow; posterior femora chalky or bluish-white) ..... *fasciata*, Latr.
- b*<sup>1</sup>. Femora of palpi and anterior legs with well-developed external fringe; bands on femora broader; no basal internal black patch on these segments.
- a*<sup>2</sup>. Abdomen uniformly brown below, as in *fasciata*; femora of anterior two pairs of legs nearly white, of third and fourth pairs uniformly greyish-brown, not distinctly banded ..... *vittata*, Poc.
- b*<sup>2</sup>. Abdomen with broad transverse pale band behind genital fold; anterior legs lemon-yellow beneath; posterior legs bluish-white, and very distinctly banded with black..... *regalis*, sp. n.

*Note on the Locality of Pœcilotheria striata.*

During the passage of this paper through the press, I have received from the Bombay Natural History Society a specimen of *Pœcilotheria* ticketed S. India, and apparently specifically identical with the type and hitherto only known representative of *P. striata*. Thus the suspicions that I have always held that the alleged locality for this species, namely Penang, would prove to be more than doubtful, and that the species itself would turn up either in India or Ceylon, are amply confirmed. In view of this discovery, I think we





may confidently regard *Pæcilotheria* as peculiar to S. India and Ceylon, where it is now known to be represented by eight species.

In the same consignment of spiders from Bombay is a specimen of *P. regalis* from Matheran, which shows that this species has a wide range in S. India.

## EXPLANATION OF PLATE A.

*Fig. 1. Pæcilotheria regalis*, sp. n., nat. size, drawn from photograph of a female example, from Arkonam.

*Fig. 1 a.* Ditto. Lower side of abdomen of same specimen, showing pale yellowish-red band (*a*) behind genital fold.

*Fig. 1 b.* Ditto. Front leg from inner aspect, showing black band (*a*) and fringe (*b*) on femur.

*Fig. 2. Pæcilotheria fasciata*, Latr. Inner view of front leg for comparison with 1 *b*, showing thin stripe (*a*) and basal black patch (*b*) on femur; also the absence of femoral fringe.

*Fig. 3. Pæcilotheria metallica*, sp. n. Inner view of front leg, showing uniform dark colour with exception of orange-yellow tibial spot.

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## YAK SHOOTING IN THIBET.

BY EDGAR PHELPS.

*(Read before the Bombay Natural History Society on 16th January, 1900.)*

What is a Yak?—is a very reasonable question to be asked. The answer is—the wild Ox of Thibet, *Bos grunniens*. To find Yak in any numbers the sportsman must journey as far East as the great Salt Lake plateau of Thibet, and it is to some of the incidents, and accidents, of an expedition there and back that I now propose to shortly introduce our readers.

Those who cross the Thibetan frontier solely for purposes of sport have, or should have, one main object in view, namely, to get into and out of the country as quietly and peaceably as possible, and to avoid contact with the natives altogether; for the very good reason that the Thibetans, acting under the influence of the Buddhist hierarchy, which governs the country with the scourge of superstition from the City of Lhasa, resent *vi et armis* any attempt of the foreigner to enter and explore their inhospitable, barren and wind-swept steppes.

To effect its purpose, therefore, an expedition must be practically self-supporting, and to render it so a great deal of calculation, combined with experience, is necessary as to the nature and amount of grain and other food supplies for man and beast which have to be carried.

The nominal starting point of our expedition, as of almost every recent expedition, whether to the Pamirs, Turkestan, or Northern Kashmir, was Srinagar, the capital of Kashmir; but our real base of operation was Leh, the capital of Ladak, about 14 marches south-east of Srinagar.

My companion, Gerry Milne, had come all the way from Australia to join me, and I feel that I was particularly fortunate in having such a genial companion on an expedition, during which one's temper was often put to the severest of tests.

We spent a fortnight in Srinagar, buying ponies, and fitting out generally. The experience of two journeys into Chinese Turkestan, and on to the Pamirs, have taught me that the Kashmir hill pony is by far the best animal to trust to for transport purposes in high altitudes, where grass is generally scarce, and dry grain the staple diet. These little beggars stand about 12 hands, and will carry a load of 200 lbs. There is considerable amusement, not to say annoyance, to be got out of the purchases. The owner will generally begin by asking 100 rupees, whereupon one promptly offers 75 rupees, and perhaps, after two or three days' patient bargaining, the purchase will be completed at an average of about 40 rupees. As to saddles, I find that the Yarkandi pack saddles are by far the best to use. They are made of reeds covered with felt, and can be procured to order in Leh for about 7 rupees each.

Another most important point to look to is shoeing, and in choosing caravan drivers I am always careful to get men who thoroughly understand the job.

On the present occasion I had not much difficulty in this, for having had so many in my previous caravans in Central Asia, I easily picked some of them up again, and was most fortunate in getting an Argoon, Russool Gullwan who was with me twice before, to again come as headman. His accomplishments, over and above the general superintendence of the outfit, included rifle cleaning, skinning, and waiting at table.

One word as to our battery. Gerry shot throughout with a Mannlicher, and found it most satisfactory in every way. My battery consisted of a double-barrelled 12-bore paradox, a double-barrelled '450 express, and a double-barrelled '303 rifle, all built by Holland and Holland. I practically did all my shooting with the '303, using a cartridge loaded with 37 grains of refeitte powder, and a split bullet of 215 grains. The '303 has a great advantage over the '450 express on account of its flat trajectory, an advantage which is greatly emphasised in a country like Thibet where, owing to the extreme clearness of the atmosphere, distances are very hard to judge accurately. I found the cartridge I have described to be quite good enough for Yak, except upon one occasion, which I will mention later, and perhaps even then it was not altogether the fault of the cartridge. There is one other very necessary addendum to one's battery, and that is a really good telescope. It is extremely hard sometimes to distinguish a Cow from a Bull-Yak even at a comparatively short distance, and a good telescope will often save one a long weary stalk ending in disappointment.

Well, to begin with, we left Srinagar for Leh on the evening of June 27th. Of our journey to Leh I need say little, except that, owing to the unusually swollen state of the rivers, we found several of the bridges carried away, and were therefore compelled to make long detours, which delayed us nearly four days. We had one nasty experience on July 6th at the Soroo river, which was crossed by a Jhula or rope bridge, made of twisted birch twigs, the larger bridge designed for pony traffic having been carried away by the recent floods. Three Baltis entirely against our wishes had joined our caravan in Srinagar, and when we reached the Jhula, which, owing to the flood, was in the middle nearly two feet under water, two of them got over safely with their loads, while the third funked it. One of his compatriots, a brother I believe, thereupon recrossed, and taking the load got half-way over on his return journey, when he was washed off his legs, and after hanging by his hands for a moment, disappeared into the raging torrent before we had a chance of helping him. All that his brother did was to loudly curse him for losing his load. Four or five days later the expedition, as far as I was concerned, very nearly came to an end. I had the bad luck to give my ankle a severe sprain, and you can imagine my feelings and expressions when I at first imagined that it was a case of good-bye to Thibet. Gerry, however, started in massaging it, and so effective was his treatment that it gave me little or no pain after leaving Leh.

We arrived there on July 13th, and immediately commenced to organise our caravan. In this we were given every assistance by our good friends, the Wazir of Leh and Captain G——, the British Joint Commissioner, the most kind and hospitable of men, being universally regarded as a sincere friend by the traders and people of Ladak.

Among others I came across seven caravan drivers who had served with me before, so I promptly re-engaged them. These men are half-bred Ladakis, and are called Argoons. If you treat them properly they are the best servants in the world. They put up with any hardship, and are always cheery and ready to turn their hands to anything. Their pay is 10 rupees per month, with an allowance of 2 lbs. of flour or rice per diem, which is reduced to 1 lb. when fresh meat is plentiful. But perhaps the most marvellous personality in Ladak or Kashmir, is a cook. Any of our readers who are householders will know what it means to be told that the kitchen range is out of order, cook in bad humour—and as a result, a bad and half-cooked dinner. How different in a Ladaki camp! The kitchen consists of the lee side of a tent: the range is a hole in the ground. The cook is never out of humour or in a fuss, but patiently cooking, and serving a dinner of four or more courses in a blinding snow or rain storm, with no fuel but wet roots and Yak droppings, which he keeps at a red glow by an ingenious arrangement of flanking shelter cloths, and this within half an hour of pitching camp. And what a dinner a Thibetan antelope saddle can make! Far better than the primest Welsh mutton. A surfeit of Antelope, however, is apt to be disastrous at times: witness the case of one of our drivers, who very nearly died from over-eating himself, and was in fact only saved by a prodigious dose of pills of a well known brand, which were certainly worth the proverbial guinea to that patient.

Our principal amusement in Leh was Polo. We played in the bazaar, which consists of an open space about 260 yards long and 30 yards wide, with a row of shops on each side, which fortunately do not boast of plate glass windows. The game was most exciting, not to say dangerous at times. Of rules there were none, the teams sometimes consisting of as many as ten or even fifteen players on each side, the ponies being of all sorts and sizes. One did not mind the crowd of players so much as some of the modes of attack. One of the most favourite tricks was for a player to ambush himself in a shop, pony and all, and then, when an opportunity of a successful flank attack presented itself, to charge out on an unsuspecting player and fire him across the bazaar. Gerry greatly distinguished himself in the more authorised aspects of the game, and quite upheld his Hurlingham reputation.

Having completed our arrangements and escorted by various friends, Gerry and I shook the dust of Leh off our feet on July 28th, leaving an American friend named Morse, who had decided to join our caravan, to

follow us on the 29th. Our first pass, the Chongla, which is about 18,000 feet, we found easy going and free from snow. For a wonder I did not suffer from mountain sickness, to which I am rather a martyr. I had taken a large dose of chlorate of potash as an experiment, and certainly found it most effective as a preventative. Gerry opened the ball by potting a marmot at about 100 yards with his Mannlicker, which was tidy shooting. The next day we dropped down to 13,000 feet, and found it very hot at a place called Tanksi, where Morse joined us in the evening with his caravan. During the march we had a good view through the glasses of a peculiar beast in the shape of a purely black wolf. We watched him for a long time, but could not get a shot at him. Much to our disgust we had to wait two days at Tanksi before we could collect what grain we required. Gerry and I had a long day's prospecting, but only bagged a small Burrhel. Cultivation we found very scarce, and what little there was of it was carried on by means of irrigation, while the vegetation consisted of a few stunted willows and patches of poplars, the rest of the country being rocks and sand.

Having collected our supply of grain, we started for good and all on August 1st, and it may be as well now to describe our caravan. It was made up of Gerry and myself with 19 engaged caravan drivers, and our cook. We had 42 ponies, of which 12 were hired at 12 annas per march of 15 miles; 50 transport Yaks, hired at 8 annas per march with 15 drivers; 10 goats for milk, 10 sheep, and last but not least, my Pamir dog. Of the 50 Yaks, 20 carried grain for the ponies, the remainder were brought by the contractor to supply the places of lame or sick beasts. Each Yak was loaded with 240 lbs. I may say here that at every camp after crossing the Thibetan frontier we buried grain and other supplies; so that on our return journey we had only personal baggage and trophies to carry. Our object in doing so was two-fold: firstly, to enable us to travel light, and secondly, to secure for ourselves a line of retreat in the event of any opposition from the natives. We found on digging it up that, owing to the dryness of the soil, the grain had not suffered in the slightest degree. Our first march was to Chucker Talow lake, over a good road, and the following day, from the ridge overlooking the village of Proprang, we had a magnificent view of the Pangong lake. We were many miles away from it, but on account of the elevation and the remarkably clear atmosphere we could see it stretching away for about 50 miles, making a glorious picture with the deep sea-green colour of the water, in which the snow-capped mountains were reflected, contrasting with the dull red of the cliffs and the hills surrounding it. We were anxious to procure some fresh meat for the caravan drivers, and on the next day, after crossing the Marmuchla Pass, we saw a herd of Kyang or wild asses, one of which I shot. The idea of eating an ass is not nice. I have had to do so on one occasion, and found

it to be like inferior beef with a sour taste. The drivers, however, seemed to think it most appetising. In spite of the heat during the day we determined to make our marches as long as possible, and after two days, on one of which we crossed the Mosikla, a nasty pass of 16,300 feet, we reached the junction of the Changchimo and Panlong rivers. We found them in high flood, and were forced to make a detour of 14 miles, and even then had great difficulty in finding a ford. We were now at 17,000 feet, and the view we got of the country before us was far from encouraging. We could see a long series of low, undulating sand hills, with no vegetation and scarcely any grass, very similar to the Red Sea littoral, with the one redeeming feature of a certain amount of water, and a background of snow-capped mountains. Morse, in spite of our persuasions, made up his mind to leave us, with the intention of striking north to Yarkand, and then south to the Tagdumbash Pamir. As he had no Chinese passports, I strongly advised him not to attempt the journey: but without success. I subsequently learned that he got through safely by dint of palavering the Chinese officials, and after shooting *Ovis poli* on the Pamir, returned to Kashmir *via* Gilgit. Having bidden good-bye to Morse and his caravan we left the river, and crossing two passes of about 17,500 feet, on the top of one of which we saw a Hoopoo, we travelled down a good road to Lumkang, and at Zaloom, 11 miles further east, we found a fair amount of grass, and plenty of boortza, or fuel composed of wormwood and Yak droppings. Furthermore Gerry shot the first antelope, which had a 22-inch horn. Signs of Yak were plentiful, though not very fresh, but still sufficiently so to raise hopes of soon falling in with the beast itself. The weather was fair enough with a little snow and a cold penetrating wind in the evening.

The following day we marched on to Lungon Koma, which means "the green highest valley," and certainly it is well christened. The elevation is 18,000 feet, and though grass was scarce, there were plenty of antelope about, at which I got three nice successful stalks. The first one I only wounded, but Goodga, my Pamir dog, at once took up the hunt, and after a beautiful course of nearly a mile pulled him down in the open.

Our next march took us over the Thibetan frontier, and for three days we kept moving East through a desert of a country, at an elevation of about 18,000 feet. Antelope continued to be fairly plentiful, and we had no difficulty in keeping ourselves supplied with fresh meat. We thoroughly expected to fall in with Champas, or natives, at Tobo Maru, which is always a favourite camping ground for them, owing to the presence of good grass and plenty of fuel. We were glad, however, to find the place untenanted by anything more formidable than antelope, and rats—I wonder what these latter feed on!—there are two kinds of hairy fellows very similar to, and nearly as big as, a guinea-pig: as far as I could see they thrived and multiplied on sand and stones.

In the evening I saw a Lynx stalking a young Antelope, but although successful in saving the youngster's life, I failed to get a shot at its enemy. The Yak drivers now wanted to leave us, but by threats and bribes we succeeded in keeping them, and after a day's rest and good grass both ponies and Yaks appeared to have taken a new lease of life. The weather became simply awful; gales of wind with hail and sleet, while the glare from the white sand made our eyes terribly sore, an additional trouble to our poor faces which had cracks in them nearly an eighth of an inch deep.

On August 13th we fell in with Yak at last. Russool saw two of them in a nullah, and after a long tiresome stalk we got within 400 yards of them, when the wind changed, and away they went. I fired and hit one of them, and as there were copious blood tracks, a Ladaki was sent to follow him up. He found him a long way off lying down on the top of a ridge, but darkness came on, and we never got him. It had been snowing and hailing all day, and having had to ford two rivers, we were fairly done up by the time we reached camp. During the evening two Champas came spying round the camp, and as we were afraid that they might have gone off to collect a crowd, there was nothing for it but to press on, paying off the hired Yaks, which owing to sore feet and saddle galls had become useless, and only a source of delay. Our route brought us to a fresh-water lake round which Antelope were plentiful, but much as we should have liked to have halted we decided that it was better to push on as far as Mangtza Cho, a salt-water lake lying at 17,300 feet. The shores of this lake are a mass of pure salt, which the Ladakis dig up and pack for transport on sheep. It is a peculiar sight to see large flocks of these little beggars trotting along with their loads of 30 lbs. in pack saddles; their daily march being about 10 miles. The water of the lake is quite bitter, the only fresh-water procurable being in little streams of snow water flowing intermittently into it. A fact that puzzled us greatly was the presence of fish in some of these small streams. Gerry and I caught several stone loach in a small stream flowing into a salt marsh about 17,500 feet above sea-level. I should like to know how they got there. Further than that, on our return journey, in the Probrong, a stream that flows into the Pangong lake, which is far too salt for fish to live in, our drivers caught a quantity of fish of the carp tribe about 1 lb. or so in weight. The natives told me that the stream is full of fish, but what happens to them in the winter, when the stream is often frozen solid, it is hard to say.

We felt disappointed at seeing no more Yak, and for three days kept moving east, our only sport being Antelope for the pot. Some of the stalks were exciting enough, and on one occasion Gerry fairly established his reputation as a Dr. Carver by knocking over a galloping Antelope from the saddle before the whole caravan. Our camps were averaging 17,900 feet, and I may say that for the whole time during which we were living at

over 16,000 feet, we suffered more or less from mountain sickness. Some people seem to be under the impression that mountain sickness is more or less of a myth, but after a long experience of it at elevations varying from 16,000 to 19,000 feet, I sincerely wish that I could indorse that impression. I know of no more miserable or enervating sensation than the awful headache, giddiness and nausea, which are its characteristic symptoms. It commences to affect me at about 16,000 feet, and though it does not absolutely disappear, still one does get in some degree seasoned to it, and after a time can even sleep, with comfort. Of course any violent exercise, such as running, will bring it on at once and then the only cure is to sit down and rest.

Averaging about 14 miles per diem we still kept moving east, the country being of a sandy undulating nature with a sprinkling of salt lakes. These lakes are fed by snow water from a range of hills lying to the north, and must at some time have been much more extensive than at present, because for miles back from the present high-water mark there are a series of water-washed ridges, which undoubtedly were formed by the lapping of waves. The elevation at one time reached 18,400 feet, and there the Antelope became scarce and far harder to stalk. We saw occasional marks of Yak, and as we had now come over 100 miles east of the Thibetan frontier without shooting one, we began to feel anxious about our prospect of sport. On August 19th with our camp on the shore of Horpu Cho, a fine fresh-water lake at about 17,300 feet, Gerry and I started off in a piercing wind with occasional hail showers, to spy the adjoining nullahs. I found a solitary bull, and after an easy stalk got my first shot at about 150 yards, and promptly missed, but was lucky enough to knock him over stone dead with the second barrel. I was disappointed at finding him to be a small beast; but never having been close to one before, I had utterly misjudged his size. We had a lovely view of the lake from one of the hills. It must be quite 60 miles round, and is studded with islands around which there were quantities of geese and duck, evidently breeding, while the whole of the southern shore was clothed in a luxuriant crop of grass, which was a great treat for our poor half-starved ponies. We had a high pass to negotiate next day, 18,500 feet, before coming on to a place where a friend of mine had shot two Yak the year before.

This was August 21st, and was the red-letter day of our expedition, and very nearly ended in disaster. Gerry and I started very early, leaving the caravan to follow us, and after going about seven miles saw two Yak grazing a long way off. It was hailing and bitterly cold; but we managed to stalk up to about 200 yards of the bulls, when, having won the toss for first shot, I let drive with my '303, and broke my beast's foreleg, hitting him again in the body with the left barrel. Off he went like a flash of lightning, so I

ran for my pony, mounted, and galloped for all I was worth in pursuit. The gallop, however, very soon developed into a walk, as at 17,000 feet a pony can only gallop about 200 yards, owing to the difficulty of breathing. After going about 3 miles over a fearful country I got within about 150 yards of him and then our respective positions in the matter of hunter and hunted were unexpectedly reversed, for my friend, wheeling round suddenly came charging straight for me like an avalanche. I gave him the contents of both barrels in the head, but might just as well have flung sand at him for all the effect it had. The hollow nosed bullet merely broke up on his skull, and it was only after a most exciting five minutes of dodging like a Toreador in a Spanish bull-fight that I got a chance of putting an express bullet into his heart, which finished him off. He proved to be a fine beast of 18½ hands, with a horn measurement of 29 inches. The excitement and exercise brought on an appalling headache, and I was right glad to get into camp, having failed in a stalk on the way owing to a shift of wind. The last I had seen of Gerry was following up his Yak, which he had wounded badly with his first shot. I was surprised at not finding him in camp, and when it came to 11 p.m. and there was no sign of him I became really anxious; - more particularly as it was now blowing a regular blizzard with hail and snow. I spent an hour firing shots, and sent men out in every direction to fire shots and blow bugles, but with no result; so I turned in, feeling practically certain that I should not see him alive again. Early in the morning we were all delighted to see Gerry making for the camp. The poor chap had had a terrible time of it. He had followed up and got his Yak, and then made for where he thought the camp should be. He lost his bearings, and spent the whole night wardering about in that awful blizzard. How he stood it I don't know, but as we had got him back, half frozen and famished with hunger, we stowed him away in bed and kept him there all day.

The next morning broke fine, and right glad it made us, as it is bad enough to be living at an altitude where it takes one's breath away to talk or even eat without having perpetual rain and hail to face outside the tent. Soon after daybreak Rassool saw a Yak about two miles from camp. I got to within 300 yards and put two '303 bullets into him; but even then he carried on for quite 200 yards before he dropped dead. In the evening we rode on over a pass of 18,600 feet very nearly as far as Charal Cho, or rotten-water lake. I saw nothing but Antelope, one of which I got with a 24½-inch horn. Gerry saw seven Yak, but failed in his stalk, and we turned in with great expectations for the morrow. We moved the camp about five miles up a side nullah, and riding a long way up the main valley we saw a crowd of Yak, with one very fine bull among them. We waited all day for them to shift into some place where we could stalk them, but without success, so we determined to have it out with them in the morning. In this we were again disappointed, as

although we saw eight or nine bulls, we could not get nearer than 600 yards. I only saved it from being a totally blank day by knocking over a hare with a stone on our way back to camp. There was a lovely fresh-water lake at the head of the nullah, so we moved the camp up to it to get the benefit of the grass for the ponies. The elevation was 18,200 feet, and we found our heads and breathing apparatus giving us a lot of trouble.

Soon after breakfast we saw a Yak from camp. There was no way of stalking him but right across the open. I took the job on, and by dint of crawling and creeping got to within 300 yards. My first shot was wild and only broke his hind leg, but he turned to charge and the second bullet catching him full in the chest finished him off at once.

The day turned out so hot that we both indulged in a bath, which by this time was becoming a necessity after a three weeks' interval, and we sat down to our dinner of most excellent Yak-steaks feeling very proud of our personal appearance, although I hardly think that Gerry's sporting friends would have quite recognised him in the bearded-looking ruffian with a face like a ploughed field who faced me across the table.

On August 27th we began to retrace our steps. We moved off west, and recrossing the pass of 18,500 feet came 22 miles to Horpu Cho lake again. Just after crossing the pass we found four Yak, two of them being fine bulls, in a lovely place for a stalk. Gerry after an easy stalk shot the biggest fellow stone dead, while the others got away out of range before I could get a chance of a shot. Next day Rassool and I explored the nullahs on the south side of the lake. We came across a herd of quite 200 Yak, but there were only four bulls in the lot. I stalked up to within 50 yards of them—a bit too close to be pleasant I thought after my recent experience. There was only one good beast, and him I killed stone dead with a '303 bullet. On the way home I shot three Antelope, one head being 25 inches. This was the last Yak that we shot, and I need but shortly describe our journey back. We retraced our steps camp by camp finding our grain and supplies which we had buried all safe and sound. We met but four Champas, and they seemed not to take much notice of us as we were on the way west.

I had a yarn with one of them with the aid of Rassool as interpreter. He was a fine handsome fellow, but I failed to get any information of interest from him. The piercing wind was what troubled us most: it seemed to cut one to the bone, no matter how many coats one put on. The temperature at night was often below zero, and it certainly was surprising to see how cheerfully our poor drivers stood it, without even the comfort of a camp fire for want of fuel to make one. We kept ourselves well supplied with Antelope meat, on which, with occasional Yak beef, we had subsisted for five weeks. In fact we had not killed a sheep the whole time we were in Thibet. Some of the men at one time began to show signs of having eaten

too much meat, so we promptly put them all on fixed rations, fearing an outbreak of scurvy.

On September 12th we recrossed the Marmichla Pass, and right glad we were to get down to 13,500 feet, where one felt more like oneself after such a long spell of rarefied air and high altitudes. The nights also became warm, and we were at last able to get a good night's sleep. Crossing the Changla on September 17th, which by the way we found very bad going, we reached Leh on the 19th, receiving a hearty welcome from all our friends.

Our bag consisted of 7 Yak, 27 Antelope, and 2 Burrhel. To anyone who may follow in our footsteps let me say one word. The game is worth the candle to a sound man ; but take care you are sound, as a weak heart or lungs would never stand the high altitude and the biting wind of Horpu Cho and its surroundings.

THE BIRDS OF THE ANDAMAN AND NICOBAR  
ISLANDS.

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(Continued from Vol. XII, page 696.)

PART IV.

1401. AMAURORNIS PHENICURUS, Penn. Blanf., IV, p. 173; "Str. Feath.," II, p. 300.

Extremely common throughout both groups, breeding, I think, throughout the year. Speaking of the difference between Andaman and Nicobar birds and Indian ones Mr. Hume says:—"In the full breeding plumage the whole head in some birds, as far back as the occiput, becomes perfectly white, while in some even the feathers of the nape are mingled with white." This description applies to the *Nicobar* birds exactly, but personally I did not see a single *Andamanese* specimen anywhere approaching the *Nicobar* birds in this respect. And I examined a great number—over 150—as they *would* go and strangle themselves wholesale in the snares I intended for the *Andamanese* Rail.

On Car Nicobar I saw one beautiful specimen of this bird which certainly appeared to have the *whole head and neck* white; it walked past me within a few feet in thick cover, too close to shoot, and before it was far enough off to kill, I lost sight of it and failed to find it again.

This water-hen, a bird like Homer's sea *τολυφλοσβος*—"many-sounding," has, in the Andamans, among a large and varied *répertoire* of uncouth and objectionable noises, an extraordinary duck-like quack. I never heard it utter this note in Ceylon, and am unaware whether it is usual with Indian birds. The quacking is very loud and can be heard a long way; the first time I heard it I certainly thought I was coming upon a piece of water hidden in the forest and tenanted by some remarkably noisy species of duck.

Car Nicobarese, "takoor."

1403. GALLIGREX CINEREA, Gm. Blanf., IV, p. 176; "Str. Feath.," II, p. 300.

Fairly common, I think, in the Andamans, but very seldom seen. Mr. Davison remarks:—"The watercock found at the Andamans belies its name by never, as far as I have observed, being found near water; the only places in which I have observed it are the sugar-cane fields." The two or three that I met with did *not* belie their name, and were flushed from the reeds and grass surrounding small pools of water.

1420. ESACUS MAGNIROSTRIS, Geoffr. Blanf., IV, p. 207; "Str. Feath.," I, p. 290.

This fine Australian form is apparently rare, but resident in the Andamans and Cocos. Mr. Hume obtained a couple of specimens, and took an egg on the Little Coco on March 24th. Previously Mr. Mason had obtained an egg at Corbyn's Cove, Port Blair, on April 15th.

I never met with it.

1421. *DROMAS ARDEOLA*, Paykull. *Blanf.*, IV, p. 208; "Str. Feath.," pp. 58 and 293.

The Crab Plover is a winter visitant, occurring in both groups. Though far from common it is generally in large numbers when one does meet with it. Mr. Hume gives a humorous account of the difficulties he had in getting four specimens from a large flock at Macpherson's Straits, the only locality in which he met with it. Davison never saw it in the islands at all. They are as a rule extremely wild, but Wardlaw Ramsay must have come across some unusually confiding individuals, as Mr. Hume says he met with a small party at Haddo, Port Blair, and shot the whole of them.

Mr. Hume found them feeding on the coral reefs at low tide, the flock collecting in a closely packed crowd at high water on an isolated rock rising only just above sea level.

I only met with these birds once, on August 6th, at Car Nicobar, where a flock of sixty or seventy were feeding on a long low reef exposed by the low tide. Never having shot the bird before I went after them at once, though I had only No. 8 shot and was by no means hopeful of getting a specimen as they were so wild. Directly I was within 200 yards they rose, and flying along the surf-fringed edge of the rocks, alighted again half a mile further on. This was repeated three or four times, and the chances of getting even a long shot seemed hopeless, when I caught sight of another large flock approaching from behind me. I crouched down flat—in about 8 inches of water—and as they passed in a densely packed crowd at about 80 yards fired the choke barrel into the thick of them. One dropped at once, winged, (and a lively runner he proved), another dropped into the surf 200 yards further on and was recovered, and a third remained unable to rise when I put the flock up again further on. I got another long shot and killed a fourth specimen. Car Nicobarese "cummermelmoa."

1425. *GLAREOLA ORIENTALIS*, Leach. *Blanf.*, IV, p. 214; "Str. Feath.," II, p. 284.

A migrant to the islands, but apparently far from common. Davison obtained them in the Andamans, Nicobars, and Cocos during March and April, frequenting gardens, ploughed fields, hill-sides, etc. He adds that they are said to breed in the Andamans.

I never saw this bird in the islands at all, but then I was not there during March and April, the only months in which Davison met with it.

1430. *STREPSILAS INTERPRES*, Linn. *Blanf.*, IV, p. 223; "Str. Feath.," II, p. 292.

Very common on all the islands of the Bay of Bengal in winter. Mr. Hume says it was, during his visit, 'nowhere numerically abundant.' It certainly was so in the Nicobars in September; along the coasts of Car

Nicobar good sized flocks were to be met with at every few hundred yards. I am not sure whether any remain through the year; in May they were still abundant at Port Blair, and in the Nicobars they were numerous at the end of August. During June and July I did not see them, but I was very little on the coast in those months.

1434. *MICROSARCOPS CINEREUS*, Blyth. *Blanf.*, IV, p. 228.

The Grey-headed Lapwing has, according to Blanford, been obtained in the Andamans.

1439. *CHARADRIUS FULVUS*, Gm. *Blanf.*, IV, p. 234; "Str. Feath.," II, p. 287.

The Golden Plover is common in winter throughout the Andamans, Nicobars, and Cocos, frequenting the seashore at low tide, paddy-fields, hill-sides, etc.

Though very common they are not met with in such large flights as in India, parties of four or five to twenty or thirty being the rule. As with so many of the waders that visit the islands in winter, a small number—probably immature birds—remain throughout the year. Mr. Hume received specimens shot in June and July; he remarks that none of these were in full breeding plumage. I shot two or three in June, but these showed no traces of black on the under parts, and were doubtless immature birds remaining in the islands. These were quite distinct from the migrating birds which began to arrive by August 8th (in the Nicobars), nearly all retaining traces of the breeding plumage.

I believe a straggling migration of these birds between India and the islands goes on during the whole winter season, as I saw individuals at sea between the Andamans and Cocos and between the Cocos and Calcutta during November.

1441. *SQUATAROLA HELVETICA*, Linn. *Blanf.*, IV, p. 236; "Str. Feath.," II, p. 287.

The Grey Plover is a winter visitant to the Andamans, apparently rather scarce. I did not meet with it during my stay.

1442. *ÆGIALITIS GEOFFROYI*, Wagl. *Blanf.*, IV, p. 237; "Str. Feath.," II, p. 288.

Common in both groups during the winter, though not so numerous as the next species. It remains in some numbers throughout the year, but, like the other waders remaining in the islands, of course does not breed. Specimens shot on the coast in May showed traces of the rufous breeding dress; after these disappeared flocks were to be met with frequenting newly-ploughed paddy fields in June and July, in company with *Æ. mongolica*, but these birds showed no traces of summer plumage. By September the migrants were back again along the coast, many still retaining a good deal of rufous on the breast.

1443. *ÆGIALITIS MONGOLICA*, Pall. *Blanf.*, IV, p. 238; "Str. Feath.," II, p. 289.

Pallas's Shore-plover is one of the commonest waders about the coast in both groups. I found large numbers frequenting the paddy fields in June and July, all in winter plumage and probably immature.

1445. *ÆGIALITIS VEREDA*, Gould. *Blanf.*, IV, p. 240; "Str. Feath.," II, p. 288.

Mr. Hume mentions a specimen obtained at the Andamans by Dr. Dobson's collectors in May, 1872.

1447. *ÆGIALITIS DUBIA* Scop., *Blanf.*, IV, p. 241; "Str. Feath.," II, p. 289.

Comparatively rare in the islands. Mr. Hume shot it on Preparis and the Cocos, and Davison got a single bird at Port Blair. I met with a few near Port Blair in December.

1454. *NUMENIUS ARQUATA*, Linn. *Blanf.*, IV, p. 252; "Str. Feath.," II, p. 296.

Curlew are common along the coasts of the Andamans and Nicobars (Davison does not seem to have observed them at the latter) after the middle of August, but an odd bird or two may be met with at any time of the year, as I saw single birds in May and June. They are extremely wary and difficult to procure owing to the absence of cover on the mud flats they frequent. I only managed to shoot a single specimen.

Car Nicobarese "Sakayok."

1455. *NUMENIUS PHÆOPUS*, Linn. *Blanf.*, IV, p. 253; "Str. Feath.," II, p. 297.

The Whimbrel is very common in both groups. Stragglers remain throughout the year; single birds were not uncommon along the coast at the end of June, and the main body of the migrants was back by the end of August.

1459. *TEREKIA CINEREA*, *Güldenst.* *Blanf.*, IV, p. 258; "Str. Feath.," II, p. 296.

Davison only met with the Avocet Sandpiper in the Andamans at Port Blair. He found it in large flocks about the creeks, settling at high water on the mangroves, and feeding at low tide on the bare mud banks. I never saw it at all, and doubt if there were any about during the season I was at Port Blair.

1460. *TOTANUS HYPOLEUCUS*, Linn. *Blanf.*, IV, p. 260; "Str. Feath.," II, p. 299.

The ubiquitous little Common Sandpiper is in the autumn and winter months met with *everywhere* in the islands—on the beach, up the creeks, on little Jungle streams, running along the roads in front of you, perching on the roofs of barracks and buildings, toddling about the tennis courts on Ross—it is difficult to go anywhere outside of dense jungle without seeing it.

In the day it is generally met with alone or in pairs, but at evening it collects in small parties, which fly up and down the creeks with shrill little piping notes before going to roost in the mangroves.

It is very pretty to see them on the shores of the Nicobars following out each receding wave to see if it has left them anything edible, and then tripping away in front of the returning surge as it comes creaming up the snowy coral beach again, keeping only an inch or two in front of the water, and yet most daintily avoiding wetting their little feet.

One that I shot on Car Nicobar fell into a large clear pool in the coral rock, and being only slightly wounded, dived repeatedly on my approach. In the crystal clear water I could see it most distinctly, swimming hither and thither about two feet below the surface with quick strokes of its wings. It remained under water for 8 or 10 seconds together, and dived again immediately on coming to the top. I had no idea they were such capital divers, having two or three times seen them fall into water only slightly shot, and never before having seen one dive as this one did.

I saw stragglers along the coast in the middle of July.

1461. *TOTANUS GLAREOLA*, Gm. *Blanf.*, IV, p. 261; "*Str. Feath.*," II, p. 298.

Not uncommon about the swamps and paddy-fields at Port Blair.

1462. *TOTANUS OCHROPUS*, Linn. *Blanf.*, IV, p. 262.

The Green Sandpiper seemed to me scarce about Port Blair. I shot one or two during the season.

1464. *TOTANUS CALIDRIS*, Linn. *Blanf.*, IV, p. 264; "*Str. Feath.*," II, p. 299.

The Redshank is common in the Andamans from September to May. Mr. Hume had a specimen from Port Blair killed in June.

1466. *TOTANUS GLOTTIS*, Linn. *Blanf.*, IV, p. 266; "*Str. Feath.*," II, p. 299.

The "Novara" expedition obtained a male on the north coast of the Great Nicobar on March 22nd. Mr. Hume thinks it must be an excessively rare straggler to the island.

1471. *TRINGA RUFICOLLIS*, Pall. *Blanf.*, IV, p. 274; "*Str. Feath.*," II, p. 298.

The Eastern Little Stint is fairly common along the Andaman and Nicobar coasts in winter. I saw it up to about the end of May.

1473. *TRINGA SUBMINUTA*, Middend. *Blanf.*, IV, p. 275.

I believe I shot the Long-toed Stint at Port Blair, but cannot find it among my notes.

1476. *TRINGA CRASSIROSTRIS*, Temm. and Schl. *Blanf.*, IV, p. 277; "*Str. Feath.*," IV, p. 294.

The Eastern Knot was obtained on the S. Andaman by Wardlaw Ramsay.

1477. *TRINGA SUBARQUATA*, Gldenst. *Blanf.*, IV, p. 278; "*Str. Feath.*," II, p. 297.

The Curlew Sandpiper, though not rare, is by no means common in the islands.

I only met with one small party of six on Car Nicobar in September. These obligingly ranged themselves in a row which enabled me to get the whole of them at one shot. All but one still showed a lot of red on the breast.

With this species too, stragglers remain throughout the year, as Mr. Hume had specimens shot in June and July.

Car Nicobarese "Suit."

1479. *TRINGA PLATYRHYNCHA*, Temm. *Blanf.*, IV, p. 279; "Str. Feath.," II, p. 298.

The Broad-billed Stint appears to be rare in the islands. Davison only met with one small party in the Andamans, and did not see it in the Nicobars. I kept a look out for it but never saw any.

1484. *GALLINAGO CELESTIS*, Frenzel. *Blanf.*, IV, p. 286; "Str. Feath.," II, p. 295.

The Common Snipe is extremely scarce in the Andamans. A very few are shot yearly, but I doubt if they are one to a hundred of the Pintails. There was not one among 300 odd birds that I shot during the season.

1485. *GALLINAGO STENURA*, Kuhl. *Blanf.*, IV, p. 289; "Str. Feath.," II, p. 294.

Snipe arrive in the Andamans in September, and remain till May; the best of the shooting, however, is over by December as a rule. Fifty couple is, I believe, about the best bag that has been obtained at Port Blair by a single gun, but the limited amount of ground is so much shot over that one is very lucky to get 20 or 30 couple once or twice in a season.

The latest date on which I saw a snipe was May 12th, but odd birds have been killed in June and July. Mr. Hume thought that the few couples that remain might possibly breed, but I think this is extremely improbable.

A year or two ago I was told of the taking of an undoubted snipe's nest in Ceylon; the finder, not an ornithologist, flushed a snipe in May and shot it, and looking down found a nest with four eggs exactly where the bird rose. I saw the eggs, which were those of *Excalfactoria chinensis*, but nothing would persuade their owner that they were not the eggs of the snipe! An instance of how mistakes arise.

In the Nicobars, where there is no paddy cultivation, snipe are not numerous, a few occurring here and there round fresh water ponds.

1487. *GALLINAGO GALLINULA*, Linn. *Blanf.*, IV, p. 292; *Finn., Jour. A. S. B.*, Vol. LXVI, Part II, No. 2, p. 525.

Only a single specimen of the Jack Snipe has been recorded from the Andamans, shot on November 25th, 1896, by Lieut. H. Turner of the Suffolk Regiment. I am told it was the first snipe he shot in the Settlement!

1497. *HYDROCHELIDON LEUCOPTERA*, Meisner and Schinz. *Blanf.*, IV, p. 308.

Obtained at the South Andaman by Mr. de Roepstorff.

1499. STERNA ANGLICA, Mont. Blanf., IV, p. 311; "Str. Feath.," IV, p. 294.

Obtained by Captain Wimberley at Port Blair in November.

1501. STERNA MEDIA, Horsf. Blanf., IV, p. 313; "Str. Feath.," II, p. 318.

Rare in the Andamans. Davison obtained three at Camorta in the Nicobars.

1508. STERNA DOUGALLI, Mont. Blanf., IV, p. 319; "Str. Feath.," II, p. 317.

This beautiful little tern is not nearly as numerous as *S. melanauchen*. Immediately after breeding it seems to disappear from Port Blair entirely.

1512. STERNA MELANAUCHEN, Temm. Blanf., IV, p. 322; "Str. Feath.," II, p. 319.

The Black-naped Tern arrives at Port Blair in numbers at the end of April, and is common till September, after which hardly any are to be seen.

I have given an account of the breeding of this and the last species on the islet at Corby's Cove in the note on the Reef Heron (*Demiegretta sacra*).

Car Nicobarese "Sannayéna."

1513. STERNA ANÆSTHETA, Scop. Blanf., IV, p. 323; "Str. Feath.," II, p. 320.

A straggler to the island in the winter months. I only noticed a few which hung about Port Blair harbour for a few days after some rough weather in November.

1515. ANOUS STOLIDUS, Linn. Blanf., IV, p. 325; "Str. Feath.," II, p. 320.

Has been obtained at Port Blair.

1516. ANOUS LEUCOCAPILLUS, Gould. Blanf., IV, p. 326; "Str. Feath.," II, p. 321.

Like the last a straggler to the islands. Once obtained at Port Blair.

1523. PELECANUS PHILIPPENSIS, Gm. Blanf. IV, p. 335; "Str. Feath.," II, p. 324.

Mr. Hume rather doubtfully includes this bird in his list on the strength of a specimen sent to Blyth said to have been obtained in the Nicobars. Mr. Tuson, one of the Settlement Officers, informed me that he saw a Pelican at Port Blair some years ago after a cyclone.

1533. PHAËTHON INDICUS, Hume. Blanf., IV, p. 349; "Str. Feath.," II, p. 323.

According to Mr. Hume this Tropic Bird is often seen in the Bay of Bengal in the neighbourhood of the Andamans and Cocos.

1534. PHAËTHON FLAVIROSTRIS, Brandt. Blanf., IV, p. 350; "Str. Feath.," II, p. 323.

A specimen was once shot on Ross Island by Col. Tytler, which had hovered round his bungalow for some days apparently attracted by his white pigeons.

1535. PHAËTHON RUBRICAUDA, Bodd. Blanf., IV, p. 350; "Str. Feath.," II, p. 322.

Said to occur in the Bay of Bengal, but I cannot find a record of its being procured in the islands since the specimen sent to Blyth from the Nicobars.

PRION, sp.? Blanf., IV, p. 358; "Str. Feath.," II, p. 317.

Mr. Hume mentions meeting with some blue and white petrels at sea between Preparis and the Cocos on the 4th of March.

1536. OCEANITES OCEANICUS, Kuht.? Blanf., IV, p. 354; "Str. Feath.," II, p. 317.

Some small dusky petrels were seen by Mr. Hume on the same day. Probably this species.

1554. ARDEA MANILLENSIS, Sharpe. Blanf., IV, p. 381; "Str. Feath.," II, p. 303.

The Purple Heron occurs in both groups, but is rather scarce everywhere.

1560. HERODIAS INTERMEDIA, Wagl. Blanf., IV, p. 386; "Str. Feath.," II, p. 303.

Occurs in both groups, but is not so numerous as the next. I generally met with them in small parties sitting on the mangroves up the harbour beyond Viper.

1561. HERODIAS GARZETTA, Linn. Blanf., IV, p. 387; "Str. Feath.," II, p. 304.

Common about paddy fields and marshes in the Andamans; probably occurs in the Nicobars.

1562. BUBULCUS COROMANDUS, Bodd. Blanf., IV, p. 389; "Str. Feath.," II, p. 309.

The Cattle Egret is fairly common in the Andamans.

1564. LEPTERODIUS SACER, Gm. Blanf., IV, p. 391; "Str. Feath.," II, p. 304.

The Reef Heron is common along rocky portions of the coasts of the Cocos, Andamans and Nicobars.

The Port Blair birds all breed on Snake Island, Corbyn's Cove, laying at the same time as the terns which also breed there.

Snake Island is a tiny rocky islet a few hundred yards from the shore, about three miles outside Port Blair harbour. I paid a visit to this breeding place on the 14th of May. In the centre of this island the rocks form a craggy mound some twenty feet high, covered with a few stunted trees—a *Hibiscus* and a *Ficus* of sorts—and here and there about the island were growing a few scrubby bushes (*Pemphis acidula*). The rest of the islet was bare rock strewn with coral *débris*.

As I landed a crowd of terns rose and wheeled about me with startled cries, while with croaks of disgust the Reef Herons left their nests among the rocks and trees and betook themselves to a neighbouring reef. Wishing to make the most of this opportunity of observing the birds I immediately sent my boat away with orders to lie off at a distance until I fired a shot, and ensconced myself in a crevice in the rocks, where I was almost completely concealed by the foliage of the *Ficus*.

All round me were numerous nests of the Reef Herons, some in the hollows and crevices of the rocks and some among the branches of the trees in which I lay hid. Most of the nests contained two or three fresh eggs, the birds having only just commenced to lay. Fifteen yards in front of me were a few scattered eggs of the terns which were wheeling in scores overhead. For a few minutes some of these terns having seen me get into my hiding place hovered over me 'mobbing' me vociferously; then, as the boat left the island and I remained perfectly still, the startled birds settled down again; the terns descended to their eggs, and the Herons came back from the reef and settled fearlessly about their nests on the rocks and branches within a few feet of me. One of the white birds, usually so shy, perched so close to me that I could almost have touched it with a stick, and remained during the whole hour that I lay concealed. The Reef Herons seemed very apathetic, sitting quite motionless, and now and again yawning sleepily. One or two of the laziest squatted down on their tarsi—not a graceful attitude! Although they seemed to keep a sharp look-out seaward, they were quite unsuspecting of my presence in their midst; once or twice I whistled sharply, but though they turned and stared towards me, they seemed quite unable to make me out as long as I remained motionless. I noticed some of them breaking off the green twigs of the *Pemphis acidula* to line their nests with.

The terns seemed rather restless sitters; there were seven of *Sterna melanauchen* on their eggs close to me, and each of them would rise every ten minutes or so, wheel round and perhaps catch a small fish, and then return to its egg. They sat with the head very upright and the wings drooped low. These Black-naped Terns eggs were laid on the rock with a few small fragments of coral carefully collected under each; the eggs were in each case single, and placed some yards apart from each other.

A little further off a small colony of *Sterna dougalli* were sitting; their eggs differing from those of *S. melanauchen* in their olive instead of stone-grey ground-colour, and also in each case single, being laid in very close company on a patch of sand which thinly overlaid the rock. A large red hermit crab was walking off with one partly sucked egg, but whether he made the hole in it originally I can't say. For the sake of the terns it is to be hoped not, as the whole island was crawling with hermit crabs of every size and colour in tens of thousands.

The birds were only commencing to lay when I visited the island; I procured about a dozen eggs of each of the terns and as many as I wanted of those of the Reef Herons. There seemed to be about five and twenty pairs of these latter breeding on the island, only one pair of white birds among them. Quite a hundred and fifty pairs of terns were about the island, but only a small proportion of these were *S. dougalli*.

I never passed a pleasanter hour watching bird life: with a pair of binoculars I could examine every bird on the islet as well as if it had been in my hands.

1565. *ARDEOLA GRAYI*, Sykes. *Blanf.*, IV, p. 393; "Str. Feath.," II, p. 309. Common at Port Blair in the winter months. I saw a few in June, but they showed no signs of breeding.

1566. *ARDEOLA BACCHUS*, Bonap. *Blanf.*, IV, p. 394.

Has been obtained in the Andamans.

1567. *BUTORIDES JAVANICA*, Horsf. *Blanf.*, IV, p. 395; "Str. Feath.," II, p. 310.

The Green Bittern is extremely common in both groups. In the Andamans its chief stronghold is the dense growth of mangroves which fringes the numerous salt water creeks. In the Nicobars I found it extraordinarily abundant, frequenting the rocks exposed at low tide in such numbers that twenty or thirty could often be counted at the same time.

1568. *NYCTICORAX GRISEUS*, Linn. *Blanf.*, IV, p. 397; "Str. Feath.," II, p. 315.

Davison appears to have met with the Night Heron only on Trinkut in the Nicobars. I did not notice it anywhere in the island.

1569. *GORSAHICUS MELANOLOPHUS*, Raffles. *Blanf.*, IV, p. 398; "Str. Feath.," II, p. 312.

Mr. Hume obtained three specimens of the Malay Bittern in the Nicobars. I failed to get or see a single specimen, but it is probably not really uncommon in suitable spots, being one of the most skulking and retiring birds of its family.

1571. *ARDETTA SINENSIS*, Gm. *Blanf.*, IV, p. 401; "Str. Feath.," II, p. 311.

The Little Bittern seems to be more numerous in the Andamans now than in Mr. Hume's time. I saw it quite a score of times altogether, and procured half a dozen specimens—three in one morning. It also occurs in the Nicobars.

1572. *ARDETTA CINNAMOMEA*, Gm. *Blanf.*, IV, p. 402; "Str. Feath.," II, p. 311.

The Little Chesnut Bittern is very common in the Andamans. It has probably increased in numbers with the increase of paddy cultivation since Mr. Hume visited the islands, as he seems only to have met with it twice. In the Andamans it breeds chiefly, I think, in May, June and July. I took a clutch of three eggs, very hard set, on July 3rd, the nest was a mere platform of rushes in the centre of a tussock of coarse grass. The bird either sits with its neck stretched upwards and its bill pointing straight into the air, or else assumes this position on hearing one approach its nest.

The appetite of the Little Bittern is nearly insatiable. One that I shot—still fishing!—had just swallowed one fish 5 in. long, nearly 2 in. in circumference, and with the skull  $\frac{3}{4}$  in. across; one eel  $5\frac{1}{2}$  in. long, and 2 eels each  $3\frac{1}{4}$  in. in length. When fired at and winged its behaviour is typically Bittern-like; falling to the shot it runs into the nearest grass and squats with its bill pointed as usual straight into the air. When one proceeds to catch it, it defends itself most pluckily, uttering harsh croaking cries and stabbing upwards

savagely with its stiletto-like bill, jumping up with a flap of its wings to add force to the strokes.

It is less common in the Nicobars, where no rice is grown.

1581. *DENDROCYGNA JAVANICA*, Horsf. *Blanf.*, IV, p. 430; "Str. Feath.," II, p. 315; Stuart Baker, *Journ. B. N. H. S.*, XI, p. 562.

The common teal of the islands, numerous and resident near Port Blair, and very abundant on some of the Nicobars. One that I shot on June 26th was just about to lay.

1591. *NETTOPUS COROMANDELIANUS*, Gmn. *Blanf.*, IV, p. 433; "Str. Feath.," II, p. 315; Stuart Baker, *Journ. B. N. H. S.*, XI, p. 191.

The Cotton Teal is only a straggler to the Andamans. Wardlaw Ramsay procured a single specimen at Port Blair, and Captain Wimberley shot a pair, but Mr. Hume's party never met with it, though he subsequently had some more specimens sent him. I did not see it during my nine months in the Settlement.

1597. *NETTIUM CRECCA*, Linn. *Blanf.*, IV, p. 443; Stuart Baker, *Journ. B. N. H. S.*, XII, p. 247.

Mr. Stuart Baker has recorded this Teal from the Andamans and Nicobars, having received information, which he considers reliable, of its being seen, though not obtained, in both groups.

1598. *NETTIUM ALBIGULARE*, Hume., *Blanf.*, IV, p. 444; Stuart Baker, *Journ. B. N. H. S.*, XII, p. 257; "Str. Feath.," II, p. 316; Butler, *Journ. Bomb. N. H. S.*, Vol. XI, p. 332.

Resident in the Andamans, but not nearly as plentiful as the Whistling Teal. I found a brood of young ones on Dec. 2nd. My notes on this teal have already appeared in this Journal.

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The following species should have been included among the Willow-wrens, enumerated in the first part of this article:—

420. *ACANTHOPNEUSTE BOREALIS*, Blas. Walden, *Ibis*, 1874, p. 140; Oates, I, p. 412.

Lord Walden recorded a specimen from the S. Andaman, and Mr. Oates says he has examined two specimens from the same locality.



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DESCRIPTION OF A NEW SPECIES OF *FIGUS*  
FROM TRAVANCORE.

By T. F. BOURDILLON, F.L.S., CONSERVATOR OF FORESTS, TRAVANCORE.

(With a Plate.)

(Read before the Bombay Natural History Society

on 16th January, 1900.)

URTICACEÆ.

*FIGUS RAMA* VARME, sp. nov.

A fast-growing tree of immense size, wholly glabrous, with irregularly shaped trunk and wide-spreading branches. Leaves erect, shining, dark green when old, very pale when young, broad ovate, acuminate, 6 ins. to 1 ft. long by 4-6 ins. broad, coriaceous, edge straight or undulate: base cordate or rounded: basal nerves 3: distinctly penniveined: nerves prominent 10-16 pairs, anastomosing at the edge of the leaf. Petiole moderately stout 1-4 in. long. Stipules in pairs from 1-6 in. in length. Receptacles in pairs in the axils of the leaves, subglobose or somewhat 3-sided on one inch peduncles, each from  $\frac{3}{4}$ -1 inch diameter, green, smooth. Base of the receptacle supported by 3 triangular bracts. Male and female flowers intermixed with many lanceolate bracteoles in the same receptacles. Male flowers numerous, scattered, pedicelled, monandrous, sepals 4 broad, anther large ovoid, almost sessile. Female flowers sessile or shortly pedicelled, naked, but with bracteoles often adhering, style elongate, stigma simple. Fruit 1 inch diameter, green when ripe, dotted with yellow spots.

A very handsome forest tree growing to a height of 100 ft. with a diameter of stem of 4 ft. or more, inclined to branch, and occurring on the hills of Travancore at elevations between 1,000 and 4,000 ft., in evergreen forest. I have not noticed it in the low country. It is fairly abundant throughout Travancore. In general appearance it resembles, when growing among smaller trees, the Banyan (*F. Benga- lensis*), but it is at once distinguished from that tree by the absence of aerial roots, by the brighter appearance of its leaves, and by its enormous "stipules." Botanically, this tree is nearest to *F. callosa*, from which it differs in habit and appearance, in its binate and not solitary

fruit, its larger stipules, its brighter many-nerved leaves, and in the structure of its flowers.

Nothing is known of its timber, which is not however likely to be in any way useful. It yields a copious supply of milk, which may possibly prove of some commercial value.

I have, with permission, called this handsome tree after H. H. the Maharajah of Travancore, G.C.S.I., a well-known patron of science.

Description of Plate.—

1. Branch of tree, natural size.
2. Fruit in section, natural size.
3. Male flowers  $\times 4$ .
4. Female flowers  $\times 4$ .



Wes. Newman Chromo.

ORIENTAL BUTTERFLIES.





West, Newman chromo.

ORIENTAL BUTTERFLIES.





West, Newman chromo



ON NEW AND LITTLE-KNOWN *LEPIDOPTERA*  
FROM THE ORIENTAL REGION.

BY LIONEL DE NICEVILLE, F.E.S., C.M.Z.S., &C.

[WITH PLATES CC, DD, & EE.]

(Read before the Bombay Natural History Society on 16th January, 1900.)

Suborder RHOPALOCERA.

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

1. HESTIA (*Nectarina*) SULA, n. sp.

*Papilio idea*, Cramer (nec Clerck), Pap. Ex., vol. iv, p. 141, pl. cccxxii, fig. D, female (1781).

HABITAT: Sula-Mangoli.

EXPANSE: ♂, 5·6; ♀, 5·4 inches.

DESCRIPTION: Nearest to *H. aza*, Boisduval, which I have from Ternate, Halmaheira (Gilolo or Jilolo), and Batjan, all in the Moluccas. MALE and FEMALE, both wings much narrower and less rounded, the apex of the forewing in the male truncated instead of evenly rounded. Forewing with the black spot in the middle of the discoidal cell ending anteriorly on the subcostal nervure, not reaching to the costa as it does in *H. aza*; the discal series of six black streaks all distinct from the outer marginal black border and twice as large, in *H. aza* the two anterior ones become merged in a somewhat broad continuous subapical black fascia from the costa to the upper discoidal interspace, beyond which are in *H. aza* seven white spots, six of which are placed in pairs between the veins, these being absent in *H. sula*. Hindwing differs in the five discal black streaks between the veins being much longer, reaching nearer to the base of each interspace bearing them, the three posterior ones quite separated from the marginal black border, in *H. aza* all the streaks run into it; the inner edge of the marginal border is also much more irregular than in *H. aza*. From *H. idea*, Clerck, it is at once distinguished by the wings being more transparent and less cretaceous, by the character of the markings at the apex of the forewing, and in many other details.

Cramer's figure of this species under the name of *Papilio idea* (which is distinct from the *Papilio idea*, Clerck, from Ceram, Amboina and Saparoea in my collection) is a very good one. Mr. Moore in Proc. Zool. Soc. Lond., 1883, p. 216, n. 2, places Cramer's

*P. idea* as a synonym of *Nectaria aza*, which he gives from Bouru and the Sula Islands. I may note also that the *Idea agelia* of Godart as figured by Lucas agrees with the species I identify as *H. aza*, while Mr. Moore (l. c., n. 3) gives it full specific rank, recording it from Batchian. Cramer records *Papilio idea* from Amboina.

Described from two males and a female captured in November, 1897, by Mr. W. Doherty in the island of Mangoli, one of the Sula Archipelago, which lies to the east of the central portion of the island of Celebes.

2. IDEOPSIS IZA, Fruhstorfer. Plate CC, Fig. 1 ♂ ♀.

*I. inuncta iza*, Fruhstorfer, Soc. Ent., vol. xiii, (1898); idem, id., Stet. Ent. Zeit., vol. lix, pp. 258, 262, n. 13 (1898).

HABITAT: Sula-Mangoli (*Fruhstorfer* and *coll. de Niceville*).

EXPANSE: ♂, 3·3; ♀, 3·1 and 3·4 inches.

DESCRIPTION: Allied to "*Danais*" *inuncta*, Butler (= *Ideopsis phæstis*, Felder), from Waigiou. MALE and FEMALE, *forewing* differs from that species in the outer marginal black border being much broader, enclosing two series of spots of the white ground-colour, the inner consisting of seven increasing spots, the outer of ten or twelve placed in pairs; the inner edge of this black border is strongly produced into festoons between the veins. *Hindwing* also has the outer black border much broader, its inner edge strongly produced into points between the veins instead of being nearly straight; the paired marginal spots more than twice as large. From *Ideopsis ribbei*, Röber (*Iris*, vol. i, p. 186, pl. viii, fig. 4, *male* (1888), from Bangkei Island, the MALE differs in the *forewing* having three elongated costal spots of the ground-colour, these being apparently wanting in that species; the two discal white streaks beyond the discoidal cell are much larger; the white area in the cell is also twice as large; the submarginal spots are larger; in the *hindwing* the cell is immaculate, in *I. ribbei* it bears two longitudinal fine lines; and in *both wings* the marginal paired spots are much larger.

The opposite sexes of this species do not differ in markings, but only in outline as in other species of the genus. It is described from one male and two females taken in Mangoli Island by Mr. W. Doherty in November, 1897.

Since the above was written Herr H. Fruhstorfer has described the same species as a local race of *I. inuncta*, so I have suppressed

the name I had given it and employ the one he has proposed for it. In his first description Herr Fruhstorfer makes no mention of *I. ribbei*, its nearest ally, though he does so in the second.

3. DANAIS (*Lintorata*) KÜKENENTHALI, Pagenstecher. Plate CC, Fig. 2 ♂.

*D. kükenenthali*, Pagenstecher, Ent. Nach., vol. xxii, p. 49, n. 1 (1896); *D. kuekenthali*, id., in Kükenenthal's Erg. einer zool. Forsch. Molukken und Borneo, p. 384, n. 85, pl. xx, fig. 5, male (1897); *Mangalisa albata kükenenthali*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xliiv, p. 77 (1899).

HABITAT: Rurukan, 3,000 ft., Minahassa, Celebes (*Pagenstecher*); Rurukan and Minahassa, Celebes (*Fruhstorfer*); Mount Tondano, N.-E. Celebes (*Hose in coll. de Nicéville*).

EXPANSE: ♂, 3.5 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* brownish-fuscous, with pale yellowish-green translucent markings of a very unusual shade. *Forewing* with the base and anterior half of the discoidal cell dusted with fuscous scales; two small oval spots on the costa divided by the second subcostal nervule; a short outwardly clavate streak at the base of the subcostal interspace, a much longer one in the upper discoidal interspace, and a shorter and broader one in the lower discoidal interspace, the base of which it does not reach; a large quadrate patch at the base of the second median interspace, a still larger one at the base of the first median interspace, and a still larger one again occupying the basal two-thirds of the submedian interspace; a narrow streak occupying the basal two-thirds of the sutural area; a sinuous series of six submarginal spots, the anteriormost is cordate, the second a mere dot, the third linear placed obliquely inwardly, the fourth and fifth are round, the sixth the largest of all, linear, and placed obliquely outwardly. *Hindwing* has the whole of the discoidal cell and a series of streaks completely encircling it of the pale yellowish-green translucent colour divided only by the brownish-fuscous veins; there is a submarginal series of five pairs of spots placed between the veins and in the middle of the broad brownish-fuscous outer area, the two anterior pairs of spots are inwardly conjoined, the three posterior pairs are well separated. UNDERSIDE, *both wings* have the ground-colour pale brown. *Forewing* differs only from the upperside in having a long subcostal streak between the costal and subcostal nervures. *Hindwing* differs from the upperside in having the outer dark area

much larger, extending slightly into the cell, thereby reducing the extent of the translucent markings, and there are traces of a submarginal series of dots.

Hitherto there has been only one known species in the genus *Lintorata* of Moore, the *L. menadensis*, Moore, Proc. Zool. Soc., Lond., 1883, p. 229, from Menado in South Celebes, with the description of which *D. kuekenthali* did not appear to agree, so I sent the drawing here reproduced to Professor Edward B. Poulton, F. R. S., who has compared it with the unique type of *L. menadensis* in the Hope Museum at Oxford, and has very kindly sent me the following note regarding it:—"Upperside, both wings have the pale markings far paler in *D. kuekenthali* than in *D. menadensis*, in the latter they are buff, even deep buff colour, and the pale markings on the inner part are much more developed and continuous, they are broken up by dark bars along the veins, and the subapical spots of the forewing are separated from the rest of the buff colour by a wide band of the dark ground-colour; moreover, the outer row of marginal spots on both wings are absent in the former, but are very distinct and numerous in the latter. The discoidal cell of the forewing in *D. menadensis* is almost all dark, with only faint linear traces of buff; in *D. kuekenthali* the cell is about equally divided between pale yellowish-green and black." I may note that *D. menadensis* has been described by the Hon. Walter Rothschild in *Iris*, vol. v, p. 430, pl. iv, fig. 3, male (1892), from Southern Celebes, as *Chlorochropsis dohertyi*.

Professor J. O. Westwood in *Trans. Ent. Soc. Lond.*, 1888, p. 471, n. 19, refers to a *Danais (Ravadeba) luciptena*, Butler, from Talisse and Kalelonda, small islands lying off the coast of Northern Celebes, and the Hon. Walter Rothschild in *Iris*, vol. v, p. 431 (1892), refers to *Ravadebra* [sic] *luciptena*, Butler, from Southern Celebes. Herr H. Fruhstorfer in *Berl. Ent. Zeitsch.*, vol. xlv, p. 78 (1899), also refers to *Parantica cleona luciptena*, Butler, from North and South Celebes. I am unable to trace this species (spelt in two ways by the authors cited), but as *Ravadeba* has "Two 'sexual marks' or scent-producing organs on the hindwing," while *Lintorata* has only one placed on the submedian nervure, it is unlikely that the species described above is the same. The name *luciptena* or *luciptena* may be

a MS. one in the British Museum—*vide* Fruhstorfer, Berl. Ent. Zeitsch., vol. xlv, p. 158 (1899).

4. EUPLŒA (*Nacamsa*) CLORINDE, Staudinger. Plate CC, Fig. 3 ♂.

*E. (Isamia) clorinde*, Staudinger, Iris, vol. ii, p. 33 (1889); *Salpinx clorinde*, Semper, Schmett. Philipp., p. 324, n. 495 (1892).

HABITAT: Palawan Island, Philippines.

EXPANSE: ♂, 3.5 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* shining dark brown with no violet gloss, the outer margins broadly pale brown. *Forewing* with a submarginal series of six or seven small sullied white spots, the anteriormost just behind the costa wanting in one specimen, the four posterior spots small and rounded, the others larger and elongated; a marginal series of rounded white dots becoming obsolete towards the apex. *Hindwing* with the usual large chalky subcostal sexual patch of whitish scales; a submarginal series of seven sullied white spots, the three anterior ones, one in each interspace, rounded, the four posterior spots, placed in pairs in the median interspaces, lengthened; a complete marginal series of white dots. UNDERSIDE, *both wings* paler than on the upperside. *Forewing* in one specimen with a costal pale violet spot placed anterior to the apex of the discoidal cell; a similar spot at the posterior outer end of the cell, large in one specimen, small in the other; an oval similar spot towards the base of the second median interspace, a much larger rhomboid spot in the first median interspace; the submarginal and marginal spots as on the upperside, except that all the spots are small instead of the anterior spots of the inner series being large as they are above; the inner margin broadly whitish. *Hindwing* with the pale streaks characteristic of the subgenus between the veins, but very obscure; the submarginal series of spots smaller than on the upperside, the marginal series similar to those above.

Two species of the subgenus, *Nacamsa simillima* and *N. meldolæ*, both of Moore, and both from the more northern islands of the Philippine Archipelago, were hitherto known until the publication of the description of the present species under a different subgeneric name, and have been figured by Semper, from both of which *N. clorinde* differs in the spots of the submarginal series in both surfaces being very much smaller, and sullied instead of pure

white. It is a beautiful instance of mimicry in the mullerian sense (two distasteful species mimicking each other for mutual protection) of *E. (Andasena) butra*, Staudinger, also of course from Palawan Island, while *E. (Andasena) lucasi*, Moore, is a similar mimic of *E. (Nacamsa) meldolæ*, Moore, in the more northern islands of the Archipelago.

Described from two males in my collection collected by Mr. W. Doherty. *E. clorinde* has been kindly identified for me by Herr Georg Semper.

#### Subfamily SATYRINÆ.

#### 5. ZETHERA MUSA, Felder. Plate CC, Fig. 4 ♀.

*Z. mixta*, Frühstorfer, Berl. Ent. Zeitsch., vol. xliv, p. 99 (1899).

HABITAT: Mindanao and Basilan Islands, Philippines.

EXPANSE: Dimorphic ♀, 3·2 inches.

DESCRIPTION: DIMORPHIC FEMALE. UPPERSIDE, *both wings* differ from the female figured by Herr Georg Semper in Schmett. Philipp., p. 38, n. 37, pl. vii, fig. 10, *female* (1886), from N., E., S.-E. and S.-W. Mindanao, in having the ground-colour black instead of brown, heavily marked with pale greenish-white. *Forewing* has the discoidal cell almost entirely greenish-white, consisting of a broad and lengthened streak posteriorly, with two narrow streaks anteriorly; a subapical macular fascia, consisting of five spots between the veins, the two anterior ones very narrow; a large patch at the base of the second median interspace, a still larger one in the first median interspace reaching beyond the submarginal round white spot in that space, and a still larger one reaching to the base of the wing and bisected by a narrow black streak in the submedian interspace; the whole of the sutural area, except at the extreme outer angle, all greenish-white; between the submarginal and marginal series of white spots is a series of greenish-white spots placed in pairs between the veins anterior to the third median nervule. *Hindwing* has the whole of the basal two-thirds of the wing greenish-white slightly sprinkled with black scales except the veins which are rather broadly black, and an outwardly-bifurcated streak in the cell and a single streak in the submedian interspace. UNDERSIDE, *both wings* marked very similarly to the upperside, but the greenish-white markings are replaced by pure white ones, and the twinned spots between

the veins placed between the submarginal and marginal series of spots are far more prominent than above, and reach the anal angle.

This interesting dimorphic form appears to be the only one present in Basilan Island, from whence I have four specimens and many males captured by Mr. W. Doherty. It is evidently a mimic of *Danaïs (Radena) juvena*, Cramer, which occurs commonly with it. Herr Fruhstorfer appears to have described it as an entirely new species.

6. *LETHE (Zophoessa) SURA*, Doubleday and Hewitson. Plate CC, Figs. 5, 6, *gynandromorphous example*.

*Zophoessa sura*, Doubleday and Hewitson, Gen. Diurn. Lep., vol. ii, p. 362, n. 1, pl. lxi, fig. 1, *female* (1851); id., Marshall and de Nicéville, Butt. Ind., vol. i, p. 164, n. 154 (1883); id., Scudder, Mem. Am. Ass. Adv. Science, vol. i, Fossil Butterflies, pl. ii, figs. 1, 3, 11, *female* (1875); id., Moore, Lep. Ind., vol. i, p. 291, pl. xci, figs. 1, *male*; 1a, *female* (1892).

HABITAT: Probably Nepal, Sikkim, Bhutan, Assam, Upper Burma.

The specimen here figured is in the collection of Mr. F. A. Möller, who has kindly lent it to me, and was obtained by his native collectors at or near Buxa in Bhutan. It is three parts male and one part female, the left-hand side being entirely masculine, as is also the right-hand forewing, while the right-hand hindwing is entirely feminine. The markings are quite normal for both sexes, and as usual the single feminine wing is much larger than the corresponding wing on the opposite side. The feminine character in the markings which immediately attracts attention is the disc of the hindwing on the underside which is marked with bright ochreous instead of violet as in the male. This is the only Asiatic monster known to me which is only one-fourth gynandromorphous, though bilateral and commingled specimens are occasionally found, the latter much less commonly than the former.

7. *ACROPTHALMIA CHIONIDES*, n. sp. Plate DD, Fig. 7 ♀.

HABITAT: Sula-Mangoli.

EXPANSE: ♂, 1.40 to 1.50; ♀, 1.45 inches.

DESCRIPTION: MALE and FEMALE. Closely allied to *A. chione*, Felder, Reise Nov., Lep., vol. iii, p. 486, n. 839, pl. lxxviii, figs. 12, 13, *female* (1867), described from Halmahera, in my collection

from that island and from Batjan, recorded by Kirby from Ternate also; from which it differs in being smaller, and on the UPPERSIDE and UNDERSIDE of *both wings* in the broad discal pure white band of that species being obsolete and barely traceable.

Described from four males and one female captured by Mr. W. Doherty in November, 1897. Mr. Hewitson in Journ. Linn. Soc. Lond., Zoology, vol. viii, p. 147 (1865), records *A. artemis*, Felder, described originally from Luzon, and apparently confined to that island of the Philippine Archipelago, from "Sulla," (as well as from Batchian, Gilolo, Morty and Menado), which is probably a variant in spelling of the Sula Archipelago, though at page 148 of the same paper he speaks of "Sula." There is, however, the Sulu Archipelago between the Philippines and Borneo, as well as the Sula Archipelago, of which Mangoli is one of the islands, to the east of Celebes. Hewitson probably refers to the latter.

Subfamily ELYMNIINÆ.

8. ELYMNIAS (*Melynius*) SAUERI, Distant. Plate DD, Fig. 8 ♀.

*E. saueri*, Distant, Rhop. Malay., p. 65, n. 7, pl. ix, fig. 3, male (1882); *Melynius saueri* (part), Moore, Lep. Ind., vol. ii, p. 161, pl. cxl, fig. 2, male (1894).

HABITAT: Province Wellesley; Tenasserim (*Distant*); Tenasserim; Province Wellesley, Malay Peninsula (*Moore*); Daunat Range, Tenasserim, Burma, March; Perak, Malay Peninsula (*coll. de Nicéville*).

EXPANSE: ♀, 3·6 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *forewing* with the base and the apex reddish-brown, the disc black; costa irregularly spotted with white; the disc crossed by six bluish-white streaks, the anterior streak short and oval, the second long, the third still longer than the second, inwardly widened out into an oval portion, the fourth, fifth and sixth increasing in length, inwardly becoming ochreous-whitish; the sutural area bearing posteriorly a narrow ochreous-whitish line. *Hindwing* reddish-brown, with lengthened ochreous-whitish streaks between all the veins, these streaks being all more or less irrorated with blackish. UNDERSIDE, *both wings* marbled with black as in the male, but the ground-colour much paler, being ochreous-whitish.

Dr. Moore (l.c.) says that the female of *E. saueri* is the *E. kunstleri*, Honrath, I have no idea from whence Dr. Moore got this idea,

which seems to be a very far-fetched one; at any rate the female described above from Perak came to me with typical males of *E. saueri*, and it presents exactly analogous sexual differences as does the allied Indian species *E. (Melynius) malelas*, Hewitson, to which *E. saueri* is most closely allied. It is true that the male of *E. kunstleri*\* has still to be discovered, but so far a single female of that species is alone known, so it is evidently an extraordinarily rare species. *E. gauroides*, Frühstorfer, Berl. Ent. Zeitsch., vol. xxxix, p. 243, pl. xviii, fig. 4 (1894), from W. Java, is allied to *E. kunstleri*. The describer does not state the sex of the type specimen, from the figure it would appear to be a female. The female of *E. saueri* here described is remarkably close to the female of *E. laisidis*, de Nicéville, from N.-E. Sumatra—*vide* Journ. Bomb. Nat. Hist. Soc., vol. xii, p. 137, pl. Y, fig. 7, *female* (1898), the chief difference being that *E. saueri* has the forewing broader and shorter than *E. laisidis*.

Subfamily AMATHUSINÆ.

9. CLEROME SULANA, Frühstorfer. Plate DD, Fig. 9 ♀.

*C. menado sulana*, Frühstorfer, Berl. Ent. Zeitsch., vol. xlv, pp. 49, 50 (1899).

HABITAT: Sula-Mangoli (*Frühstorfer* and *coll. de Nicéville*.)

EXPANSE: ♂, 3·3; ♀, 3·6 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* as in the same sex of *C. chitone*, Hewitson, from Celebes, except that the ground-colour is ferruginous instead of rufous-orange. UNDERSIDE, *forewing* has the discal fuscous line very much more irregular, and the white or pale violet band against it outwardly is reduced to a small patch behind the costa, instead of being broad and reaching the outer margin; there is a small round white-pupilled black ocellus in the upper discoidal interspace which in *C. chitone* is much larger, and is outwardly surrounded by an ochreous ring; otherwise similar. *Hindwing* has the two discal fuscous fasciæ much closer together, owing to the two ocelli beyond the outer fascia being much larger, this is especially noticeable at the anterior end of each fascia, as they are at this point half the distance apart than they are in *C. chitone*; the apical ocellus is twice as large, larger than the subanal one, in *C. chitone* the anterior is the smaller; the submarginal fuscous

\* This name should not be written *kunstleri*, though so given originally. (See *Hornath*, Berl. Ent. Zeitsch., vol. xxxi, p. 353 (1887).)

fascia is much more regular. FEMALE. UPPERSIDE, *both wings* of a deep ferruginous colour, in the same sex of *C. chitone* they are rufous-orange; none of the markings showing through by transparency. UNDERSIDE, *both wings* hair-brown, in *C. chitone* it is "pale rufous-orange"; markings similar to those in the male. It is also near to *C. menado*, Hewitson, from Celebes, but the absence of the narrow band of white behind the apex of the forewing on the underside will distinguish the present species.

Described from one male and three females captured in Mangoli Island by Mr. W. Doherty in November, 1897. Herr Fruhstorfer's description of the species having appeared before mine, I suppress the name I had proposed for it.

Subfamily NYMPHALINÆ.

10. HESTINA NAMOIDES, n. sp. Plate DD, Fig. 10 ♂.

HABITAT: Tse Kou, Western China (*R. P. Dubernard*).

EXPANSE: ♂, 3.3 inches.

DESCRIPTION: MALE. Differs from *H. nama*, Doubleday, which is found in Northern India all along the Himalayas from Kashmir (*Moore*) on the west to Assam on the east, in Burma, the Malay Peninsula, Indo-China, Chia-kou-ho, Omei-shan and Wa-shan—the three latter places in Western China, in N.-E. Sumatra and Eastern Java (*Pagenstecher*), in being smaller. *Forewing* has the entire discoidal cell and five streaks beyond it entire and amalgamating with the innermost of the three marginal series of spots which are found in *H. nama*, as is also the streak in the submedian interspace, which is moreover entire instead of being bifurcated. *Hindwing* has all the bluish streaks very much broader; the outer margin is of a much brighter and paler castaneous, bearing anteriorly three large black spots not found in *H. nama*; the outer margin also is much more rounded and less produced at the anal angle. UNDERSIDE, *both wings* present much the same differences as above, besides which on the *hindwing* the submarginal and marginal series of whitish spots are almost obsolete.

Monsieur Charles Oberthür in *Etudes d'Entomologie*, vol. xx, p. 30, pl. x, fig. 177 (1896), has described and figured a melanic aberration of *H. nama* from Tumlong, Sikkim, calling it *melanina*. In my collection there is a still more remarkable melanic aberration

of *H. nama*, and in the late Mr. Otto Möller's collection, now in the possession of the Hon. Walter Rothschild, there are two other remarkable aberrations of the same species, all three are males from Sikkim. It appears to the present writer that the naming of aberrations is to be deprecated, especially so such as these which are purely individual, it being extremely improbable that second specimens of any one of them identical with the first will be found. I would not have ventured to describe the present species as new, more especially as I possess but a single specimen of it received from M. Oberthür, were it not for the fact that it differs markedly in the outline of the hindwing from *H. nama*, which is not likely to be an aberrational character.

11. NEPTIS (*Phædyma*) NERIO, n. sp. Plate DD, Fig. 11 ♀.  
*N. (Phædyma) heliodora*, de Nicéville (*nec* Cramer), Journ. A. S. B., vol. lxxvii, pt. 2, p. 312, n. 34 (1898).

HABITAT: Kayeli in Buru, one of the Moluccas.

EXPANSE: ♀, 2·8 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *both wings* with all the white markings larger and more prominent than those in *N. amphion*, Linnæus, = *N. heliodora*, Cramer, = *Papilio pellucidus*, Goeze, = *Athyma cerne*, Butler, from Amboyna.\* *Forewing* has two subapical white spots only, the third anteriormost in *N. amphion* being absent in the present species, they are larger also, and rhomboid; the two discal spots in the median interspaces are also larger, and divided only by the black second median nervule; there are two spots on the sutural area against one in *N. amphion*, the anterior placed above the submedian nervure is of the same size as is the solitary spot in that species, while the posterior is twice as large; the inner of the two submarginal series of white spots is also more prominent. *Hindwing* has the discal white fascia of quite a different character: its anterior edge is quite straight and even instead of being highly irregular and uneven, its posterior edge is also much more regular, the band is also wider, tapering to both ends and divided into spots only by the black veins, in *N. amphion* all the spots are well separated from the veins; the two submarginal series of white

\* "*Papilio amphion* is perhaps a *Neptis*" (Kirby, Trans. Ent. Soc. Lond., 1870, p. 147, n. 205). Arrivillius, Kongl. Svenska Vet.-Akad. Handle., vol. xix, n. 5, p. 103, n. 122 a (1882).

spots are also more prominent. **UNDERSIDE**, *both wings* with much the same differences as on the upperside.

Having now obtained both sexes of *N. amphion* from Amboyna I am able to satisfactorily describe the present species, which is represented in my collection by a single example captured by Mr. William Doherty.

12. **CIRRHOCYROA AORIS**, Doubleday and Hewitson. Plate DD, Figs. 12, 13, *gynandromorphous example*.

*Cirrochroa aoris*, Doubleday and Hewitson, Gen. Diurn. Lep., vol. i, p. 158, n. 1, pl. xxi, fig. 2, *male* (1848); id., Westwood, Trans. Ent. Soc. Lond., 1880, p. 113, pl. ii, *gynandromorphous examples*.

**HABITAT**: Probably Nepal, Sikkim, Bhutan, throughout Assam, and the Northern Shan States of Upper Burma.

The gynandromorphous specimen here figured is in the collection of Mr. Paul Möwis, who has kindly lent it to me for description, and was obtained in Sikkim by his native collectors. It is absolutely bilateral, the left-hand side and left fore-leg being male, while the right-hand side and right fore-leg are female, Professor Westwood having figured and described a specimen in which the opposite sexes are reversed, the feminine side being on the left, the masculine on the right. He also figures and describes a second specimen of this species in which the coloration of the two sexes is strangely commingled in the right-hand pair of wings, while the left-hand pair is entirely male, the body and fore-legs being masculine. Professor Westwood did not record the exact locality from whence his specimens came, but said they are in the collection of the British Museum.

#### Family LYCÆNIDÆ.

13. **THYSONITIS ILLUSTRIS**, Röber. Plate EE, Figs. 14 ♂, 15 ♀.

*Plebeius illustris*, Röber, Iris, vol. i, p. 53, pl. iv, fig. 6, *female* (1886); *Thysonitis illustris*, H. H. Druce and Bethune-Baker, Proc. Zool. Soc. Lond., 1893, p. 552; id., de Nicéville and Kühn, Journ. A. S. B., vol. lxvii, pt. 2, p. 266, n. 56 (1898).

**HABITAT**: Ké Isles.

**EXPANSE**: ♂, 1·4 to 1·5; ♀, 1·5 inches.

**DESCRIPTION**: **MALE**. **UPPERSIDE**, *both wings* non-iridescent rather dull blue, with a very narrow black marginal line, rather broader towards the anal angle and on the posterior portion of the abdominal margin of the hindwing. *Forewing* with the costa narrowly black; an obscure

irrorated white patch on the centre of the disc. *Hindwing* with the broad discal white band of the underside showing through but more or less irrorated with blue scales, the portion anterior to the first subcostal nervule pure white; a rather short black white-tipped tail from the termination of the first median nervule not shown in Herr Röber's figure. **UNDERSIDE**, *both wings* white. *Forewing* with a broad black costal band occupying the anterior half of the discoidal cell and extending along the outer margin where it is broadest posteriorly and bisected by a narrow white line, with another anteciliary thin white line, both these lines ending anteriorly at the lower discoidal nervule. *Hindwing* with a broad basal black band not reaching the costa, being sharply bounded by the costal nervule; the posterior third of the wing also black, bearing in its middle a broad band of spots of beautiful metallic green divided only by the black veins, each of these spots is again centred by a round black spot; a thin anteciliary white line cut by the veins. *Cilia* black throughout. **FEMALE**. **UPPERSIDE**, *both wings* black, the base irrorated with brilliant metallic green scales. *Forewing* with a broad discal white area reaching into the cell but well separated from the outer margin, and occupying the basal two-thirds of the inner margin; a submarginal thin metallic green line from the submedian nervule to the second median nervule. *Hindwing* with a broad discal white band, broadest in the middle, narrowest on the costa, its anterior edge straight, its posterior edge irregular in one specimen but regular in another; a submarginal series of five metallic green lunules between the veins. **UNDERSIDE**, *forewing* as in the male, except that the outer black border is considerably broader. *Hindwing* as in the male. *Cilia* white on the hindwing and at the anal angle of the forewing, anteriorly black.

The type specimen described from Tual in the Key Islands is a female, not a male as stated by Messrs. Druce and Bethune-Baker. Herr Röber's specimen appears from its photographic representations to have been mended and to have lost its tails, as correctly pointed out by the above-mentioned writers.

14. **THYSONITIS KORION**, H. H. Druce and Bethune-Baker. Plate EE, Fig. 16 ♀.

*T. korion*, H. H. Druce and Bethune-Baker, Proc. Zool. Soc. Lond., 1898, p. 547, pl. xlvi, fig. 8, male; id., de Nicéville and Kühn, Journ. A. S. B., vol. lxxvii, pt. 2, p. 266, n. 55 (1898),

HABITAT : Ké Isles.

I take the opportunity of figuring the female of this species, described by me in the Journ. A. S. B., the male having previously been figured by Messrs. Druce and Bethune-Baker.

15. THYSONITIS TRIOPUS, de Nicéville. Plate EE, Fig. 17 ♀.

*T. triopus*, de Nicéville, Journ. A. S. B., vol. lxvii, pt. 2, p. 265, n. 54 (1898).

HABITAT : Ké Isles.

The female type specimen is here figured, the species being based on that sex. The male is indistinguishable from the same sex of *T. apollonius*, Felder.

16. ARRHOPALA COMICA, n. sp. Plate EE, Fig. 18 ♀.

HABITAT : Lwe Long, near Bhamo, Upper Burma, 5,000 ft.

EXPANSE : ♀, 1·7 inches.

DESCRIPTION : FEMALE. UPPERSIDE, *forewing* black ; the whole of the disc from the base of the wing to one-fourth from the outer margin, and from the subcostal nervure to the inner margin shining purple, the end of the discoidal cell marked with a wedge-shaped tooth of the black ground-colour. *Hindwing* reddish-brown, the basal area occupying about one-third of the total area of the wing shining purple ; the anal lobe reddish ; the tail very broad at the base, thence tapering to a fine point, reddish without a white tip. UNDERSIDE, *both wings* light reddish-brown ; all the markings black, of a curious character and unlike any species of the genus known to me. *Forewing* with the three usual increasing markings in the cell, the two outer ones with a spot each anterior to them on the costa ; two spots below the cell divided by the first median nervule ; a discal highly irregular macular band, which is broadest on the costa, tapering to a mere dot behind the first median nervule ; a very obscure macular submarginal fascia. *Hindwing* with the six usual basal spots ; a prominent discal macular fascia commencing behind the costal nervure towards the apex of the wing, terminating on the middle of the abdominal margin in front of the internal nervure ; beyond this is another fascia on the disc, each spot of which is represented by several black dots in a ring ; the submarginal fascia as on the forewing, but even more obscure ; no anal metallic markings whatever.

This very comical-looking species may be an aberration or "sport," but I am at a loss to conjecture of what species it can be an aberration,

more especially, as the shape of the tail with its broad base is very aberrant. On the upperside it is coloured and marked as in the same sex of *A. alemon*, mihi, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 371, n. 20, pl. F, figs. 20, *male*, 21, *female* (1891), which flies with it.

Described from a single example taken by Major F. B. Longe, R.E., on 12th March, 1898.

### Family PAPILIONIDÆ.

#### Subfamily PIERINÆ.

#### 17. METAPORIA PARACRÆA, n. sp. Plate EE, Fig. 19 ♂.

HABITAT: Tse Kou, Western China (*R. P. Dubernard*).

EXPANSE: ♂, 3·25 and 3·40 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* differ from those of "*Pieris*" *acræa*, Oberthür, in having all the black markings of a very much deeper shade, deep black instead of dull black (judging from Oberthür's figure), and many of the broadly-bordered-with-black veins themselves defined with pure white; the veins in *P. acræa* appear to be entirely black. *Forewing* has the curved discal series of five white spots very much smaller and all well isolated, in *P. acræa* the three anterior ones would touch each other were they not divided by the black veins; the marginal short white streaks between the veins much smaller and quite narrow instead of being almost quadrate. *Hindwing* has the five spots beyond the discoidal cell very much narrower; and the marginal spots are also smaller. UNDERSIDE, *both wings* as on the upperside, except that all the white markings are tinted with yellow, and that the *hindwing* on the outer margin has a pair of elongated whitish streaks in each nervular interspace. Also near to *Metaporis lotis*, Leech, described from Wa-shan, Ta-chien-lu, Pu-tsu-fong and Moupin, all in Western China, in my collection from Pa Tse Fang and Tien-Tsuen, in Western China, received from M. Charles Oberthür and named by him "*Pieris acræa*," but differing therefrom in many salient characters as will at once be evident by comparing Mr. Leech's figure of *M. lotis* with mine of *M. paracræa*. *M. oberthuri*, Leech, from Chang-yang in Central China, and Onei-shan in Western China, is another allied species, but is altogether a much whiter insect.

Described from two examples kindly sent to me by M. Charles Oberthür. I may note that M. Oberthür does not record the exact habitat of *P. aceræa*, recording it from Thibet only, and that neither Mr. Leech nor I have seen a specimen of it. The figure gives one the impression of having been taken from an abnormal specimen, which impression is heightened by the curious shape of the abdominal margin of the hindwing as figured.

Subfamily PAPILIONINÆ.

18. PAPILIO PANOPÆA, n. sp. Plate EE, Fig. 20 ♂.

HABITAT: Tse Kou, Western China (*R. P. Dubernard*).

EXPANSE: ♂, 2·7 and 3·2 inches.

DESCRIPTION: MALE. Differs from *P. eurous*, Leech,\* from Changyang, Central China, and Moupin, Western China (*Leech*), and from Ta-tsien-lu, Western China (*coll. de Nicéville*), in the *forewing* being slightly broader, as are also all the black bands, thereby reducing the width of the bands of the white ground-colour between them, and the *hindwing* lacking altogether on the UPSERSIDE the median black band seen in *P. eurous*; the innermost of the three marginal bands of *P. eurous* which extends from the anal black area to the costa is incomplete in *P. panopæa* as it does not reach anteriorly beyond the second subcostal nervule, consequently the hindwing of *P. panopæa* is much whiter than the corresponding wing of *P. eurous*.

Described from two specimens which I owe to the kindness of M. Charles Oberthür.

19. PAPILIO PARUS, n. sp. Plate EE, Fig. 21 ♂.

HABITAT: Tse Kou, Western China (*R. P. Dubernard*).

EXPANSE: ♂, 3·2 inches.

DESCRIPTION: MALE. Differs from *P. tamerlanus*, Oberthür,† from Moupin, Western China (*Oberthür*), Moupin, Wa-ssu-kow and Chow-pin-sa, Western China (*Leech*); Western China (*Rothschild*), Moenia, Thibet (*coll. de Nicéville*), in the *forewing* having the fourth black band from the base of the wing abbreviated, reaching only to the middle

\* *Papilio eurous*, Leech, Butt. China, Japan, and Corea, vol. ii, p. 521, pl. xxxii, fig. 3, male (1893); id., Rothschild, Nov. Zool., vol. ii, p. 408, n. 166 (1895).

† *Papilio tamerlanus*, Oberthür, Et. d'Ent., vol. ii, p. 13, n. 1, pl. ii, fig. 1, male (1876); id., Leech, Butt. China, Japan, and Corea, vol. ii, p. 521 (1893); id., Rothschild, Nov. Zool., vol. ii, p. 409, n. 169 (1895).

of the discoidal cell instead of extending completely across it and invading the base of the second median nervule, it is also much narrower; the submarginal white fascia is also half the width, thus giving the outer area of the wing a much blacker appearance.

Described from a single example received from M. Charles Oberthür.

Suborder HETEROCERA.

Family SPHINGIDÆ.

20. SATASPES HAUXWELLII, n. sp. Plate EE, Fig. 22 ♀.

HABITAT: Taungoo, Upper Tenasserim, Burma.

EXPANSE: ♀, 2·6 inches (66 millim.).

DESCRIPTION: FEMALE. UPPERSIDE, *both wings* deep indigo-blue. *Forewing* with a rather broad violet-grey band at the extreme base; then a rather broader deep black band; then another violet-grey band, as broad as the basal band, but bisected by a narrow black line; then a V-shaped black marking, the area enclosed by it of a shining golden bronze colour; then a broad oblique discal shining golden bronze area crossed by the indigo-blue veins; the outer margin broadly of the ground-colour. *Hindwing* with the costa white; the base of the wing and on the projection of the outer margin of the wing near the abdomen deep indigo-blue; the rest of the wing shining golden bronze crossed by the indigo-blue veins. UNDERSIDE, *both wings* deep indigo-blue; a narrow basal white line. *Forewing* with the basal half of the wing glossed with golden bronze. *Hindwing* glossed almost throughout with golden bronze. *Antennæ* black, the tip ochreous. *Thorax* above deep indigo-blue, but bearing a large shining paler area with a few scattered yellow scales on it. *Abdomen* above deep indigo-blue, at the sides bearing four prominent paler segmental spots, the dorsal area paler than the lateral areas, shining; the lateral and anal tufts of hairs—which are large—deep indigo-blue; beneath the abdomen is dull ferruginous along the middle line, and the lateral and anal tufts are of the same colour.

Allied to *S. infernalis*, Westwood, but nearer to *S. ventralis*, Butler, from a single specimen of which in the collection of the Indian Museum, Calcutta, from Sikkim, it differs in having fewer yellow scales on the upperside of the thorax, no yellow collar, the coloration of the wings much richer, and all the markings more prominent;

on the underside of both wings there is a white basal line; and the abdomen beneath has the last four segments obscurely marked with dull ferruginous, in *S. ventralis* these markings are very much larger, very prominent, and pale gamboge-yellow.

I have named this handsome moth (which is unique) after Mr. T. A. Hauxwell, Deputy Conservator of Forests, who is an enthusiastic collector of birds and *Lepidoptera*. It is a beautiful mimic of the very common large blue carpenter bee, *Xylocopa uvripennis*, Lepeletier, a male of which I have figured—for the first time—for comparison, on Plate EE, Fig. 23. Colonel Bingham tells me that he has also obtained this new moth in the Ataran Valley, Central Tenasserim.

Family SESIIDÆ.

21. MELITTIA BINGHAMII, n. sp. Plate EE, Fig. 24 ♂.

HABITAT: Thandaung, 4,000 ft., Tenasserim, Burma.

EXPANSE: ♂, 1·4 inches (35 millim.).

DESCRIPTION: MALE. UPPERSIDE, both wings hyaline, colourless, the veins and the markings black; cilia fuscous, with a slight dull ferruginous tinge. Forewing with all the margins narrowly black, the apex and outer margin rather broader than the costa and inner margin; a narrow black bar from the costa to the inner margin at the end of the discoidal cell, giving off a short tooth into the cell; the basal two-thirds of the wing with two hyaline interspaces; the outer third of the wing with six, the second from the costa small. Hindwing unmarked. Antennæ black above, dull ochreous below. Palpi pale yellow mixed with black hairs. Thorax above clothed with shining "old gold" setæ, beneath pale yellow. Abdomen above deep black, with narrow yellowish segmental bands, beneath pale yellow. Foreleg yellow. Midleg has the femur yellow, the tibia black with a few iridescent hairs, white in some lights, amethystine in others, tarsi black. Hindleg greatly developed, with very long hairs, the femur above black, with a thick outer mane of yellow hairs, the tibia and tarsi deep black, the leg beneath black, with three tufts of differently-coloured hairs, the anterior one is entirely iridescent opaline, the middle one is yellow with a few opaline scales, the posterior one entirely yellow.

Apparently nearest to *M. kulluana* (the *M. kuluana* of Hampson) from Kullu (the Kulu Valley in the Western Himalayas), from which

it differs in its larger size (1.4 as against 1.2 inches in alar expanse), the transparent apical area of the forewing is traversed by five instead of four veins, the abdomen beneath is pale yellow not bluish-white, and the femur and tibia of the hindleg are not clothed with dull chestnut-red and yellow hairs, the hairs being entirely yellow. From the figure of the type specimen of *M. kulluana* in Ill. Lep. Het. B. M., vol. vii, p. 98, pl. cxxxv, fig. 12 (1889), it chiefly differs in the apex of the forewing being much more produced and the hindleg being much longer.

Described from a single specimen, which I have named in honour of Colonel C. T. Bingham, so well known in many branches of Natural History, who captured it and presented it to me.

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## EXPLANATION OF THE PLATES.

## PLATE CC.

|         |                                                         |        |             |
|---------|---------------------------------------------------------|--------|-------------|
| Fig. 1. | <i>Ideopsis iza</i> , Fruhstorfer                       | ... .. | ♂ ♀, p. 158 |
| „ 2.    | <i>Danais (Lintorata) kuckenthali</i> , Pagenstecher    | ... .. | ♂, p. 159   |
| „ 3.    | <i>Euploea (Nacamsa) clorinde</i> , Staudinger          | ... .. | ♂, p. 161   |
| „ 4.    | <i>Zethera musa</i> , Felder                            | ... .. | ♀, p. 162   |
| „ 5.    | <i>Lethe (Zophoessa) sura</i> , Doubleday and Hewitson— |        |             |
|         | Upperside. Gynandromorphous example.                    |        | p. 163      |
| „ 6.    | „ Underside                                             | „      | p. 163      |

## PLATE DD.

|       |                                                    |        |           |
|-------|----------------------------------------------------|--------|-----------|
| „ 7.  | <i>Acroptalmia chionides</i> , n. sp.              | ... .. | ♀, p. 163 |
| „ 8.  | <i>Elymnias (Melynius) saueri</i> , Distant        | ... .. | ♀, p. 164 |
| „ 9.  | <i>Clerome sulana</i> , Fruhstorfer                | ... .. | ♀, p. 165 |
| „ 10. | <i>Hestina namoides</i> , n. sp.                   | ... .. | ♂, p. 166 |
| „ 11. | <i>Neptis (Phædyma) nerio</i> , n. sp.             | ... .. | ♀, p. 167 |
| „ 12. | <i>Cirrhochroa aoris</i> , Doubleday and Hewitson— |        |           |
|       | Upperside. Gynandromorphous example.               |        | p. 168    |
| „ 13. | „ Underside                                        | „      | p. 168    |

## PLATE EE.

|       |                                                  |        |           |
|-------|--------------------------------------------------|--------|-----------|
| „ 14. | <i>Thysonittis illustris</i> , Röber             | ... .. | ♂, p. 168 |
| „ 15. | „                                                | ... .. | ♀, p. 168 |
| „ 16. | „ <i>korion</i> , H. H. Druce and Bethune-Baker. | ... .. | ♀, p. 169 |
| „ 17. | „ <i>triopus</i> , de Nicéville                  | ... .. | ♀, p. 170 |
| „ 18. | <i>Arrhopala comica</i> , n. sp.                 | ... .. | ♀, p. 170 |
| „ 19. | <i>Metaporia paracræa</i> , n. sp.               | ... .. | ♂, p. 171 |
| „ 20. | <i>Papilio panopæa</i> , n. sp.                  | ... .. | ♂, p. 172 |
| „ 21. | „ <i>parus</i> , n. sp.                          | ... .. | ♂, p. 172 |
| „ 22. | <i>Sataspes haurwvelli</i> , n. sp.              | ... .. | ♀, p. 173 |
| „ 23. | <i>Xylocopa auripennis</i> , Lepeletier          | ... .. | ♂, p. 174 |
| „ 24. | <i>Melittia binghamii</i> , n. sp.               | ... .. | ♂, p. 174 |

## MISCELLANEOUS NOTES.

NO. I.—ACCOUNT OF A REMARKABLE SWARMING FOR BREEDING PURPOSES OF *SPHEX UMBROSUS*, CHRIST, WITH NOTES ON THE NESTS OF TWO OTHER SPECIES OF *SPHEX* AND OF CERTAIN OF THE *POMPILIDÆ*.

All the species of wasps belonging to the genus *Sphex*, known to me, are eminently fossorial in their habits. Diggers of the earth, I have never found them taking advantage of odd holes in trees wherein to make their nests, as many of the *Pompilidæ*, a family also belonging to the *Fossores*, do. Nor does one ever see *Sphex* becoming a mason and building herself a mud nest as her near cousin *Sceliphron* does. Honest hard digging and delving and a nest in the warm earth are good enough for her. To those who have paid any heed to the ways of insects I need not say that it is only the female that does the work. The gentleman of the family takes no part in the house-building.

In digging *Sphex* has much the action of a dog, scraping and scratching away with her powerfully spined forelegs and, when the loosened earth accumulates behind her, flicking it to a distance with a rapid kick or two of her long hindlegs.

Up to last week I was under the impression that *Sphex* never bred in large companies. Two or three nests excavated close together is the most I have found. However, one day last week Major Birch, R.A., Commanding the Mountain Battery stationed at Mandalay, told me that an extraordinary swarm of brilliantly metallic "flies" had suddenly made an appearance near the Artillery Lines, and had commenced vigorously digging holes in the ground round the end of one of the barracks.

It was late in the evening when I heard this, but, accompanied by Major Birch, I at once went off to inspect the swarm. I found that for about forty or fifty yards round the west end of the barrack the ground had been literally riddled with holes. It was getting dark and the insects had evidently retired for the night, possibly into their nest holes, but I caught a glimpse of two belated individuals and recognised them as unmistakeably *Sphex* of some kind.

Next morning having a lot of office work I was unable to go collecting, but Major Birch was good enough to catch and send me over a bottleful of the insects. They were all females of one species and, as I had half guessed from the glimpse I had had the night before, belonged to a variety of the widely-spread *Sphex umbrosus*, Christ. They differed, however, from all varieties of that insect that I have seen in a few particulars. Resembling *Sphex umbrosus*, var. *argentifrons*, Lepel., in having the base and apex of the wings stained with dark fuscous, unlike that variety, these had, instead of all black legs, the basal three-fourths of the tibiæ and the whole of the femora of the intermediate and posterior legs blood red.

I may note here that in my volume on the bees and wasps of India in the Fauna of India series only the typical *Sphex umbrosus*, Christ, is described.

To-day I went down in the morning to see the swarm by daylight, and a marvellous sight it is.

The site of the barrack, round which the *Sphex* was swarming, was on a slope. To get a level space for the building the ground had been cut away to the west, leaving a perpendicular bank, extending along three sides of the end of the barrack at a distance from the edge of the lower verandah, of from twelve to fifteen feet. This space for a length, as I have said, of forty or fifty yards, as also the perpendicular face of the bank itself, was one mass of the wasps' burrows. There must be some thousands of the insects about, and the loud buzzing, with the incessant motion of the brilliant little creatures flying, digging, walking around, is most astonishing. When disturbed they rose in clouds and flew about one's legs, but did not attempt to attack, as the true wasps (*Vespidæ*) or the honey bees (*Apis*) would have done.

A noticeable thing was that the openings to the burrows all faced the verandah, the direction of the burrows radiating outwards from the barrack. One or two that I dug up showed that they had been tunnelled obliquely into the ground for about a foot or so and then, turning at an angle upwards, ended in a slightly enlarged oval chamber. If one stood still the wasps took no notice but continued their work unconcernedly. Some walking about with the alert jerky air and quivering of the wings peculiar to fossorial wasps, others dug on industriously, paw over paw like any terrier, while others continued bringing in their captures of green grasshoppers stung into a state of unconsciousness. These they stuffed, and pulled and pushed into their burrows always head downwards. The grasshoppers I found belonged to the family *Locustidæ*, and all that I saw were in the immature stage, unable to fly.

Of other species of *Sphex*, I have found and dug up at various times the nests of *Sphex aurulentus*, Fabr., var. *ferrugineus*, Lepel., and *Sphex nigripes*, Smith. The latter I found provisioning its nest like *S. umbrosus*, with immature *Locustidæ*; while in the nests of *Sphex aurulentus* I found only the immature forms of some large species of *Acrididæ*. It is probable that the species of *Sphex* keep to *Orthoptera* as their prey; each species confining itself to some one species of locust or grasshopper, for the captures I found in the nests of *S. nigripes* belonged to a different and larger species of the *Locustidæ* from the species I found *Sphex umbrosus* bringing in as noted above.

The majority of the species of the *Pompilidæ*, members of the genera *Pompilus*, *Pseudagenia*, *Paragenia*, *Salius*, etc., provision their nests with spiders, again each species of wasp selecting and keeping to one species of spider. A few, e.g., *Pompilus braccatus*, and *Salius verticalis*, I have found hunting and carrying off cockroaches, but spiders are par excellence their prey. I once saw and timed a fight between the huge fossorial wasp *Salius sycophanta*, Grebodo, and a very large species of spider (*Galeodes*) which is common in

the forests of Tenasserim, living in holes at the roots of trees and clumps of bamboo. I give a copy of the note I made at the time :—

Camp Ataran, 16th October, 1891. Found the nest of a large hairy spider, a *Galeodes*, behind my tent among the roots of a clump of bamboos. The animal was outside and I tried to catch it, repulsive looking as it was, with a pair of forceps, but he, or she rather, escaped and ran down a hole. On digging it up I found the hole ran obliquely into the ground for about two feet and ended in a slightly enlarged chamber. I had dug gently and carefully to avoid injuring the spider and thus came on her crouching inside. I tried to pick her up with the forceps, but with a sudden leap she sprang on to my sleeve and began running up my arm. This was too much for me and I gave a violent jerk to my arm, sending spider and forceps flying. The spider fell close to the side of my tent on a rather bare space and then, to my astonishment, scuttled for its life. I followed and caught sight of the cause of its alarm. A beautiful large *Salix* with black body and tawny red wings which I recognised as *S. sycophanta* was flying in an excited way round and round. Looking for the spider, after a hunt, I spied her crouching between a tuft of grass and a bundle of wooden tent pegs that had been thrown down. She had tucked in her legs and made herself as small as she could, and I was struck by the resemblance of her reddish-brown furry body to the colour of the ground. Quite a long time the *Salix* kept quartering the ground and it seemed to me quite evident she was hunting by sight, for as long as the spider remained motionless, although the wasp passed two or three times within an inch or so, she never seemed to find it out. At last, why I don't know, the spider made a rush trying to get to the shelter of a biggish clump of thatching grass about a yard away. Like a flash the *Salix* swooped down on her and then commenced a rough and tumble fight on the ground, both combatants rolling over and over so fast that I was quite unable to see whether the wasp managed to sting the spider or the spider managed to bite the wasp. However, the spider in a few seconds shook herself free and again tried to reach shelter, but in vain, the *Salix* with a loud buzz flew right over and alighting on the ground beyond faced round and intercepted her. Then commenced a curious scene: the spider stood on the defensive, turning and facing the wasp, as the latter with quivering wings and abdomen paced round and round, evidently watching an opportunity to close again, and the spider quite on its guard, standing up and keeping a vigilant eye on her enemy. This went on, I should think for fully ten minutes until, perhaps, tired out and taking advantage of the wasp's stopping still for a second, the *Galeodes* made a second rush only to find herself grappled by her enemy. This time the hand-to-hand or rather sting-to-jaws fight did not last so long, when the spider shook herself clear of her antagonist she was evidently injured. Her rush for shelter was a crippled run and it was clear she was nearly done for. The wasp, apparently as fresh as ever, leisurely flew after her, caught her up and

this time I distinctly saw the sting go in once, twice, three times, the poor spider making but feeble resistance and, unable to bite her enemy, lay still at length writhing a little. Then for a minute or so *Salix* danced her dance of triumph, parading round her prey in a quick jerky sort of walk, flirting her wings and quivering her antennæ. Finally, she approached the comatose, if not dead, spider and deliberately bit off the long strong legs. Then, half flying with it and anon dragging it along the ground, she conveyed her shikar to her nest, which was excavated at the foot of a large *padouk* tree (*Pterocarpus indicus*) about fifty yards from my tent. Here she disappeared, and I had little difficulty in finding the entrance to her burrow. Placing my butterfly net over its mouth, I waited. In about five minutes out she came and I bottled her. Then I dug up her nest and found the bodies of no less than five *Galeodes*, all deprived of their legs and all with a single egg attached to the fur on the underside of their stomachs. So far as I could make out all the spiders were quite dead, except the last caught which still moved feebly when touched. As I said above, I timed the fight I have described. From the time I saw the wasp looking for the spider to the time the latter lay moribund, having its legs sawed off, was exactly thirty-five minutes.

C. T. BINGHAM,

MANDALAY, 19th October, 1899.

Conservator of Forests.

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NO. II.—A VARIETY OF THE COMMON MYNA, *ACRIDOTHERES TRISTIS*, LINN.

To-day my man brought me in a variety of this species in peculiar plumage. I append a description:—Head, neck and upper breast white, slightly tinged with pale primrose yellow, one or two blackish feathers on lores, round the eye, on the ear coverts; lower plumage vinous brown as in the usual form; abdomen and lower tail coverts white; the thighs and their coverts mixed with white; upper plumage mixed brown and white; rectrices black tipped white; median pair white with a hard terminal band black and also tipped with white; primaries blackish with the bases white, secondaries and inner secondaries vinous brown; primary and median coverts white. Colours of soft parts, bill, orbital skin, eyelids, legs, feet and claws, yellow; inside mouth fleshy. The irides were damaged with shot, so it was impossible to state their colour.

There is also a sooty band below the white of the upper breast. The inner secondaries are both brown and white, the abdomen is white tinged with vinous. On dissection the specimen proved to be female.

Unfortunately this bird was still moulting and so the plumage is not very good. It was shot in company with another of the usual form. My man had seen it here for several days, but whenever he brought out his gun it used to disappear; other people it did not seem to mind, feeding close to their houses on the grain spread out to dry.

C. M. INGLIS.

JAINAGAR FACTORY, MADHUBANI, 28th September, 1899.

No. III.—NOTE ON THE WEB-SPINNING HABITS OF THE  
 “RED ANT,” *ECOPHILA SMARAGDINA*.

In 1896 I had the honour to read before the Entomological Society of London (Proceedings, Ent. Soc. of London, 1896, p. IX,) a note on the web-spinning habit of the ant *Ecophila smaragdina*, Fabr., in which I quoted the observations of Mr. W. D. Holland of Balangoda, Ceylon, who informed me that he had actually seen the parent ants holding their larvæ in their jaws and utilizing them as spinning machines. A similar observation had, I believe, been previously recorded from India. I have just now been able to corroborate this supposed fact from my own personal observation. Having found some leaves newly fastened together by the ants, I separated them and set myself to watch the proceedings of the occupants. The edges of the leaves were quickly re-drawn together in the usual manner, the ants stretching across the gap and seizing the opposite edge with their jaws. After the two edges had been approximated, a row of ants still held them firmly in position and so matters remained for a long time without the formation of any web-like matter. I should mention that there were no larvæ amongst the occupants of these particular enclosures. After watching for nearly an hour, during which time no further progress had been made, I went in to “tiffin.” On my return, an hour later, I found the spinning process actively progressing, and there, sure enough, were the small white grubs being passed backwards and forwards across the sutures and gaps in the walls of the shelter. Each grub (there were apparently only two of them) was held in the jaws of one of the worker ants and its movements directed as required. A continuous thread of silk was proceeding from the mouth of the larva. It is probable that only fully grown larvæ, ready to construct their cocoons, are employed for the work. On looking about for the nests from which the web-spinners must have been procured, none could be found nearer than the top of an adjacent “jack-tree,” which doubtless accounts for the considerable time that elapsed before the rent was repaired. Messengers had to be despatched to headquarters for the weaving members of the community.

E. ERNEST GREEN,

Govt. Entomologist.

R. B. GARDENS, PARADENIYA,  
 CEYLON; 25th October, 1899.

No. IV.—EGG-BLOWING AND ITS DIFFICULTIES.

All birds'-egg collectors must on many occasions have experienced the vexation, amounting not rarely to actual grief, caused by finding a valued clutch of eggs so hard set, as to render blowing difficult, if not impossible; and I think from my own experience the following procedure, which I am not aware of anyone but myself having practised, worthy of publication, and trial by others. It occurred to me after taking my 5th clutch of *Brachypternus aurantius*, all endeavours to blow the eggs on every occasion having proved

equally futile. On this occasion I had spent about half an hour using every endeavour to rid the first egg of its contents, and finally, in spite of a large disfiguring hole from which all else had been evacuated, I found that the head refused to budge. I filled the egg with water and placed it hole uppermost on my table, intending to try the results of maceration, this at about 6 p.m. one evening. On the following morning with no effort the head came out. The other eggs of the same clutch I treated similarly, making only moderate holes, and I found no difficulty in blowing all.

I have since tried this method on many occasions and with wonderful success. Of course there must be a limit to its effects, but I find in those cases where after some trouble most of the contents have been liberated and where a limb protrudes, portion of which may be got away, it is wisest to go no further but to try maceration, and I think I may venture to say that an egg is blowable in this way perhaps three days later on in the incubation (of moderate sized birds) than the usual methods adopted can render it so.

In the hills no doubt the period of maceration would require to be more lengthy.

The egg is left with an odour of putrefaction which I overcome by blowing in weak Condy's fluid.

F. WALL, CAPT., I.M.S.

RANGOON, 20th October, 1899.

#### NO. V.—OCCURRENCE OF THE WHITE-FACED STIFF-TAIL DUCK AT MARDAN.

On November 12th, 1899, on a favourite haunt of Duck some three miles from Mardan, known as the Long Pond, I shot an extraordinary looking bird, which, directly I had it in my hand, I knew to be a specimen of the White-faced Stiff-tail Duck (*Erismatura leucocephala*).

I was riding in the morning along the side of the nullah (for this so-called Long Pond is in reality a nullah some 600 yards long of varying width and winding course, with groups of rushes here and there at its bends) and had just drawn a favourite corner blank, when I saw a solitary bird in the middle of the pond that looked in the distance more like a pochard than anything else. On getting closer, however, though its head and the carriage of its neck gave it the appearance of a duck, its tail, which it carried cocked at a right angle to its body, and its habit of constantly diving and remaining under the surface for a considerable time, led me to doubt whether it was a duck at all. Without dismounting for a nearer inspection I rode off to tie up my pony, determined to return and shoot it for the sake of identification.

On coming back I found the bird very much in the same place; but as I approached a hawk came on the scene and hovered over it evidently imagining that it had found its breakfast, and I sat down to see what would happen and

in order to watch the bird more intently before shooting it. What did happen was that whenever the hawk poised itself in air preparatory to striking, the duck dived incontinently, and on re-appearing after some 20 to 30 seconds immediately disappeared again, keeping all the time very much in the same place.

After some five minutes of this the hawk went off disappointed, and I now approached nearer still. I was more than ever struck by the very peculiar appearance of the bird; it was swimming very low in the water, was of a dusky brown, almost blackish colour with white bars above and below the bill, the lower broader than the upper one; its tail was carried when swimming always at a right angle to the body and was thin, stiff, and wedge-shaped with the angles rounded off; when it dived the tail was straightened out, and then appeared much longer and was the last thing to disappear under water. After watching it for some time, and since it would not rise as I came nearer, but merely swam away from me diving every now and then, I ran up after one of these disappearances and shot it as it rose.

Its measurements were as follow:—

Length  $16\frac{1}{2}$  inches, wing  $6\frac{1}{2}$  inches, tail from vent  $3\frac{3}{8}$  inches. Tarsus  $1\frac{3}{8}$  inches, hind toe and claw  $2\frac{3}{4}$  inches. Bill at front  $1\frac{3}{4}$  inches. Bill from gape  $1\frac{7}{8}$  inches. Breadth across back between wings  $4\frac{1}{2}$  inches. The tail consisted of 19 (these were carefully counted two or three times over) narrow linear feathers, with fine, narrow, short, and separate webs, bare at the tips, stiff and spinous; it reminded one, when it was first seen and still wet, not a little of the fin of a fish.

The bill was blackish-plumbeous, curiously swollen at the base; the irides brown, the legs dark plumbeous. The description given on pp. 436-437 of the Appendix to the 3rd Volume of Hume and Marshall's Game Birds of India, Burma and Ceylon is so closely applicable to the present specimen in most of its details that I merely give the following slight variations:—

“A narrow white stripe lightly streaked with brown runs from the base of the upper mandible on each side to the base of the occiput, both stripes nearly meeting in the middle line behind, and broader behind than in front. Below these, from the gape, runs a brown stripe, the feathers edged with yellowish-brown, broader behind than in front. On the breast the tips of the feathers are of an almost chestnut tinge as far as the upper part of the breast is concerned, passing to a less rufous and a lighter yellowish-brown lower down in the middle and to a darker and less distinct pencilling on the sides of the lower chest and abdomen. About the vent is a little dull white, by no means a pure white. The bird was a female.”

A. J. MACNAB, F.R.C.S., CAPT., I.M.S.,

Medical Officer, Q. O. Corps of Guides,

MARDAN, PESHAWAR DISTRICT, November, 1899.

No. VI.—PARTURITION OF AN *ECHIS CARINATA*.

With reference to a question raised by Mr. E. C. Cholmondeley in his note in the last number of this Journal, concerning the parturition of viviparous snakes, I may mention that while I was stationed at Trichinopoly, an *Echis carinata* that I had had in my possession for some weeks (suspecting pregnancy) gave birth to 12 young. This happened on the night of the 7th August, 1896, but unhappily as I was ignorant of the event until the morning of the 8th, I could not attend the accouchement.

The mother did not add to her original brood, for I kept her for some time afterwards. In spite of the fact that there was no possible means of escape from their prison box, the brood decreased in numbers without any dead bodies being found and for which a search was instituted, and this suggested to me that the mother might have preyed on her offspring. She had live frogs put in daily to tempt her should she have felt hungry, so there was no excuse for such behaviour which indeed I failed to verify.

Each of the young cast a slough shortly after birth (before the next night). One specimen I measured was  $4\frac{2}{3}$ " in length.

F. WALL, CAPT., I.M.S.

RANGOON, 21st December, 1899.

## No. VII.—KINGFISHERS KILLING BIRDS.

If it is not generally known that kingfishers occasionally kill small birds, possibly the following instance of their doing so may be of interest.

Water is terribly scarce in these parts, most of the rivers and tanks being long since dry, and perhaps these kingfishers were compelled by stern necessity to change their diet. My camp was pitched under a huge Banyan tree recently (where, by the way, I noticed no less than 23 specimens of birds within a few yards of my tent) and one afternoon a kingfisher, *Halcyon fuscus*, made a determined attack on a bird which escaped with the loss of a cloud of feathers. Next day, however, the kingfisher was more successful, for I saw it accompanied by its mate fly past me carrying a small bird in its bill. They flew into a big tamarind tree where, I presume, they discussed their breakfast. Three magpies also mobbed and killed and carried away a full-grown bulbul from below the same tree the previous day, but I believe their carnivorous habits are well known.

W. F. BISCOE.

HYDERABAD, DECCAN, 30th December, 1899.

No. VIII.—*VESPERTILIO PACHYPUS*, TEMMINCK.  
(A CORRECTION.)

In the last number of the Journal (XII-4) I recorded the receipt of a pair of bats from Mr. Fry which I identified as *Vespertilio pachyotis*, Dobson. I have recently taken a series of more than a dozen in the same locality, viz., Londa, on the Southern Mahratta Railway, and there can be no doubt that

the species is *Vespertilio pachypus*, Temminck (No. 180), and not *V. pachyotis*, Dobson (No. 179), so that the latter is still only represented by the type specimens in the Calcutta Museum. *V. pachypus*, too, is an Assam-Malay form, and it is interesting to find it plentiful in Kanara. That in these days of stress my natural history work has to be done in short snatches of leisure, is the explanation of my mistake, but is, I humbly recognise, no excuse for it.

The measurements of 11 specimens which I took immediately after death compare as follows with those recorded by Blanford and Dobson:—

|                       | Head and Body. |       | Tail. | Forearm. |
|-----------------------|----------------|-------|-------|----------|
| Blanford (♀) ... ..   | 37.5           | 26.25 | 26.25 |          |
| Dobson ... ..         | 43.75          | 32.5  | 27.5  |          |
| Average of 4 ♀ ... .. | 40             | 31    | 29.5  |          |
| Average of 7 ♂ ... .. | 41             | 31    | 29    |          |

Several of my specimens gave 42 for head and body and one or two 33 for tail, but not one had a forearm of less than 28, and two or three had 30. Blanford's measurements were probably from a spirit specimen, but evidently the Kanara form has a rather longer forearm than those from Assam, &c.

In the same Journal I recorded a doubtful specimen of *Harpiocephalus tubinarius*, Scully, taken by Colonel Fulton at Dhamsala. This specimen has since been kindly compared with the type by the Superintendent, Indian Museum, who declares it to be distinct, so that it is in all probability a new species. The rules of that institution require that specimens sent for comparison with the type must be given to the Museum, an arrangement which handicaps any worker who cannot personally visit Calcutta.

R. C. WROUGHTON.

POONA, 6th January, 1900.

#### No. IX.—BIRDS OF PREY.

Will any member who has had opportunities of observing hawks and eagles after they have struck down their game, kindly inform me whether, when the feathers of the victim have been plucked out on the ground, the body is carried elsewhere to be eaten? While wandering about the higher ranges of the Himalayas, I have frequently come across the whole of the feathers of large birds, such as those of Mornal pheasants and Snow Cocks on the open hillside, which have, I conclude, been killed by eagles. In no single instance have I been able to find any bones, or even the least trace of blood. On pointing this out to my shikari, he said that the bones had been eaten up, or carried off, by foxes; this may be so no doubt, or what is more likely been taken off by vultures,—supposing the remains of the bird were left when it was struck down; but I can scarcely believe that in every single instance I have come across the entire feathers of large birds, the absence of all other parts can be so accounted for.

G. S. RODON, MAJOR.

DHARWAR, 12th January, 1900.

## No. X.—THE GREAT CRESTED GREBE IN BURMA.

It is, I think, worth recording that I shot a specimen of the Great Crested Grebe (*Podiceps cristatus*) in a jheel, about 6 miles from Myingyan, on the 17th of last month. This is about 50 miles south of Mandalay, and is below Latitude 22° N.

According to the Fauna of British India, Birds, Vol. IV., Mr. Oates obtained a specimen of this bird at Myitkyina in the extreme north of Burma, but hitherto it has never been recorded so far south in this country.

B. S. CAREY.

MYINGYAN, BURMA, *January, 1900.*

No. XI.—OCCURRENCE OF THE BRONZE-CAPPED  
TEAL IN TIRHUT.

Two days ago a fowler brought me a male of this rare species (*Eunetta falcata*). It was snared on a large chur lying to the W. of this Sub-division. This chur, I believe, extends for several miles, and during the cold weather teems with wild fowl. I have never been able to visit it myself, and think were it worked thoroughly many rare species would be obtained.

I now think a female was also among the duck brought me, but I sent it away taking it to be a female gadwall. I had not Mr. Baker's able article on this species by me, else I would not have made a mistake. I can only hope that I may secure another. The fowler tells me there are others at the same place, but the one he brought me was the only one snared. If I do secure fresh specimens, I will record them in the Journal. My bird is evidently a young bird, the sickle-shaped tertiaries only just sprouting and the mane as yet imperfect. There are some brown feathers on the upper back and scapulars and there is no black band formed by the tips of some of the outer scapulars; the speculum too is more a dead black than at all glossed with green.

Unfortunately some of the primaries of one wing were pulled out by the *malla* who snared it, the tips of those on the other wing have got broken; it having been brought to me in a basket with some other ducks. The tail also has got a bit damaged. I give the measurements and colours of the soft parts taken in the flesh. Total length 19"; tail 2·8"; it would probably have measured 3" had it not been frayed: tarsus 1·5"; bill at front 1·62"; bill from gape 2·1". The wing measurements were not taken as both were damaged. Bill black; iris brown; legs and feet dusky olive-grey.

CHAS. M. INGLIS.

MADHUBANI, TIRHUT, *20th January, 1900.*

No. XII.—*MEGADERMA SPASMA*, L.

The Society has received four specimens of a vampire taken by Col. Kirtikar, I.M.S., at Ratnagiri (N. Lat. 17°, E. Long. 73°), which prove to be *Megaderma spasma*, L. The length of the forearm in these specimens

corresponds with the measurement given by Blanford. Blanford gives 85 mm. as length of head and body, which is also the size he gives for *M. lyra*, yet he describes *M. spasma* as rather smaller than *M. lyra*. The two larger of the Ratnagiri specimens are 60 and 62, while the two smaller are 55 and 56, the largest being a ♂ and the others ♀. Blanford however notes that the specimens from Ceylon are specially small. *M. spasma* is a Malay form, and except a doubtful specimen recorded from Travancore, Ceylon is the nearest locality to Ratnagiri at which *M. spasma* has been found. I have recorded in "Some Konkan Bats" that the vampire North of Bombay Harbour is *M. lyra*, and it would be interesting to know exactly where the two species meet.

POONA, 27th January, 1900.

R. C. WROUGHTON.

No. XIII.—OCCURRENCE OF THE SHELDRAKE (*TADORNA CORNUTA*) ON THE BHEEMA RIVER.

Although it is unsatisfactory to record having seen one of our rare cold weather visitants, without bringing it to bag, still I feel convinced that I saw the Sheldrake (*Tadorna cornuta*) some ten days ago on the Bheema, about ten miles below Pandharpur.

Mr. Stuart Baker, in his excellent work on "Indian Ducks and their Allies," pages 572—73, Vol. XI (No. 4) of our Journal, states that this duck is "confined to the northern portion" of India, but that probably it would be found along our sea coast, if its lonely parts were more frequently visited.

I was moving down the banks of the Bheema, where I saw many Ruddy Sheldrake or Brahminy Duck (*Casarca rutila*), mostly in pairs, resting on sandy banks and stretches. At one spot, several ducks were basking, viz., Brahminies, Gadwall, Pintail, Pochards, &c. On my approach they rose. My attention was immediately attracted to a Sheldrake, its white colour and smaller size marking it, for it was in the company of two Brahminies. Short of shooting the bird I am as certain as I can be that I was not deceived, for I am a very close observer of bird-life.

I marked the bird, but unfortunately it went up stream. Had it come anywhere within range, I should have fired at it, no matter how long a shot, in preference to any nearer shot at other duck, in the hope of bringing it down. I only noticed one bird.

R. M. BETHAM, CAPT.,

POONA, 27th January, 1900.

8th Bombay Infantry.

No. XIV.—CURIOUS INSTANCE OF HERMAPHRODITISM.

This morning, when visiting a Dharmasala for cattle, I was shewn a very curious specimen of hermaphroditism. The animal which had the general appearance of a rather stumpy cow was peculiar in that it had no sexual organs whatever, at least outwardly. It had, however, slightly developed

teats, and between them was an aperture through which it urinated. The animal appeared about 4 or 5 years old and was in good condition. I was informed that it had been sent in from a village to be preserved in the Dharmasala, an institution for starving cattle kept up by the Hindus of this place.

A. NEWNHAM, CAPT., F.Z.S.,  
Cantonment Magistrate.

NASIRABAD, 1st February, 1900.

No. XV.—OCCURRENCE OF *DIPSAS CYANEA* IN BURMA.

As far as we are aware, this snake has never been recorded from Burma, and our specimen was captured within eight miles of the heart of this city, and in close proximity to a large suburban town. Its rarity is also suggested from the fact that we have from time to time received a large number and many species of snakes from this particular locality, and also from all parts of the Province, including the Chin, Kachin, and Arrakan Hills, yet this is the sole specimen of this species that has so far reached us. We think the fact of its occurrence in Burma worthy of being placed on record.

Though native testimony is rarely of any value in such matters, we may observe that a Karen shikari, known to one of us for some ten years, and who is very intelligent about jungle creatures, while looking through our collection, asserted that he recognized this snake, and mentioned that he had occasionally come across it in the jungle; that it was a true tree snake, and lived on Geckos and Lizards. He further was able to recognize other specimens, which we happen to know come from his locality.

A detailed description of our specimen is unnecessary, as with one or two exceptions it accords with that so well given in Boulanger's work. We, however, note the following differences:—

- (1) Frontal—Equals distance to rostral only.
- (2) Ventrals—254.
- (3) Colour—Above, almost uniform light blue-clay, what is, we understand, termed Goblin-blue. A few scales are irregularly and thinly outlined blackish.

Under parts, uniform buff on chin, throat, and anterior part of body, becoming mottled with blue later, the blue prevailing more and more on hinder part to become uniform beneath tail.

- (4) Apical pits—Capricious, both single and double on dorsals, continued to supra-caudals, on the broadest of which were three or four pits.

Length—Four feet. Tail—Thirteen inches.

F. WALL, CAPT., I. M. S.,  
GEO. H. EVANS, A. V. D.

RANGOON, January, 1900.

No. XVI.—INCUBATION OF A BROOD OF *ZAMENIS MUCOSUS*.

About 7 a. m. on the 9th of December, 1899, we received a clutch of thirteen eggs (two already hatched) of *Zamenis mucosus*. We placed the eggs in a prune bottle, so that the hatching process might be minutely observed.

During the course of the day (December 9th) four more eggs hatched, and some two or three others showed cracks at one pole. The remainder hatched on the 10th December, and it would appear that daylight provided a necessary stimulus to their activity, since no egg was hatched between 5 p.m. on the 9th and 7-30 a.m. on the 10th. Immediately after an egg was cracked, air bubbles were observed to escape, and the rostral of the young snake presented, but the creature appeared to be in no hurry to emerge, remaining in this position sometimes for a quarter of an hour. In from  $\frac{1}{2}$  to  $\frac{3}{4}$  hour the head and neck were protruded, and then some gradually worked their way out, while others withdrew for a time wholly into their prison.

The time occupied in emerging thus varied, the quickest exit took two hours, and the longest eight hours. One egg, sound at 3 p.m. on the 9th, was observed cracked at one pole at 3-25 p.m., the head and two or three inches of the snake was clear at 4-30 p.m., but at 5-30 p.m. the hatchling had withdrawn, and did not make its exit until 7-30 a.m. on the morning of the 10th.

The eggs were pure glossy enamel white, and were cemented into a cluster, the adhesive points being inconstant in situation (either lateral or polar).

The length varied from  $1\frac{5}{8}$ " to  $1\frac{3}{4}$ "; the breadth from 1" to  $1\frac{1}{8}$ ".

The openings were stellate or linear, were in a sub-polar situation, and varied in the former shape in size from  $\frac{3}{8}$ " to  $\frac{1}{2}$ ", and in the latter were about  $\frac{5}{8}$ ". Unlike the eggs of most birds, the two poles were alike, being domed to an equal width and shape.

The young were very lively after birth, and prettily marked, and when three or four had collected were removed and put into spirit. These were individually examined later, and the departures they exhibited from Boulanger's description, with other remarks may be of interest.

Length— $14\frac{1}{2}$ " to  $15\frac{1}{4}$ ".

The Temporals—In one specimen were 2+1. (R. & L.)

The Labials—In one specimen 9, (5 and 6 touching the eye). (R. & L.)

The Ant. Chins—In one case on one side came into contact with six lower labials.

Colour—Bluish or greenish-olive, some scales edged whitish, others darkish; the former arranged in such a way as to form fairly clear light transverse bands or semi-bands.

Each band is formed by a limb thrown upwards from the belly; these limbs usually meet their fellows to form complete bands, but sometimes fail to meet and then end in bulbous extremities on the vertebral region.

The bands are thinner than the intervals, and are conspicuous anteriorly, but less so posteriorly where they become dirty yellowish, sometimes disappearing as such altogether.

Belly uniform dirty white.

The pigmented margins of labials, chin, and throat shields and streaks on ventrals are much less pronounced than in adult specimens.

We also noted that in all the specimens examined, in which we searched for it (4) the umbilical fissure was patent at one spot. A bristle was thrust into the fissure, and the specimen dissected. This fissure implicated usually two ventrals (rarely three), and from 21 to 24 perfect ventrals intervened between it and the anal scale.

We have received since this, on 2nd January, 1900, and 6th January, 1900, two other small *Zamenis mucosus* apparently recently hatched, since they both have very evident umbilical scars, and measure  $16\frac{1}{2}$ " and  $16\frac{3}{4}$ "; so it would appear that this is the regular season of incubation for this species here.

GEO. H. EVANS, CAPT., A. V. D.

RANGOON, 30th January, 1900.

F. WALL, CAPT., I. M. S.

#### No. XVII.—OCCURRENCE OF *PYTHON MOLURUS* IN BURMA.

On reference to Boulanger's work we observe that Burma is not mentioned as a habitat of the *Python molurus*, and since that author remarks that the snake is rare in the Malay Peninsula, we venture to record that we have seen at least four specimens obtained in this Province, and we would further add that on questioning some Burmans, living in a jungle tract in the Pégú district, on the subject of Pythons, we elicited the following information, viz., that they recognized two species, one which they called Sa-ba-ohn, was described as having six labial pits. Having a fresh specimen of *P. molurus* before us, we enquired how many pits they would count on this snake, which they described as Sa-ba-ohn, they counted six, inclusive of the rostral pits. The other Python is known as the Sa-ba-gyi, which they recognize as having nine or ten pits, counted in a similar manner (probably *P. reticulatus*). They asserted that, as far as their particular locality was concerned, the *P. molurus* was the more common of the two. Their method of recognizing the two varieties at least points to their being moderately observant, hence we were surprised to find no mention of Burma as a habitat in the above-named work. Another thing which suggests to us that it is not so rare is, that at the present time there are 3 caged Pythons in the gardens of the Agri-Horticultural Society, all specimens of *P. molurus*, and obtained in this Province, and Mr. Noble, the Custodian, tells me that whereas *P. molurus* is commonly brought to him, he can only remember 6 specimens of *P. reticulatus* during his 18 years tenure of this appointment.

In the Rev. Dr. F. Mason's work, "Burma, its People and Productions," re-written and enlarged by W. Theobald, we find that in Vol. II, page 308 Burma is included as a habitat of this snake.

The flesh of the Python, as is the case of some other snakes, is eaten by many Burmans, and is esteemed a delicacy amongst the Karens. The gall bladder is much valued by the latter people for medicine. Karens and Burmans assert that the female incubates her eggs; that the female and male make a kind of nest of leaves, &c., the female coiling herself over the eggs, while the male keeps guard in the neighbourhood.

F. WALL, CAPT., I. M. S.  
GEO. H. EVANS, A. V. D.

RANGOON, 30th December, 1899.

No. XVIII.—*RHINOLOPHUS AFFINIS*, HORSF.

The Society has received a specimen of this handsome bat, which was taken by Mr. E. H. Aitken.

The specimen is of the "golden-orange-brown" variety. The measurements are head and body 60 mm., tail 22 mm., forearm 47 mm., ear from base of inner margin 18 mm., which agree very closely with those given by Blanford, except, curiously enough, that of the forearm, which is 5 mm. shorter.

Blandford writes that the species is one chiefly frequenting areas of heavy rainfall, nevertheless it is worth while to record its actual capture near Bombay.

ROBT. C. WROUGHTON, I. F. S.

BOMBAY, February, 1900.

No. XIX.—NOTES ON *CASARCA RUTILA* (THE BRAMINY DUCK)  
AND *NYROCA FERRUGINEA* (THE WHITE-EYED DUCK).

*C. rutila*:—A male shot on the 3rd instant, was still undergoing a moult. The old, frayed feathers are very pale buff, but the new ones which are sprouting out on the upper breast are very deep orange-brown.

Another snared on the 4th instant, in Nepal, has already assumed a beautiful black collar on the lower neck; it is most distinct. This must surely be abnormally early, as Blanford says it is only assumed about March.

*Nyroca ferruginea*:—A female procured on the 2nd instant, has got a few white feathers, forming a spot on the foreneck. It has also a large white spot on the chin, much larger than my only female specimen of *Nyroca baeri* has got. It reaches right down to the base of the lower mandible.

CHAS. M. INGLIS.

JAINAGAR, MADHUBANI, TIRHUT, 8th February, 1900.

No. XX.—THE WESTERN WHITE-EYED POCHARD.

In looking over Mr. Oates's Manual of the Game Birds of India (Bombay, 1899), I find it stated that the Western White-eyed Pochard, which he calls

*Nyroca nyroca*, is "entirely a fresh-water bird" (Vol. II, p. 321). Mr. Blanford, (Fauna of British India, Vol. IV, Birds, p. 461, mentions it as met with "in places on the sea coast."

It is a thing certain to me that this is *the* sea-duck of the Alibag Coast, just south of Bombay, where flocks not exceeding fifty in number were constantly to be observed every winter, during my long service on that coast.

They generally rode just outside the surf, where they were safe from disturbance by passing boats, which keep further out, and I have no reason to suppose that they fed there. Sometimes they came into shallower water, and passed my boats, which were less shy of the surf than others, at very short distances, evidently thinking themselves pretty safe at sea. I shot few, as they are seldom good to eat.

It is likely that they used the sea as a refuge during the day, and fed inland at night; but I cannot be sure of this.

I have mentioned this before in your Journal, I think, but perhaps not in a quotable form.

W. F. SINCLAIR.

LONDON, *January*, 1900.

No. XXI.—GEOGRAPHICAL RACES OF THE BANTING; THE  
"SAPI" OF THE MALAY PENINSULA.

(*With a Plate.*)

In the Proceedings of the Zoological Society for 1898 (p. 276) Mr. Lydekker, summing up the available information on the subject, showed the Burmese Banting to be quite distinct from the Javan animal, and proposed for the former race the name of *Bos sondaicus birmanicus*.

Mr. Lydekker adds: "Whether it is this or the typical race that occurs in the Malay Peninsula I have at present no information."

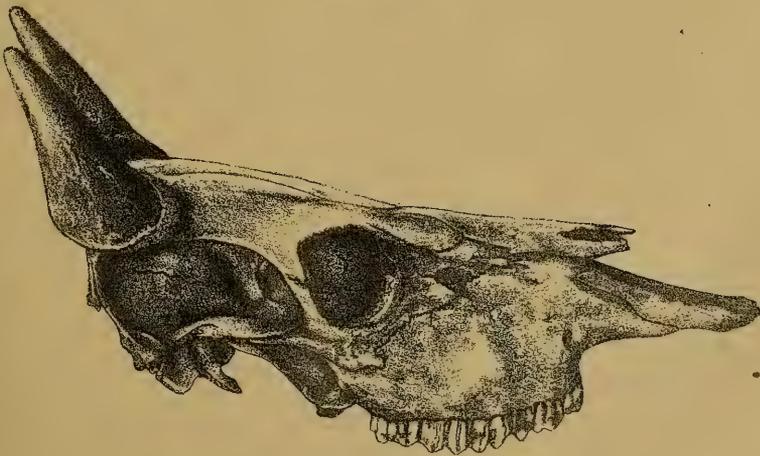
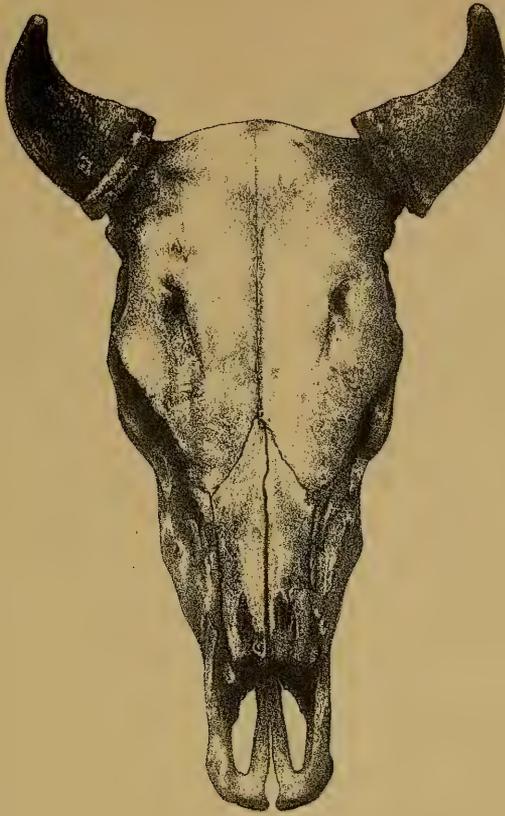
Unlikely as it may seem, I cannot but think that it is possible that a *third*—as yet unnamed—variety inhabits the Peninsula. The evidence on the subject is very scanty, but all points to this conclusion.

A constant characteristic of both the Burmese and Javan Banting is that both sexes have a conspicuous white rump patch, and dirty white or yellowish-white "stockings." The peninsular race appears to have *no white rump patch*, and to show far more variation (probably dependant on age and sex) in the colour of the legs than is usual in animals of this group.

The information relating to the colour of the Malayan "Sapi" which I have been able to collect is as follows:—

Firstly,—a description in "A Trip to Moar," Logan's Journal, Vol. IV, 1858, p. 354, by T. O. (Thomas Oxley):

"It was a young cow killed at Bukit Kupong out of a herd of nine. The 'Sapi' has much the appearance of Bali cattle [domesticated *Bos sondaicus*, A.L.B.] but *has not the white patch on the buttocks*. The horns are small



A.C. Chowdhary lith.

BOS SONDAICUS, MALAYAN FORM



and curved inwards, tipped with black. The forehead is flat with a tuft of long hairs on it, particularly on the bulls. The back is curved, the highest point being about the centre. The total height of the animal killed from hoof to spine of dorsal vertebræ was 6 feet 2 inches. The hair was smooth and silky, of a brown colour, except on the feet which were dirty white. A mane about 2 inches long ran along the spine. There was no dewlap."

The words "particularly on the bulls" are important, implying that the writer, who says the "Sapi" has no white rump patch, had shot or seen bulls as well as cows.

Secondly,—according to Mr. Lydekker (Royal Natural History, Vol. II, p. 181), the Malays describe the "Sapi" as having ferruginous-red instead of white on the legs. I believe that years ago Mr. Davison described such an animal in the P.Z.S., though I have been unable to look up this reference.

Thirdly,—about two months ago in Perak, Captain J. C. Lamprey, of the Malay States Guides, fired at a "Sapi" in the dusk of an evening and apparently missed. Two days later, while following its tracks, he came upon the carcase of the animal, which had in the meantime been killed by a tiger. Captain Lamprey described this animal to me shortly afterwards as being entirely of a rich, reddish-chestnut colour, *with no white rump patch* and with *blackish "stockings"* and muzzle. On these points he was absolutely positive. As to the sex he was uncertain, the tiger having commenced its meal between the thighs.

Unfortunately Captain Lamprey preserved nothing but the skull of this specimen, which he kindly let me have for the Museum. It appears to me to be that of a cow. I enclose two photographs of it which show the slightly convex forehead very distinctly.

If the above evidence proves nothing, it at least serves to show the want of further information about the 'Sapi' or Banting of the Malay Peninsula. It seems to me difficult to identify Captain Lamprey's beast with either *Bos sondaicus*, Müller and Schlegel, or *Bos Sondaicus birmanicus*, Lydekker.

A. L. BUTLER,

Curator, Selangor State Museum.

#### No. XXII.—OCCURRENCE OF UNCOMMON BIRDS IN RAJPUTANA.

The occurrence in this district of the birds mentioned below is, I think, worthy of note.

*Vultur monachus*.—The Cinereous Vulture. For the first time during my stay in India I set eyes on this magnificent bird, when I came on one last year as it was feeding on the carcase of a dead bullock. It was in company with a number of other vultures, but the way in which it dwarfed all others

made it conspicuous from some distance. I was able to approach quite close and secure it. This year about the same time (January) and at precisely the same spot I saw a second specimen.

*Salpornis spilonotus*.—I have come across this rare creeper twice within the last few weeks. In its habits it more resembles a nuthatch than a creeper, as it works the branches backwards and forwards instead of ascending the tree in the jerky spiral so characteristic of *Certhia*. It had rather a feeble flight, and its note was a thin whistle.

*Merula atrogularis*.—I saw a single specimen of this during the short spell of cold weather. It had probably lost its bearings to get so far South, for I see Delhi is given in Oates' book as its southernmost limit.

NASIRABAD, February, 1900.

A. NEWNHAM, CAPT.

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No. XXIII.—GOAT KILLED BY A PORCUPINE.

On the night of the 26th instant I had some goats tied up along a nullah near my camp as bait for a panther.

Next morning I found that one of them had been killed by a porcupine, evidently early in the night, for the body was stiff and cold. One large quill had pierced the heart, and remained there, whilst another was imbedded in the stomach. Three smaller quills were lying on the ground close by. The foot-marks showed that the porcupine had made a rush at the goat, but whether it had purposely attacked it or not, it is impossible to say.

R. G. BURTON, CAPT.,

Indian Staff Corps.

JALNA, 28th February, 1900.

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PROCEEDINGS

OF THE MEETING HELD ON 16TH JANUARY, 1900.

A meeting of the members took place at the Society's rooms on the 16th of January 1900, Dr. D. MacDonald presiding.

NEW MEMBERS.

The election of the following new members was announced:—Capt. F. R. E. Loch, I.S.C. (Bombay); Mr. H. S. H. Pilkington (Bombay); Lieut. J. Stewart (Lucknow); Mr. D. E. W. Leighton (Madras); Mr. E. S. Mumford (Burma); Mr. D. Hardinge (Burma); Dr. Cuthbert Christy (Bombay); Dr. A. M. Elliot (Bombay); Mr. C. W. Allan, I. F. S. (Burma); Mr. J. S. Scot, I. C. S. (Cuddapah); Lieut. A. H. E. Mosse, I. S. C. (Mhow); Lieut. E. R. Wethrall (Jalna); Major F. V. Whitall (Jalna); Dr. T. H. Aquino (Bombay); Mr. S. G. Velinker (Bombay); Mr. D. O. Witt, I. F. S. (Damoh, C. P.); Captain E. C. Ogilvie, R. E. (Quetta); Major H.

Lestock Reid (Rangoon); Mr. John H. Lace, I. F. S., F. L. S. (Dalhousie); Mr. M. V. Woods, C. E. (Haflong, Assam); Mr. G. O. Ranger (Calcutta); Mr. Dunbar-Brander, I. F. S. (Jabalpur); Lieut. T. D. Broughton, R. E. (Rangoon); Mr. H. Gill (Bombay); The Mess President, Officers' Mess, Q. O. Corps of Guides (Mardan); Mr. Merwanjee P. Talati (Bombay); Colonel R. H. Kellie (Deolali); Major J. M. Jones, R. A. M. C. (Deolali); Colonel H. C. Fox (Dharwar); and Captain George Lamb, I. M. S. (Bombay).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum:—

| Contribution.                                         | Description.                              | Contributor.                             |
|-------------------------------------------------------|-------------------------------------------|------------------------------------------|
| 1 Cobra (alive) .....                                 | <i>Naja tripudians</i> .....              | Mr. W. F. Jardine.                       |
| 1 Green Tree Viper (alive).                           | <i>Trimeresurus gramineus</i> ...         | Mr. Paul Girhardt.                       |
| 2 Young Porcupines (alive)                            | <i>Hystrix leucura</i> .....              | Mr. H. Bulkley.                          |
| Gold-fish from China .....                            | .....                                     | Lieut. Fitzroy, P. and O.<br>S.S. Pekin. |
| 1 Painted Stork .....                                 | <i>Pseudotantalus leucocephalus</i> ..... | Mr. Paul Girhardt.                       |
| A number of Scorpions and Spiders .....               | .....                                     | Col. H. J. W. Barrow, R. A. M. C.        |
| 2 Bar-tailed Cuckoo Doves.                            | <i>Macropygia tusalia</i> .....           | Lieut. W. G. Nisbett.                    |
| A number of Butterflies ...                           | .....                                     | Do.                                      |
| 1 Pin-tail Duck (an Albino)                           | <i>Dafila acuta</i> .....                 | Col. W. B. Ferris.                       |
| 1 Python (alive) .....                                | <i>Python molurus</i> .....               | Mr. J. Brand.                            |
| 2 Skins and 1 Egg of the Andamanese Banded Rail ..... | <i>Hypotaenidia obscurior</i> .....       | Major H. C. Hudson, I. M. S.             |
| 2 Eggs of the Blue-breasted Banded Rail.....          | <i>Hypotaenidia striata</i> .....         | Do.                                      |
| A collection of Moths .....                           | .....                                     | Mr. Paul Girhardt.                       |
| 2 Chameleons (alive) .....                            | <i>Chamaleon calcaratus</i> .....         | Mr. C. Merrony.                          |
| 1 Tuckto Gecko (alive) ...                            | <i>Gecko verticillatus</i> .....          | Lieut. N. Wilson, R. I. M.               |
| 1 Spotted Eagle .....                                 | <i>Spizaetus nepalensis</i> .....         | Mr. C. Donald.                           |
| 1 Crested Serpent-Eagle ...                           | <i>Spilornis cheela</i> .....             | Do.                                      |
| 1 Chameleon (alive) .....                             | <i>Chamaleon calcaratus</i> .....         | Mr. C. P. George.                        |
| 1 Night-Jar (alive) .....                             | <i>Caprimulgus asiaticus</i> .....        | Mr. S. D. Navalkar.                      |
| 1 Paradise Flycatcher .....                           | <i>Terpsiphone paradisi</i> .....         | Mr. W. Plunket.                          |
| 1 Orange Minivet .....                                | <i>Pereorocotus flammeus</i> .....        | Do.                                      |
| 1 Small Minivet .....                                 | <i>Pereorocotus peregrinus</i> ...        | Do.                                      |
| 1 Indian Bush-Chat .....                              | <i>Pratincola maura</i> .....             | Do.                                      |
| 1 Purple Honeysucker .....                            | <i>Arachnechthra asiatica</i> ...         | Do.                                      |
| 1 Racket-tailed Drongo ...                            | <i>Dissemurus paradiseus</i> .....        | Do.                                      |
| 2 Palm Civets (alive).....                            | <i>Paradoxurus niger</i> .....            | Mr. T. B. Fry.                           |
| 1 Do. (alive) .....                                   | Do. ....                                  | Mr. S. Armstrong.                        |
| 1 Dobson's Wrinkle-Lipped Bat.                        | <i>Nyctinomus tragatus</i> .....          | Mr. A. Lowrie.                           |
| 1 Marbled Teal.....                                   | <i>Marmaronetta angustirostris</i> .....  | Mr. H. C. Wright.                        |
| 1 Night-Jar.....                                      | <i>Caprimulgus mahrattensis</i> .         | Mr. J. Brand.                            |
| 1 White-bellied Drongo ...                            | <i>Dicorurus caeruleus</i> .....          | Do.                                      |
| Fresh Water Shells.....                               | .....                                     | Mr. A. M. Simcox, I.C.S.                 |
| Do. ....                                              | .....                                     | Mr. F. J. Ede.                           |

| Contribution.                     | Description.                       | Contributor.                            |
|-----------------------------------|------------------------------------|-----------------------------------------|
| 1 Pintail Green Pigeon ...        | <i>Spencocercus apicicauda</i> ... | Lt. W. G. Nisbett.                      |
| 1 Phoorsa .....                   | <i>Echis carinata</i> .....        | Capt. F. W. Townsend.                   |
| 1 Night-Jar.....                  | <i>Caprimulgus asiaticus</i> ..... | Mr. J. G. Counsell.                     |
| 1 Wild Cat (alive) .....          | <i>Felis chaus</i> .....           | Dr. S. G. Ranaday.                      |
| 2 White-faced Stiff-tailed Ducks. | <i>Erismatura leucocephala</i> ... | Capt. C. D. Lester.                     |
| 1 White-eyed Tit .....            | <i>Zosterops palpebrosa</i> .....  | Mrs. L. Burns.                          |
| 1 Grey Hornbill.....              | <i>Ocyercus birostris</i> .....    | Mrs. Duff.                              |
| 1 White-breasted Water-Hen.       | <i>Amaurornis phoeniceus</i> ...   | Lieut. Fitzroy.<br>P. & O. s. s. Pekin. |
| 1 Chinese Rail .....              | .....                              | Do.                                     |
| 1 Water Cock .....                | <i>Gallicrex cinerea</i> .....     | Do.                                     |
| 1 Oyster Catcher .....            | <i>Hamaropus ostralegus</i> .....  | Mr. J. D. Inverarity.                   |

MINOR CONTRIBUTIONS.

Mrs. Bourdillon, Mr. G. W. Taylor, Mr. Littlewood, Mr. A. Spilling, Mr. F. G. Hutchinson, Mr. G. H. Laxton, Mr. J. Stiven, Mr. W. F. Jardine, Mrs. Hawks, Mr. W. Brady, Mr. R. V. Marathe, and Mr. E. W. Beveridge.

CONTRIBUTIONS TO THE LIBRARY.—

The Student's Flora of New Island, by Thomas Kirk ... ..From the Author  
 A Hand-list of the Genera and Species of Birds. Vol. I. (Bowdler Sharpe) ... ..From the Author.  
 Catalogue of the Lepidoptera (Phalænæ) in the British Museum ...In exchange.  
 The Fishes of North and Middle America (Jordon, Evermann).  
 Vols. II. and III. ... .. In exchange.  
 The Geology of Baroda State, by R. Bruce Foote ... ..From the Author.  
 Memoirs of the Geological Survey of India, Vol. I, Part II.... ..In exchange.  
 Annuaire du Musée Zoologique de St. Petersburg, 1899, Nos. 1  
 and 2 ... ..In exchange.

Major H. G. C. Swayne, R.E., exhibited a black buck's horn, which was struck obliquely by a bullet, about half way up, and torn completely off the core. The animal was so stunned that it was unable to move, and remained for some time standing on the spot.

Colonel T. Freeman exhibited the larvæ of a beetle which attacks the wild almond trees (*Prunus eburnea*) on the hills round Ziarat, 40 miles north-east of Quetta, 8,000 feet above the sea. A specimen of the beautiful gum exuded by this tree was also shown.

PAPERS READ.

The following papers were read and discussed :—(1) Description of two new lizards from Selangor, by G.A. Boulenger, F. R. S.; (2) The *Coccidæ* of Ceylon, by E. Ernest Green, F. E. S.; (3) Yak shooting in Thibet, by Edgar Phelps; (4) Notes on Somaliland, by Captain P. Z. C. x; (5) Fishing in Indian waters, Part V., by F. O. Gadsden, R. I. M.; (6) Hints to beginners on collecting specimens of Natural History, Part I., by E. Comber; (7) Geographical races of the Banting, the "Sapi" of the Malay Peninsula, by A. L. Butler, F. Z. S.

## MISCELLANEOUS NOTES.

(a) Account of a remarkable swarming, for breeding purposes, of the wasp, *Spheg umbrosus*, &c., by Col. C. T. Bingham, I. F. S. ; (b) A variety of the common Myna, by C. M. Inglis ; (c) Note on the web-spinning habits of the red ant, by E. Ernest Green ; (d) Notes on the habits of some Indian bats, by E. H. Aitken ; (e) Occurrence of the white-faced stiff-tail duck at Mardan, by Capt. A. J. Macnab, I. M. S. ; (f) A wild dog's earth, by J. D. Inverarity ; (g) *Vespertilio pachylus*—A correction, by R. C. Wroughton, I. F. S. ; (h) Kingfishers killing birds, by W. F. Biscoe.

## ACCOUNTS FOR 1899.

Captain A. J. Peile, R. A., the Honorary Treasurer submitted the accounts for the year ending 31st December, 1899, showing a cash balance at credit, of Rs. 851-3, besides Rs. 4,800 invested in Government Paper.

It was resolved that the accounts be passed subject to the usual audit.

## ELECTION OF COMMITTEE.

The President, Vice President, and members of the Managing Committee for 1899 were elected for the present year.

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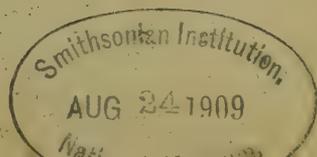
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J.G. Keulemans del.

Mintern Bros. Chromolith.

THE RED-BREASTED MERGANSER.

*Merganser serrator.*

*1/2 Nat size.*

CORRECTION.

Vol XII, page 186, 13th and 14th lines from top, for " chur " read  
" chaur."

EDITOR.



# JOURNAL

OF THE

## BOMBAY

# Natural History Society.

Vol. XIII.

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No. II.

### INDIAN DUCKS AND THEIR ALLIES.

BY E. C. STUART BAKER, F.Z.S.

PART X, WITH PLATE X.

(Continued from page 24 of this Volume.)

Subfamily—MERGINÆ.

This subfamily is at once distinguishable from all others by its bill, which differs very greatly from the shape most generally considered as being typical of a duck. Instead of being considerably depressed in the ordinary manner, it is actually compressed, and instead of having the usual lamellæ along the sides, having regular tooth-like serrations on the edges of both upper and lower mandible. This last characteristic suffices to distinguish the *Merginæ* from the *Merganettinæ*, a subfamily which has neither teeth nor serrations, but which is not represented in India.

The *Merginæ* consist of two genera only, as represented in India, with one other, *Lophodytes*, confined to North America.

*Key to the Genera.*

- (a) Culmen shorter than tarsus, under 1·5"; wing about  
 7" to 8" ... .. *Mergus.*
- (b) Culmen longer than tarsus, over 1·9"; wing about 9"  
 to 11" ... .. *Merganser.*

Genus MERGUS.

The genus *Mergus* contains but a single species, the well-known Smew, *Mergus albellus*. Its curious narrow beak and its much smaller

size than either of the Mergansers, will at once serve to distinguish it from all other species of duck found in India.

MERGUS ALBELLUS.

*The Smew.*

*Mergus albellus*.—Salvadori, "Cat., Birds of British Museum," Vol. XXVII, p. 464; Blanford, "Avifauna of British India," IV, p. 467; Oates, "Game Birds of India," II, p. 413.

*Mergellus albellus*.—Jerdon, "Birds of India," III, p. 818; Hume, "Str. Feath." I, p. 265; Butler, Hume, *ibid*, IV, p. 31; Butler, *ibid*, VII, p. 188; Ball, *ibid*, p. 233; Hume, Cat. No. 973; Hume and Marshall, Game Birds, III, p. 293; Reid, "Str. Feath." X, p. 95; Barnes, "Birds of Bombay," p. 417.

*Description: Adult Male*.—A large patch from base of both mandibles to back of eye and including base of ear-coverts black, with green reflections; subordinate and lateral feathers of the crest the same, the black extending in a narrow line, more or less, on to the sides of the head; a crescentic black band above the upper back descending down on either side of the breast; back black, duller on the lower back and changing to brown-grey on the rump and upper tail-coverts, where the feathers are dark centred; rest of head and whole lower surface white; under aspect of tail pale grey, the feathers white-shafted except at the tips; primaries brown, dark shafted above, white shafted below; outer secondaries black with white tips, the next two or three white, the innermost silver grey with dark shafts and white outer edges; greater coverts black, those over the secondaries tipped with white; median white, the remainder black; scapulars white, the outer webs edged with black, giving them a barred appearance, and with a black bar across the base, from the centre of the upper back, past the shoulder of the wing and on to the sides of the body; these and the flanks are white, very finely barred with black.

"Bill bluish lead-colour; nail generally brown, often paler; irides brown; legs and feet lavender-grey" (Blanford).

"Bill of a bluish lead-colour; irides bluish-white, legs and feet bluish-lead, webs darker" (Salvadori).

"In fourteen specimens I have recorded the irides as brown or deep brown, in one as red-brown, and I have observed no other colour. Macgillivray records it from fresh specimens examined by himself

as red and bright red. Naumann says that in the young it is dark-brown—then nut-brown, in males of the second year brownish-grey, later light ash-grey, and in very old males a pure pearl colour or bluish-white.

“The bill is, as a rule, a delicate pale plumbeous, sometimes a clearer and bluer tint, sometimes duskier, and, in some specimens, young of both sexes and old females, it has been almost black.

“The nail is generally brownish, horny whitish at the extreme tip, but in some it has been bluish-white throughout, and in some almost black throughout.

“The legs and feet vary from pale blue-grey to plumbeous and dark lavender; the webs, except just where they join the toes, being dusky to black, and the claws brownish-black. Often there is an olive tinge on the tarsi, and occasionally, in the young only I think, both these and the toes exhibit small dusky spots and patches” (Hume).

“Length 17" to 18·1" ; wing 7·55" to 8·32" ; tail from vent 3·35" to 4·1" ; tarsus 1·2" to 1·31" ; bill from gape 1·33" to 1·72" ; weight 1 lb. 4 ozs. to 1 lb. 12 ozs.” (Hume).

*Female.*—The black lorial patch in the male is replaced by rich dark brown, almost black in very old females; whole upper head, crest and nape ferruginous-brown, richest and reddest at the end of the crest. Upper back grey-brown, changing to blackish-brown on the lower back and again to dark grey-brown on the rump, upper tail coverts and tail; wings like those of the male, but the inner secondaries darker and browner and the lesser coverts brown instead of black; breast mottled grey; rest of lower plumage white, the flanks more or less mottled with dark brown, axillaries white.

The colour of the soft parts would seem to be the same in the females as in the males, but the irides are always brown.

“Length 15·5" to 16·75" ; wing 7·01" to 7·3" ; tail from vent 3·3" to 3·9" ; tarsus 1·11" to 1·19" ; bill from gape 1·48" to 1·6" ; weight 1 lb. to 1 lb. 6½ ozs.” (Hume).

*Male in post-nuptial plumage* assumes the plumage of the female, but appears to have the white wing bar larger and the lesser wing coverts darker. They also “shew the two dark crescentic bands on the breast” (Salvadori).

"Males in first nuptial dress have brown streaks on the hind neck and scapulars" (Seeböhm).

The young resemble the adult female, but have no dark defined lorial patch, and the crest is darker and rather duller. The white wing patch is suffused more or less with brown, and the breast is more spotted.

"Young in down.—Upper parts, including the sides of the head below the eye, but only the back of the neck, dark brown; below the eye a very small white spot; white spots on the posterior edge of the wing, on the sides of the back, just near the joint of the wing, the sides of the rump and on the flanks; throat and sides of the upper part of the neck conspicuously white; crop region dusky, flanks brown; breast and abdomen white" (Salvadori).

The habitat of the Smew, during the summer and breeding season, is practically the Palearctic region throughout Europe and Asia, whence it descends south into Southern European countries, the basin of the Mediterranean, Northern India and adjoining countries, China and Japan, and very rarely also it has been recorded from North America.

As regards its occurrence in India, Blanford writes:—"Within our limits the Smew is fairly common in winter in the Punjab, and it is found in Sind, Northern Guzerat, the North-West Provinces and Oudh. Jerdon records it from Cuttack, and I met with it more than once near Raniganj in Bengal, but it has not been observed further east nor in Southern India." To this I can add no absolutely certain record, but I think that once in 1882 I saw a flock of these birds, five of them, near Hazaribagh in Chota Nagpur. It is very unlikely that I could have made a mistake in my identification, and I have no doubt myself about what they were, still I failed to shoot one, so that the record is not a perfect one.

I can find nothing further *re* this bird being obtained in India beyond the fact that in the British Museum Catalogue there are three birds "♂ ♀ ad. et ♂ juv. stn." obtained by Falconer in Bengal. As Oates remarks, there is no reason why it should not be obtained in Northern Burma as it extends further east and south in China.

Even in Northern India it can nowhere be called a common bird, though there are some few places to which they resort with compara-

tive regularity, though never, it would seem, in large numbers. In Bengal it is nowhere anything but a rare straggler, and Cuttack would appear to be its extreme limit south.

In its northern homes the Smew generally congregates in flocks, numbering anything from a dozen or so to nearly a couple of hundred, flocks of over fifty being the exception. Here, in India, even the latter number is very exceptional indeed, and most birds are seen in comparatively small parties of a dozen to twenty. Hume mentions as few as seven, and I saw five together, but there seems to be no record of single birds or pairs having been obtained.

They are as much salt as fresh-water birds, though they do not seem to have been noticed on our Indian sea coasts. As might be expected of sea-haunting ducks, failing salt-water they keep almost entirely to large open rivers and lakes; but Hume notes:—"I have, in unfrequented localities, occasionally seen them on ordinary good-sized jhils covering, perhaps, barely a square mile." They are essentially diving ducks, and as such naturally prefer water unencumbered by vegetation, and which is of considerable depth. They are wonderfully quick, active little birds in almost every way. On the wing they are very fast and strong, though they always prefer water to air when possible; they get up very straight and quickly in spite of their short wings, rising lightly and at once getting into full flight. As swimmers and divers few birds can approach them, probably none can excel them. Hume gives them the reputation of being even better divers than Grebes and Cormorants and, as he watched them diving after fish and again when diving in clear water after being slightly wounded, he ought to know. Few of us have been as fortunate as Hume in this respect, but many people have doubtless seen the Cormorants and Snake-birds being fed at the Zoo and other places, so that we can appreciate what a compliment Hume pays the Smew when he declares it to be smarter even than these.

It swims very fast indeed and generally seeks escape by swimming and diving rather than by flight, and as it is a very wide-awake and extremely shy bird, it is no easy matter to get within shot. On foot, except perhaps rarely when it is found on rivers, it is almost impossible to get a shot, as they always keep well away from the shores and from

vegetation, so that the sportsman has but few opportunities of stalking them. Hume, however, tells us that they may sometimes be approached in a boat by sailing past at a distance of about forty yards ; in an ordinary native boat it is no use attempting to circumvent the Smew, for he can swim and dive almost as fast, if not faster, than the boat can travel.

Like the genera *Phalacrocorax* and *Plotus* it seems that the Smew makes use of its wings to assist it in diving, and like these birds it can swim at will with only its head and neck out of water, though normally it swims with its whole upper parts out of water.

Its food is practically entirely animal and consists of crustacea, molluscs, water insects, larvæ, small fishes, etc. The Smew itself is quite unfit for food ; even Mr. Finn who considers that my remarks on the edible qualities of many ducks are rather unflattering, only remarks of this bird, "The flesh is said to be very bad indeed, it being, according to Pallas, *pisculentissima*."

Mr. Finn also notes (*Asian*) "It \* \* \* \* gets about nimbly enough on land where, however, it seems to be very rarely seen in a wild state. I judge from captives in the London Zoo." Other authors have given it a very bad reputation for walking powers, but it is noticeable that most ducks have been very much underrated in this respect, and Mr. Finn has set right a goodly number of antiquated mistakes on this subject.

As regards the breeding of the Smew there is not very much on record, and what little has been recorded by various authors is with reference to eggs got from other people.

Weire says he took what he believed to be eggs of this species near Griefswald in Germany, but there was little by which he could identify them beyond the size and colour of the eggs and the fact that they were taken from a hollow tree. He did not obtain or see the parents ; and though he was very likely right in his identification, they cannot be accepted as authentic without doubt.

Mr. J. Wolley in the *Ibis* for 1859, pp. 69-76, describes at considerable length how he obtained eggs of the Smew through a certain Carl Lepparjervi from Sodankyla. After trying for a long time to obtain eggs, without the slightest success, he received a small wooden box addressed to "The English Gentleman, Joh Wolley in Mueniovaara."

In this box, amongst other things, there was the head of a female Smew and three eggs, part of a clutch of seven. These three eggs were described by Wolley as follows:—

“On comparing them with a series of something like fifty Wigeon’s eggs, I found they were pretty nearly of the same size, though rather below the average. They were flattened at the small end more than any of the Wigeons’, and they had less of the yellow tinge about them, so that persons not much used to eggs could pick them out of the lot; but all these peculiarities might be accidental, though it seemed remarkable that any woodman trying to pass off Wigeon’s eggs for Smews’ should have been able to find so abnormal a nest. But it was not so very long before I satisfied myself that there was a decided difference of texture. This could be perceived on ordinary examination; but it became very striking on exposing the eggs to direct sunshine and examining the penumbra, or space between full light and full shadow, with a magnifying glass—the sharp *mountainous* character of the Wigeon’s egg was strongly contrasted with the lower and more rounded character of the elevations in the Smew’s. \* \* \* \* \* Further I tried the sense of touch; scratching the egg with the most sensitive of my finger nails I could at once perceive the greater roughness of the Wigeon’s egg \* \* \* \* \* The ivory-like texture if the goosanders’ egg was a pretty parallel to the character of the Smew’s.”

Afterwards Wolley received from the priest Liljebad the other four eggs of the set, and with them the rest of the remains of the duck Smew, the head of which had been sent to him with the first three.

The dimensions of these eggs he gives as 2·04" to 2·05" in length and from 1·42" to 1·52" in breadth.

They are described by Wolley at great length, but briefly may be said to have been broad ovals, one end very much smaller than the other, yet decidedly obtuse.

Seebohm and Harvie Brown obtained the eggs from the peasants in North-East Russia; these were obtained from hollows in trees, lined thickly with the usual pale grey down.

According to Oates, “Some of these eggs brought by Mr. Seebohm from Petchora are now in the British Museum. They are nearly elliptical in shape, very smooth and glossy. They are of a pale cream

colour, and measure from 1·9" to 2·05" in length and 1·42" to 1·52" in length."

"The Smew generally breeds in the month of July, and lays seven or eight eggs, which are placed in a hollow of a tree or in one of the boxes hung up by the villagers for the use of the Golden-eye."

Morris in "British Birds" says:—"The nest of the Smew is made of dry grass, and lined with the down of the bird itself. It is placed on the ground, upon the banks of lakes and rivers, not far from the water, or in a hollow in a tree.

"The eggs are said to be eight or ten, or from that to fourteen in number, and of a yellowish white colour."

The eggs, as shown by him in the plate, is a bright deep buff.

The only egg of this species in my collection I owe, as I do most of my rarer ducks' eggs, to the generosity of Herr Kuschel.

In general description my egg agrees very well with those obtained by Seeböhm and described by Oates. It is much stained, but where the original colour shews it is an extremely pale, rather clear cream. It measures 1·95" by 1·47", and was taken in Finland on the 6th of June, 1895. It appears to me to have been considerably incubated at the time it was taken, so they must, sometimes at least, breed long before July, which is the month in which the greater number are said to breed.

#### Genus MERGANSER.

The differences between *Merganser* and *Mergus* have already been defined, and there is no other genus found, or likely to be found, in India with which it can possibly be associated.

According to Salvadori, there are seven species in the genus, but he divides *Merganser castor* into two species, the Indian form, which he designates *Merganser comatus* and distinguishes as being "Somewhat smaller, the feathers of the crest thinner, narrower and longer; the bill usually shorter; the male has the black edges of the tertials broader, the lower back and rump paler grey and usually much freckled with white." As regards these differences, both forms vary *inter se* in every respect, and I cannot understand how they can be made specific so, in this case, I have suppressed *Merganser comatus*, and think our birds should be known as *castor* together with the European form.

No simpler key to the two Indian species can be found than Blanford's, which I give below :—

- a. Head and upper neck black, glossed with green (adult males).
  - a'. Lower parts white throughout .....*castor*.
  - b'. Upper breast rufous with black marks ...*serrator*.
- b. Head and upper neck rufous (females and non-adult males).
  - c'. Chin white, back grey .....*castor*.
  - d'. Chin streaked with rufous, back brown ...*serrator*.

#### MERGANSER CASTOR.

##### *The Goosander.*

*Mergus merganser*.—Hume, Cat., No. 972; Scully, Str. Feath., VIII, p. 364; Hume and Marshall, Game Birds, III, p. 299; Hume and Cripps, *ibid*, XI, p. 347; Aitken, Jour. B. N. H. S., II, p. 56.

*Mergus castor*.—Jerdon, Birds of India, III, p. 817; Hume, Str. Feath., I, p. 423; Parker, *ibid*, II, p. 336; Ball, *ibid*, p. 439; Hume, *ibid*, VII, p. 149, Ball, *ibid*, p. 233.

*Merganser castor*.—Salvadori, Cat. British Museum, XXVII, p. 472; Blanford, Avifauna B. I., IV, p. 469; Oates, Game Birds of India, II, p. 123.

*Merganser comatus*.—Salvadori, Cat. British Museum, XXVII, p. 475.

*Description: Adult Male*.—Whole head, upper neck and crest black, glossed with metallic green, showing purple in some lights, the centre of chin and throat un glossed; lower neck and under parts pure white; upper back glossy black; lower back, rump and upper tail coverts grey, more or less vermiculated with white on the outer feathers, and the tail coverts also dark-shafted and sometimes with paler edges; tail silvery brown, paler and more grey on the lower surface; primaries and outer secondaries very dark brown, inner secondaries white with a narrow edging of black on the outer webs; large secondary coverts white with black bases; primary coverts and edge of wing, black; remaining coverts white; outer scapulars white, with narrow black margins; the inner all black; one or two, next the white ones, tipped or with narrow, irregular white edgings.

“The bill is, according to age, a brighter or duller, lighter or deeper red, almost vermilion in some, a cinnibar or deep blood-red in others. The nail and a broader or narrower stripe along the culmen, from the nail to the forehead, brownish-black, dusky, or black. In some, this

stripe is only indicated. There is often more or less of dusky on the lower mandible, which, in some, is entirely of this colour, but in others almost wholly orange."

"The irides, brown in the young, grow redder with age, and in old males become a deep red, with scarcely a tinge of brown."

"The legs and feet, including the webs, are bright vermilion in the old of both sexes, perhaps rather duller in the females; and reddish-orange in younger birds. The claws greyish or horny white, brownish or reddish towards their bases" (Hume).

"Length about 25; tail 4.25"; wing 9.5"; tarsus 2.0"; bill from gape 2.7" (Blanford).

"Wing 10.95" to 11.8"; tail from vent 4.80"-5.9"; culmen 1.90"-2.10"; tarsus 1.68"-1.80" (Salvadori).

"Wing 10.95" to 12.1"; tarsus 1.86" to 2.03"; bill from gape 2.25" to 2.6"; weight 2 lbs. 12 oz. to 3 lbs. 5 oz." (Hume).

It will be seen from the above that the wing varies from 9.5" to 12.1" according to different authorities.

*Description: Adult female.*—Chin and throat white and lores somewhat albescent; rest of head and neck dull rufous, the crown more brown; sides of neck and whole lower surface white, the flanks striped with grey; primaries and first few secondaries dark brown, the next few white, and the innermost grey with dark margins; upper parts grey, rather mottled in appearance and the upper tail coverts with dark shafts; tail grey-brown with darker shafts; some of the scapulars very dark brown, the lesser and median wing coverts mottled grey and greyish-white.

The colour of the soft parts seem to resemble those of the male, but are, on an average, somewhat darker and more dull.

In size it is considerably smaller. Blanford gives the wing at about 9", and Hume as 6.8" to 10.95". The weight as being 2 lbs. to 2 lbs. 10 oz.

"*Young in first plumage*, closely resemble adult females, but have shorter crests, and brown instead of grey markings on the breast and flanks; *males* may be distinguished by paler feathers on the median wing-coverts and outer scapulars and darker feathers on the inner scapulars" (Seebohm).

"*Males in moulting plumage*, closely resemble adult females, but have traces of a black ring round the neck and are darker on the back

and shoulders and show the whitish wing of the immature bird" (Seebohm).

"Males in first nuptial dress have more grey on the shoulders than adults."

"Young in down, similar to that of *M. serrator*, but perhaps not so dark on the upper parts" (Salvadori).

A very young unsexed bird in the Indian Museum, Calcutta, has the upper parts of the head and neck dull rufous, the lower parts white, and the upper parts and tail grey; the back very rufescent, and the wing and tail feathers dark-shafted.

The Goosander is found at different times throughout the whole of Europe and all Asia above the 20th latitude, below which it only occurs as a straggler.

In America it is replaced by a very closely allied species.

In regard to Indian limits, Hume goes so fully into details that I cannot do better than quote him fully. He writes:—

"In the larger rivers of the Himalayas, though nowhere numerically very abundant, they are so universally distributed high up in summer, low down in winter, that it is needless to specify the particular localities, over 70 in number, whence I have received them, or where they have been reported to have been obtained."

"Outside the Himalayas, I have received them, or know for certain of their having been obtained from the Peshawar Valley on the Cabul River; near Attock, Kalabagh, and just above Dehra Ismail Khan on the Indus; near Sealkot on the Chenab and smaller streams; the Kangra Valley; below Roopur on the Sutlej; Dehra Dun, not only on the Ganges from Rukikes to below Hurdwar, but in the interior; Pilibhit on the Sardeh; the Sandi Jhil, near Hardui (*Irby*); the Kosi river towards the north of the Purneah district; the Western Doars (where they appear to be extremely numerous); the Monas in the Kamrup district; some streams north of Lakhimpur; close to Sadiya; numerous localities near the bases of the Garo and Khasi Hills on both their northern and southern faces and well inside them; near Jamtara, about 156 miles from Calcutta on the East Indian line of railway (*Brooks*); at a large lake seven miles from Barrakur; on the Grand Trunk Road where there were some hundreds (*Parker*); on the Damuda in Bankurah and Bardwan; in Manbhurn and Dhalbhum

on the Subanrika ; Lohardugga (*Ball*) ; Singhbhum (Chyebassa, *Tickell*) ; the Rer River, Sirguja (*Ball*) ; the Mahanadi, near Arung (Raipur), and further down almost to Sambalpur (*Blewitt*) ; this latter district north of the Mahanadi (*Ball*) ; Palamow (*Money*) ; and the Sone River near Dehree-on-Sone (*E. Stewart, C. S.—W. Forsyth*) ; lastly Ajmere, near which place Major O'Moore Creagh, V. C., shot a fine male in a large tank."

In addition to these places in *Stray Feathers*, Vol. XI, Hume gives Sylhet and Cachar, though I have never seen or heard of them myself in either of these districts.

The next record is a most important one by E. H. Aitken and was noted in this Journal : " I shot a Goosander (*Mergus merganser*) at Shewa just across the Bombay Harbour on the 2nd instant (December). It was a female or immature male, and was playing along in a shallow sheet of water which formed the reservoir of one of the salt works. I believe this is the most southern point in India from which this bird has been recorded yet."

Oates, merely because it was found in *salt-water*, does not accept Mr. Aitken's identification, and says it must have been *M. serrator*. I can see no reason for thinking Mr. Aitken was wrong, and accept, fully, Bombay as the most southern point in India in which the Goosander has been obtained.

The next record I can find is that of a Merganser shot by R. F. B. at Myitkyina, Burma, and sent with a note to the *Asian*, dated 1st March, 1897, the bird having been shot the previous day. This bird was identified by Mr. F. Finn, who kindly notified me of its occurrence.

Oates in his " *Game Birds* " says that " The Goosander is a common bird in the Upper Irrawaddy, and occurs in small parties of from two or three to six. Owing to my being obliged to travel about in steamers, I never succeeded in shooting one of these birds, but Commander A. C. Yorstoun kindly procured me one and sent me the skin for identification."

The Goosander is a permanent resident in India, but during the summer is confined to the Himalayas at various heights about 10,000 feet, whence it descends in the end of October and early November to the foot-hills and into the plains. The limits of their local migrations have been already noted.

In most countries the Goosander is nearly as much a salt-water as a fresh-water frequenter, but here in India it seems to be essentially a fresh-water species, and the only record of its having been shot in the sea, within our limits, that I can find is that of Mr. Aitken. In the Persian Gulf, however, it has been frequently obtained, and possibly closer search on our extreme north-western coasts might produce more birds.

It haunts the larger streams and rivers, keeping to such as have a distinct current and clear water, avoiding the more sluggish dirty rivers with muddy bottoms. From what observers have noted the Goosander likes, rather than dislikes, a rough current, and in the same way they do not appear to be at all troubled by a rough sea; thus Dresser notes meeting a flock in the sea near Guernsey which was in water rough enough to make the steamer he was in, dip its paddle boxes alternately into the water.

Lakes and still water are not frequented when clear running rivers are adjacent, but sometimes the Goosander may be found on such, though in these cases the water will invariably be found to be free of much vegetation and fairly clean and clear.

It is quite at home in the rough tumbling hill streams which it frequents in its summer home and will there be found swimming and diving at its ease with or against the roughest and quickest of rapids or floating idly in some deep pool.

In such places as these the Goosander may be sometimes surprised, the well-wooded banks allowing of a near approach and screening the stalker, until he actually debouches on the edge of the bank itself. As a rule, however, the Goosander is one of the variest and wildest of birds, and this whether on salt or fresh water. Should he consider that danger is coming too near, his wonderful powers of swimming are at once called into action to place him out of danger; if hard pressed he resorts to diving, at which very few birds can surpass him, though he is said not to equal the Smew in this respect. It is, however, only as a last resource that he takes to wing, for, though once well up and away, his flight is strong and comparatively swift, he takes long to rise off the water, and a long time to get properly under weigh. They rise very obliquely, spattering along the top of the water some yards before clearing it, and even then going some further distance before mounting

well into the air and into full flight. Their mode of starting is very similar to that of Cormorants and Divers, but once fairly started their flight is then swifter than that of either of these birds. Swimming about undisturbed and with no particular object in view, they float with about one-third to half their bodies exposed, but they can sink themselves at will, and Hume says that, especially when swimming against stream, they sink very deep, as do Cormorants, and that when wounded and pursued they never show more than their heads and necks out of water.

As a rule, all over their wide habitat, it is more common to meet the Goosander in quite small flocks of a dozen or so, or varying from half a dozen to a couple of dozen, whilst single birds and pairs are often seen. Sometimes, however, they go in far larger flocks. Cripps writes: "In the Western Dooars I have seen numbers of the species in flocks of from 50 to 200." One or two other authors have noted large flocks, but, except Cripps, all Indian observers seem to concur in considering very small flocks to be the rule in India. On the Irrawaddy Oates speaks of meeting them in small parties numbering six or fewer individuals. A note sent me by Mr. S—— of the Civil Service from Darbhanga mentions only seeing comparatively small flocks.

The food of the Goosander is as purely an animal diet as that of any duck in existence, and the greater portion of it consists of fish, in the diving after which it is wonderfully expert. Very often flocks work in concert in their fishing; sometimes they will gradually work the fish into some narrow inlet, and when driven into it almost exterminate a shoal before the surviving members of it break through the living cordon of greedy birds and make good their escape.

Ball says: "In the Subanrika they may be seen in parties swimming against the stream, and all diving together apparently to catch fish. The sudden disappearance of the whole flock at the same moment gives the idea that they work in concert in hunting the fish which are coming down with the stream. Their flight is very rapid."

They are most voracious birds and do a great deal of damage in fishing rivers. Mr. E. T. Booth in "Rough Notes" writes: "Goosanders are blest with strong, healthy appetites . . . . When wounded or alarmed, I have occasionally remarked that an immense quantity of fish was thrown up. After a shot . . . . at a number of these

birds . . . . scores of small rudd and roach were discovered lying on the surface where the flock had been resting."

Again to quote Mr. Finn from the *Asian*:—"A captive bird I had under observation devoured no less than forty fish, about two inches long, at a meal. No castings were found, but bones and all were digested as by a Cormorant, and the excreta were semi-fluid and very fetid. The stomach of this bird proved to be soft throughout, not hard and muscular like a duck's gizzard." Some time after this was written Mr. Finn was talking to me about this same Goosander, and he observed to me that the attitude of the bird on the completion of his meal was undoubtedly rather pensive, and he wore a rather strained look about his face as if he knew he had reached the limit of his carrying capacity.

The cry with which the Goosander is generally credited is a croak by no means musical or soft, but Booth describes the note of the female and young as being a soft plaintive whistle.

For the table the Goosander is quite worthless, and I advise no one to try it as long as *any* other food is obtainable, the only thing to be said in its favour is that two courses, fish and game (both nasty), may be combined in one. However, Hume says that they are eatable if skinned, soaked several times, and then stewed with onions and Worcester sauce. He remarks that it will form then "an abundant meal for a hungry man;" probably it would, or for several hungry men.

This Merganser undoubtedly breeds freely throughout a great portion of the higher and well-watered Himalayas from 10,000 feet upwards, but so far no one has, I believe, ever taken nest or eggs though the young have been captured.

A very careful search through every book on the subject available in the Asiatic Society's fine library has brought to light nothing that has not been freely quoted already with regard to the nidification of this bird, so I must again make use of the previously much used remarks of Dresser, Seebohm and others.

The Goosander breeds throughout most of Northern Europe and Asia. Its nest has been taken frequently in the British Isles, though the bird is more common in winter than in the breeding season; it is found at that season throughout Denmark, Norway and Sweden,

North Germany and North and East Russia, and thence through North Central Asia, descending to far lower latitudes,—*i.e.*, the Himalayas, the Pamirs, Thibet, Persia, etc., etc.,—in the West than in the East.

Normally the Goosander makes a rough nest in a hollow of a tree, lining the same very copiously with down. This tree is, as a rule, close to water, or at all events within a hundred yards or so of some stream or lake, but sometimes it is placed in a tree well away from all water. Thus Mr. Booth in "Rough Notes" observes: "Throughout the districts in which I met with Goosanders during the breeding season, the females appeared in some instances to resort to situations for nesting purposes at a considerable elevation on the hills. A cavity in a large and partially decayed birch was pointed out by a keeper as the spot from which some eggs had been taken, the old and weather-beaten stump was on the outskirts of a thicket of birch, fir, and alder stretching from a swamp up a steep brae, and *within a mile of a loch*" (*the italics are mine*).

Dresser in his "Birds of Europe" notes "In Denmark it . . . . remains to breed, nesting in hollow trees."

Acerbi, quoted by Yarrel, Hume, etc., etc., writes of Lapland: "The *Mergus merganser*, instead of building a small nest, like the ducks . . . chooses to lay her eggs in the trunk of an old tree, in which time or the hand of man has made such an excavation as she can conveniently enter. The person that waylays the bird for her eggs, places against a fir or pine tree, somewhere near the bank of a river, a decayed trunk, with a hole in its middle; the bird enters and lays her eggs in it; presently the peasant comes and takes away the eggs, leaving, however, one or two, the bird returns and, finding but a single egg, lays two or three more, which the man purloins in the same manner; the bird still returns and . . . . proceeds once more to complete the number she intended. She is defrauded of her eggs as before and continues the same process four or five times . . . . As soon as the eggs are hatched, the mother takes the chicks gently in her bill and lays them down at the foot of the tree, whence she teaches them the way to the river, in which they instantly swim with astonishing facility."

It also often makes use of the nest boxes which are hung up in so many countries for the use of ducks generally, the habit being recorded from Scandinavia, Russia, Finland, North Germany, Lapland and

Greenland. Seebohm remarks: "The Goosander immediately avails itself of the wooden boxes which the Finns fasten up in the trees to tempt them. These boxes are made with a trapdoor behind, so that the peasant may daily rob the nest and thus make the too-confiding bird lay a score or more eggs."

Sometimes, however, the nest is made on the ground. Thus Dresser: "In Uleaborg I obtained eggs from nests on the ground, in a hollow scratched out and filled with down." Again Dybowski, writing of its nidification in Southern Siberia, says: "It nests on the ground amongst the grass, building with dry grass and lining the interior thoroughly with down."

The bird is a very close sitter and most affectionate mother. Dr. Leverkühn writes to me: "*Merganser castor*,—Four times I found this beautiful bird breeding in North Germany and Finland; the nests were placed in holes in old trees, once in a public garden in the vicinity of a small town. The female bird was on the eggs and did not like to relinquish them, although we made much noise by striking with our sticks against the tree. In the end I climbed up to the hole and attempted to capture the bird with my hand, covered by a stout glove, but the bird attacked me so energetically that she made the blood run from my hand and I was forced to retire. I returned the following day with two friends and a complicated machine for taking the bird, but on our approach, we were very much disappointed to find the hole empty, without bird or eggs. The whole hollow was filled by a mass of downy feathers, quite sufficient to make a pillow."

"On a melancholy lake, in the midst of Finland, I once observed a female with 13 chicks who climbed about on the back, and even on the head, of their mother, probably being tired by the, as yet little used, art of swimming."

Several other observers have seen the female Goosander carrying her ducklings in this manner.

Booth notes one thing which I should not pass over; he says, "From time to time a portion of the brood turn over on their backs, remaining often in this position for several seconds." Most of us know the unhappy result if a tame duckling has the misfortune to tumble over on its back,

The eggs are said by various writers to number from six to twelve, though the bird will continue to lay on being robbed, and in such cases will lay over a score of eggs.

Yarrell describes the eggs as being of a "uniform buff-coloured white, measuring two inches-and-a-half in length by one inch and eight lines in breadth. Six or seven young are considered a large brood; the careful mother has been seen . . . to carry some of her offsprings . . . on her back when in the water." Dresser says that the eggs are, or are said to be by his correspondents, "warm, yellowish-white" and "rich cream or creamy white, very smooth in texture of shell, and in size average about  $2\frac{2}{40}$  by  $1\frac{3}{40}$ ". The down in which they are deposited is greyish-white."

Hume writes: "The eggs are said to vary in number from seven to twelve. They are broad, regular ovals, with very fine, smooth, satiny shells of a uniform buffy-white or creamy-yellow. They vary from 2.5" to 2.9" in length and from 1.66" to 1.9" in breadth, but the average of eleven is 2.7" by 1.8" nearly.

I have only two eggs of this species in my collection which were taken in Lapland on the 20th April, 1886. This seems to be about the normal time for them to commence to lay, but as these two eggs were considerably incubated they had probably been laid early in the month. They are found well on into June.

My two eggs are rather long, very regular ovals, though in both there is an appreciable difference between the two ends. The texture is extremely smooth and close and has the satiny feel to the touch that some passerine birds' eggs have.

The colour is a very pale dull buff, with a decided gloss. They measure 2.75"  $\times$  1.82" and 2.62"  $\times$  1.72".

I had nearly forgotten to quote Humes' note about this birds' manner of progression; he says: "On land one only sees them resting on the water's edge, and when disturbed, they shuffle on their breasts into the river. I do not think that they can walk at all. Anyhow, I have always seen them just half glide, half wriggle, breast foremost, and I think touching the rocks, into the water." Now this may have been due to Hume having only seen the birds on the very edge of the water, and even tame ducks *when close* to the water and *on a shelving* bank or stone often seem to wriggle and glide into the water,

their breasts practically touching the ground *en route*. Mr. Finn, in his article on ducks, which appeared in the *Asian*, has shewn that the Mergansers can walk all right. "On shore they move about very little, and are clumsy walkers, although they get about better than one would expect from the published accounts of their gait."

MERGANSER SERRATOR.

*The Red-breasted Merganser.*

*Mergus serrator*.—Hume and Marshall, "Game Birds, III," p. 305 ; Hume, "Str. Feath., IX," p. 268 ; Barnes, "Birds of Bombay," p. 416.

*Mergus castor*.—Hume, "Str. Feath.," IV, p. 496 ; Butler, *ibid*, pp. 291, 393.

*Merganser serrator*.—Salvadori, Cat. British Museum, XXVII, p. 479 ; Blanford, "Avifauna of B. India, IV," p. 470 ; Oates, "Game Birds of India, II," p. 124.

*Description: Adult Male*.—Whole head, crest and a narrow black line down the nape of the neck, black, the posterior part of the head and the crest glossed green ; neck white ; back black ; lower back, rump and upper tail coverts white and very dark brown in fine wavy lines, the bases of the feathers on the lower back brown and shewing a good deal, tail dark grey, edged paler. The primaries, three outer and innermost secondaries dark brown, the next white with black bases and from these to the longest white with narrow black margins ; greater and median coverts white ; edge of the wing and smaller coverts brown, breast rather rich rufous-brown, the feathers more or less centred black, side of the breast, under the shoulder of the wing, black with a patch of feathers white, merely margined with black ; outer scapulars white, inner black.

*Males*.—Length, 24·0" to 26·0" ; expanse, 29·0" to 32·5" ; wing, 9·0" to 10·0" ; tail, from insertion of feathers, 3·1" to 4·2" ; tarsus, 1·8" to 2·05" ; bill at front, along calmen, 2·4" to 2·5" ; weight (Naumann) a little over 2 lbs.

"In the male the bill varies from orange-red to deep vermilion, is more or less dusky on the ridge, and has the nail varying from pale yellowish-grey to almost black ; the feet vary similarly to the bill, and are brighter externally, paler internally, and duller on the webs ; the claws are light grey, duller, and browner or redder towards their bases" (Hume).

The above dimensions and colours of the soft parts are compiled by Hume from different authors.

Salvadori gives the total length as 21 inches, and the culmen 2·15", whilst he states the tarsus to be only 1·5".

Blanford gives the bill from gape as 2·75".

*Adult Female*.—Lores and upper part of head and neck pale rufescent-grey, with darker centres to the feathers, a faint supercilium dull rufescent-white; a dark eye-streak like the lores; chin and throat rufescent-white; remainder of head and neck dull rufous; upper parts ashy-brown, most of the feathers edged paler, lower parts white; flanks mottled brown and white; primaries and innermost secondaries dark brown; outer secondaries and their coverts white, the latter with brown bases; remainder of wing coverts ashy-brown; under wing coverts grey and white.

"Length, 22·0" to 23·5"; expanse, 28·0" to 31·0"; wing, 8·5" to 9·3"; tail from insertion of feathers 2·7" to 3·6"; tarsus, 1·66" to 1·83"; bill, as above, 2·1" to 2·3".

"In the young and females there is more dusky on the upper mandible, where the red is often only a lateral band, and the feet are duller coloured than in the adult male" (Hume).

"*Adult male in Summer*.—In the plumage that the male of this species assumes for a short time during the summer it resembles the female, but is distinguishable by its larger size, the different colour of the abdomen and of the scapulars" (Dresser).

"*Young male* closely resembles the female, especially when the latter is in fresh plumage with a greyish tinge, but can usually be distinguished by its larger size and shorter crest" (Dresser).

"*Males in first nuptial dress* have the lower back brown, and the white round the neck streaked with brown" (Salvadori).

"*Young in down* are dark brown on the upper parts, shading into reddish-brown on the head, and into reddish-brown on the sides of the neck; a white patch on each wing, one on each side of the upper back, and one on each side of the rump; underparts pure white, and lores white, margined above and below with dark brown" (Seebohm).

The Red-breasted Merganser is found practically throughout the Northern Hemisphere, breeding to the north and extending south to

the Mediterranean basin, Central Asia to Persia, Northern India, China and Japan, and in America to the United States.

On the whole it is a more northern bird than the Goosander and is circumpolar, whereas the latter is an eastern or old-world form.

In India there is no doubt that it occurs only as the most rare of stragglers.

The first specimen quoted as being an Indian one, and which was the only one known to Hume at the time "Game Birds" was written, was erroneously so recorded. Blanford corrects this mistake; he says "The bird stated in 'Stray Feathers' (b. s. c.) and the British Museum Catalogue to have been shot by Captain Bishop at Manora, Karachi Harbour, was really obtained by him at Chakbar in Persian Baluchistan. This correction is founded on a letter from Captain Bishop to Mr. Cumming, which I have seen."

In "Stray Feathers" (V, p. 323), Captain (then) E. A. Butler notes: "There is a fine specimen, a ♀, of this species in the Frere Hall Museum, shot by Capt. Bishop, at the Manora point off the Karachi Harbour, another specimen has just now been captured, at the end of June." Both these birds are referred to as *M. castor*, but the first was the *M. serrator* obtained by Capt. Bishop at Chakbar as already noted. Whether the second bird was *M. castor* or *M. serrator* I cannot ascertain.

Beyond this there are only two recorded instances of the actual occurrence of the Red-breasted Merganser within our limits. Of these the first was that obtained by Major Yerbury at Karachi, and which may be the second noted by Capt. Butler. The wings of this are in the British Museum.

The other Indian specimen is that in the Indian Museum, Calcutta, an unsexed specimen obtained in the Calcutta bazaar on December 17th, 1889.

The habits of this bird vary little from those of the last, the main thing about it merely being the fact that it is more essentially a sea bird. Like the Goosander it generally associates in rather small flocks, but may occasionally be seen in parties numbering as many as two hundred or even more.

Dresser, writing of this bird, observes: "In the Gulf of Bothnia, where the sea is fresh-water, I found it extremely common in the summer season, frequenting the coasts and less often the inland lakes,

but usually in places where the forests extended down to the shores, and frequently in localities where there are reeds or dense herbage, as is frequently the case on portions of the coast. It is a wary and shy bird, soon taking alarm and not easy to approach within range; but I often obtained them when out very early in the morning about sunrise, when they appeared less shy than otherwise. It is a very expert diver; and on the coast of New Brunswick I observed them fishing in flocks at the entrance of a small bay, and evidently driving the fish before them, as they formed a sort of cordon round the entrance to the bay, some diving, whilst the others remained on the surface. When pursued or threatened with any danger, it usually seeks safety by diving in preference to trusting to its powers of flight. It flies with great swiftness; and I observed, when one passed at full speed near my hiding place in the rocks, that it made a whistling sound with its wings, easily heard even at some little distance. It feeds on fish of various kinds; larvæ of water insects, worms, and it is also said to some extent frogs, form its staple food."

Naumann describes their cry as "A loud, resounding guttural keer-r-r or ger-r-r," heard chiefly during flight, sometimes on rising, and the females and young are said to be more noisy than the adult males.

Like the Goosander the Red-breasted Merganser can at will either float fairly high on the surface of the water, deep down in the water, or entirely submerge its body leaving only its head and neck visible.

As regards its breeding habits, it is remarkable that, whereas it is the exception for the Goosander to breed, building its nest on the ground, it would appear to be the rule for this bird to do so and the exception for it to build on trees.

Saxby, describing its nesting in the Shetlands, says that "Although they often lay amongst long grass, they seem to prefer the shelter of a roof of some kind, and thus it is that the eggs are most commonly found under rocks, in rabbit burrows, and even in crevices in old walls."

In Yarrel's "History of British Birds," III, p. 288, there are the following remarks:—"This species, Mr. Thompson says, . . . is indigenous to Iceland, nesting in islets both of marine and fresh-water loughs. Pennant has recorded its breeding in the Isle of Islay.

Sir W. Jardine and Mr. Selby found nests of this species when on a fishing excursion upon Loch Awe in Argyleshire. One of these nests was upon a small wooded island, placed among thick brushwood, under the covert of a projecting rock, and completely surrounded with nettles, long grasses and ferns. It was carefully made of moss, plucked from the adjoining rocks, mixed with the down of the bird, both in structure and materials resembling that of the Eider Duck. It contained nine eggs of a rich reddish-yellow or fawn-colour. The bird was remarkably tame, sitting until nearly taken with a small hand net. Sir W. Jardine very kindly sent me one of these eggs for my collection; it measured two inches-and-a-half in length and one inch-and-three-quarters in breadth."

Dresser also says that "it usually places its nest upon the ground, in quiet, unfrequented places amongst the low bushes or rank herbage; occasionally it is found in the hollow of a tree. I possess a nest, which is now before me, and which is composed of moss, fine grass bents, and a few small pieces of twigs well felted together and mixed with down."

The eggs, from eight to twelve in number, are usually deposited late in June or somewhat earlier than that."

He describes the eggs as being "A dull stone drab or creamy buff with a greenish grey tinge, and measuring approximately from 2.55" to 2.80" in length and 1.70" to 1.85" in breadth."

Morris, who gives a longer note on the nidification of the Red-breasted Merganser than on most ducks, observes: "These birds build, it seems, on the borders of, and small islands in, lakes, whether of fresh or salt-water, and rivers, preferring such as have a growth of wood, the nest being placed a few yards from the edge, at the foot of the tree, or under the shelter of brushwood, in the midst of grass, fern, nettles, or other wild vegetation. Also in divers other situations, among stones in a hollow, on the bare ground, at the top of a tall tree, or in the deserted nest of some other bird, or in the end of a deep recess. It has been known, moreover, in a bleak and unsheltered situation, on an island in the sea, at some distance from the main land. The materials of its composition are moss, flags, stalks, grass, small roots and feathers, placed carelessly together, and intermixed with the down of the bird, added to, it appears, as incubation advances."

“The eggs are from six or seven, to nine, ten or eleven in number, of a rich reddish-yellow, or brownish fawn-colour. As soon as the females begin to sit, the males quit them for the season. The species appears to be late in its nidification, scarcely beginning to build before the end of May, or the early part of June. The bird sits very close, and will almost allow herself to be trodden on before she will leave the nest.”

With this summary of Morris' most writers agree, but the eggs are said to vary from five to fifteen in number, and many authors remark on the fact that the nest of this Merganser is, *comparatively* perhaps, unusually well put together and compact. All note the curious way the down is felted in with the rest of the materials into the body of the nest as well as being used as a copious lining.

It should be noted that, in Holstein, Boje found it breeding in old crows' nests.

The eggs in my own collection vary in length between 2.39" and 2.65" and in breadth only between 1.7" and 1.76".

They are very similar to the eggs of the Goosander, but are, on the whole, rather broader ovals, all are somewhat darker in colour and two have a well-defined greenish tint. One clutch was taken on the 29th April, 1899, another on the 10th June, 1880, and the third on the 2nd July, 1898.

#### ERRATA.

1. Mr. W. T. Blanford has shewn that *Cygnus bewicki* (Bewick's Swan) must be expunged from our list, and that *C. musicus* (The Whooper) must be included. This correction may be taken as absolutely final, and is based on Mr. Blanford's personal examination of the skull and foot of Hodgson's bird in the British Museum. (Bom. N. His. Jour., XI, No. 2, p. 306).

In the *Asian* of the 27th February, 1900, there is a notice of a young male and female *Cygnus olor* being shot, many others seen, and a third shot by a native shikari near Dera Ismail Khan.

2. The Flamingo does breed in India. I most unfortunately overlooked the Miscellaneous Note in Vol. VIII of this Journal, p. 553. Mr. C. D. Lester draws attention to this in Vol. XI, p. 321.

[THE END.]

Tarsus about sat

Bill more or less depre

Tail feathers normal. Tail f  
SUB-FAMILY FULIGULINÆ. SUB-F

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Primaries without Primaries with  
any white on base. more or less  
GENUS CLANGULA. white on base.  
*C. glaucion.*  
*The Golden Eye.*

l with  
k band

A full, thick crest. No crest  
Lamellæ very long a long  
and prominent. Lamella  
Bill tapering. well apart  
GENUS NETTA. very pro  
*N. rufina.* GENUS FU  
*The Red-crested NYR*  
*Pochard.*

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No white speculum.  
*Nyroca ferina.*  
*The Red-headed*  
*Pochard.*

Feet :  
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*A. br.*  
*The Pi*

Back and scapulars Low  
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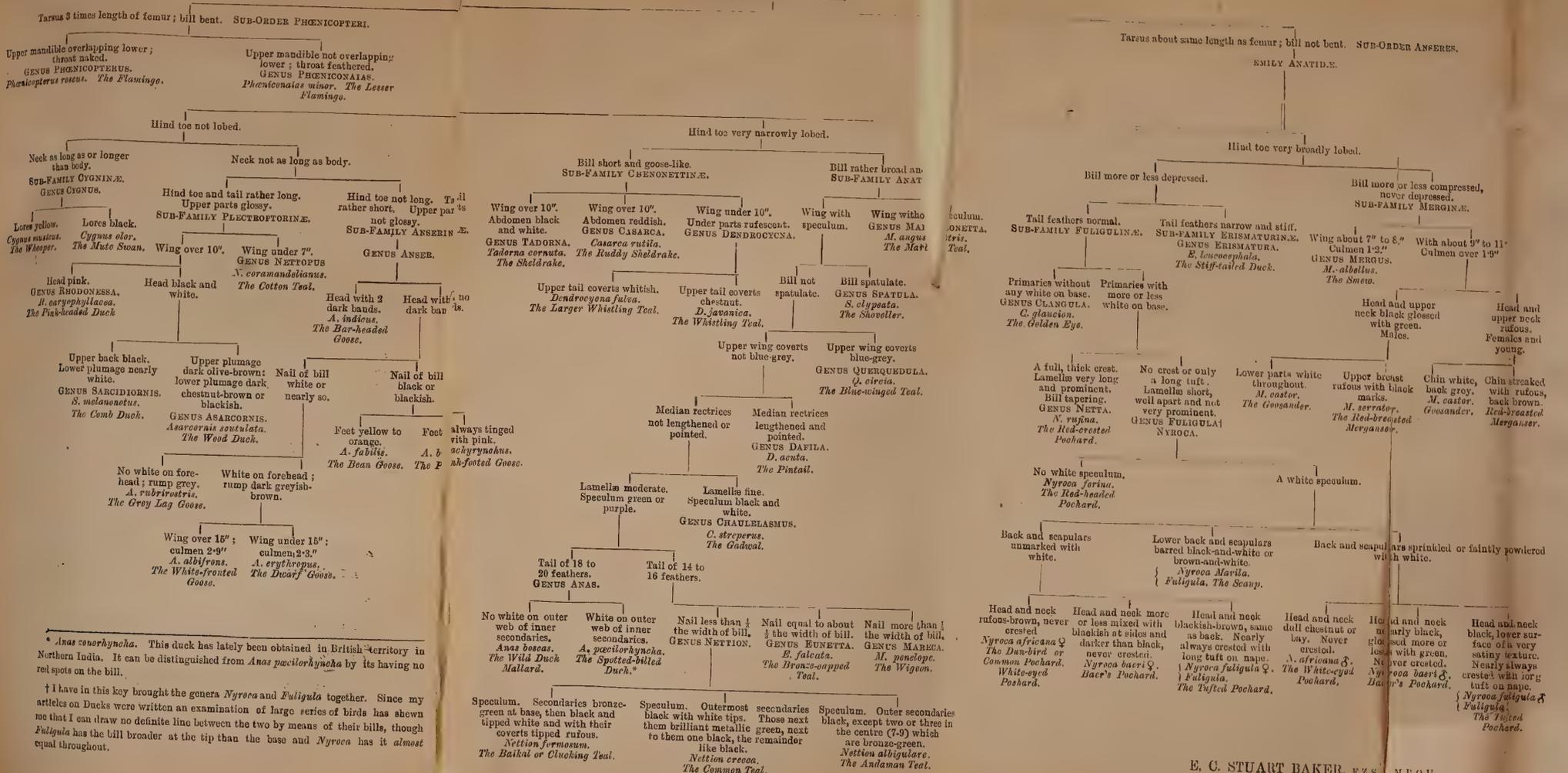
Head and neck Head and neck more  
rufous-brown, never or less mixed with  
crested. blackish at sides and  
*Nyroca africana* ♀ darker than black,  
*The Dun-bird or* never crested.  
*Common Pochard.* *Nyroca baeri* ♀.  
*White-eyed* *Baer's Pochard.*  
*Pochard.*

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KEY TO THE INDIAN DUCKS. ORDER CHENOMORPHÆ.



\* *Anas coscorrhyncha*. This duck has lately been obtained in British territory in Northern India. It can be distinguished from *Anas pectorrhyncha* by its having no red spots on the bill.

† I have in this key brought the genera *Nyroca* and *Fuligula* together. Since my articles on Ducks were written an examination of large series of birds has shown me that I can draw no definite line between the two by means of their bills, though *Fuligula* has the bill broader at the tip than the base and *Nyroca* has it almost equal throughout.

# KEY TO THE INDIAN DUCKS.

## EXPLANATIONS.

- Tarsus* = the shank of the leg, from the (so-called) knee joint to the base of the hind toe.
- Femur* = the thigh, or the part of the leg from the body to the knee.
- Lores* = the three-cornered portion of the face between the eye and the base of the bill.
- Nail* = the triangular-shaped hard patch at the tip of the upper mandible.
- Culmen* = the upper margin of the upper mandible.
- Tailcoverts* = the soft feathers which overlie the quill feathers of the tail.
- Primaries* = the outermost quill feathers of the wing, in ducks 11 in number.
- Secondaries* = the remaining quill feathers of the wing.
- Wing-coverts* = the soft feathers of the wing from the shoulder to the quills.
- Speculum* = the pattern usually found on the outer secondaries formed by various colours.
- Rectrices* = the quill feathers of the tail.
- Lamellæ* = the tooth-like projections in the bill of the duck.
- Scapulars* = the feathers of the outer back or shoulders.
- Compressed* = Pressed laterally as if pinched at the sides.
- Depressed* = Pressed vertically as if held above and below and flattened out.
- Spatulate* = Shovel or spoon-shaped.
- ♂ = Male.
- ♀ = Female.

## ILLUSTRATIONS.



A Duck's hind toe not lobed as in the Swans, Geese, Cotton-teal, etc.



A narrowly lobed toe as in the Pintail, Gadwal, Teal, etc.



A broad lobed toe as in the Pochards, Mergansers, etc.

THE MOTHS OF INDIA.  
 SUPPLEMENTARY PAPER TO THE VOLUMES IN  
 "THE FAUNA OF BRITISH INDIA."

SERIES II. PART II.

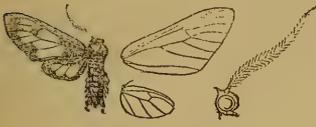
BY SIR G. F. HAMPSON, BART., F.Z.S., F.E.S.

(Continued from page 51 of this Volume.)

Genus ERESSA.

Type.

*Eressa*, Wlk., 1, 149 (1854)..... *confinis*.  
*Trianeura*, Butl. Journ. Linn. Soc. Zool., xii, p. 353 (1876)... *subaurata*  
 Proboscis small or well developed; palpi short and porrect, frons hairy;  
 mid and hind tibiæ with small terminal  
 pairs of spurs. Forewing usually broad;  
 vein 3 from well before angle of cell; 4, 5  
 from angle; 6 from below upper angle;  
 7, 8, 9, 10, 11 stalked. Hindwing with vein  
 2 from well before angle of cell; 3·5 well  
 separated at origin; 4 absent; 7 absent.



*Eressaconfinis* ♂ ♀.

Sect. 1. Antennæ of male bipectinate.

- A. Abdomen with dorsal and lateral series of orange-yellow spots.
- a. Hindwing with large hyaline patch below base of cell.
- a. Forewing broad, with the elongate hyaline patch below vein 2 commencing below middle of cell ..... 455. *confinis*.
- b. Forewing narrow, with the hyaline patch below the cell commencing near base of wing ..... 456. *subaurata*.
- b. Hindwing with hyaline spots between veins 2 and 5 and in end of cell ... 457. *affinis*.
- B. Abdomen with six orange bands.
- a. Frons black; markings of thorax and abdomen orange..... 444. *erressoides*.
- b. Frons and markings of head, thorax and abdomen pale-yellow ..... 457a. *vespa*.
- C. Abdomen with short dorsal yellow bands on each segment, ventral surface yellow ..... 408. *microchilus*.
- D. Abdomen with two orange-red bands and lateral spots on intermediate segments ..... 459. *erythrosona*.
- E. Abdomen with one basal yellow band ..... 450. *aperiens*.
- F. Abdomen with lateral series of white spots... 458b. *amosa*.

455. *ERESSA CONFINIS*, insert (syn.) 454. *Eressa musa*.

457. *ERESSA AFFINIS*, insert (syn.) *Eressa politula*, Swinh., Cat. Het. Mus. Oxon., p. 52 (1892).

457a. *ERESSA VESPA*, Hmps., Cat. Lep. Phal., B. M., i., p. 118, pl. iv, f. 27 (1898).

Black; frons, tegulæ, patagia and stripes on thorax yellow; thorax at sides and fore coxæ yellow; abdomen with six yellow bands; wings yellowish, hyaline. Forewing with the veins black; the margins rather broadly black; the base of cell, a disco-cellular band and projections from the terminal band along vein 5 and between veins 2 and 3 black. Hindwing with the terminal band narrowing from costa to vein 2.

*Habitat*.—Burma, Karen Hills. *Exp.* ♂ 22, ♀ 26 mm.

408. *ERESSA MICROCHILUS*, insert (syn.) 458a. *Syntomis plumalis*.

458b. *ERESSA ANNOSA*, insert (syn.) *Syntomis marcescens*, Feld., Reise, Nov., pl. 102, f. 12 (1874), and *Syntomis lasara*, Pag., Jahrb. Nass. Verh., xxxviii, p. 13, pl. 2, f. 8 (1885).

Sect. II. Antennæ of male serrate, of female simple.

A. Abdomen crimson, with a series of blue-black spots.

a. Wings hyaline yellow; forewing with small apical black patch ..... 446. *multigutta*.

b. Wings hyaline white; forewing with the hyaline patch extending to vein 4 ..... 431. *lepcha*.

B. Abdomen with each segment slightly fringed with yellow; forewing with the apical patch extending to vein 4 ..... 448. *nigra*.

446. *ERESSA MULTIGUTTA*, insert (syn.) 447. *Syntomis blanchardi*.

Sect. III. Antennæ ciliated ..... 428. *discinota*.

Genus *DYSAUXES*.

437. *DYSAUXES PUNCTATA*, insert (syns.) *Bombyx serva*, Hübn., Eur. Schmett., III, f. 115 (1827), and *Bombyx confamula*, Hübn., Eur. Schmett., III, ff. 226, 227.

Genus *EUCHROMIA*.

A. Wings with the markings yellow ..... 469. *polymena*.

B. Wings with the marking hyaline ..... 468. *magna*.

469. *EUCHROMIA POLYMENA*, 470. *Euchromia orientalis*, with the three crimson bands on abdomen, is a sub-species from Lower Burma, Siam and Philippines, of which 471. *E. laura* is an aberration.

461a. *SYNTOMIS PENANGA* is a *Zygænid* of the genus *THYRASSIA*.

472. *Euchromia amcena*, Moschl, is from S. Africa.

*ZYGÆNIDÆ*.

474a. *ZYGÆNA RUBRICOLLIS*, n. sp. (Pl. B, f. 9).

♀. Blue-black; tegulæ crimson; abdomen with crimson band on 6th segment. Forewing with broad subbasal crimson band, its outer edge ex-

curved below costa and cell, then incurved; a spot in middle of cell and larger spot below the middle; a rounded spot in end of cell, and a subterminal spot between veins 3 and 5. Hindwing crimson, the termen black at apex and vein 2, the cilia black.

*Habitat*.—Chitral, Shishi Kuh Valley (G. H. Colomb). *Exp.* 38 mm.  
*Type*.—In British Museum.

Genus ZYGÆNOPROCRIS, nov.

*Type*.—*Z. chalcoclora*.

Palpi short porrect; antennæ of male bipectinate, of female simple, the extremity in both sexes dilated into a large hollowed-out knob; tibiæ without spurs; wings with all the veins present and from cell.

475a. ZYGÆNOPROCRIS CHALCOCHLORA, n. sp.



*Zygænoprocris chalcoclora*, ♂  $\frac{3}{8}$ .

*Habitat*.—Chitral, Jhela Drosh (Capt. S. W. Harris). *Exp.* 20 mm.  
*Type*.—In British Museum.

481. CALLARTONA PURPURASCENS and 481a. SCAPTESYLIX HEMICHRYSIS belong to the *Tineidæ*.

483a. ARTONA ALBICILIA, n. sp.

♂. Uniform dark-brown with a slight purplish tinge; underside of head white; tarsi tinged with white; cilia white.

*Habitat*.—Nága Hills; Pulo Laut (Doherty). *Exp.* 10 mm.

483b. ARTONA FLAVIPUNCTA, n. sp., (Pl. B, f. 22.)

♂. Black-brown; palpi, a line above eyes, upper edge of patagia and coxæ yellow; abdomen with faint traces of dorsal yellow band and more prominent ventral bands. Forewing with yellow streak below basal third of costa and short subbasal streak on inner margin; a rounded spot below end of cell, and an oblique postmedial bar between veins 4 and 8. Hindwing with short yellow streak below middle of cell, and an elliptical spot beyond the cell.

*Habitat*.—Khàsis. *Exp.* 24 mm. *Type*.—In Coll. Elwes.

503. PHACUSA PROPERTA, insert (syn.) *Northia dohertyi*, Oberth., Et, Ent., xix, p. 31, pl. 5, f. 36 (1894).

504. PHACUSA TENEBROSA, insert (syn.) *Northia birmana*, Oberth., Et, Ent., xix, p. 31, pl. 5, ff. 22, 37.

505. PHACUSA CYANOCERA, insert (syn.) *Northia ignea*, Oberth., Et, Ent., xix, p. 29, pl. 5, f. 35 (1894).

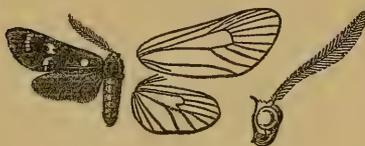
517. CALLIZYGENA AURICINCTA=AURATA, Cram., Pap. Exot., iii, pl. 264, f. A.

## Genus LAMPROCHLÖE, nov.

Proboscis fully developed; palpi minute; antennæ of female bipectinate, somewhat flabellate at the extremity; hind tibiæ with the medial spurs absent. Forewing long and narrow; the cell constricted towards base; all the veins from the cell except 10-11 which are stalked. Hindwing with the termen excised towards tornus; vein 3 from angle of cell; 4-5 stalked; 6-7 at intervals from long below angle of cell.

518a. LAMPROCHLÖE ALBIPUNCTA, n. sp.

♀. Head, thorax and abdomen brilliant metallic blue-green, the extremity of tegulæ and patagia bright coppery. Forewing black, suffused with dark-green; a yellowish hyaline subbasal spot below the cell; two spots in end of cell, an oblique transverse spot below the end, and a band beyond the cell formed of five small con-



*Lamprochloë albipuncta*, ♀  $\frac{1}{2}$ .

joined spots. Hindwing semihyaline black with a slight green tinge; the costal area ochreous.

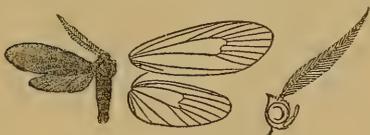
*Habitat.*—Ceylon, Pundaloya (Green). *Exp.* 30 mm. *Type*—In British Museum.

523. PHLEBOHECTA FLAVICOSTA, insert (syn.) *Soritia lithosia*, Oberth. Et. Ent., xix, p. 26, pl. 5, f. 25 (1894).

## Genus PHAUDOPSIS, nov.

Proboscis minute; palpi upturned, slender, reaching vertex of head; antennæ bipectinate with long branches; hind tibiæ with the medial spurs absent. Forewing elongate elliptical, all the veins from cell; 9 absent. Hindwing with veins 3-4 from angle of cell; 5 from well above angle; 6 from below upper angle.

612a. PHAUDOPSIS IGNEOLA, n. sp.



*Phaudopsis igneola*, ♂  $\frac{1}{2}$ .

♂. Head brown; thorax fiery red; abdomen brown. Forewing fiery red, with broad purplish-fuscous streaks in submedian interspace and on inner margin tapering to base and termen; a wedge-shaped fuscous patch from median nervure to apex and vein 2. Hindwing

brown. ♀. Forewing with only slight streak in submedian interspace and none on inner margin; the postmedial patch not reaching termen.

*Habitat.*—Khâsis. *Exp.* 26 mm. *Type*—In British Museum.

## PSYCHIDÆ.

621a. ACANTHOPSYCHE (*Æceticoides*) MINIMA, n. sp.

♂. Uniform black-brown; wings rather sparsely clothed with black hair, rather more thickly on basal half of inner area of forewing.

Larva case covered with small land-shells, bits of the pupa of a large moth, &c. One specimen bred from about 200 similar cases by J. Pole, who says it is preyed on by a small wasp to an almost exterminating extent.

*Habitat*.—Ceylon, Puttalam (Pole). *Exp.* 12 mm. *Type*—In British Museum.

631*b*. ACANTHOPSYCHE (*Metisa*) GIGANTEA, Dudgeon, J. Bomb. N. H. Soc., xii, p. 644, pl. I, f. 14 (1899).

♂. Frons and thorax pale reddish-brown, vertex of head and collar grey-brown; abdomen reddish-brown, forewing grey-brown, the inner area pale yellowish-brown up to cell and from middle of vein 2 narrowing to tornus. Hindwing grey-brown, the area below the cell and vein 2 yellowish-brown. Forewing with veins 4-5 stalked; 7, 8, 9, 10 stalked. Hindwing with veins 4-5 from point, and a spur from middle of vein 8 towards costa.

*Habitat*.—Sikhim, 1,800'. *Exp.* 54 mm.

#### COSSIDÆ.

##### Genus DUDGEONEA, nov.

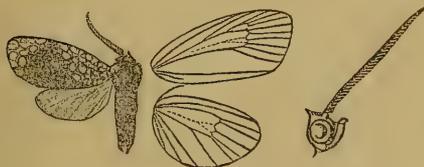
*Type*.—*D. LEUCOSTICTA*, Hmps. n.

*Range*.—Sikhim; W. Africa.

Palpi upturned, reaching vertex of head; antennæ of male bipectinate to apex with very short branches; tibiæ with the spurs well developed. Forewing somewhat broad and quadrate, the apex rounded, the inner margin arched near base; veins 3, 4, 5 separate at origin; 6 from well below angle of cell, 7 from just below; 8, 9, 10 arising separately from areole; 11 from cell. Hindwing with veins 3, 4, 5 separate at origin; 6 from well below angle of cell; no bar between veins 7 and 8; both wings with forked veinlet in cell.

656*a*. DUDGEONEA LEUCOSTICTA, n. sp.

♂. Ferruginous; thorax dark rufous-brown, with the patagia white except at base; palpi in front and coxæ whitish. Forewing with numerous silvery white spots on basal half, tinged with yellow below costa, and small and yellowish towards their outer region; the apical area with large silvery white spots mixed



*Dudgeonea leucosticta*, ♂  $\frac{1}{2}$ .

with small yellowish ones. Hindwing whitish, tinged with ferruginous, especially towards medial part of termen.

*Habitat*.—Sikhim, 1,800' (Dudgeon). *Exp.* 32 mm. *Type*—In British Museum.

Subsp. Forewing with the outer edge of the spotted basal area more erect, the spots on costa and on apical area smaller. Hindwing dark rufous.

*Habitat*.—Sierra Leone, W. Africa (Clements).

657a. *DUOMITUS PARDALIS*, Dudgeon, J. Bomb. N.H. Soc. xii, p. 645, pl. I, f. 17.

♂. White; frons and tips of antennæ black; tegulæ, patagia, pro-meso and metathorax with paired black spots; legs banded black and white; abdomen with lateral black bands on each segment. Forewing with the veins and inner area yellowish; numerous black spots, of which the more prominent are a spot in cell, a round spot beyond cell, and a subterminal spot between veins 5 and 6. Hindwing with greyish-black streaks in the interspaces broken up into spots near termen.

*Habitat*.—Sikhim, 1,800'. *Exp.* 44 mm.

#### ARBELIDÆ.

675a. *ARBELA WATSONI*, n. sp.

♂. Grey; tegulæ, metathorax and the tufts at base of abdomen dark at tips; the anal tuft with the spatulate end of scales dark. Forewing with fine dark striæ and suffused with darker grey, leaving a somewhat triangular medial whiter patch; a subbasal blackish triangular patch below median nervure; a diffused oblique blackish postmedial band, with the black discoidal spot with white point beyond it on its inner edge; traces of a subterminal line. Hindwing with numerous fine dark striæ. ♀. Paler.

*Habitat*.—Madras (E. Y. Watson). *Exp.* ♂ 26–34, ♀ 36 mm. *Type*—In British Museum.

#### DREPANIDÆ.

696a. *EUCHERA DICTYARIA*, Swinh., A. M. N. H. (7), iii, p. 111.

♂. Nearly pure white; head black; legs largely marked with black. Forewing with fuscous lunule above inner margin towards tornus; both wings with a subterminal series of black spots, with two minute points between each nearer termen; hindwing with discoidal black spot. Underside with large round discoidal back spots on each wing.

*Habitat*.—Canara. *Exp.* 66 mm.

709a. *DREPANA UNDULIFERA*, n. sp. (Pl. B, f. 10).

♂. Whitish suffused with very pale ferruginous; head dark ferruginous. Forewing with crenulate ferruginous ante and postmedial lines, the latter very acutely angled below costa, then oblique; dark points at angles of cell. Hindwing with scarcely a trace of ferruginous tinge; a fine postmedial line from submedian fold to inner margin.

*Habitat*.—Tibet, Yatong 10,500' (Hobson). *Exp.* 32 mm. *Type*—In British Museum.

712a. *DREPANA FULVICOSTA*, Dudgeon, J. Bomb. N. H. Soc. xii, p. 652 (1899).

Almost pure white; frons brown; antennæ, tibiæ, and tarsi tinged with fulvous; wings irrorated with silvery scales. Forewing with the costal edge pale fulvous; a very indistinct oblique waved medial line from cell to inner margin, and similar postmedial and subterminal lines. Hindwing with indistinct waved postmedial and two subterminal lines.

*Habitat*.—Punjab; Mynpuri; Bhutan. *Exp.* 34-38 mm.

759c. ORETA OLIVACEA, Dudgeon, J. Bomb. N.H., xii, p. 657, pl. II, f. 20 (1899).

♂. Olive-brown; head and base of tegulæ purplish; palpi scarlet; legs scarlet above, greyish below; hind tibiæ with prominent black stripe; abdomen purplish towards extremity. Forewing finely irrorated with silvery grey; a rufous medial line strongly angled below costa and slightly on median nervure and vein 1, some purplish suffusion beyond its costal portion; two fuscous and grey points on discocellulars; a line across apical area very acutely toothed at middle, incurved below costa and near termen, the area beyond it irrorated with white; a black point near tornus and another on vein 2. Hindwing irrorated with silvery, and a few black scales. Underside red irrorated with black; a postmedial black line on forewing angled below apex, then oblique, on hindwing curved.

*Habitat*.—Sikhim, 1,800'. *Exp.* 40 mm.

#### THYRIDIDÆ.

761a. CAMPTOCHILUS SINUOSUS, Warr., Nov. Zool., iv, p. 342 (Pl. B, f. 24).

Forewing with the costa lobed at base, excised at middle and greatly arched towards apex. ♂. Head, thorax and abdomen ferruginous; wings with the basal area pale pinkish-ferruginous, with dark ferruginous spots forming oblique series, the margin of this area oblique on forewing from costa to vein 2, below which there is some diffused ferruginous on inner area, on hindwing it shades off into olive-green, the rest of wings olive-yellow, becoming whitish on costal area of forewing and towards tornus of hindwing; forewing with triangular pale rufous patch on costa beyond middle, with a white spot on it.

*Habitat*.—Mào, Manipur. *Exp.* 32 mm.

761b. CAMPTOCHILUS FURCIFERA, Warr., Nov. Zool., v, p. 5. (Pl. B, f. 4).

♀. Head, thorax, and abdomen orange-yellow; wings yellow, very closely reticulated with fine orange striæ. Forewing with pinkish suffusion on inner margin from base to beyond the middle; fine brown subbasal and antemedial lines, oblique from costa to median nervure, then recurved, the latter obsolete below submedian fold; a brown-pink lunulate patch on costal sinus, with an oblique brown band from it to inner margin, less prominent below submedian fold; a fine slightly sinuous line to tornus, and a line from its outer edge to middle of termen; four fine oblique striæ on costal half of terminal area. Hindwing with subbasal line from cell to vein 1; a stronger straight

brown antemedial line, a fine line from the same point on costa to tornus near which it forks ; a fine line from costa beyond middle to near middle of termen where it forks.

*Habitat*.—Khâsis, *Exp.* 38 mm.

771. RHODONEURA NÆVINA, insert VAR. *cornata*, Warr., Nov. Zool. v, p. 8.

778. RHODONEURA NITENS, del. *Microsca marginipunctalis*.

790b. RHODONEURA SCRIPTA, Warr., Nov. Zool., v, p. 7 (1898).

♀. Red-brown ; abdomen paler. Forewing with dark striæ and waved dark lines, defining obscure bands ; a series of short black streaks on costa with three points between each ; a subcostal series of dark-edged ochreous spots ; a pale elliptical medial patch from below costa to inner margin conjoined at middle to a large diffused patch on terminal area strongly irrorated with black ; a black-edged whitish subapical spot with some black points round it. Hindwing pale suffused with rufous and striated with black ; a quadrate rufous discoidal spot, with a short black streak below it in submedian fold, and quadrate black spot on inner margin. Underside of forewing with series of whitish patches with black strigæ on them ; a subcostal ferruginous streak ; black and white streaks on subcostal nervure in cell and on the veins beyond upper angle.

*Habitat*.—Khâsis. *Exp.* 26 mm.

796a. RHODONEURA FURCIFER, n. sp.

♀. Very pale red-brown ; head and collar slightly darker ; wings closely reticulated with brown. Forewing with traces of subbasal lines ; an antemedial line slightly excurved below costa ; a straight postmedial line giving off a fork below costa to tornus ; a slightly curved line across apical area. Hindwing with antemedial line ; traces of a sinuous postmedial line ; a line across apical area.

*Habitat*.—Bhutân (Dudgeon), Ceylon ; Australia, Gayndah. *Exp.* 20 mm.  
*Type*—In British Museum.

801. *Rhodoneura* MUNDA belongs to the genus *Hypolamprus*.

806a. HYPOLAMPRUS MARGINEPUNCTALIS, Leech, Entom, 1889, p. 66, pl. iv., f. 10.

„ *Pallescens*, Hmps., P. Z. S., 1897, p. 64.

*Pharambara quadrovata*, Warr., Nov. Zool., iv, p. 343.

♀. White, almost wholly suffused with pale reddish-brown. Forewing with a slightly mottled appearance especially below middle of cell. Hindwing with traces of whitish bands. Underside of forewing striated with black, forming an oblique band from below apex to above middle of inner margin ; a white subapical spot with a black speck on it. Hindwing thickly striated with black.

*Habitat*.—China ; Ceylon ; Mysol ; W. Australia. *Exp.* 28 mm.

806b. HYPOLAMPRUS RUPINA, Swinh., A. M. N. H. (7), iii, p. 116 (1899).

♀. Grey-brown; legs thickly irrorated with white, wings closely reticulated with brown; forewing with obscure dark discoidal spot. Underside of forewing irrorated with white scales; hindwing white reticulated with brown.

*Habitat*.—Tarimpur. *Exp.* 32 mm.

808b. *HYPOLAMPUS PRÆLONGATA*, Warr., *Nov. Zool.*, v, p. 6.

♂. Brownish-grey; abdomen with pale segmental lines; wings evenly striated with black. Forewing with some of the striæ forming very obscure subbasal, antemedial, medial, postmedial and terminal bands filled in with slightly darker brown, the 2nd and 3rd obtusely angled on median nervure, the 4th fine, curved, and ending at vein 4; an obscure browner apical patch. Hindwing with blackish medial band from cell to inner margin, and traces of a terminal band.

*Habitat*.—Khâsis. *Exp.* 36 mm.

## LIMACODIDÆ.

835a. *THOSEA POSTORNATA*, n. nov.

*Setora sinensis*, Moore, *A. M. N. H.* (4), xx, p. 93 (1877), nec Wlk.

♀. Dull brown; head and thorax tinged with pink. Forewing with pink suffusion; irrorated with a few black scales on basal costal area to below cell between the two lines, and on terminal area from below apex to vein 3; an obliquely curved line from costa beyond middle to inner margin before middle; a velvety black-brown outwardly oblique postmedial line expanding into a large patch on termen from vein 3 to tornus.

The type from Shanghai has no pink suffusion, and the postmedial line and patch are much less conspicuous.

*Habitat*.—Shanghai; Sikkim 1,800' (Dudgeon). *Exp.* 40 mm.

856a. *MIRESA SCOTOPEPLA*, n. sp.

♂. Head, thorax, and abdomen black-brown mixed with silvery scales. Forewing silky black-brown mixed with silvery scales, the median nervure and basal half of vein 2 reddish; a black discoidal bar; the terminal area a rather browner. Hindwing fuscous, with the terminal area brownish.

*Habitat*.—Sikkim, 5,000' (Pileher). *Exp.* 28 mm. *Type*—In British Museum.

860a. *PARASA METAPHÆA*, n. sp.

♂. Head and thorax green; palpi, frons, a fascia on vertex of head and thorax, pectus, legs, and abdomen dark brown, the last with the dorsum yellowish. Forewing yellow-green; the costa brown; a small oblique brown patch from base of costa to above inner margin; a terminal brown band, with a curved darker line on its inner edge. Hindwing uniform dark red-brown.

*Habitat*.—Travancore, Pirmâd, 2,500' (H. G. Place). *Exp.* 34 mm. *Type*—In British Museum.

871. *PARASA HERBIFERA*, Wlk.

♂. Dark chocolate brown, with the patagia and part of tegulæ apple

green. ♀. Paler chocolate; forewing with broad curved apple green band from middle of costa to base of inner area, its outer edge waved.

*Habitat*.—Simla, Murree, Nepal, Sikkim. *Exp.* ♂ 26-30, ♀ 36 mm.

871a. *PARASA FUMOSA*, Swinh.

♂. Vertex of head and whole of thorax above apple green.

*Habitat*.—Nilgiris. *Exp.* ♂ 30 mm.

878b. *CERATONEMA JASEA*, Swinh., A. M. N. H. (7), iii, p. 111.

♀. Uniform dark brown thickly irrorated with grey. Hindwing black brown. Forewing with vein 10 shortly stalked with 8-9.

*Habitat*.—N. Canara. *Exp.* 28 mm.

877a. *ORTHOGRASPEDA NEMACERA*, n. sp.

♂. Dark brown mixed with grey. Forewing irrorated with black scales; an oblique, very ill-defined, black fascia from costa beyond middle to middle of inner margin; a minutely dentate dark postmedial line defined by grey on outer side. Hindwing uniform fuscous; both wings with fine pale terminal line, the cilia chequered pale and dark.

*Habitat*.—Khásis. *Exp.* 34 mm. *Type*.—In British Museum.

879b. *CERATONEMA ALBIDIVISUM*, n. sp.

♀. Head and thorax pale ferruginous; abdomen brown. Forewing with the basal area pale rufous, extending on costa to three-fourths of wing, on inner margin to middle, its outer edge with white point at upper angle of cell, and white line from lower angle to inner margin; terminal area dark brown. Hindwing brown.

*Habitat*.—Sikkim, 1,800' (Dudgeon). *Exp.* 24 mm. *Type*.—In British Museum.

890a. *ALTHA OBLIQUIFASCIA*, n. sp. (Pl. B, f. 11).

♂. Silky whitish; head and collar tinged with fulvous-orange; abdomen with dorsal orange bands. Forewing slightly suffused with orange; the costa orange; a diffused orange-red band from beyond the cell to middle of inner margin; a curved postmedial line. Hindwing slightly tinged with orange.

*Habitat*.—Madras (E. Y. Watson); Trichinopoly; Calicut (J. Fellowes Wilson); Ceylon. *Exp.* 24 mm. *Type*.—In British Museum.

892a. *NAROSA ARGENTIPUNCTA*, insert (syn.) *Narosa narcha*, Swinh., A. M. N. H. (7), iii, p. 110, Karwar.

892c. *NAROSA HOLOXANTHIA*, n. sp.

♂. Bright orange-fulvous. Forewing slightly irrorated with redder scales. Hindwing paler.

*Habitat*.—Khásis. *Exp.* 24 mm. *Type*.—In British Museum.

892d. *NAROSA PROPOLIA*, n. sp.

♂. Forewing with veins 4-5 shortly stalked; vein 10 stalked with 7-8-9. Head whitish; palpi blackish at sides; antennæ fulvous; thorax and abdomen golden yellow with a reddish tinge, thorax mixed with white; legs fringed with white. Forewing yellow suffused with cupreous-red; the costal

area broadly suffused with white ; some white on basal area ; an indistinct pale line from lower angle of cell excurved, then dentate to inner margin ; a pale line from costa beyond middle, defined by fulvous on inner side on white area, oblique to vein 4, then subterminal and minutely dentate ; a terminal series of dark points. Hindwing golden yellow.

*Habitat.*—Sikhim, 2,800' (Pilcher). *Exp.* 24 mm.

LASIOCAMPIDÆ.

905a. METANASTRIA FIA, Swinh., A. M. N. H. (7), iii, p. 113. (Pl. B, ff. 17-18).

♂. Head brownish-white ; antennæ rufous ; thorax reddish-brown tinged with grey ; abdomen orange-brown, the extremity of anal tuft dark. Forewing red-brown, with subterminal series of small black spots in the interspaces. Hindwing red-brown, thinly scaled.

♀. Dark brown. Forewing with two oblique grey antemedial lines not reaching inner margin ; two similar postmedial lines with grey suffusion between them and incurved below vein 6 ; a subterminal series of dark spots in the interspaces.

*Habitat.*—Kashmir. *Exp.* ♂ 40, ♀ 50 mm.

928a. CLISIOCAMPA VULPES, n. sp. (Pl. B, f. 26).

♀. Hindwing with two or three accessory costal veinlets. Colour uniform bright rufous.

*Habitat.*—Chitral, Shishi Kuh Valley, 10,000 (G. H. Colomb). *Exp.* 40 mm.

*Type*—In British Museum.

938a. LENODORA CRENATA, n. sp.

♀. Dull yellow-brown. Forewing suffused in parts with yellowish-white ; a diffused whitish fascia on subcostal nervure ; an obscure crenulate, slightly curved, dark line from below apex to middle of inner margin ; veins 6·7 from angle of cell. Hindwing with slight whitish patch on disk.

*Habitat.*—Ceylon (Green). *Exp.* 60 mm. *Type*—In British Museum.

945a. ODNOSTIS LIDDERDALI, Druce, A. M. N. H. (7), iii, p. 471.

♂. Head and thorax dark red-brown irrorated with grey ; abdomen dark red-brown. Forewing dark red-brown irrorated with grey ; two indistinct waved antemedial lines, the outer defined by grey on inner side, a greyish discoidal spot ; the postmedial line oblique from costa to vein 6, where it is angled, then inwardly oblique, crenulate and slightly defined by grey, and with traces of a curved crenulate line beyond it ; a subterminal series of points, diffused and bent inwards towards costa, the points just below veins 3 and 4 placed rather further from termen ; the apex chocolate with some grey suffusion. Hindwing dark red-brown, with traces of a pale curved postmedial line ; the costa highly lobed at base.

*Habitat.*—Sikhim (Lidderdale). *Exp.* 50 mm.

953a. STENOPHYLLOIDES ENCAUSTA, n. sp.

♂. Palpi and forewing short ; both wings with the outer margin evenly curved. Head dull ochreous ; palpi and antennæ brown ; thorax

dull red; abdomen grey-brown dorsally tinged with red. Forewing fuscous, the costal area and cell suffused with grey, running obliquely from lower angle to apex; the inner area bright brick red with a dull ochreous mark at middle; the terminal area slightly tinged with red; a black discoidal point. Hindwing fuscous, slightly tinged with purplish-red, the inner area greyish; cilia tipped with ochreous.

*Habitat*.—Simla (Pilcher). *Exp.* 46 mm. *Type*—In British Museum.

LYMANTRIADÆ.

961a. *ORGYIA SENICA*, n. sp. (Pl. B, f. 23).

♂. Head, thorax, and abdomen brown strongly tinged with grey. Forewing dark red-brown; a curved grey antemedial line; a rounded grey-edged discoidal spot with dark lunule on its inner edge, with grey patch from it to costa, and traces of a line from it to inner margin; the postmedial line bent outwards below costa and strongly incurved below vein 4; the terminal area very strongly suffused with grey, defining an irregular subterminal line which emits projections at veins 6 and 4, and is connected with termen by a white patch below vein 2. Hindwing bright rufous.

*Habitat*.—Chitral, Shishi Kuh Valley 10,000' (G. H. Colomb). *Exp.* 34 mm. *Type*—In British Museum.

979a. *LÆLIA CALAMARIA*, n. sp. (Pl. B, f. 19).

Pale mouse brown; palpi fulvous-yellow, the second joint black at sides; antennæ with the basal joint fulvous. Forewing with curved series of small black spots from below costa towards apex to below base of vein 2, the spot above vein 6 displaced outwards, above 4 displaced inwards. Hindwing fuscous-brown.

*Habitat*.—Nilgiris, Coonoor, 6,000' (A. G. Cardew). *Exp.* ♂ 42, ♀ 54 mm.

*Larva* pale red-brown with sparse long hairs; head brighter red; long lateral tufts of brown hair projecting forward from 1st somite, thick dorsal rufous pencils of hair on somites 2-5, and dorsal tufts of long hair on terminal somites projecting backwards. Food-plant *Calamus huegelianus*, Mart. Pupated Aug. 1st, emerged 22nd.

1051a. *TOPOMESA DISCOLOR*, insert (syn.) *T. lerwa*, Swinh., A. M. N. H. (7), iii, p. 111, Karwar.

1074a. *EUPROCTIS PHÆA*, n. sp.

Black-brown. Forewing with indistinct obliquely curved antemedial pale line; a diffused black discoidal spot; an indistinct whitish postmedial line incurved below vein 3; an obscure subterminal series of white lunules, double in places, and with some blackish marks near them towards apex, and some olive on their inner side at middle and towards inner margin.

*Habitat*—Khâsis. *Exp.* 22 mm. *Type*—In British Museum.

1074b. *EUPROCTIS FLAVICOSTA*, n. sp. (Pl. B, f. 3).

♂. Head, thorax and base of abdomen fulvous-yellow; legs whitish; anal tuft orange. Forewing olive-brown mixed with orange scales; the costal

area yellow ; indistinct orange ante- and postmedial lines angled at middle, and the dark colour extending to costa on outer edge of former and inner edge of latter ; cilia yellow. Hindwing black-brown, the cilia yellow.

*Habitat*.—Sikhim 1,800' (Dudgeon). *Exp.* 28 mm. *Type*—In British Museum.

1125a. *CISPIA CHARMA*, Swinh., A. M. N. H. (7), iii, p. 112.

Differs from *C. punctifascia* in the forewing not having the orange medial band edged by dark points ; a whitish patch sometimes developed at lower angle of cell.

*Habitat*.—Karwar. *Exp.* ♂ 50, ♀ 76 mm.

(*To be continued.*)

## THE FERNS OF NORTH-WESTERN INDIA.

Including AFGHANISTAN, the TRANS-INDUS PROTECTED STATES, and KASHMIR: arranged and named on the basis of Hooker and Baker's *Synopsis Filicum*, and other works, with New Species added.

By C. W. HOPE.

(Continued from Vol. XIII, page 36.)

## PART III.—THE GENERAL LIST.—(continued).

## Ord. FILICES.

## Sub-Ord. III.—POLYPODIACEÆ.—(continued).

Genus 11.—**ADIANTUM**, L.

1. **A. lunulatum**, Burm.; Syn. Fil. 114; C. R. 452; Bedd. H. B. 82.

PUNJAB: *Chamba*; McDonell (in list); *Kangra Valley* W. 2800', Trotter; *Mandi State* 4000', Trotter; *Simla Reg.* 2-4500', Hope, Blanf., Bliss.

N.-W. P.: *D. D. Dist.*; common from the valley up to 4500' in the Himalaya; *Kumaun* 1800'—5800.

DISTRIB.—*Trop. Amer*: from Mexico southward to the Organ Mts. in Brazil. *Asia*: N. Ind. (Sub-Him. and Him.) up to 4500', very common. Bengal—Chutia Nagpur. Cent. Prov. Cent. Ind. S. Ind. Very general on the western side, in the plains and lower slopes of the hills (Beddome). Burma. Ceylon. Malay Penins.—Perak. Cochin China. China—Hongkong. Polynesia. Trop. Australia. *Afr.*: Cape Verde Isles, Angola, Guinea, Zambesi Land, Madagascar.

This is one of those ferns that are so common along the foot of the Himalaya that one neglects or postpones collecting them. It grows even by the roadside in the heart of the town of Dehra, and onwards to Rajpur on the way up to Mussoorie. Far to the southward I gathered it in 1860, in Bagelkhand, Centr. Ind., alt. about 800'. Mr. Gamble got it in Bengal—Lohdardaga Dist., Mr. Clarke in Centr. Ind., and Mr. Duthie in the Centr. Provs. Mr. Clarke says it is plentiful in ditches in Calcutta.

The cutting of the pinnae of this species varies much. The largest fronds I have from Darjiling, collected by *Levinge*, have entire pinnae, with only the marginal row of sori broken. Smaller fronds of the same gathering have pinnae cut down  $\frac{1}{3}$  to  $\frac{1}{2}$ -way to the lower edges, with one, two, or three lengths of sorus to each of the 5 or 6 lobes. In the *Syn. Fil.*, the pinnae are said to be subdimidiate; but I should say that the costa, or main vein, of a pinna forms the lower edge: the veins radiate from the attachment of the petiolate secondary rhachis, or from the costa near it, and may be said to be about 12 in number at the base of the pinna. They form dichotomous groups stretching to the lobes, and sub-lobes if any, and they continually fork or branch up to close to the edge of the pinna, until there must be from two to three

## THE FERNS OF NORTH-WESTERN INDIA.

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*Corrections in fourth instalment, published in No. 1 of Vol. XIII.*

*On p. 26, 14th line from bottom, in parenthesis, "1" should be "l".*

*On p. 29, 8th line from top, the comma after "1890" should be a semicolon.*

*On p. 29, 14th line from top, insert "of *D. multident*" at end of line, after "frond."*

*On p. 29, 11th line from bottom, insert "Assam—" before "N. Manipur."*

*On p. 30, add to 3rd line "Plate XV."*

*On p. 30, 8th line, strike out "Simla Reg. 9000', very rare."*

*On p. 30, 5th line from bottom, for "*ternifolium*" read "*tenuifolium*."*

*On p. 35, 10th line from top, "var. B" should be "var.  $\beta$ ."*

Kew, 4th June, 1900.

C. W. HOPE.



hundred veinlets at the row of sori, in a large pinna. This of course gives the required stiffness to the pinna, the lamina of which is membranous in texture.

2. *A. caudatum*, L. ; Syn. Fil. 115 ; C. R. 453 ; Bedd. H. B. 83.

KASHMIR : *Jhelam Vy.*; from Uri downward, MacLeod ; *Tawi Vy.* 5000', Trotter ; "3000', very common," Gammie.

PUNJAB : Hazara—35-4000, Trotter. *Chamba*, McDonell (in list) 3000', Trotter ; *Kangra Vy.*, W. 3000', E. 4590', Trotter ; *Salt Range*, Aitch. ; *Kullu* 5500', Trotter ; *Simla Reg.*, below Simla 35-4500', Hope, Gamble, Blauf.

N.-W. P. : *D. D. Dist.*, common, up to nearly 5000' in the Himalaya ; *T. Garh.* 4-5000', Duthie ; *Kumaun* 6500' S. & W., Davidson, Hope 2000', common.

DISTRIB.—*Asia* : Arabia Felix. N. India (Himalaya and other Mts.) 0-3000' very common. Centr. Provs., Ind. Centr. Ind. Bengal—"In *Mont. Behar, Calc. to Agra*," *Jacquem.*, Dhakka. Bombay Presy.—Poona *Jacquem.* Burma—Tenasserim. S. Ind. and Malay Penins., plains and lower slopes of hills (Bedd.), Ceylon, Java, Borneo, Philippines, China. *Afr.*, Cape Verde Isles, Banks of the Niger, Angola, Zambesi Land, Cape Colony, Mauritius.

This species, the last preceding, and the next following, belong to the "radicantes group," the rhachis being often prolonged and rooted at the point. A specimen gathered in the Dehra Dun has fronds about three feet long, perhaps one-half consisting of secondary growth. The fronds hung down from the bank of a stream, and had rooted and grown in the air, like *Saxifraga sarmentosa*.

3. *A. Edgeworthii*, Hook., Sp. Fil. II., 14 ; Syn. Fil. 2nd Ed. 472. *A. caudatum*, L. var.  $\beta$ . *rhizophorum*, Wall., C. R., 453. *A. caudatum*, L. var.  $\beta$ . *Edgeworthii*, Bedd. H. B. 84. *A. Edgeworthii*, Hook., Bedd. Supp. H. B. 17.

PUNJAB : Adah Valley near *Multan*, M. P. Edgew., Sept., 1838 ; *Simla Reg.*—Bhaji State 5-6000', Trotter ; *Simla* 5-6250', Hope, Blauf., Bliss.

N.-W. P. : *D. D. Dist.*—5-6000', Mackinnons, Hope, Duthie, rare ; *T. Garh.* 4500', Hope ; *Suarna-ka-ser*, 6000', Gamble, 1898, "*Garhwal*, Edgew., A. Hume" (Clarke) Mrs. Fisher ; *Kumaun*, 3-6000' S. and W., A. Hume, Hope, Davidson, Duthie, Trotter, MacLeod.

DISTRIB.—*Amer.* : W. Ind. Sieber, in Herb. Hort. Sahar. (7 pair of pinnae only), *Asia* : N. Ind. (Him.). Nepal, *Wallich.* Assam—Khasi Hills 4500', *Mann.* Manipur, *Clarke*, *Watt.* Burma—Fort Stedman, Abdul Hak, 1893. China—Peking, *Dr. Williams*, *Dr. Bushell*, *Hancock* (largest I have seen). Malay Isles. Timor, *H. O. Forbes*, 1882-83.

Since gathering it in Kumaun, in 1861, I have always considered this a distinct species. It has been long in obtaining general recognition. Published by Hooker in 1858, in the *Sp. Fil.*, it was reduced in the *Syn. Fil.* to the place of a synonym of *A. caudatum*,  $\beta$ , *A. rhizophorum*, Sw., and but doubtfully raised in the 2nd Ed. to the rank of species. Clarke in his "Review"

adhered to the view taken in the first edition of the *Synopsis Filicum*. In his Hand-book of 1883, Beddome placed *A. Edgeworthii* as *var. Edgeworthii* of *A. caudatum*, but in the Supplement of 1892 gave it full rank. The only habitat Hooker cited (knew of ?) was near Multan, where originally it was discovered by Mr. Edgeworth. Hooker says :—“ Mr. Edgeworth, in his notes, observes of this, ‘ it is not *A. rhizophorum*’ (for indeed the texture of the frond and venation are totally different), ‘ nor *A. caudatum*, Sw., nor *flagelliferum*, Roxb. n. 76 ’ (for in those varieties of one and the same plant the fronds, and especially the stipes, are more or less clothed with fulvous hairs or chaff) : ‘ (it differs from all in the integrity of the pinnæ).’ On these grounds I give it as distinct, though we need more copious specimens to see that it does not pass into *caudatum*.” Sir W. Hooker goes on to remark that “ the nerves are the same ” ; . . . “ the fertile pinnæ scarcely exhibit an appearance of lobes ; and the contiguous sori form a pretty even line at the edge.” From this it appears that the first parenthesis, in the quotation from the *Species Filicum* given above, is a version of Edgeworth’s original note, and, from a careful examination of the numerous specimens of both species in my collection, I think I can say that as regards the venation Edgeworth was right, and Hooker wrong ; and the venation shown in the enlarged figures of the two species, Plates LXXX and LXXXI, Sp. Fil., seems to bear me out. In *A. caudatum* (*A. rhizophorum*, Sw.), so far as I can see, the system of venation is flabellate, *i.e.*, the veins all radiate directly from the petiole, whereas in *A. Edgeworthii* a branch of the petiole, corresponding to the costa of a dimidiate pinna, runs along the inferior, straight edge of the pinna, giving off branches inwards all along its length. It is not always clear whether this branch, or costa, itself forms the thickened, or stiffened, margin of the pinna, or whether the thickened margin is outside of it ; but this inferior vein, or costa, gives off no branches on the outer, or inferior, side. The inferior vein of a pinna of *A. caudatum* seems to me to branch towards the inferior margin, as well as upwards. But the venation of *A. caudatum*, shown in Beddome’s enlarged figure, t. 44 of the Hand-book, is as I have described it for *A. Edgeworthii*.

I must, with regret, impeach the integrity of the pinnæ of *A. Edgeworthii*, certified to by Edgeworth, and partly doubted by Hooker and Beddome, for the lobes are always more or less distinct and deeply separated, especially in barren fronds, though the divisions are never so deep as they often are in *A. caudatum* ; when they are shallow, they are sometimes obscured by the involucre overlapping them, and even each other. The involucre are often deeper (broader ?) than in *A. caudatum*, and they are membranous, transparent, and larger than the ripe sori are. When turned back, and the sporangia scraped

off, they show the prolongations of the veinlets in them very distinctly; but the veinlets appear to break connection between the lamina and involucre at, or at a stage prior to, the maturity of the sorus. The involucre of *A. caudatum* are coriaceous, and narrower I think.

The differences of venation and involucre, taken together with the now-known wide range of habitat—from Sind to China and Timor, and perhaps the West Indies—and the yet rarity of the plant, besides the differences of texture, quite justify the tardy elevation of *A. Edgeworthii* to a species.

*A. Edgeworthii* seems generally to have longer stipes than *A. caudatum* has, sometimes almost as long as the fronds are. *A. caudatum* has very short stipes, unless the fronds have had to struggle out from between rocks or loose stones.

#### 4. *A. Capillus-Veneris*, L.; Syn. Fil. 123; C. R. 453; Bedd. H. B. 84.

AFGHAN.: *Kurram Valley*—Aitch, 1879, 3200', Aitch. 1884-85.

TRANS-IND. STATES: *Kafiristan* and *Badghis* 5000', Aitch. 1885; Kaghuni (?) 5500', Giles, 1886; *Swat* and *Baraul* 6-8500' (5 stations), Harriss, 1895, 4-6000' (3 stations), Gatacre, 1895.

KASHMIR: 35-8000', Trotter, Duthie, MacLeod; "common in Kashmir in moist places" (MacLeod).

PUNJAB: *Hazara*—Gatacre, Oertel, Trotter. *Chamba*—McDonell (tripinnate); *Rawal Pindi*, Aitch.; *Kangra Valley Dist.* W.—25-3000', 3-4000' Trotter; *Kullu*—5-6000', Trotter, *Simla Reg.* 35-6000', Hope, Gamble; *Bisahir*—7000', Lace.

N.-W. P.: *D. D. Dist.*—Jaunsar 3000', Gamble, Mussoorie and below it 47-6000', Hope; in the Dun 1-3000'—very common by running or trickling water and within reach of spray: on banks of canal cuttings, in Dehra; *T. Garh.* 3-4000', Duthie; *Saharanpur Dist.*—Dolkhand, Gamble; *Kumaun*—Sarju Valley 3500', Jagthana 5200' S. and W.; below Naini Tal, in the Gola Valley, 5-6000', Hope, 1861: station long ago swept away in landslips; Gola Valley, 2500', Hope, 1890; Káli Valley 7-8000', Duthie; Rámanga Valley 4-5000', Trotter.

DISTRIB.—*Amer.*: Florida, southward to Venezuela and Amazon Valley. *Europe*; United Kingdom (Ireland, Isle of Man and S. W. Eng.), Central and Southern Europe, Caucasus. *Asia*: Syria (Jerusalem, Sinai, Galilee), Siberia, Arabia, Beluchistan, common all over N. Ind.; Sind, *Dr. Stokes*; Bengal—in the Ganges Valley (Arrah, Dinapur, and Calcutta); Himalaya and valleys at foot of the range, common up to near 6000'; Assam—Khasi Hills. Centr. Provs., India. S. Ind.—Bombay and Madras Presidencies, common on west side up to 5000'. S. E. China. *Japan*. *Polynesia*. *Afr.*—Canary Islands and in many parts of the Continent, both North and South.

The distribution of this species in India is not fully indicated in the three books to which I restrict my references. I have specimens from walls in the Entally suburb of Calcutta, and I have taken it (a small size) from wells in Dinapore and Arrah; and Mr. Duthie got it at Pachmarhi in the Central

Provinces. It appears to be found all over India, where circumstances are favourable. Shade and permanent moisture are essentials; and limestone is, I think, preferred.

5. **A. Wattii**, Baker, in Journ. L. Soc. XVIII, 381, t. 14 a, figs. 1 and 2. *A. Levingei*, Baker, Ann. Bot., Vol. V. No. XVIII. *A. Capillus-Veneris*, L., var. *Wattii*, Bedd. Suppl. H. B. 18.

PUNJAB: *Chamba*—Pangi, G. Watt, Chenab Valley, Pangi 8000', McDonell, 1882; *Kullu*—75-10006', Trotter, 1887.

DISTRIB.—*Asia*: N. Ind. (Him.); Sikkim—Chingtam (or Chintang, or Chingtang) alt. 3,000', *Levinge* and his collectors; S. Ind.—(Nilgiris), Leech Falls, Conoor R., *Lev.*

Baker's description under *A. Wattii* is the more detailed, but when analysed it does not seem to differ much from his later and shorter description of *A. Levingei*, of which plant I have seen and also possess very good specimens. I must have long ago seen McDonell's and Trotter's specimens from Chamba, but I can find no notes of them. *A. Wattii* is the older name, and, therefore, as I think there is only one species here, I put all the specimens, whether from the Punjab, Sikkim, or the Nilgiris, under this. The Nilgiri specimens I found in Gamble's collection, in the *A. Cap.-Ven.* bundle. Colonel Beddome, in his Suppt. of 1892, says that Mr. Baker described *A. Wattii* from some small poor specimens, and he gives both that name and *A. Levingei*, Baker, as synonyms of his *A. Cap.-Veneris*, var. *Wattii*, saying that copious specimens from both Sikkim and Chamba prove that Mr. Baker's (two) supposed species belong to the same plant. I add the Nilgiris as a habitat for one or other. Beddome gives a very detailed description of his var. *Wattii* of *A. Capillus-Veneris*, with which I find no fault; but I may remark that it is remarkable that a "slight variety," as he calls it, of a common fern should require so minute and lengthy a description. According to this the variety seems to differ in every particular from the type. I see no grounds for reducing this fern to a variety of *A. Cap.-Veneris*. The superior pinnules on all the pinnæ of *A. Levingei* seem the larger. Dr. G. King has recorded on a sheet of *A. Levingei*, from Sikkim, in the Calcutta Herbarium, that the scales of the rhizome are broader than the corresponding scales on *A. Cap.-Veneris*.

6. **A. æthiopicum**, L.; Syn. Fil. 123; Bedd. H. B. 83.

AFGHAN.: *Kurram Valley*—Aitch., 1879, No. 1265 in Herb. Hort. Saharanpur.

DISTRIB.—*Amer*: from Texas and California southward to Valparaiso and Monte Video. *Europe*: Spain, G. McLeavy, 1860. *Asia*: S. Ind.—Nilgiri and Pulney Mts. at the higher elevations; Ceylon. *Australia*—Temp. and Trop.; N. Zeal. *Afr.*: Cameroon Mts. at 7000', Abyssinia, Zambesi Land, Natal, Cape Colony, Bourbon, Madagascar.

This species seems very difficult to preserve : the pinnae drop off.

**7. *A. venustum*, Don. ; Syn. Fil. 125 ; C. R. 453 ; Bedd. H. B. 86.**

AFGHAN : *Kafiristan*, Griffith ; *Kabul*, Clarke (in Rev.) ; Kurram Valley, Aitch., May, 1879, No. 1264, Major (now Sir Henry) Collett, July, 1879.

TRANS-IND. STATES : *Baraul*, 5000', Harriss ; 8000', Gatacre.

KASHMIR : Clarke (in Rev.), 4-8500', Trotter ; 6000' Gammie, "common at all altitudes from 8000' to 10,000'," MacLeod.

PUNJAB : *Hazara Dist.*—Black Mt., Gatacre, 1888, Oertel, 1891 ; Kálapáni 6,500', Trotter, 1890 ; Kagan Vy. 4-8000', Inayat, 1896-7 *Chamba*—McDonell ; *Kullu* 10,000, Trotter ; *Mandi State* 5-6000, Trotter ; *Simla Reg.* 7-10,400', common.

N.-W. P. : *D. D. Dist.*—Jaunsár 65-8000', Sundar Lál, C. G. Rogers, Gamble ; Mussoorie 5-7,000', not uncommon, Mackinnons, Hope ; *T. Garh.* 8-12,000', Duthie ; *Kumaun* 6-10,000', S. and W., Hope, Davidson, Duthie, Trotter, MacLeod.

DISTRIB.—*Asia* : N. Ind. (Him.) Nepal, *Wallich*.

Trotter, in his privately printed List of the Ferns of the Punjab, has pointed out that Clarke, in saying that this is one of the commonest ferns of the N.-E. Himalaya, must have written North-East by mistake for North-West, and that Beddome has copied the mistake. I do not know of any specimen having been found in the N.-E. Himalaya. I have been told that a species of "Maiden Hair" is exported in cartloads from Jaunsar, along the cart-road to Saharanpur, for some purpose, perhaps medicinal : this is probably *A. venustum*. Of the stipes and rhachises of a species of *Adiantum*, probably *A. monochlamys*, Eaton, the Japanese make brushes, or miniature brooms, for dusting china with. Blanford says this is "One of the commonest and most abundant ferns of Simla, covering banks and sloping ground in shady places, and ranging from 4500' up to the top of Hattu at 10,500'." *A. venustum* grows in the soil in forest : I have never seen it by running water like *A. Cap.—Veneris* ; but in 1861 I used to see it in the forest on the west side of the Naini Tal Lake, near the level of the water.

**8. *A. pedatum*, L. ; Syn. Fil. 125 ; C. R. 453 ; Bedd. H. B. 86, and Suppl. 19.**

KASHMIR : Ring Nála 8000', MacLeod, 1891 ; Kishenganga Valley—Kajliban 7-8000', Duthie, 1892.

PUNJAB : *Hazara Dist.*—Siran and Kagan Vys. 12,000, Inayat, 1896 ; *Chamba*—"Upper Chenab Valley," Pángi 7000', R. Ellis, 1878, in Herb. Gamble ; 10,000' (perhaps in Kashmir) Baden-Powell, 1879 ; Ravi Valley—Tunda Valley 8000', McDonell, 1882 ; *Simla Reg.*—Hattu Mt. and vicinity 85-10,000', Gamble, Blauf., Hope, Trotter, Bliss, in forest ; Raiengarh forest 8000' ; Gamble, 1898.

N.-W. P. : "*Garhwal*"—Sinjari, S. & W. ; *T. Garh.* 9-10,000', 6 stations, Duthie, Dr. Cantor ; *Brit. Garh.*—Mrs. Fisher ; Dombitia Gádh 9-10,000' Duthie ; *Kumaun*—Wallich ; "Dusali, near Pindree 8000'," Major Madden ; Pinsara 8000', Davidson ; Dhauri Valley 8-9000', Duthie.

NEPAL W. ; Opposite Budhi Village 9-10,000', Duthie, 1886.

DISTRIB.—*Amer.* Unalaska and Canada, southward to Virginia and California. *Asia* : N. Ind. (Him.), Sikkim, scattered, not plentiful. China—Manchuria. Japan.

Both Clarke and Beddome give Garhwál as the Western limit of this species in India, but it will be seen above that it was long ago obtained in Chamba, and perhaps in Kashmir, by Ellis and Baden-Powell; and more lately Macleod and Duthie have found it in the West of Kashmir. MacLeod says:—"Only on northern slopes of dividing ridge between Kishenganga and Jhelam valleys, 7-10,000'; not uncommon; grows to great perfection." It was on this ridge and in the adjacent valleys that MacLeod collected in 1891. Quite lately it has been found in the west of the Hazára District by Mr. Duthie's collector, Inayat. Seeing much of these ferns exhibited at shows in London, I once asked an exhibitor, Mr. Birkenhead, whence he got his supplies, and he said from N. America, never from India.

Genus 12—CHEILANTHES Sw.

Sub-genus—ADIANTOPSIS, Fée.

1. *C. Duthiei*, Baker, in Ann. Bot. Vol. V. No. XVIII; Bedd. Suppt. H. B. 20.

"*Stipes* densely tufted, castaneous, glabrous, 1—1½ in. long, with a few paleae towards the base. *Fronde* oblong-deltoid, membranous, glabrous, 2 in. long, green on both surfaces. *Pinnæ* oblong-deltoid, sessile, lowest the longest, produced on the lower side. *Pinnules* oblong, ⅓ — ⅓ in. broad. *Sori* placed all around the edge of the pinnules, usually orbicular, rarely confluent. *Indusium* grey, glabrous, orbicular-reniform, persistent. British Garhwal, *Duthie*, 5,144. Cutting of *C. subvillosa*, but indusium of this subgenus."

N.-W. P. : *Brit. Garh.*, near Kuári Pass, 12-13,000', *Duthie* 5144, 8-9-85; rocks east of Dhakwáni, 11-12,000', *Duthie* 5196, 11-9-85.

The name of this fern, and the above notes of habitat, were entered in the Catalogue of the Ferns in the Saharanpur Herbarium, published in 1890, in advance of publication by Mr. Baker,—I having seen it, and the entry in Mr. Baker's MS. list of new Ferns at Kew, in 1888. It is one of the rarest of Indian Ferns. The stipes reach 3½ inches in length.

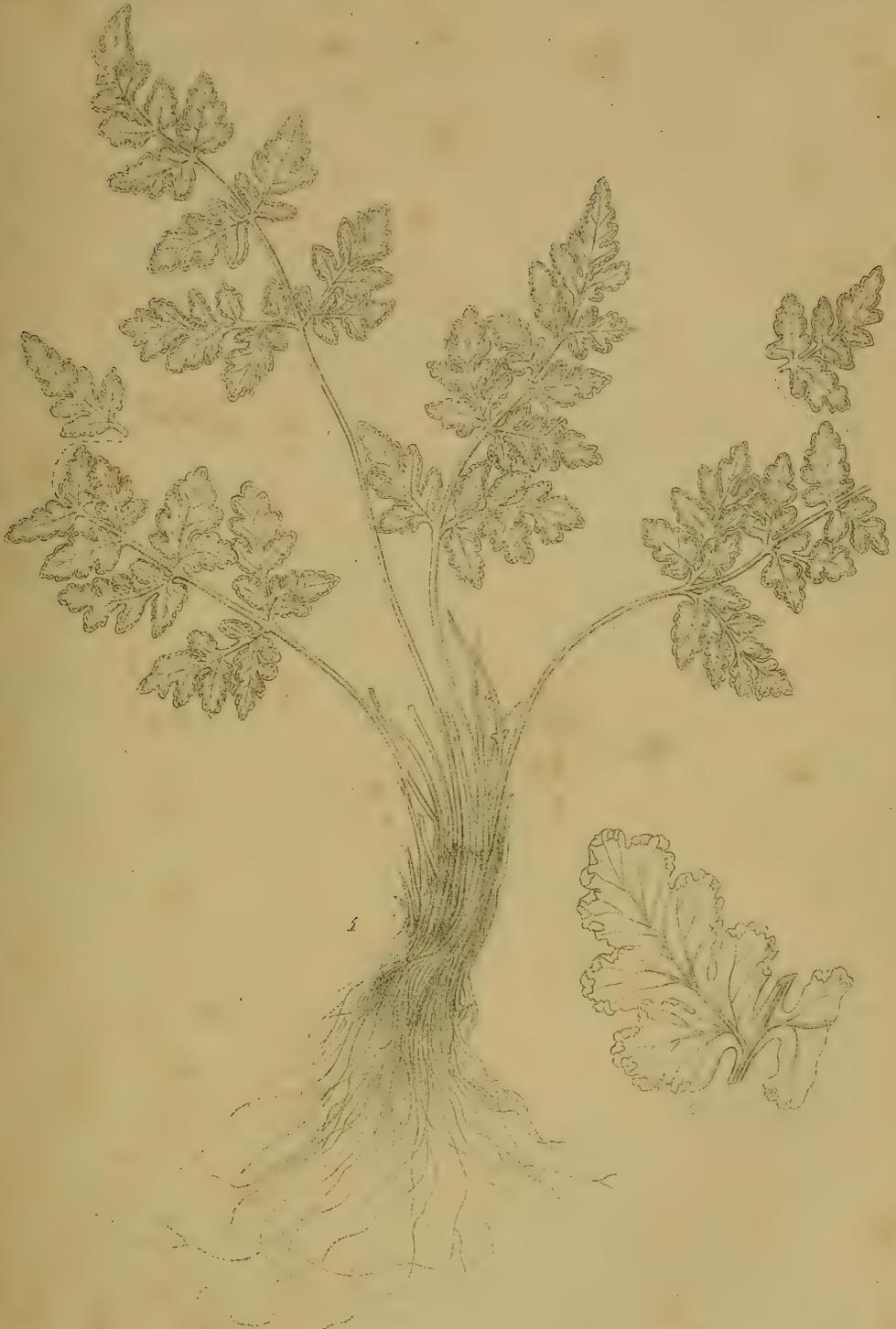
Sub-genus—EU-CHEILANTHES, Sw.

2. *C. fragrans*, Webb. and Berth. (non Sw.); Syn. Fil. 134. *C. fragrans* (Swartz, Syn. Fil.) Webb. and Berth., Phyt. Canar. iii., 452; C. R. 454. *C. fragrans*, Sw., Bedd. H. B. 88.

AFGHAN. : *Landikkhāna*—Griffith; *Kabul*, (Clarke in Rev.).

TRANS-IND. STATES : *Chitral*—F. E. Younghusband, 1894; Baraul 4500', (6 stations) Harriss 4-5000', Gatacre.

PUNJAB : *Cherat* 4000', Collett 8-92; *Hazara*—Black Mt. 6000', Oertel, 1891; between Murree and Kohala 4000', Lev., 1875; Dhamtaur Hill, and hill opposite to it 4,000' and upwards, Oertel, 1890-91, Trotter, 1890-92. "Punjab—Turki," Common



H. Reimisp. d.d.

CHEILANTHES DUTHIEI, Baker.

Lith. by A. C. Smith. B.

1. Plant.—natural size.

2. Portion—magnified 4 diameters.



Aitch 6-78. *Chamba*—Ravi Valley 5-7000', McDonell, 1882; Chenab Valley 5000', T. T. 1848, J. Marten 1898.

KASHMIR : *Jhelum Valley*—near Pirni 5-6000', Duthie, 1892. *Kishtwar* 35-5000', C. R. Clarke, 1877.

DISTRIB.—*S. Amer.*? (*C. andina*, Hook.) *Europe* : Centr. France, Switzerland, Spain, Portugal, Italy, Greece, Turkey. *Asia* : Syria (Jerusalem, Lycia, Cilicia); Baluchistan. *Afr.* : Canaries, Madeira, Morocco, Algeria.

Clarke argues against Baker's dictum that this fern is not *C. fragrans* of Swartz; but all three authorities seem to agree that it is *Polypodium fragrans* of Linnæus. Beddome does not mention Webb. and Berth. in the matter, and there seems no doubt that there is here only one species. The Himalayan plant is exactly the same as a specimen I have from the Canary Islands, Teneriffe near Oratava, collected by my friend Mr. P. Neill Fraser, except that the latter seems to have white powder on the involucre.

### 3. *C. subvillosa*, Hook. ; Syn. Fil. 137 ; C. R. 456 ; Bedd. H. B. 93.

KASHMIR : Chittapani Valley, 9000', Rattan Pir 8000', Trotter.

PUNJAB : *Hazára Dist.*—Mian Jáni Mt. 9000', the Gullies near Kalabágh 7000, Kalabágh 7500', Trotter; *Chamba*—Kálátóp Forest 7500', Rávi Valley near Alwas, 6800', McDonell; J. Marten, 1898; *Kullu*—Jalori Pass, N. 9-10,000', Trotter; *Simla Reg.*—Great Thibet Road : Mahásu to Hattu Mt. 7-10,450', Edgew., Gamble, Blanf., Hope, Trotter, Bliss; Pábar Valley and Kotgarh, Edgew.

N.-W. P. : *T. Garh.*—Ganges Valley 9-10,000', and above Suki 9-10,000' (Duthie); Deota 6000', Dhanti 8000', Gamble; *Kumaun*—Káli and Dhauli Valleys 8-9000', Duthie.

DISTRIB.—*Asia* : Sikkim—Darjiling 7500', *Levinge*, 1880.

This fern is not so rare as was thought up to 1880 and 1883, when Clarke's and Beddome's books were published; but Beddome says nothing more about it in his Suppl. of 1892. There is now no break in its known range from the Indus to Kumaun, unless for the Kangra Valley and the Jaunsar Hill-tract of the Dehra Dun District.

### 4. *C. Dalhousiæ*, Hook. ; Syn. Fil. 137. *C. farinosa*, Kaulf., var. *Dalhousiæ* (sp.), Hook. C. R. 457. *C. farinosa*, Kaulf., var. $\beta$ . *Dalhousiæ*. Bedd. H. B. 93.

KASHMIR : 6-9000', frequent (Clarke in "Rev.")

PUNJAB : *Hazára*—The Gullies—5 stations 75-9000', Trotter; *Chamba*—Dalhousie and Kajiár, Clarke; Kálátóp Forest, McDonell 7000—7500'; *Mandi State*—9-10,000', Trotter; Kullu 8-9000', Trotter; *Simla Reg.*—From Simla to Hattu Mt. 65-10,500', Hope, Gamble, Blanf., Trotter, Bliss.

N.-W. P. : *D. D. Dist.*—Mussoorie 7000', Hope, 1890; Jaunsar, Kanjátra 8500, Gamble, 1898; *T. Garh.*—Surkunda Mt. 8-9000', Lev. (*Levinge*), 1872; Jamnotri 10-11,000', Duthie, 1883; Dhanti, 8000', Gamble; *Brit. Garh.*—Dombitá Gádh 9000', Duthie, 1885; *Kumaun*—Naini Tál, Hope, 1861; 8-10,000', 4 stations, Duthie; Pindar Gorge 9-10,000', Trotter; Sarju Ganga Valley 6,000', MacLeod.

NEPAL—W. : Opposite Buddhi Village 9-10,000', Duthie, 1886.

DISTRIB.—*S. Amer.* : “Gathered also lately by Mr. White in New Grenada, and doubtless only a denudate variety of *farinosa*.” (Syn. Fil.). *Asia* : N. Ind. (Him.) Sikkim—Lachen Valley 10,000', Sinchal, 8000'.

I feel sure that the habitat given in the *Synopsis*—“North of Hindustan,”—so far as it may mean that the fern is got below the Himalaya, is a mistake : this is eminently a high-level fern. The remark in the *Synopsis* quoted above is, I presume, Mr. Baker's. I consider that Hooker was quite right in setting up this fern as a species. Whether in shape of frond, appearance, or habitat it is quite unlike *C. farinosa*, and there is no passage between them either physical or topographical. The specimens of *C. Dalhousie* got by me in Mussoorie in 1890 were growing among *C. albo-marginata*, dealbate fronds of which are rather like it. I have not heard of *C. Dalhousie* having ever been found elsewhere, or by anyone else, in Mussoorie. Since Mr. Clarke's “Review” was published, Colonel Beddome seems to have given up *C. Dalhousie* as a South Indian plant.

Blanford says—“Quite distinct from *C. farinosa*, and subject to little variation. Its range” (in the Simla Region) “is from 7800' to the highest visited (10,500'). It appears to be restricted to the Himalaya, and is most abundant in the N.-W. Himalaya. In Sikkim it appears to be rare, but Sir J. D. Hooker gathered it at 10,000' on Lachely” (Lachen Vy. ?), “and Mr. Levinge found it growing plentifully on Sinchal close to Darjiling at 8000'. He agrees with me as to its specific value. The following is a description of its distinctive characters :—

“Stipes 2 to 4 ins. long, shorter than the frond, naked or with a few lax spreading scales near the base. Fronds 6 to 9 ins. long, 2 to 4 ins. broad, acute lanceolate, without white powder at any stage of growth. Lower two pairs of pinnæ subequal. Segments narrow. Lines of sori interrupted at the sinus. Involucres even, crenate or toothed on the margin, hardly lacerate.”

Some of Mr. Duthie's specimens from Kumaun are the largest I have seen—15 in. l. by 7 in. br., without stretching, besides the stipe. His No. 3,644, Kumaun—Forest above Sosa, 9-10,000', mounted in the Kew Herbarium on the same sheet with Beddome's *C. farinosa*, Kaulf., *var. flaccida*, from the Annamallay Hills, Madras Presidency, is said to have—“fronds mealy on both surfaces,” but as mounted the upper surface is not visible. The mealiness of *Cheilanthes* in Kew has generally been washed off in the process of poisoning.

I would separate, as perhaps a new species, Dr. King's No. 90 from Chumbi in Thibet, Ling-moo-tong, 27-7-84, in the Calcutta Herbarium. The frond is deltoid and tripinnate.

5. *C. albomarginata*, C. B. Clarke in Trans. Linn. Soc., Bot. Ser. 2, I. 456, t. 52; Baker in Ann. Bot., Vol. V., No. XVIII. Bedd. H. B. 94. *C. furinosa*, var. *albo-marginata*, Bedd. Suppl. H. B. 22.

The localities given by Clarke are :—

N.-W. HIMALAYA—KASHMIR, Falconer; Basaoli 5000', C. B. Clarke. Dalhousie 6000', C. B. Clarke. Simla 7000', T. Thomson. Garhwāl 2-9000', H. C. Levinge. Distrib. Nilgiris, *vide* Major Henderson.

The habitats in the Lists, and of the specimens, I have examined are :—

PUNJAB: *Hazára Dist.*—65-8000', Trotter; *Chamba*—Bavi Valley, "common" 4-5000', McDonell; *Kangra Vy. Dist.*—Dharmasála, Trotter; *Kullu*—7-9000', Trotter, Coventry; *Simla Reg.*—6-8500', Hope, Gamble, Blanford, Bliss.

N.-W. P.: *D. D. Dist.*—Mussoorie 7000' and down to about 4000', very common; *T. Garh.*—above Sahlra 7500', Gamble; *Kumaun* 4500—5000', S. and W. Naini Tal—Hope, Levinge, Davidson, Duthie, near Sosa 8-9000', Duthie.

DISTRIB.—*Asia*: Eastern Him. (Baker in Ann. Bot., Vol. V.), S. Ind., Madras Presidency—Ganjam and Nilgiris, *Gamble*, 1884.

"Eastern Himalayas," in the Annals of Botany, is probably merely an addition to the habitats given by Clarke; but, if *albo-marginata* scales be the distinguishing character of the species, *C. albo-marginata* was found long before Clarke's "Review" was published. Gamble's No. 5200, July, 1873, "Old walls, Kurseong, 4500' (below Darjiling)," must be placed here, though, were it whiter on the under-surface, it might perhaps be put under Blanford's *C. anceps*. Gamble's No. 13,886, from Mahendragiri, Ganjam District, Madras Presidency, 4500', March, 1884, and his No. 14,389, from Naduvatam, Nilgiris, 6000', June, 1884, have perhaps the most characteristic scales of any I have seen, though the shape of the former number is rather that of *C. anceps*.

The name *albo-marginata* I have always thought a somewhat misleading one: the character which seems to have suggested it is merely—"white margined scales." And even this is hardly correct: the scales are brown in colour—dark in the centre, and paler at the edges—bicolourous, in fact. Blanford's *C. anceps* also has bicolourous scales, as opposed to the self-coloured scales of *C. Dalhousie* and *C. furinosa*; but no one seeing these four plants growing, as I have, would think of uniting them, or even of making three of them varieties of the fourth. The four ferns are distinct and easily distinguishable each from the other.

*Cheilanthes albo-marginata* is undoubtedly a good species, though it has hardly been adequately described by its author. I will not intrude with a revised description: Blanford has given one, and Beddome another; but I may indicate where revision seems necessary. Clarke's plate gives the shape of certain fronds of the plant, but the frond is not, as he says, lanceolate, the lowest pinnæ being much the largest. The sequence in growth of the fronds is rather complex:

small, very coriaceous fronds, very dark-green above, whitish and densely scaly beneath, remain expanded or curled up through the winter and succeeding hot dry weather,—uncurling when the rainy season sets in. Then, much larger, herbaceous, fronds spring up, the cutting and colour of which is at first very beautiful; and in the Autumn very large fronds are found, with a coarser cutting, which wither light-brown or yellow, and seem to have a greater proportion of lamina, and are almost membranous in texture. Fronds quite similar to these last, though smaller, are found in *C. rufa*. I do not know when the small coriaceous persistent fronds (described above) found remaining the next season spring up. I have never seen powder approaching to yellow on this fern, but always pure white, though not very dense. Fronds, especially the late, large, ones, are often found without powder; but Mr. Baker is wrong in describing the fern as “denuded,”—if he means denuded of white powder.

Of this species Blanford says—“very abundant in and around Simla, covering the roadside banks and old stone retaining walls. Range from 4800' (my lowest) up to 8500', above which it is replaced by *C. Dalhousie*. The following is a description of *C. albo-marginata*, which is well represented in the figure, Plate 52, of Clarke's Review, except that the scaliness of the costæ and veins is not fully shown.

“Stipes 4 to 10 ins. long, generally shorter than the frond, bearing throughout dark linear lanceolate scales with pale translucent margins. Similar scales extend to the primary and secondary rhachises and costæ. Fronds up to 11 inches long, acute deltoid, under-surface naked, or in the young state and in the small fronds that persist through the dry season, thinly coated with yellowish-white powder. Lowest pair of pinnæ generally the longest. Segments oblong. Lines of sori scarcely interrupted at the sinus. Margins of involucre highly lacerate.

“It is always readily distinguishable from the other allied forms by the presence of scales on the veins and costæ, and by the highly lacerate involucre.”

6. *C. dubia*, n. sp.—Plate II. (see Part II, p. 528.)

Sub-genus—*PHYSAPTERIS*, *Presl.*

7. *C. Szovitzii*, Fisch. and Meyer; Syn. Fil., 139; C. R. 454; Bedd. H. B. 89.

AFGHAN.: Kabul (Clarke in “Rev.”).

TRANS-IND. STATES: *Chitral*—4500', Harriss; “near Baraul, 5500', Griffith.”

KASHMIR: *Baltisthán*—5-7000', frequent; *Gilgít Dist.*—7000', Col. Tanner, 1880; *Kishtnar*, 5000', Clarke, 31,336, 17-9-'76; Shagartang Valley 9-10,000', Duthie, 1892; Srinagar—5-6000', Levinge, 1875; Martand Ruins, Levinge, 1875, McDonell, 1891; Takht-i-Sulimán Hill, near Srinagar, 63-6500', Trotter, 1888, Gammie, 1891.

PUNJAB : Peshawar Hills, Major Vicary, in Herb. Hort. Kew. *Chamba*—"common at 5000'," McDonell; *Pangi*—McDonell; *Kullu*, Edgew.; *Lahaul*—10,000', Watt.

DISTRIB.—*Europe*: Italy and Dalmatia. The Caucasus. *Asia*: Asia Minor Persia, Afghan., Baluchistan, N. Ind.—Sind. Tibet 7-8000'. *Afr.* Algeria.

Clarke says of this species—"Exceedingly like *C. fragrans*, and only to be distinguished by the indusial hairs. The hairs are really confined to the sori, which occupy a very large portion of the very small segments, so that the lower surface of the frond appears densely matted." But in the *Synopsis* *C. fragrans* is No. 16, and put under the subgenus *Eucheilanthes*, while *C. Szovitzii* is No. 39, and placed in *Physapteris*, which has smaller segments.

Sub-genus—ALEURITOPTERIS, Fée.

**8. *C. rufa*, Don; Syn. Fil. 141; C. R. 457; Bedd. H. B. 94.**

PUNJAB: *Chamba*—3500', McDonell.

N.-W. P.: *D. D. Dist.*—In the Dún, and on the Himálaya 25-5000'; common low down; *T. Garh.*—Mussoorie and Chakráta Road 4500', Hope; *Kumaun*—near Phurka 6500', S. and W., Kali Valley—2-4000', Duthie; Gola Valley, about 4000' Hope.

DISTRIB.—*Asia*: N. Ind. (Him.), Sikkim, 5,000', "rare, as is limestone," Clarke. Assam—Khasia 4000', "plentiful wherever there is limestone." Clarke. Burma—Mergui. China—Yünnan 5400', "very rare," W. Hancock, 1893.

Clarke says—"I have collected much of this fern, but only on limestone; it is generally closely procumbent, curling up on the rock, and easily recognised by its woolly hairiness. Scales often none, or undistinguishable from the hairs; scales, when present on the stipe mixed with the hairs, are narrow-linear, uniform-coloured. Fronds above laxly flocculose or woolly, or almost tomentose." I find that the scales, near the base of the stipe at least, though narrower and longer than those of *C. albo-marginata*, are quite as bi-coloured. The plant curls up only if withered, or in dry weather; when growing, or in damp weather, its fronds are patent. I think that like some other ferns it is hygroscopic, and uncurls again in wet weather. The lowest pair of pinnæ are always shorter than the next superior pair are, and on them the lowest pinnules are produced, and sometimes pinnatifid; and sometimes the frond diminishes in width gradually from the middle. The upper surface cannot be said to be tomentose, but there are scattered hairs on it: the stipe and rhachises and under surface are notably tomentose, and the involucre also, I think. The involucre are as rufous as is the tomentum. In the Dehra Dun the plant grows on sandstone, of Siwálik formation, and, on the slope of the Himalaya, on shale: higher up—perhaps on mguesian limestone. The dimorphism I have alluded to under *C. dubia*. On again going over my specimens—the description of *C. dubia* having been written four or five years ago—I think that *C. dubia* inclines rather to *C. rufa* than to *C. albo-marginata*; but if the two first-

mentioned plants are to be considered as one there is no gain, in beauty at least, to *C. rufa*, as the *dubia* form is very rough and coarse,—late in the season at least: some specimens almost wholly cover my sheets—18" × 12". Taking large, whole plants of each species, they are all three distinct; but individual fronds might be culled to match from all three.

9. *C. farinosa*, Kaulf.; Syn. Fil. 142; C. R. 457; Bedd. H. B. 92.

KASHMIR: Jhelam Valley—"between Chakota and Domel, not common," MacLeod, 1891; Kaman Goshi 3000', Tawi Valley 4000', Gammie, 1891.

PUNJAB: *Hazára Dist.*; (Trotter in M.S. List). *Salt Range*—Tilla Mt., Aitch., 1870, *Chamba*—Ravi Valley 8000', McDonell; Kangra Valley District, W. 2500', E. 4500', Trotter; *Simla Reg.*, near Simla 6500', Kotgarh Road, 45 miles E. of Simla, 9000', Gamble; Simla—Samal Valley 5000', Blanf.

N.-W. P.: *D. D. Dist.*—Siwálik Range 1-3000', abundant along road through Mohand Pass, and probably everywhere else; in the Dún, and up to above 4000', on the Himalaya, abundant; *Saharanpur Dist.*—Siwálik Range; *T. Garh.*—Ganges and Jumna Valleys; *Kumaun*—common 2-4500', near Pitoragarh 5-6000', Kali Valley 9-10,000', and between Gini and Munshiari 7000', Duthie.

DISTRIB.—*Amer.*: Mexico (up to 8000', Guatemála, New Grenada, Brazil. *Asia*; Arabia; N. Ind. (Him.), Sikkim, Bhotan; Assam—Khasia; Bengal—Chittagong and Chutia Nagpur; Centr. Provs., Pachmarhi 3000'; Centr. Ind.—Bagelkhand to Rajputana. S. Ind.—whole Deccan and Madras Presidency in the plains, and up to 8000 on the hills. Burma—Moulmein. Ceylon, Malay Penin. Java. Philippines. *Afr.*: Cameroon Mts., Angola, Zambesi Land, Abyssinia, Bourbons.

: The texture of this fern varies from 'almost membranous to ceriaceous' and very heavy. I agree with Mr. Clarke, that it is easily separable from *C. rufa* and *C. albo-marginata*; but he might have gone further and have said that it has no resemblance to either, beyond being of the same genus.

In his "Summary of New Ferns" (Ann. Bot., Vol. V.) Mr. Baker refers to the late H. F. Blanford's paper on "Silver Ferns of Simla" read before the Simla Natural History Society, June 25th, 1886, for an account of the Indian forms of *C. farinosa*, and says he cannot separate specifically *C. anceps* and *C. grisea* therein described as species. But Mr. Blanford modified his views afterwards, and in his "List of the Ferns of Simla," Journ. Asiatic Soc. Bengal, Vol. LVII, Part II., No. 4, 1888, gave those plants as merely varieties of *C. farinosa*. This is what he said of the type plant in the latter mentioned paper:—

"This is very abundant in the Siwáliks and Doons, and in the deeper valleys of the outer Himalaya up to 4000'. In the neighbourhood of Simla it may be found as high as 5000', above which I have not met with it. The following characters distinguish it from other allied forms. Stipes up to 12 ins. long, generally longer than the frond, deep red-brown, naked or with a few linear scales near the base only.

Fronde deltoïdly lanceolate, acute to acuminate, up to 8 ins. long and 5 ins. broad, always thickly coated beneath with white powder. Lowest pair of pinnæ always the largest. Segments narrow. Sori continuous round the sinus. Margins of involucre entire, uneven, or toothed, not lacerate.

"This form ranges all over India. I have collected it at Pachmarhi at 3000', and I have specimens from the Khasi Hills at 3-5000' and from the Nilgiris up to 6000'."

I found this fern abundant in the Rewa State of Central India, in 1860-61. It seemed to be common along the north edge of the plateau, at the heads of the valleys running down thence northwards. And I have a sheet on which is a ticket of Mr. Clarke's—" *Cheilanthes farinosa*, Central India? " One plant of this is exactly small *C. anceps*, Blanf.

10. *C. anceps*, Blanf., in "The Silver Ferns (*Cheilanthes*) of Simla and their Allies," read before the Simla Natural History Society, 25th June, 1886. *Cheilanthes farinosa*, var. *anceps*, Blanf. in Journ. As. Soc. Bengal, Vol. LVII, Pt. II., No. iv, 1888; Cl. and Baker, in Journ. Linn. Soc. XXV. 411; Bedd. Suppl. H. B. 21, under *C. farinosa*.

"Stipes thick, up to 8 ins. long, little longer or shorter than the frond, dark chestnut to almost black, bearing, generally throughout, dark linear-lanceolate scales, with pale margins, which often extend to the principal rhachis but not beyond. Frond lanceolate to oblong-lanceolate. Under surface always thickly coated with white powder. Lowest two or more pairs of pinnæ subequal, rather distant. Involucre narrow, with toothed or lacerate margins.

"Readily distinguished from the typical form by the shortness of the lowest pair of pinnæ, and the greater extension of the scales. In large well grown fronds the lower three or four pairs are nearly equal, and the form" (shape?) "of the frond approaches that of *C. subvillosa*. Specimens collected by Mr. Clarke in the Khasi Hills present the same characters as those of the N.-W. Himalaya. I have specimens also from Mt. Abu (Rajputana), collected by Dr. King, and from the Nilgiris at 4000' and 6000', collected by Mr. Gamble."

The above is Mr. Blanford's description of var. *anceps* in the Journal of the Asiatic Society Bengal. As to habitat, he said:—

"In the North-West Himalaya it has a well defined, but restricted range of elevation, viz., from 3500 to 6000 ft., and is common below Simla between 4500 and 5000 ft.

Other records are :—

PUNJAB : *Kullu*—Inner Seoraj, 5000', Trotter.

N.-W. P. : *D. D. Dist.*—Jausar, near Lohwa, 4000', Blanford, 1886 ; near Rájpur 28-4000', plentiful, Hope ; Landour, 6500', Miss Parrott.—Mussoorie-Chakrata Road, 4500', Hope ; *Kumaun*—7000', Duthie ; 4500' Hope, Trotter, Gori Ganga Valley—Bugdiar 8500', MacLeod.

DISTRIB.—*Asia* : N. Ind. (Him.) Sikkim—Pankabari 3000', *Clarke*, 1884 ; Assam—Khasi Hills 5000', frequent, *Clarke* ; Rajputána—Mt. Abu, King, Duthie. S. Ind.—Madras Presy., Nilgiris 4-6000', Gamble. "So common on all the mountain ranges in India," *Bedd.*, Supp. H.B.

I feel obliged to set up this fern as a species (though the late Mr. Blanford, its author, latterly degraded it to the rank of a variety of *C. farinosa*), because I think it very distinct, though the specimens I group here, following Blanford, differ considerably from each other. My specimens collected near Simla, in Blanford's company, are small and not stout, and seem nearer his *var. grisea* than to the large, stout fern which is got on the lower slopes of the Mussoorie range of the outer Himalaya and in Kumaun, and which in thickness and blackness of stipe resembles specimens from other parts of India ticketed *C. bullosa*, the stipe, however, being much more scaly than the stipe of that fern, and the frond longer and narrower. The scales on the large form are bi-coloured, but those on some specimens of the small form are not so. The involucre on Miss Parrott's Landour fern, gathered in September, are of reddish-brown colour ; and in that respect, and in general habit the plant is almost the same as a plant of *C. grisea* gathered by Blanford in the Simla Region in the same month.

On the way up the Himalaya from Rájpur to Mussoorie *farinosa* is the only *Cheilanthes* seen for the first few hundred feet of elevation ; then *anceps* begins to appear, and very soon entirely supersedes *farinosa* and is alone until, with a little of *rufa*, it meets the lower limit of *albo-marginata*. The large form of *C. anceps* is, however, met with also considerably lower down, in the Raspana Valley. The marked difference of *anceps* from *farinosa* at once catches the eye : it is stiffer, and much darker in colour, and the frond is narrowly lanceolate. The coat of farina on the under side is much thicker, and therefore looks much whiter than that on *farinosa*, and it presents a marked contrast to the dark-coloured rhachises. The colour of the frond is a dark-green. If the large stout form is to be put with *C. bullosa*, Kze., it seems to me to be all the more necessary to make a distinct species of them ; but the shape of the frond seems different in the two plants. I am inclined to transfer Blanford's Simla, high-level type, and the similar small plants from elsewhere, to *C. grisea*.

11. *C. grisea*, Blanford in "The Silver Ferns" (*Cheilanthes*) "of Simla and their Allies," read before the Simla Nat. Hist. Soc., 25th June, 1886 ;

*C. farinosa*, Kaulf., var. *grisea*, Blanford in Journ. Asiat. Soc. Bengal, Vol. LXVII, Pt. II, No. 4, 1888; *C. farinosa*, form *minor*, Cl. and Bak. in Journ. Linn. Soc., Vol. XXV, p. 411; Bedd. Suppl. H. B. 21.

“Stipes slender, 2-6 ins. long, light-brown, naked, or bearing a few thin brown and translucent lanceolate scales (not white-margined) near the base. Fronds dimorphous:—one form narrow lanceolate 4-5 ins. long  $1\frac{1}{2}$ -2 ins. broad, thin papyraceous: lower 3-4 pairs of pinnae subequal distant: under surface thickly coated, upper surface sprinkled with white powder: segments narrow oblong. The other form ovate-lanceolate: pinnae close, triangular; lower two pairs equal. Both forms fertile. Involucres as in typical variety.”

PUNJAB: *Chamba*; Rávi Valley, 8500', McDonell. *Simla Reg.*—Gt. Thibet Rd. from Nazkanda to Bági, and Hattu Mt., 83-940', Blanf., Trotter, Bliss; *Simla*—The Waterfalls, Bliss.

N.-W. P.: *D. D. Dist.*—Mussoorie, about 6200', Hope, 1881; *Brit. Garh.*—Dombitía Gadh, 9-10,000', Duthie; *Kumaun*—above Sosa, 9-10,000'; Byáns—Káli Valley, above Chálek, 11-12,000', Duthie.

DISTRIB.—*Asia*: N. Ind. (Him.) Sikkim—Darjiling, Sinchal, 8,000', Gamble. Assam—Khasia Hills, Nunklow 2500', Clarke No. 45686.

McDonell's plant from Chamba is very elegant; stipe twice as long as the frond, which is very white beneath; involucres light-brown. Bliss's specimen from Bági, No. 243, is similar but smaller, and stipe not so long; and mine from Mussoorie is the same, but with numerous sharp-pointed scales extending half-way up the stipe: it, as well as Trotter's from the Simla Region, has a little of the white powder on the upper surface, but in such cases the "powder" may have fallen from the under surface of other fronds. Blanford's and Bliss's specimen from the low elevation, as well as Duthie's from B. Garhwal, have yellow-brown involucres. The powder in all cases is white.

(To be continued.)

SUPPLEMENTARY NOTES ON THE *COCCIDÆ* OF CEYLON.

BY E. ERNEST GREEN, F. E. S., GOVERNMENT ENTOMOLOGIST.

WITH PLATES A—G.

*(Continued from page 76 of this Volume.)*

AONIDIA PERPLEXA, n. sp. (Pl. E, figs. 19, 20.)

Female puparium (fig. 19) oval, flat. Secretory area greenish-grey, semi-transparent, completely covering the pellicles except over a circular spot in the centre of the first, where the surface of the pellicle is exposed. The first pellicle is really almost colourless and transparent; but appears black, the colour of the second pellicle showing through it. Second pellicle black, the colour partially concealed by the thin layer of greyish secretion which extends as a moderately broad border beyond it. Extremity of second pellicle with six prominent wedge-shaped lobes and some stout squames between them. Size of second pellicle 1.20 by 0.75 mm. Length of complete puparium 1.75 mm. Breadth 1.25 mm.

Male puparium greyish, semi-transparent. Pellicle very pale yellow: a circular spot in the centre exposed. Length 1.50 mm. Breadth 1 mm.

Adult female broadly rounded in front, with two minute indentations on the anterior margin, immediately in front of the rostrum. Antennæ, each consisting of a tubercle with one longish and one very short hair, placed a little within the margin. Rostrum large and conspicuous. Spiracles without parastigmatic glands. Margin of abdominal segments not fringed, but with one or two longish spines. Pygidium (fig. 20) rounded, with a conspicuous truncate median prominence bearing three small spines. Two conical prominences at intervals on each side, each with one longish and two very small spines. Immediately lateral of the several prominences are the six lobes which are rather inconspicuous on account of their pale colour and transparency. Without careful adjustment of the light the true lobes may be overlooked and the five prominences mistaken for them. Each lobe is short but very broad, sloping downwards from the side of the adjacent prominence to the margin: the free edge minutely serrate. Anal and genital apertures situate about the centre of the pygidium, on the dorsal and ventral surfaces, respectively. Length 0.75 mm. Breadth 0.75 mm.

Adult male not observed.

Habitat:—On the under surface of leaves of *Messua ferrea*, in the Botanic Gardens, Peradeniya. Placed singly by the side of the midrib.

This insect occurs on the same leaves as the preceding one, (*A. mesuce*); but the two species are confined to the opposite surfaces of the leaves. Their structural characters are quite distinct.

AONIDIA PLANCHONIOIDES, n. sp. (Pl. E, figs. 21, 22, 23.)

Female puparium (fig. 21) oval : very pale yellow, transparent, revealing the adult insect enclosed within the large second pellicle.

The second pellicle has an opaque yellowish-white margin, and beyond this the secretory area forms a narrow frilled border. Towards the posterior extremity is a circumscribed concave patch, immediately followed by a rounded ridge. Both the pellicles are quite transparent ; their appearance being that of a celluloid covering, through which the sublying insect is clearly discernable. The second pellicle, removed from the puparium, (fig. 22), is pear-shaped, a circumscribed triangular patch at the extremity quite colourless and glassy. Size of second pellicle 1 mm. by 0.75 mm. Total length of puparium 1.12 mm.

Male puparium of same size and form as female, but without the marginal zones. Pale transparent yellow : the single pellicle subcentrally situated.

Adult female, after oviposition semi-circular, the abdominal segments retracted. Colour yellow. Pygidium (fig. 23) with a marginal series of large irregular pointed processes, their extremities often deeply cleft. The shape and number of these processes is variable : but one is always medially situated, and there are usually five on each side. The lobes are represented by four (sometimes six) narrow chitinous bands in the spaces between the marginal processes. There is a longish slender spine in the space on each side of the median process. The anal is situated considerably below the genital aperture. Length about 0.50 mm. Breadth 0.62 mm.

Adult male of normal form : genital sheath pointed. Feet with two-knobbed hairs on tarsus and one on claw. Length, including genital sheath, 1 mm.

Habitat :—On both surfaces of leaves of a species of *Ficus*, in the Botanic Gardens, Peradeniya.

This little insect bears a remarkable resemblance to some species of *Asterolecanium*, (or *Planchonia*), so much so, that I provisionally determined it as a member of that genus : and it was only after a microscopical examination that I discovered my mistake. The transparent scale, revealing the sublying insect occupying the anterior half, together with the submarginal zone and the frilled border, all aid in the deception : though one can conceive no possible use for the resemblance.

#### Genus MYTILASPIS.

MYTILASPIS LASIANTHI, n. sp. (Pl. F, fig. 24.)

Female puparium elongate, broadest across the middle and tapering to either end ; moderately convex above ; margin not abruptly flattened ; with a cylindrical median channel and broad border below, as in *gloverii* and *pallida*. Eggs disposed in two rows. Colour brownish-yellow to bright orange ; examples on upper surface of leaf with the brighter tint ; margin paler. Pellicles straw-colour. Length 2.50 mm. Greatest breadth slightly under 1 mm.

Male puparium, pale straw-colour, with colourless margin. Length 1.50 mm.

Adult female of normal form : segments well defined, with prominent margins dotted with numerous oval pores. A prominent rounded tubercle on each side of the head, marking the position of rudimentary eyes. Anterior spiracles with parastigmatic glands consisting of two or three pores only. Pygidium (fig. 24) rounded. Median lobes conical, with a minute notch low down on each side. Second lobes duplex : the mesal lobule largest, with rounded extremity, slightly narrowed at base : lateral lobule narrow, inner edge longest. Other lobes obsolete. Spines, squames and dorsal pores as in *gloverii*. Circum-genital glands in five groups, the three upper groups sometimes almost confluent : the number of orifices unusually constant : median group with 4, upper laterals with 10, and lower laterals with 8. Length of extended insect about 0.75 mm.

Adult male not observed.

Habitat.—On both surfaces of leaves of *Lasianthus strigosus* ; Pundaluoya : November. Also on croton leaves ; Colombo.

As with many members of this genus, it is extremely difficult to convey a clear idea of the differences between this species and its nearest allies. It belongs to the group containing *gloverii* and *pallida*, with the distinct median channel and divided ventral scale. It is perhaps nearest to *pallida* : but may be distinguished by the lanceolate form of the puparium, tapering to either end : by its brighter colour : and by the more evenly convex dorsal surface of the scale, the margin not being flattened off above. The adult female may be distinguished from *pallida* by the much greater number of marginal pores, which are crowded along the sides of the segments from the meso-thorax downwards, and by the rather more prominent lobes on the pygidium. The abdominal segments are also much more strongly produced.

MYTILASPIS PALLIDA, Green.

*M. gloverii*, Packard, var. *pallida*, Green. 'Coccidæ of Ceylon,' Part I, p. 85.

After examination of a large amount of material, I have come to the conclusion that *pallida* should rank as a good species. Prof. Cockerell, of New Mexico, is also of the same opinion. It may be separated from *gloverii* by the much paler colour of the scale, and by the broadly expanded margin. The division in the ventral scale of *pallida* is quite broad, while in *gloverii* it is merely a narrow slit.

#### Genus DIASPIS.

DIASPIS AMYGDALI, Tryon.

This species has lately appeared in considerable numbers on the stems of the 'Dadap' tree (*Erythrina* sp.), in Pundaluoya. It does not appear to cause these very succulent trees any appreciable harm.

DIASPIS LORANTHI, n. sp. (Pl. F, figs. 25, 26.)

Female puparium greyish-white, semi-transparent : but both colour and transparency obscured by the tomentose covering of the leaf, which is continuous over the surface of the scale. Pellicles small, pale yellow, some-

times subcentral, sometimes close to the margin, concealed beneath the tomentose covering, visible only on the inner surface of the scale. Form approximately circular; flat; very thin and delicate in texture. Ventral scale remaining attached to the leaf.

Diameter about 3·50 mm.

Male puparium of normal form, elongate, narrow, sides almost parallel, strongly tricarinate: snowy-white, the pale yellow pellicle situate at the anterior extremity. Ventral scale well developed, completely closing the puparium below.

Length 1·15 mm.

Adult female (fig. 25) bright yellow; elongate, narrow; cephalo-thorax and meso-thorax slightly broader than the remaining parts. Segments well defined, the second abdominal moderately produced at the sides, the third abdominal merged in the pygidium. Antennæ at some little distance within the margin, each consisting of a small tubercle and a long curved hair. Mouth parts large and conspicuous, close to the anterior extremity. Spiracles small; both pairs accompanied by parastigmatic glands; the anterior pair one on each side of and close to the mentum; the second pair just within the anterior border of the meta-thorax. There is a pair (sometimes two pairs) of conspicuous depressed spots on the dorsal surface of each segment, besides a number of scar-like spots above the cephalic segment. There is a group of about 7 spiniform squames on the margins of the second abdominal segment. The pygidium, which in this section of the genus includes the 3rd abdominal segment, may otherwise be subdivided as in typical *Chionaspis* (vide 'Coccidæ of Ceylon,' Part II, p. 106, Pl. XXXI). Median lobes large and diverging, partly sunk in a conspicuous median cleft (fig. 26), their free edges minutely serrate, their bases united. Second lobe duplex; the mesal lobule prominent, elongate and narrow; the lateral lobule, short and sloping away to the margin; rather difficult to define, being more or less confused with the adjacent spine and squame; both lobules entire. Third lobe duplex; the mesal lobule rather prominent, slightly dilated at extremity, the inner edge longest, the free edge serrate; lateral lobule short, outer edge sloping to the margin. Single spiniform squames on the 1st, 2nd, 3rd and 4th lateral spaces: three or four on the 5th space: and from seven to ten on the base (the 3rd abdominal segment). The marginal dorsal pore on the 2nd space is situated on a prominent point. There are two marginal pores on the 3rd space, the mesal one on a prominent rounded process that may be mistaken for one of the true lobes; the second pore in a cleft between the lobules. Marginal spines rather long, particularly that between the lobules on the second space. Series of conspicuous oval dorsal pores at the junctions of the suppressed segments. Circumgenital glands in five groups with numerous orifices: median 8 to 16: upper laterals 14 to 25: lower laterals 11 to 26. Anal and genital apertures superimposed.

Length 1.50 mm. Breadth 0.62 mm.

Adult male red; of normal form: genital sheath almost as long as the body. Antennæ with a knobbed hair at the apex and another from the side of the terminal joint. Foot with 1 unguis and 2 tarsal digitules. Length about 0.75 mm.

Habitat.—On under surface of leaves of *Loranthus tomentosus*; sometimes also on the young stems; Pundaluoya; Banderawella.

In general form this species closely resembles *D. rosæ*: but the colour of the adult female, (*rosæ* being red), and the much more prominent pygidial lobes will serve to distinguish it.

#### Genus FLORINIA.

FLORINIA FLORINÆ, Targ.

In Part I of the 'Coccidæ of Ceylon' I stated that I had not yet observed this insect upon the tea-plant. I have now to record that it is by no means uncommon on tea in several of the up-country districts. Fortunately the pest seems to affect the small-leaved (China) jats only and is subject to a fungal disease which keeps it in check. The diseased insects are easily recognised by a fringe of bright orange-coloured matter projecting from beneath the scale.

FLORINIA SAPROSMÆ, Green. (Pl. G, fig. 27.)

Subsequent examination, of better preparations, shows that the inter-antennal tubercle of the adult female is not tricuspid, but bears a number of small spine-like points (fig. 27).

FLORINIA SAPROSMÆ, var. GELONII, n. var. (Pl. G, fig. 28.)

A form from *Gelonium lanceolatum* has the median lobes more prominent and distinctly serrate (fig. 28). The first lateral lobe is sometimes developed in this variety. The position of antennæ and inter-antennal tubercle are as in the type. This form may be distinguished as var. *gelonii*.

FLORINIA PROBOSCIDARIA, n. sp. (Pl. G, figs. 29, 30, 31, 32.)

Female puparium (fig. 29) elongate lanceolate, with a distinct median carina. Colour golden brown, shining. First pellicle pale yellow, projecting from the anterior extremity. The rest of the puparium consisting of the enlarged second pellicle. Length 2.25 mm. Breadth 0.40 mm.

Male puparium undetermined. As this species occurred in company with *F. sapsomæ*, and the males of closely allied species being almost indistinguishable, it was impossible to separate with any certainty the male scales of the two insects.

Adult female (fig. 30) elongate, tapering at both ends. At the anterior extremity is a remarkable proboscis-like organ (fig. 31), which has suggested the specific name of the insect. It is an extension of the inter-antennal tubercle found in *sapsomæ* and some other forms. The antennæ are situated at the base of it. Accompanying this excessive growth the anterior part of the body has become twisted to one side. Parastigmatic glands represent-

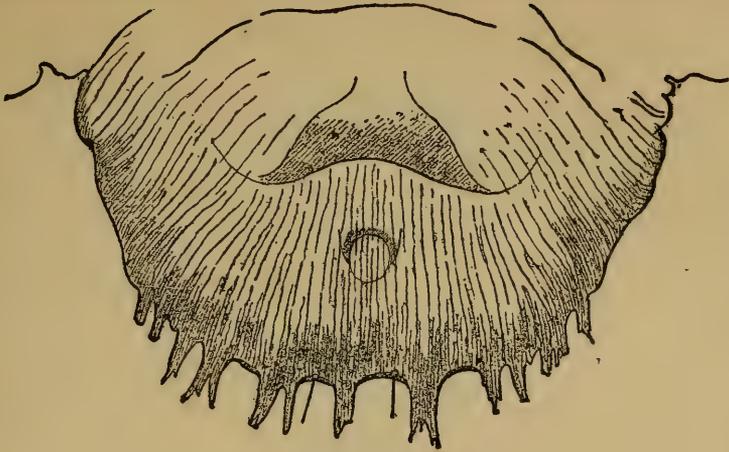


FIG. 23.

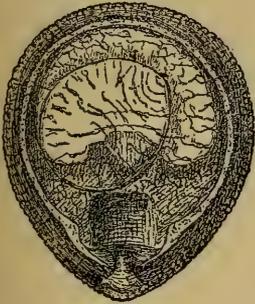


FIG. 21.

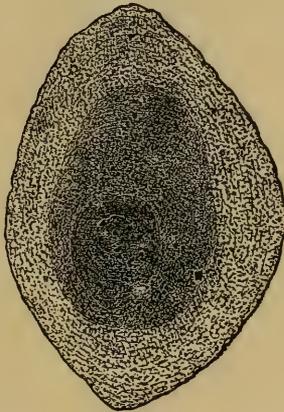


FIG. 19.

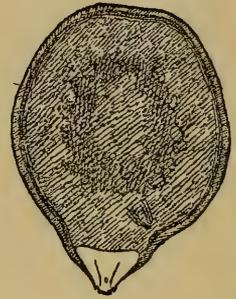


FIG. 22.

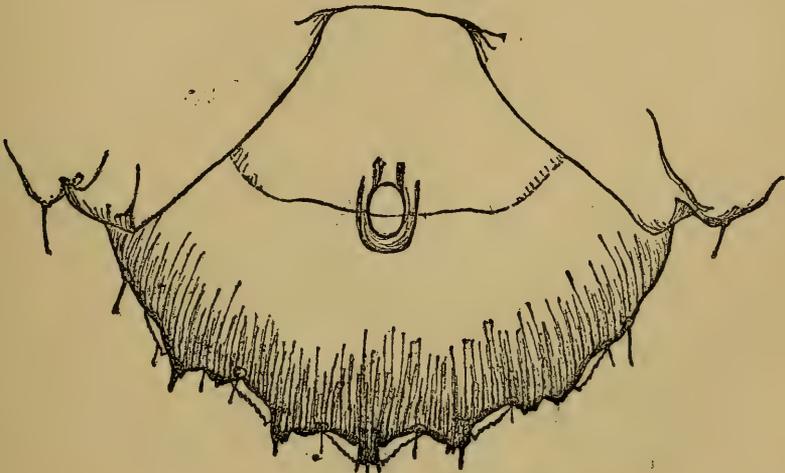


FIG. 20.

THE COCCIDÆ OF CEYLON.



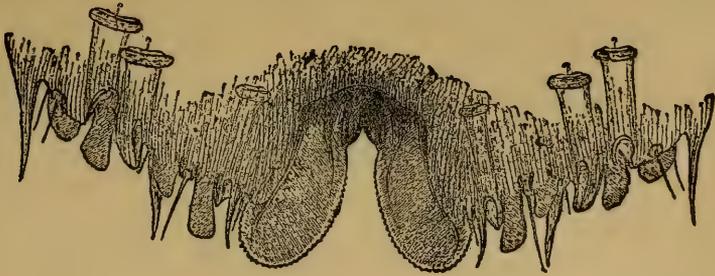


FIG. 26.

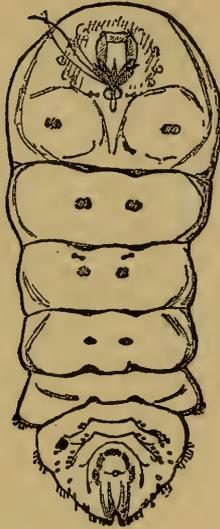


FIG. 25.

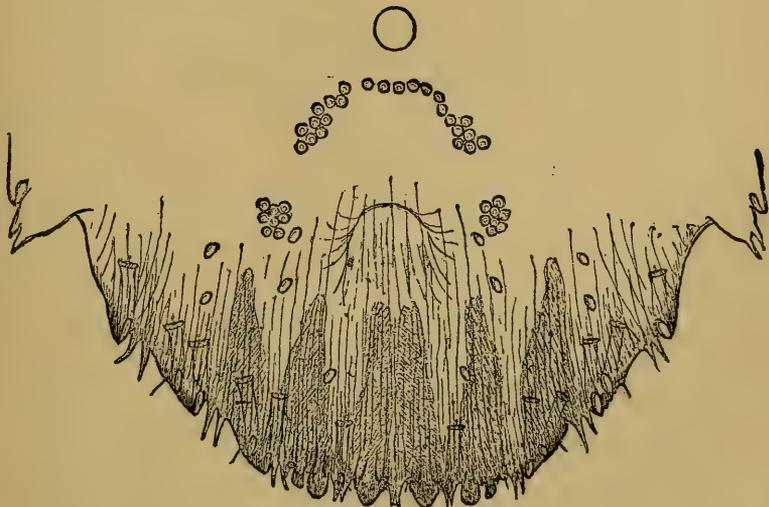


FIG. 24.

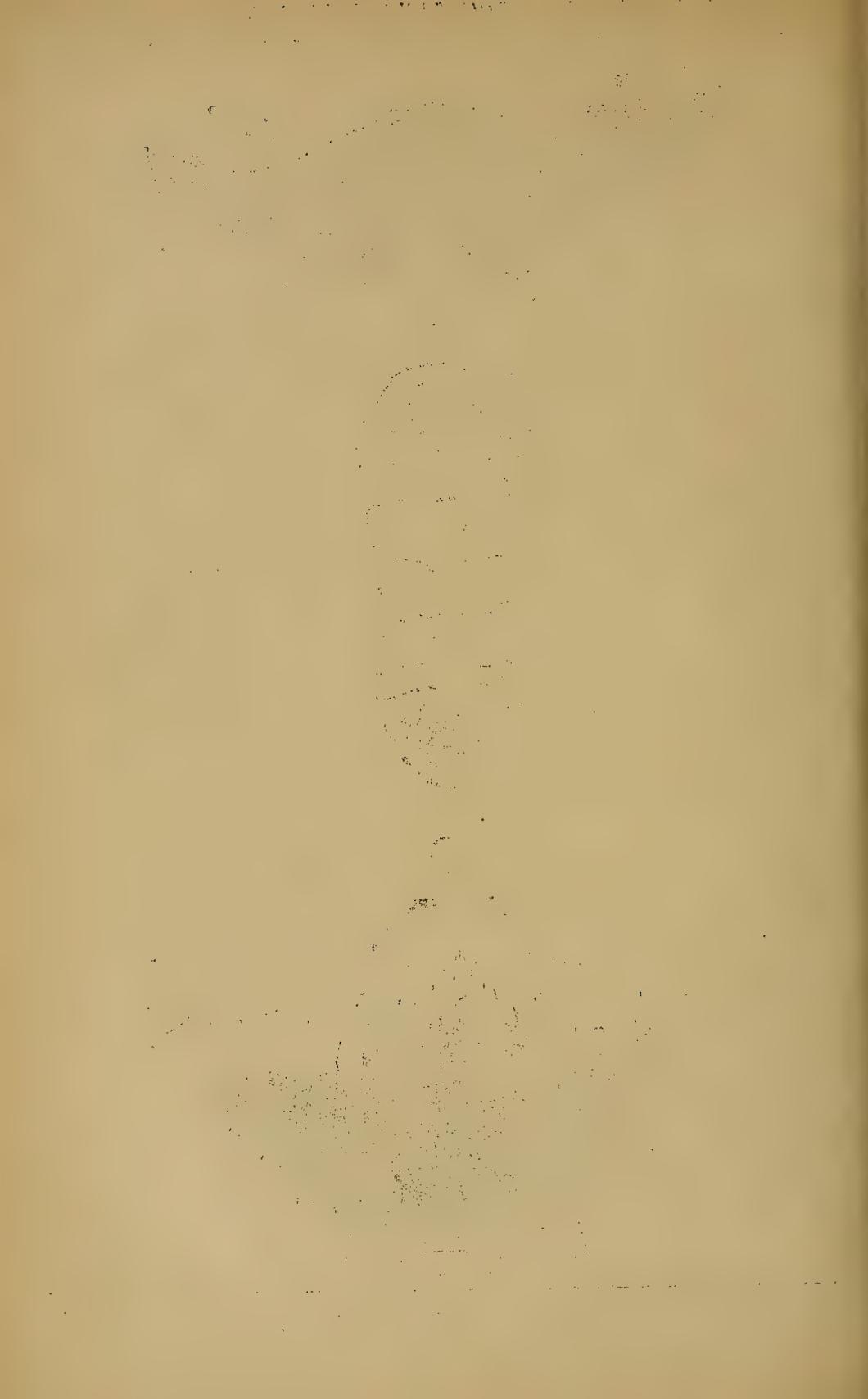




FIG. 28.

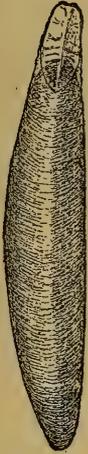


FIG. 29.

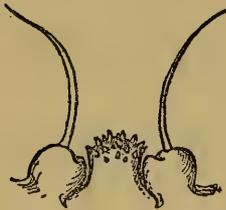


FIG. 27.

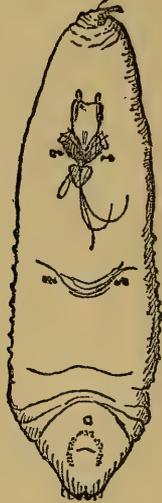


FIG. 30.

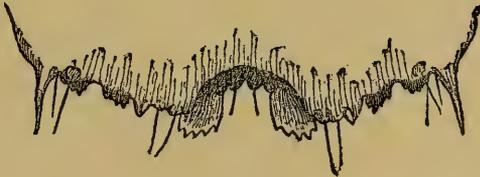


FIG. 32.

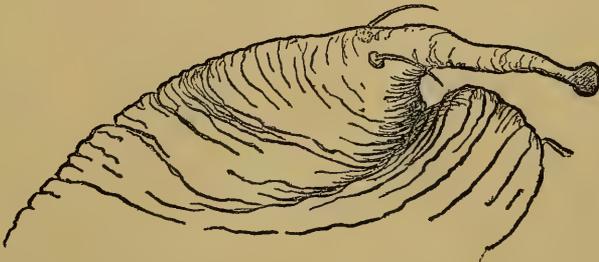


FIG. 31.

THE COCCIDÆ OF CEYLON.



ed by a single pore at each of the first pair of spiracles. The lateral margins of the metathorax are set with small blunt tubercles. Pygidium bluntly triangular. Median lobes moderately large, widely diverging, coarsely serrate. Two serrated chitinous prominences on each side represent the lobules of the first lateral lobes (fig. 32). Spines well developed; two between the median lobes: others in the usual positions. There is a single large, stout squame near the extremity on each side. Anal aperture close to base of pygidium. Circumgenital glands in five groups, sometimes in a continuous arch: median 6 to 7: upper laterals 12 to 16: lower laterals 20 to 24. Length 1 to 1.12 mm.

Adult male not observed.

Habitat.—On leaves of *Gelonium lanceolatum*: Pundaluoya: August.

This species is remarkable for, and may easily distinguished by, the extraordinary development of the usually small interantennal tubercle. The organ exists in *saprosmeæ* as a minute spinous tubercle. In *F. theæ* (Green, MS), from India, it appears as a prominent spatulate process. It is difficult to imagine any use for the elephantine proboscis of the present species.

EXPLANATION OF PLATES E, F, & G.

PLATE E—

- Fig. 19. *Aonidia perplexa*; female puparium.
- „ 20. „ „; pygidium of adult female.
- „ 21. „ *planchonioides*; female puparium.
- „ 22. „ „; 2nd pellicle of female puparium.
- „ 23. „ „; pygidium of adult female, ventral view.

PLATE F—

- Fig. 24. *Mytilaspis lasianthi*; pygidium of adult female, dorsal view.
- „ 25. *Diaspis loranthi*; adult female, ventral view.
- „ 26. „ „; pygidium of adult female.

PLATE G—

- Fig. 27. *Fiorinia saprosmeæ*; inter-antennal tubercle of adult female.
- „ 28. „ „; var. *gelonti*; pygidium of adult female.
- „ 29. „ *proboscidaria*; female puparium.
- „ 30. „ „; adult female, ventral view.
- „ 31. „ „; anterior extremity of adult female.
- „ 32. „ „; pygidium of adult female.

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM  
AND BHUTAN.

BY G. C. DUDGEON, F.E.S.

WITH NOTES BY H. J. ELWES, F.Z.S., F.E.S., &C.,

AND

ADDITIONS BY SIR GEORGE F. HAMPSON, BART., B.A., F.E.S., &C.

PART VIII.

With Plate III.

(Continued from page 84 of this Volume.)

Family LIMACODIDÆ.

Genus SCOPELODES, Westw.

817. *S. venosa*, Wlk.

Sikhim and Bhutan up to 5,000 feet. A very common species attracted to light. It is found in April, May, August, September and October, but I have no females in my collection. (The forms *ursina*, Butl., and *testacea*, Butl., both of which occur in Sikhim, seem to me to be sufficiently distinct.—*H. J. E.*)

818. *S. sericea*, Butl.

Sikhim, 3,000 feet. I have only one which is a female. The wings are uniform ochreous and of a silky transversely ribbed form. (The silky corrugation of the forewings is either not constant, or I have two species under this name.—*H. J. E.*)

819. *S. unicolor*, Westw.

Sikhim, 1,800 to 3,000 feet. I have no doubt that this occurs in Bhutan also, but all my specimens are from Sikhim. It is easily recognizable from the last two species in being smaller, with the forewing, thorax, and palpi red-brown, and the hindwing yellow. It has a habit of sitting on twigs with the head and thorax elevated and the wings folded, and in this position it resembles a velvety brown leaf bud and is very inconspicuous. My specimens were obtained in May, August and September. (My specimens named by Hampson average as large as those of *S. sericea* and *S. venosa*.—*H. J. E.*)

820. *S. contracta*, Wlk.

Sikhim and Bhutan, 1,800 to 5,000 feet. The male has both wings grey-brown with the inner margin of the hindwing yellowish. The female which I have taken with the male has the forewing pale reddish-

brown minutely irrorated with black scales, and the hindwing dark grey. It occurs in May and June, and is not common. (My male specimen has the hindwings of uniform colour with the forewing. It may be that Mr. Dudgeon has another species.—*H. J. E.*)

Genus HYPHORMA, Wlk.

821. *H. minax*, Wlk.

Sikhim and Bhutan, 3,000 feet. My only specimen I took at Fagoo in May sitting on a branch in the same position as I have mentioned *S. unicolor*, Westw., adopts.

Genus SUSICA, Wlk.

824. *S. pallida*, Wlk.

Sikhim and Bhutan up to 6,000 feet. Males are extremely common at low elevations, but I have never seen the female. Fresh specimens have a high tuft or crest on the thorax.

Genus THOSEA, Wlk.

825. *T. cana*, Wlk.

Sikhim and Bhutan, 4,000 feet. I have taken it in May and August. (Commoner in the Khasias, where I took it at 6,000 feet in September.—*H. J. E.*)

827. *T. tripartita*, Moore.

Sikhim and Bhutan, 1,800 to 3,000 feet. Easily recognised from the last by the basal portion of the forewing being dark brown, and the pale line bounding it being more erect, also by the postmedial line meeting the margin above the outer angle. Occurs in May, July, August and September. (Only once taken at light in Darjeeling, on August 26th.—*H. J. E.*)

829. *T. fasciata*, Moore.

Bhutan 2,500 feet. One specimen, a female taken in August.

832. *T. cervina*, Moore.

Sikhim and Bhutan, 1,000 to 4,000 feet, at least. Twenty-two specimens in my collection fall under four forms. Two of which seem to me to be sufficiently distinct, and may possibly be found to belong to another species.

- A. Dark brown irrorated with black, disco-cellular speck minute, postmedial line *pale edged*, slightly *incurved*, arising from costa *just before the apex*, ending *near outer angle*. *Exp.*  
♂ 36-38, ♀ 39-46 millim.

*B.* Postmedial line *straight*, not pale edged, arising from costa long before the apex and ending just beyond the middle of the inner margin.

*a.* Disco-cellular spot round and distinct. Ground-colour grey.

*a'.* Grey suffused with brownish on the basal portion as far as just before the origin of the postmedial line at the costa, and just before the middle of the inner margin. *Exp.* ♂ 31-39, ♀ 40-43 millim.

*b'.* Pale grey, with a suffused indistinct darker irregular fascia from before the middle of the inner margin, angled outwards below vein 2, and bent in towards the origin of the vein; a dark cloudy mark beyond the postmedial line between veins 2 and 5. *Exp.* ♂ only, 48-50 millim.

*b.* Disco-cellular spot minute or absent. Red-brown throughout, with a diffused fuscous fascia from before the middle of the inner margin to beyond the middle of the costa. *Exp.* ♂ only, 40-42 millim.

The form *A* seems to be the typical one, and was bred from a quantity of cocoons sent me by Mr. Geo. Murray, late of Rungamuttee Estate in the Western Doora. The larva had done a considerable amount of harm to the tea, and many thousands of larvæ and pupæ were destroyed on this garden alone in 1894. The cocoon, which was found in the ground, was dark brown in colour and nearly round, and was so much like a tea seed in appearance that it might easily be overlooked in searching for it. The specimens sent me all emerged in August. I have three males and two females in my collection. Form *B. a. a'*. I have taken in Sikhim and Bhutan from 1,800 to 3,000 feet. I have four males and four females showing no variation; this was identified as *T. cervina*, Moore, by Hampson, it occurs in May, August and September. Form *B. a. b.* I have three

males from Bhutan, 2,500 feet, and two males from Sikhim, 1,800 feet ; it is a much larger insect than the others, and I have taken it in August only. Of form *B. b.* I have four specimens, all males taken at 1,800 feet in June and September at Punkabaree.

834. *T. cotesi*, Swinh.

Sikhim and Bhutan up to 3,000 feet. Occurs commonly in March, April, May, August, September and October.

835. *T. divergens*, Moore.

Sikhim and Bhutan 1,800 and 3,000 feet. The common form is pale red, almost pink, the forewing, thorax and abdomen being all the same tint. I have three specimens in which this colour is everywhere replaced by brown, and the pectinations on the basal half of the antennæ are shorter. This brown form I have only taken in Bhutan at 2,500 feet in May and September. The typical form occurs in the same months in Sikhim and Bhutan.

835a. *T. postornata*, n. n. (PLATE II, FIG. 29, ♀).

*Setora sinensis*, Moore, A.M.N.H., (4) xx. p. 93, 1877, nec, Wlk.

♀. Dull brown ; head and thorax tinged with pink. Forewing with pink suffusion irrorated with a few black scales on basal costal area to below cell, between the two lines, and on terminal area from below apex to vein 3 ; an obliquely curved line from costa beyond the middle to inner margin before middle, a velvety black-brown outwardly oblique postmedial line expanding into a large subquadrate brown patch below vein 3.

Sir Geo. Hampson remarks that the type from Shanghai has no pink suffusion, and the postmedial line and patch much less conspicuous.

*Hab.* Shanghai ; Sikhim, 1,800 feet. July (*Dudgeon*). *Exp.* 40 millim.

Genus NATADA, Wlk.

838. *N. conjuncta*, Wlk.

Sikhim and Bhutan. I have taken this species at Singla, 1,200 feet, Badamtam, 3,000 feet, and Fagoo, 2,500 feet, in August. It is not common. (I have a single female *Natada* which Sir Geo. Hampson considered not in good enough condition to describe, but which is certainly distinct. It may be known by a large chocolate ocellus-like patch on the outer half of the forewing. It was from Möller's collection taken in October.—*H. J. E.*)

843. *N. ocellata*, Moore.

Sikkim and Bhutan, 2,500 to 6,000 feet. Two males from Bhutan have each a tuft of long hairs on the thorax pointed forwards over the head, the forewing is lightly longer and with less fuscous suffusion towards its base. Some of the Sikkim specimens have black dorsal tufts on the second and third abdominal segments. It is a very common insect at Tukvar at 5,000 feet, and occurs in May and June. (I took this at light at Darjeeling in July. My Naga specimens have no black hair tufts on the abdomen and thorax like those from Sikkim, the Khasias and Upper Burma.—*H. J. E.*)

844. *N. velutina*, Koll.

Sikkim and Bhutan. Perhaps the commonest of the genus, occurring along the Himalayas westward as far as the Punjab certainly. I have specimens taken at 1,000 feet up to 5,000 feet in May, June, August and September.

## Genus TETRAPHLEPS, Hmps. n.

845. *T. brevilinea*, Wlk.

Sikkim and Bhutan. I have never taken this myself, but I have several specimens which I believe were taken at about 6,000 feet in June and September by my collectors. (I found this common at Darjeeling and on the top of Tongloo at light in July.—*H. J. E.*)

846. *T. crispa*, Swinh.

Sikkim, 9,000 feet. I have a specimen from Dr. Pilcher taken in June and labelled thus. (I have several specimens from Möller's collection, but never took it myself. I believe it is a low-level species, and probably local.—*H. J. E.*)

## Genus BIRTHAMA, Wlk.

848. *B. junctura*, Wlk.

Sikkim, 1,800 feet, Bhutan, 2,500 feet. I took one male in Bhutan at light in September, 1895, which measures 38 millimetres, and one female at Punkabaree, also at light in September, 1898, which measures 50 millimetres. I have seen no others.

## Genus MIRESA, Wlk.

856. *M. bracteata*, Butl.

Sikkim and Bhutan, 4,000 feet up to 7,000 feet. A common species at light at the higher elevation in July and August. (Very common from 5,000 to 8,000 feet. A form of this or perhaps

a good species, named in my collection *M. argentifera*, Wlk., by Sir G. Hampson, has the silvery band much fainter and no triangular silvery patch as in *M. bracteata*. I took this in August at Darjeeling. Col. Swinhoe has marked a specimen "not in B. M." The hindwing of this is much darker than in *M. bracteata*.—*H. J. E.*)

857. *M. decedens*, Wlk.

Sikhim and Bhutan, 1,000 to 5,000 feet. A common species. Vein 10 of the forewing arises from the end of the cell in most of my specimens, in one from Bhutan it is stalked with 7, 8 and 9 distinctly, and runs close along the latter vein. In *M. nivaha*, Moore, which I have from Kanara, Western India, vein 10 is distinctly stalked with 7, 8 and 9. *M. decedens* occurs in August and September.

Genus PARASA, Moore.

860. *P. repanda*, Wlk.

Sikhim (*Hampson*). I have never seen a specimen. (I also have never seen a specimen from Sikhim but it occurs in the Nagas.—*H. J. E.*)

862. *P. argentilinea*, Hmps. n.

Sikhim and Bhutan, 1,800 to 3,000 feet. I have only eight specimens in my collection taken by me at light in June, August and September.

863. *P. hilaris*, Westw.

Sikhim and Bhutan, 1,800 to 3,000 feet. A very common species occurring in April, May, July, August and September.

864. *P. pastoralis*, Butl.

Sikhim, 1,800; Bhutan, 2,500 to 3,000 feet. Occurs, attracted to light, in May and September.

868. *P. bicolor*, Wlk.

Sikhim, 1800; Bhutan, 2,500 feet. Five specimens taken at light in April, July, August and September. One specimen has no trace of the brown marks on the forewing.

871. *P. herbifera*, Wlk. (PLATE I, FIGS. 8, ♂; 9, ♀).

Sikhim 1,800 feet. Under this species in the "Moths of India" Sir George Hampson has given the description of the male of *P. fumosa*, Swinh.; a specimen of which has been kindly given me by Mr. Bell taken in Kanara. Sir George Hampson, after receiving specimens of the males and females of *P. herbifera*, Wlk., from me informs me that *P. fumosa* should be removed from the synonymy.

The two sexes of *P. herbifera* are very different, and it remains to be seen whether the same is the case with regard to *P. fumosa*. I give descriptions of both sexes taken from my specimens.

♂. Head and thorax dark brown, the latter with a pea-green patch on each side. Forewing dark maroon-brown, with the basal two-thirds reddish. Abdomen and hindwing dark brown. *Exp.* 21-23 millim.

♀. Head and thorax pale brown, the former with an indistinct green line from the base of the antennæ over the eyes, the latter with a pea-green patch on each side. Forewing pea-green with an oval brown patch from the base along the costa to just before the middle, a postmedial waved brown line becoming medial at the inner margin, beyond which the area is purplish grey-brown suffused with silvery scales; a submarginal patch of brown between veins 4 and 5, and another at the outer angle. Abdomen and hindwing pale brown, the latter slightly paler towards the base. *Exp.* 27-34 millim.

I reared two batches of larvæ, which emerged in February-March and August-September. I also took a male at light in May.

The larvæ feed gregariously on a plant which is parasitic to *Shorea robusta* and other trees, the Nepalese name for the plant is "Aijhal."

*Larva.* Two distinct forms are found together. The first is greenish, with three pale yellow dorsal lines throughout, a sub-dorsal row of short spiny tubercles on a yellow line, those on the 3rd, 4th, 10th and 11th somites longer and with black points; three lateral yellow lines followed by a sub-lateral row of yellow-brown tipped tubercles longer than the sub-dorsal ones; 1st somite with a pair of black spots, followed by a bright blue band which is generally hidden; 12th somite with a pair of large velvety black spots, and terminating in two tubercles similar to the sub-lateral ones. Head brownish, under-surface yellowish-green. The second form, which is assumed by some of the larvæ two moults before pupating, by others not until the last moult, and still not at all by others, differs from the first form in the central dorsal and central lateral lines being blue-green, and all the tubercles orange or scarlet on lines of the same colour.

*Pupa* is formed in a cocoon of brownish silk of the ordinary Limacodid form beneath a protecting outer web on the under-surface of dead leaves of the food-plant. Four or five cocoons are often joined together. I reared 22 specimens from larvæ taken.

872. *P. dentata*, Hmps. n.

Sikhim. I have never seen a specimen of this species. (The type of this is from Möller's collection, and is very like a *Parasa* in colour and pattern. I have two ♂ from the Naga hills.—*H. J. E.*)

## Genus TRIPLOPHLEPS, Hmps. n.

876. *T. inferna*, Swinh.

Sikhim, 1,800 feet. I took one specimen at light at Pünkabaree in September. The hindlegs have enormous tufts of long hairs with flattened spade-like tips. My specimen measures 25 millimetres in expanse.

## Genus CERATONEMA, Hmps. n.

878. *C. albifusum*, Hmps. n.

Sikhim and Bhutan, 2,500 to 3,000 feet. Taken at light by me at Badamtam and Fagoo in May and June.

878a. *C. ferrugineum*, Hmps. n.

Sikhim, 1,800 feet. I took four specimens of this species in May and October at light. My specimens, one of which I sent to Sir Geo. Hampson, who remarks that it is more suffused than the type, differ from the description in having the head, thorax, and base of the wings only yellow-brown; the thorax with a black tuft posteriorly. Abdomen brown, suffused with fuscous; forewing leaden fuscous, with a distinct lobe of dark flattened scales on the inner margin before the middle, and a postmedial curved line; hindwing fuscous.

879. *C. retractum*, Wik.

Sikhim, 7,000 feet; Bhutan, 3,000 feet. I have specimens taken in July and August. The neuration of the forewing, in that the veins 2 and 3 are much bent down, is like that of *Trichogyia semifascia* Hmps. n. (Taken at Darjeeling at light in August.—*H. J. E.*)

880. *H. fasciatum*, Hmps. n.

Bhutan, 2,500 feet. One specimen taken in August, which exactly corresponds to the description, has the hindwing with 6 and 7 stalked.

880a. *C. pallidinota*, Hmps. n.

Sikhim. I have not seen this species.

*C. albidivisum*, Hmps. n. ined. (PLATE I, FIG. 10.)

Sikhim, 1,800 feet. I have five specimens, one of which was indentified by Sir Geo. Hampson as *C. albidivisum*. I took them in May, June and July at light at Pünkabaree. They seem to me to belong

to the genus *Trichogyia*, if the latter genus is really separable from *Ceratonema*. The only difference between the two genera appears to be that *Trichogyia* has veins 3 and 4 of the hindwing stalked or arising from a point, whereas in *Ceratonema* their origin is separate. *C. albidivisum* has these two veins distinctly stalked. Both genera have veins 2 and 3 of the forewing more or less bent downwards, and vein 1c more or less diverted from vein 1b; veins 6 and 7 of the hindwing arising separately (except in *C. fasciatum* where they are stalked). *T. semifascia* has veins 3 and 4 arising from a point, but there is no perceptible stalk in my specimens.

Genus TRICHOGYIA, Hmps. n.

1413. *T. semifascia*, Hmps. n.

Bhutan, 3,000 feet. I took two males of this species at Fagoo in July, 1894.

880a. *T. metamelæna*, Hmps. n.

Sikhim, 1,800 feet. Six males which I took at light at Punkabaree in May and June. Veins 3 and 4 of the hindwing are distinctly stalked but the stalk is short. This species and *C. pallidinota*, Hmps. n., bear the same number, viz., 880a. in Moths of India, Hmps. n.

Genus ARÆOGYIA, Hmps. n.

This genus seems to be separated by Sir Geo. Hampson from *Ceratonema* by vein 7 being from below the angle of the cell in the forewing, vein 10 not stalked with veins 8 and 9, and the legs naked. Vein 7 is from below the angle in *C. ferrugineum* and *C. albidivisum* as also in *T. semifascia* and *T. metamelæna*; so that vein 10 of the forewing being from the cell and the legs being naked, are the only points on which to separate it.

881. *A. spatulata*, Hmps. n.

Sikhim. I have not seen a specimen. (This was not rare at Darjeeling in 1886. I find five specimens in my collection, three of which I took at light myself on June 21st. It is a small dull coloured species which probably gets overlooked.—H. J. E.)

882. *A. castanea*, Hmps. n.

Sikhim, 1,800 feet. I took one ♀ in August, which expands 20 millimetres. The palpi are not longer than those of *C. albifusum* (Only one specimen, the type is in my collection.—H. J. E.)

Genus CANIA, Wlk.

883. *C. bilinea*, Wlk.

Sikhim and Bhutan, 1,800 to 6,000 feet. A common species occurring in April, May, June, August and October.

Genus ALTHA, Wlk.

886. *A. castaneipars*, Moore.

Sikhim and Bhutan 2,500—7,000 feet. Occurs in May, June, August and September. Very common at light.

887. *A. nivea*, Wlk.

Sikhim and Bhutan, up to 6,000 feet. The higher elevation forms have the olive markings forming regular patches on the forewing. Low elevation specimens correspond to one I have received from Calcutta and those taken in the Punjab. (I have no specimen from Sikhim, and there were none in Möller's collection, so I presume it is very local.—*H. J. E.*)

890. *A. rufotessallata*, Moore.

Sikhim. I do not know this species. (I also have never seen a Sikhim specimen.—*H. J. E.*)

Genus NAROSA, Wlk.

891a. *N. uniformis*, Swinh.

Bhutan, 2,500 to 3,000 feet. I have three specimens of a pale rufous species of this genus which are entirely without markings. I took them at Fagoo in July, August and September, the smallest expands 21 millimetres and the largest 26 millimetres. They correspond to no other of the species described, so they are probably slight varieties of this one.

892. *N. conspersa*, Wlk.

Sikhim and Bhutan up to 3,000 feet. A common but variable species, chiefly in the extent of white on the forewing, and the absence or presence of brown specks on the nervures below the cell. Occurs in May, June, July, September and October.

893. *N. denia*, Moore.

Sikhim and Bhutan up to 5,000 feet. A fairly common species occurring in May, June, July, August and September. Expanse of my specimens ranges from 19—27 millimetres.

Genus *MONEMA*, Wlk.893a. *M. coralina*, Dudgn. (PLATE I, FIG. 20.)

Bhutan, 3,000 feet. I obtained three males, including the type which is in my collection at Fagoo, in September, 1894, attracted to light.

Genus *BELIPPA*, Wlk.894. *B. laleana* Moore.

Sikhim and Bhutan, up to 5,000 ft. A common species. The description given by Sir Geo. Hampson was evidently taken from a female. The male has the forewing narrower and of a dark brown, in some specimens chestnut, colour with a waved antemedial indistinct line, a black speck at the lower angle of the cell and a black apical patch; pale creamy patches below the lower angle of the cell, and from below the apical patch to vein 3 on the outer margin. Hindwing fuscous with the costa and outer margins more or less fulvous; a black subapical spot and another at the anal angle. Some specimens have the inner margin of the hindwing as far as vein 2 fulvous. The larva is found on tea, but cannot be considered as doing any serious damage. I have taken both sexes of the perfect insect in May, June, July and September.

895. *B. thoracica*, Moore.

Sikhim 7,000—10,000 feet. I have a specimen taken at Gnatong in July. (Taken at Darjeeling at light in July.—*H. J. E.*)

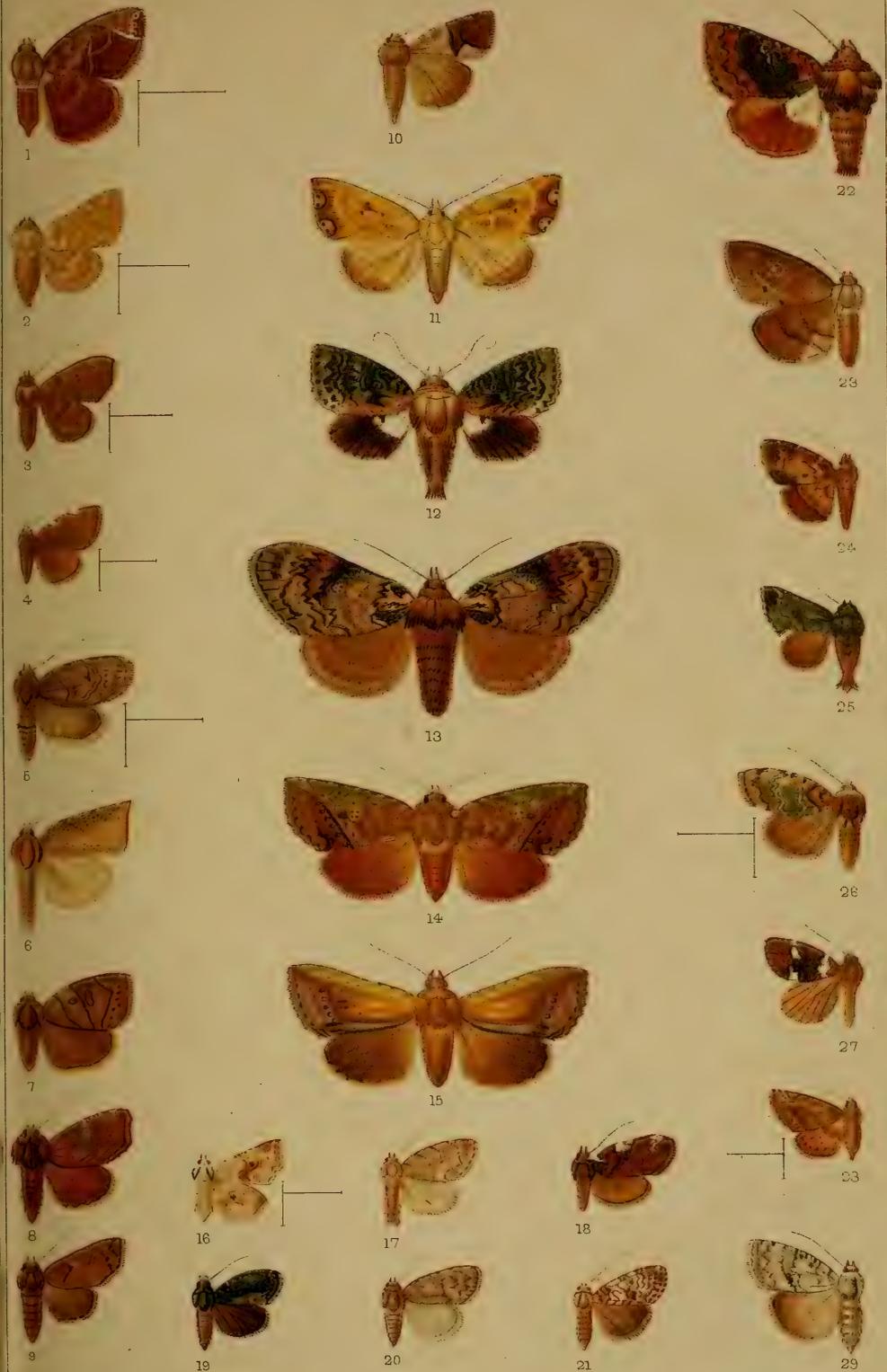
896. *B. apicata*, Moore.

Sikhim. I have not seen this, but it seems close to *B. laleana*, Moore. The male of this latter species has the outer margin of the hindwing straight in 4 of my specimens and the apex acute, whereas other 4 males have it rounded. A specimen of *B. lohor*, Moore, from Kanara in my collection has the outer margin of the hindwing rather deeply excised.

Genus *MAHANTA*, Moore.899. *M. quadrilinea*, Moore.

Sikhim, 6,000 feet. I have only one specimen taken near Darjeeling in June. (I took one at light at Darjeeling in July, another from Möller's collection in May. It seems quite a rare species.—*H. J. E.*)

(*To be continued.*)



West, Newman chromo.

New or little known Heterocera from Sikkim & Bhutan.



## THE HETEROCERA OF SIKHIM AND BHUTAN.

## EXPLANATION OF PLATE III.

1. *Zurobata plagiotola*, Hampson, ♀,  $\frac{3}{2}$ .
2. *Eublemma coccidiphaga*, Hampson,  $\frac{3}{2}$ .
3. *Eublemma rubiginea*, Hampson, ♂,  $\frac{3}{2}$ .
4. *Corgatha costipicta*, Hampson, ♀,  $\frac{3}{2}$ .
5. *Plotheia stigmatophora*, Hampson, ♂,  $\frac{3}{2}$ .
6. *Carea rectimarginata*, Hampson, ♂,  $\frac{1}{1}$ .
7. *Brevipectex cosmioides*, Hampson, ♀,  $\frac{1}{1}$ .
8. *Eutelia viridinota*, Hampson, ♀,  $\frac{1}{1}$ .
9. *Eutelia stictoprocta*, Hampson, ♀,  $\frac{1}{1}$ .
10. *Westermanniæ calisigna*, Hampson, ♀,  $\frac{1}{1}$ .
11. *Risoba flavipennis*, Hampson, ♀,  $\frac{1}{1}$ .
12. *Catephia lichenea*, Hampson, ♀,  $\frac{1}{1}$ .
13. *Trisula dudgeoni*, Hampson, ♀,  $\frac{1}{1}$ .
14. *Xanthoptera nigridia*, Swinhoe, ♀,  $\frac{1}{1}$ .
15. *Xanthoptera magna*, Swinhoe, ♀,  $\frac{1}{1}$ .
16. *Mimoruza rosealis*, Hampson, ♀,  $\frac{3}{2}$ .
17. *Barasa floccifera*, Hampson, ♂,  $\frac{1}{1}$ .
18. *Plotheia nigralba*, Hampson, ♂,  $\frac{1}{1}$ .
19. *Sarothripa chlorana*, Hampson, ♂,  $\frac{1}{1}$ .
20. *Barasa alopha*, Hampson, ♂,  $\frac{1}{1}$ .
21. *Barasa metalophota*, Hampson, ♂,  $\frac{1}{1}$ .
22. *Catephia intrahens*, Walker,  $\frac{1}{1}$ .
23. *Callyna chalceola*, Hampson, ♂,  $\frac{1}{1}$ .
24. *Xanthoptera combusta*, Hampson, ♂,  $\frac{1}{1}$ .
25. *Callopietria variegata*, Swinhoe, ♂,  $\frac{1}{1}$ .
26. *Dendrothripa verna*, Hampson, ♂,  $\frac{3}{2}$ .
27. *Euplexia niveifascia*, Walker, ♂,  $\frac{1}{1}$ .
28. *Eublemma rubra*, Hampson, ♂,  $\frac{3}{2}$ .
29. *Barasa costalis*, Dudgeon, ♀,  $\frac{1}{1}$ .

## SOME HINTS FOR BEGINNERS ON COLLECTING AND PRESERVING NATURAL HISTORY SPECIMENS.

BY E. COMBER.

### PART II.

(Continued from page 112 of this Volume.)

After the first part of this paper went to press, I received the following useful hints from Mr. R. C. Wroughton about the preservation of small mammals:—

1. In skinning bats the limb should not be cut at the knee or elbow, but the hip or shoulder joint. It is most difficult to make a decent skin with only the fore arm and lower leg left in.

2. The measurement "Hind foot" is no use in bats. "Fore arm" should be substituted.

3. The rule to pin the fore feet close to the head is not to be taken too literally, or the specimens will be too cylindrical and will not "lie" in the cabinet. It is much better to pin the fore paws with about an inch between them (*i. e.*, with ordinary bats and mice) and the hind feet the same. This gives the specimen a flat base to lie on, and it does not roll about when one opens and shuts the drawer.

4. Take out the brain before macerating a skull. It seems to ferment and sometimes blows up the skull.

Following on the Mammals that were dealt with in the first part of this paper, we can now turn our attention to the great class *Aves* which comprises all the feathered fowl of the world.

*Birds*, as a class, are a particularly well-defined group, being separated from all other forms of animal life by so many distinctive characters, and are besides so universally distributed over almost every portion of the earth's surface, that, go where we may, some species are around us almost every day of our lives. This companionship and familiarity with birds does not, however, in any way tend to lessen our respect for our friends, and it is difficult to imagine any man's natural feelings being so depraved as to fail in appreciation of a bird's beauty. There certainly is something in the appearance or character of every species of bird that is attractive to our humble minds. Some, of course, are beautiful in every way, but even those that have least claim to such a designation, possess some redeeming character; even the vultures, whose habits are in many ways repulsive, cause one to forget all that by raising a feeling of admiration for the grandeur and grace of their flight as they soar across the sky. And so with all others that I ever knew.

From the point of view of the Naturalist, birds have always claimed a large share of attention, and in India there has been no exception to this general rule. The long list of the names of Indian ornithologists would fill a page of our journal, and this is perhaps most forcibly instanced by the fact that no other section of Natural History has ever found workers in

this country sufficient to support such a publication as the eleven volumes of "Stray Feathers" published during the years 1873—88. The great number and variety of species, of course, accounts for this to some extent.

In spite, however, of the amount of time that has been expended and the extent of the literature on the study of Indian birds, we are very far still from having anything like a complete knowledge of many species. Besides the birds themselves and the record of the geographical range and habits of each species, there are also their nests and eggs to study and collect. We can, therefore, best divide the subject under these various heads.

There are not many who care to undertake a collection of birds' skins for themselves, for they are difficult to prepare originally, they take up a considerable space, and they require constant care to keep them in good order, being specially liable to the attacks of insects. Our museum, however, contains a very fair collection of skins, available always for reference of members, and although there are many gaps amongst even the commoner species, with a little help from members in different parts of the country, this could easily be improved. With a view to assisting in this, the list of species that are not represented in the collection, which accompanies the present copy of the journal, has been prepared. This will probably, for the present, prove of more general assistance, for easy reference of members who are in a position to contribute, than a catalogue of the specimens in the collection, and for the sake of convenience of collectors it has been drawn up into sections that represent, as far as possible, the main geographical divisions of the country, so far as concerns the distribution and ranges of species. It is a formidable list at first sight, but with a little general help could, as I say, be easily reduced.

As regards the actual collecting of specimens, there is not much that I need say, as local surrounding circumstances must chiefly guide the collector. But one most important item in the equipment of an ornithologist is a good pair of field-glasses: without them he will never get along well, and will waste a lot of time by failing to discriminate between the birds worth following and those which are not. One hint with regard to them—get a case made that will hold them at your focus. Then you have only to take them out and get them 'on' the bird, instead of having to vigorously screw them out and find the focus, during which operation it probably pops off behind the next bush, very likely to be seen no more.

Nearly every one in this country is possessed of a gun, and it is on shooting his specimens that every collector will have to mainly rely. An ordinary 12 or 16 bore gun can be made available for shooting even the smallest species by means of a few specially loaded cartridges with reduced charges and suitable size of shot. In loading cases with reduced charges, they should be kept the same length as with full charges by filling up with clean sawdust between the powder and the shot. There must, of course, be a tight-fitting

wad above and below the sawdust, and the whole rammed down well to form one thick wad. For small birds a special small-bore collecting gun is of course better, and for this a .28 or .410 bore is most suitable.

The "walking-stick guns" of the latter gauge are cheap and handy.

One thing I may mention in connection with the shooting of birds that are destined to be prepared as specimens, and that is the advantage of always using the smallest quantity of the smallest size of shot that will serve the purpose. The great point is to injure the bird as little as possible in killing it. A pellet must necessarily at times strike and shatter the beak or tarsus, but the smaller the shot and the fewer there are of them the better chance there is of avoiding such accidents. The disadvantage, of course, is that the bird will more often not be killed outright when shot, but, with a little care and practice, it can be quickly and effectively despatched without injury to it as a specimen. I cannot do better, I think, than quote the following instructive paragraph from Mr. Hume's useful little "Ornithological Vade Mecum" on this subject, which unfortunately is now out of print:—

"The moment a bird is shot, it should be carefully picked up by the feet or beak, and if still alive not allowed to flutter and bedaub itself with sand or blood. The feet, beak, and wings should be firmly held, and, if it is a small bird, it can be killed by pressing firmly with the thumb under one wing and the fore or middle finger under the other . . . . . Where the bird is very large, it should, if possible, be killed with prussic acid or cyanide of potassium. But these are dangerous things to carry about, and very often cannot be kept in hand on the march. In such cases the wings, beak, and feet being firmly held, the bird should be laid on its *breast* on a piece of cloth stretched on a smooth stone or piece of ground, and strong pressure exerted on the upper back. If the bird is only the size of a kite or large duck, this can be done with the hands; but in the case of eagles, vultures, geese and the like, a man must stand on the bird throwing all his weight on to the one foot he stands on. Whether hands or feet are used, a cloth or handkerchief should first be placed on the back to prevent injury to the plumage."

On the subject, too, of the treatment and bringing home of dead birds, Mr. Hume's instructions, as the result of his great experience, are worthy of the attention of all collectors. He writes:—

"The bird dead, all the feathers should be at once carefully smoothed, any shot-holes plugged, well washed, *sand* (not dust) sprinkled on any place from which blood seems oozing, shaken off when saturated, again sprinkled, and so on, until the issue seems stopped. In the case of blood issuing from mouth, nostrils, ears or eyes, these should be firmly plugged with cotton wool, after having been dried, as much as possible, with sand.

"For carrying all small birds I take a rod about three feet long, and, at distances of three or four inches apart, tie on pieces of string each with two

ends loose; to one end I tie a good-sized pin by the head, to the other a slice of common cork about  $\frac{1}{2}$  inch thick, so that the cork hangs about two inches below the rod, and the pin, when held horizontally, is just opposite the centre of the cork. The pin is run through the nostrils of any small bird we have to carry, and the point pushed firmly into the cork. Thus suspended, 10 or 20 small birds can be carried by any cooly in one hand without any injury to the plumage being possible. Larger birds cannot be thus treated; their weight in some cases might break the nostrils, in all would unduly stretch the neck. These should be hung by the feet by loops attached to a rather stouter rod, a strip or two of rag or cloth, about three inches wide, being pinned close round them, so as to keep the wings closed tight against the body. . . . .

“It sometimes happens that the naturalist has no companion, and must perforce carry his birds himself. In this case, *after most carefully plugging mouth, nostrils, and shot-holes*, and placing sand or a piece of cotton over any bloody place, he should make a cone of paper (which a single pin put in the proper place will suffice to do), and then drop the bird carefully into the cone head foremost; the broad portion of the cone is then to be carefully folded in round the hinder part of the bird, and the folds secured with a second (or, if necessary, a third or fourth) pin. Thus packed, the bird will travel uninjured in game bag or pocket, but the plugging is an essential part of the business, as otherwise water or blood is sure to run out of the mouth, &c., and greatly injure the plumage.”

The necessity for prompt and careful labelling, referred to in the previous part of this paper, of course, applies equally to birds as to all other specimens, and in the case of any doubtful or rare species it is always advisable to note thereon the colours of the ‘soft parts’—*viz.*, the legs, beak, iris, bare skin about the face or head, &c. Measurements are not of such importance, for, with the exception of the length, which is taken in a straight line between the tip of the bill and the end of the longest tail feather, the others that are usually taken remain constant in the dried specimen, and can be referred to at any time. These are the lengths of wing, tail, bill from-gape to tip of upper mandible, tarsus, and possibly of toes and claws.

The label should be after the same style as that described for small mammals, only of somewhat smaller size—say  $2\frac{1}{2}$  inches by 1 inch—made of thin but tough ‘hand-made’ paper, so that it will not injure the feathers. In the corner should be gummed a small disc of thin card or ‘cartridge paper,’ with a small hole punched in its centre afterwards, to take the attaching thread. The best material for this is thick crochet-cotton tied as follows:—After passing the thread through the hole in the label, knot it close in to the edge and then knot it again  $\frac{1}{2}$  to  $\frac{3}{4}$  inch further up. It is then ready for tying on to the specimen’s legs, and will lie nicely and be easy to read on both sides. Supplies of such labels are always available at the Society’s rooms,

The record of the sex is all important, and, for convenience, is usually noted by the sign ♂ for male and ♀ for female, these being the astronomical signs for the planets Mars and Venus. In the case of birds the sex can *only* be determined by dissection, for the colouration of plumage and other external distinctions are utterly unreliable, for the reason that, where the sexes differ, instances of male birds assuming the female plumage and *vice versa* are by no means rare. It is better not to note the sex at all unless carefully ascertained by dissection, for it is only likely to be misleading, and any external distinctions will be retained by the specimen.

Of the process of skinning and the preparation of specimens as dry skins, I feel that it is useless my attempting a description. Both are delicate operations that require considerable practice and skill to perform really successfully. Written explanations are of very little practical assistance, and anyone wishing to attain the requisite knowledge of its accomplishment can learn more in an hour from someone who knows 'how it is done,' with a fresh specimen to work on, than from all the published descriptions that have ever been written. The turning out of really perfect specimens is an art just as is the mounting of "stuffed" specimens in natural attitudes, or the skill of an artist in any kind of work. Practice of course will do much, and anyone who can use his fingers can learn enough with a little trouble to prepare specimens of a practical value. In this country, where we are constantly attended by a number of servants, there is generally some 'boy' in the establishment—more often than not the 'cook's-mate'—who can learn enough in a week or two to make him useful as a 'skinner,' and the Society is always ready to help members by training skimmers in the rudiments of such work if sent to our head-quarters in Bombay.

For preserving bird skins *Arsenical soap* is generally used, and it is certainly the best preservative for all ordinary occasions. I quote the recipe for making it from Mr. Hornaday's book already mentioned:—

|                                            |          |
|--------------------------------------------|----------|
| White bar Soap, soft rather than hard..... | 2 pounds |
| Powdered arsenic .....                     | 2 „      |
| Camphor .....                              | 5 ounces |
| Sub-Carbonate of potash.....               | 6 „      |
| Alcohol .....                              | 8 „      |

Directions: Slice the soap and melt it in a small quantity of water over a slow fire, stirring sufficiently to prevent its burning. When melted add the potash and stir in the powdered arsenic. Next add the camphor, which should be dissolved in the alcohol at the beginning of the operation. Stir the mass thoroughly, boil it down to the consistency of thick molasses, and pour it into an earthen or wooden jar to cool and harden. Stir it occasionally, while cooling, to prevent the arsenic from settling at the bottom. When cold it should be like lard or butter. For use mix a small quantity with water until it resembles butter-milk, and apply with a common paint brush.

Bird skins should never be cured with alum, like mammal skins, as this would make them too hard and brittle, but in the case of large birds the application of the arsenical soap can, at times with advantage, be supplimented by an immediate sprinkling of powdered alum.

When skinning a bird the liberal use of plenty of Plaster-of-Paris or fine dry sawdust or even clean wood ashes, which are always at hand, is most essential, to absorb all the blood and grease and keep them off the feathers. If the plumage does get soiled it can be cleaned by washing with clean turpentine applied with a soft brush. This is then absorbed by the application of plenty of Plaster-of-Paris, which should be rubbed gently into the feathers, and at once shaken or knocked out. The application of the plaster should be repeated until it comes away quite dry, and then all the remaining plaster must be gently whipped out.

Many birds, particularly the ducks and their allies, are very fat, and the removal of this layer of fat from the inside of the skin is too often neglected. There are two reasons for the necessity of this. In the first place the fat will entirely prevent any of the preservative that you apply from getting at the skin and doing the work it was intended to; and secondly, unless you carefully scrape off all this oily grease, it will gradually find its way through the opening cut when the skin is made up into a specimen, and the feathers of the whole breast will become one solid mass of nasty yellow grease.

Sufficient attention is not, as a rule, paid to the attitude of bird specimens, and I wish to make a special appeal to collectors on this point, for a very little care in this direction would enormously increase the value of many specimens received by the Society. Native skimmers, as a rule, have a very vague idea of 'making up' a skin nicely, and I have always found it advisable to superintend this part of their operations myself. The main points to bear in mind are the following:—When it comes to putting in the cotton or tow to fill the body, see that there is just enough to give the skin a plump appearance without its being 'over-stuffed.' The head and neck should be drawn out in a straight line with the body to the natural length, with the closed beak too in the same line, and *not* set at right angles to the line of the body and neck. The wings should lie naturally close into the sides of the body, with the scapulars adjusted over the shoulder of the wings: this can easily be done with the aid of a pair of small forceps, or even a penknife, by lifting small bunches of the feathers and letting them fall back into position, when they will drop into their natural order. The tail should, of course, carry out the line of the back, being slightly spread if possible, and the legs should be crossed—tied with a thread just above the feet—lying close down over the base of the tail, the feet being arranged as well as possible so that the claws will not injure the tail or catch on to everything that comes near them.

In the case of all long-necked birds—including the ducks—the neck, into which no stick is put, should be bent round so that the head lies alongside one of the wings, and in the same way, with very long-legged birds, the legs should be bent upwards from the joints so that the feet rest upon the lower part of the belly. In this case be careful to wrap up the feet in brown paper, with a pad of it between them and the feathers, to prevent the grease, which will ooze out in drying, from soiling the feathers.

Bird skins are best put up carefully in paper cones for drying, and then pinned on to a string across the verandah. Care must necessarily be taken in putting them up in the cones, for what appears a nice skin when finished will come out very differently after drying if put up carelessly. And, what is more, it will be a difficult job, even if possible, to get it into shape again after it is dry.

The length of time it will take a skin to dry thoroughly depends of course upon the climate and on the size of the specimen, but under ordinary circumstances it should not take more than a week, and often two or three days will suffice. When you think it should be dry, take it out of its cone to see that it is all in proper order; and, if so, it can be put away again either in its cone, or, if it has not to travel, in a suitably-sized tube made of brown paper. The latter is the more convenient for ready reference at any time, and such tubes can easily be made of various sizes in long lengths and cut as required to suit the length of each specimen. A size should be selected that is just large enough to allow the bird to slide in with a little gentle pressure and coaxing, and the name can be written on the outside for convenience. However packed, skins can best be stored in tin boxes with close-fitting lids, but in any case be sure you put with them plenty of camphor, naphthaline, or something to protect them from the attacks of insects—the best being naphthaline, which can be had from any chemist made up in small balls the size of marbles—and do not forget that they require constant renewal owing to evaporation.

*Preserving birds without skinning them.* Although birds are best preserved by skinning, there is, fortunately for many of our members who cannot undertake the skinning themselves, and do not find it worth their while to keep a special skinner, an eminently simple process by which birds can be preserved whole and, with a little care, can be turned out as excellent specimens. The process is known as 'carbolicizing,' and if it were more widely understood it would, I am sure, be far more often availed of by members who could pick up really valuable specimens. It cannot be applied with success to very large birds, and, although it may be resorted to in emergency, it cannot be recommended for anything larger than a common mynah. I quote Mr. Hume's instructions with regard to this carbolic process.

"In carbolicizing birds.....three or four points have to be borne in mind in every case. First, when the bird dries and the flesh shrinks, the keel

of the sternum would be left standing up in a knife-like ridge, which will soon become bare of feathers by taking the specimen in and out of its case. The first thing, therefore, to do before carbolizing the bird is to break the sternum in thoroughly, as cooks do who wish to make a skinny fowl look plump upon the table. Secondly the eyeballs will fall in and shrink and give the head, when dry, a very miserable appearance; two days after the bird has been carbolized it will be found quite easy to turn the eyeball out of the sockets, and then, brushing the inside of the sockets with a little carbolic acid, wool can be filled in to the proper size, and the eyelids drawn over it in the usual manner. Thirdly, the feet will dry harsh and hard, with a great tendency to interfere with the tail; they will often also become greasy in drying. The best plan is to cross the legs and feet, and wrap them both up in a little piece of blotting paper. This will insure their drying without soiling the tail, and in such a position as not thereafter to interfere with the tail. Fourthly it is difficult to open and measure the wings on carbolized specimens. To do it properly one has to break the bones of the wings; this can be safely done when the bird is fresh, but not quite so well when it is dry; therefore, before a carbolized specimen is dry, always break the wing-bone close to the body.

If the bird to be carbolized is not bigger than a sparrow, all that is really necessary, after firmly plugging the vent with cotton, is (the four points above noted being borne in mind) to hold the bird up by the bill, open the mouth, push a pencil down the throat, as far as it can go, to open the gullet, and drop in carbolic acid, 5, 10, 15, 20, 30 drops, as much as will go, due regard being had to the size of the bird, and great care being taken not to allow any to run over the edge of the mouth on to the feathers, as it bleaches some feathers and injures all. A plug of cotton should then be put into the throat, and the bird hung up for a little while by a pin run through the nostrils to allow of the acid being absorbed. A couple of hours later, the bird may be placed in a cone or tube in the usual way, and left to dry as usual.

With care the most superb specimens of humming birds, sunbirds, fire-crests and the like, may be preserved at the rate of about 12 per hour by this process.

If the bird is larger than a sparrow it is better, though not absolutely essential, to open the abdomen, extract all the entrails, clean out the cavity of the body, and then fill in the cavity with a good lump of cotton wool well coated exteriorly with carbolic acid. The abdomen is then sewn up again, a plug of cotton wool saturated in carbolic acid is put into the throat, and from inside the mouth a small hole is bored into the brain-pan, a little carbolic acid syringed through this, cotton wool soaked in carbolic acid placed in the mouth, and the bird hung up as before, and later put up to dry. Be the bird big or little, the four points first noted must be attended to if a good specimen is wanted.

It may be well again to draw prominent attention to the fact that carbolic acid destroys the eyesight, and that the greatest care must be taken not to allow the smallest splash of the acid to get into the eye.

In connection with the preservation of birds without skinning them, I lately came across, in Mr. Montagu Browne's most useful book "Practical Taxidermy," an allusion to a successful experiment by him of keeping a bird in the flesh for some weeks by immersing it in benzoline. He explains how the preservation was complete, and, after drying it with Plaster-of-Paris, how it was skinned as if it was a freshly-killed specimen. This would on many occasions be most useful, both to the collector when he gets more specimens than his skinner has time to tackle, and more particularly to the member who kills a bird that he wishes to send to the Society, but cannot do so because he is unable to skin it and is too far away to send it down in the flesh. But unfortunately there is the difficulty that benzoline is not obtainable in this country, and I consequently set about to find a substitute for it. This, I am pleased to say, has turned up in Formalin—a solution that has proved a wonderful disinfectant as well as a preservative for minnows and prawns to be used as baits, or for surgical specimens for subsequent dissection. It is obtainable as a 35 per cent. solution, and for the purpose of preserving a bird—or for the matter of that any other specimen—this can be reduced by the addition of from ten to fifteen parts of water to one part of Formalin solution. The specimen is then to be simply immersed in this reduced solution, after an insertion has been made under the wing to allow of its thoroughly impregnating it, though it is probably advisable to entirely remove the intestines. For keeping a specimen any length of time a stronger solution would no doubt be found necessary, but one part to fifteen of water was perfectly successful in the experiment I made with a Rose-coloured Pastor that was immersed for five days. On removing it the bird was dusted all over with Plaster-of-Paris, and then allowed to lie for three hours to dry, when the plaster was removed and the bird then skinned in the ordinary way, making a perfect specimen. I hope that our up-country members will bear this in mind, and keep a bottle of Formalin by them to make use of as occasion occurs, instead of sending down specimens that strike them as valuable, or that they wish to be identified, only to arrive in a putrid and useless state of decomposition.

I will only add that birds so preserved dry as one solid mass, and it is very necessary, in order to make a good specimen, to be careful that everything is arranged nicely, as there is no making any alterations or improvements afterwards.

*Nests and eggs.*—If it is true that we have a lot still to learn about many of the birds that are found in the countries within our area, how much more is it true of their nests and eggs—and particularly the former? The difficulty with nests is that when anyone goes collecting and comes across a rare

nest, he, as a rule, contents himself with taking the eggs it contains, and perhaps jotting down in his note-book a scanty description of the nest and its situation. The reason, no doubt, is that the formation of a collection of nests themselves is a formidable undertaking; they are difficult to keep in a state that will retain their value, and take up a lot more space than the ordinary field naturalist can afford them; whereas those of many of the larger species, and of practically all that make loosely constructed or underground nests, are almost impossible to preserve. At the same time it is to be hoped that we shall still find members who will help with work in this direction, and to those who may I wish strongly to recommend the assistance of a hand camera. Written descriptions of the materials, form and situation of nests can be enormously increased in value if supplemented by pictures of them taken while *in situ*; and now that the means for taking snap-shots is so simplified and brought to such perfection, every field naturalist should provide himself with one. Every one must naturally please himself of course as to the camera he selects, but, to those who have not already formed opinions, I can recommend the Eastman "No. 4 Bullseye," which takes pictures 5 by 4 inches. Besides being cheap (cost between £2 and £3) it is a great advantage to be able to change the spool of films in broad daylight. Films of course *must* be fresh, and I myself find the best plan is to send a postal order for 25s. to Eastman's in London as fresh supplies are wanted; this covers the cost and postage of six spools of one dozen exposures each.

The eggs of birds have always proved an attractive form of collection, and as a means of becoming acquainted with the birds themselves and their little ways, there is nothing to equal a ramble in search of their eggs. One cannot make a collection of eggs without making the acquaintance of the original owners, for the reason that it is all important to identify *for certain* who those owners are, otherwise the eggs are of no value whatever. This, unfortunately, on many occasions can only be accomplished by the destruction of either or both of the parent birds, though, with many conspicuous species at any rate, patient watching with field-glass in hand for the reappearance of the birds will often enable them to be recognised beyond doubt.

For the purposes of a scientific collection, the whole 'clutch' of eggs laid for one brood should be collected and kept separate from others of the same species. I feel that it is hardly necessary to describe the apparatus used for blowing eggs, consisting of the drill to form a round hole and a blow-pipe. The eggs should of course invariably be blown with one small round hole in the middle of one side only, and besides care not to burst the egg with too great pressure of air, there are no difficulties, except when the egg contains a well-developed embryo, which we will come to presently. Having emptied the egg of its contents it is important to wash the inside quite clean by

blowing a little fresh water in through the hole with the blow-pipe. Then it can be laid aside on a clean cloth or cotton wadding, with the hole downwards, to drain and get dry, and then, after the removal of stains and dirt from the outside with soap and warm water, it will be ready for the cabinet.

When an egg is 'hard-set,' however, the process is not so simple, and often considerable patience is required to clear it of its contents. The great thing is not to try and hurry the job in any way. Having removed as much of the liquid contents as possible with the blow-pipe, prick the embryo with a needle in various directions and fill up the egg with water. This will hasten the decomposition of the contents and it can be laid aside, in a warm place for choice, for a couple of days, when it can again be 'worked' a bit, and perhaps a few pieces removed before being put aside again—of course filled up with water as before.

By this means the largest embryo can, with care and patience, be successfully extracted, and after a little practice an egg, even on the point of hatching, can be cleared through a wonderfully small hole, but, until confidence is gained by actual experience, it is a mistake to try with too small a hole, as it will probably only end in the destruction of the egg.

With eggs, to which of course it is impossible to attach a label, the date must necessarily be written on the underside of the egg itself. This is best done with Indian ink, or in the case of dark coloured eggs with a solution of white paint, applied with a fine etching pen or with a very fine red sable brush, the latter for choice. The necessary data consist of—

- (1) Name of species, with Text Book No.
- (2) Collectors' number which belongs to every egg of a clutch.
- (3) Number of eggs in the clutch.
- (4) Date in full.

*(To be continued.)*

## NOTES ON SOMALILAND.

BY CAPTAIN P. Z. COX.

PART II.

*(With 2 Plates.)**(Continued from page 99 of this Volume.)*

## THE LION.

*(Felis leo).*

Time was when 12 or 15 lions would not uncommonly fall to the rifle of a single sportsman during a four or five months' expedition, and I think once or twice the number has even exceeded 20; but these very big bags always meant that the sportsman had had an exceptional deal of luck in hitting off the lions, apart from good management in bagging them when met with.

Granted the best of luck, however, the days of such big bags of lions are a thing of the past, though, as I have mentioned before, they are still fairly plentiful, and seven or eight would not be an extraordinary bag for a four months' trip, if the sportsman laid himself out for them. One Englishman whom I met during my recent sojourn in the country, had bagged five in two months, without giving up other shooting, but he was exceptionally fortunate in coming across them, and made the most of his opportunities when he did.

Generally speaking, if you want to make a big bag of lions, you must make that your principal object, and let other shooting be subservient to it, and I think that on a first visit to the country, when all the game is new to them, most men find that to do this would considerably lessen their total enjoyment of the expedition as a whole. In my own opinion it is tedious work, twiddling one's thumbs for two or three days together, waiting for a kill or for news of fresh tracks; on the other hand, if you want lions, and are perhaps tying up baits to attract and locate them, you cannot be shooting at antelope or shikarring small game for the larder round the camp, without marring your chances of the greater quarry.

Here I should like to say a word or two regarding the several ways of hunting lions. Just as the lion varies in type according to his surroundings, so must the method of hunting him be adapted to changing circumstances. There are three methods usually employed. The first is to walk him up quietly with a couple of good trackers—one of them carrying a spare rifle; this can always be done where the character of the ground renders tracking possible, and is by far the most sporting and enjoyable method of tackling him, and a lion bagged in this way is, in my opinion, a much more valued trophy than one obtained by any other method. The second is to bring him to bay with the aid of Somali horsemen, the sportsman himself being on foot. Four cavaliers are enough—more are a nuisance. On arrival at a new camp the four horsemen are sent out to scour the country for tracks, and at all times where the ground is rideable are very useful in this respect, as they can cover a large area of country in a morning's ride. As

soon as any sufficiently recent spoor is found, two of the men remain on the spot, or follow the track for some distance, if necessary, while the other two return to the camp to report to "Master." The latter rides down to the place where the messengers left the track, taking with him his usual shikari or gun-bearer, and then the business of the day commences. The four horsemen divide themselves up, two going on each side of the track, and keeping about 200 yards away and 100 yards ahead of the sportsman. Being mounted, they naturally get the first view of the lion, and we will presume that the quarry has also seen or heard them. It is at this point that their experience and efficiency come in, the object being not to ride the lion down or tire him out, but to manœuvre him to a standstill, whilst keeping at a safe distance themselves, and good men do it very cleverly, working together and regulating their pace by that of the lion and always endeavouring to keep a little ahead of him and if necessary guide him in any required direction. As a rule, the lion finding he cannot elude them, and seeing himself constantly headed, pulls up, and awaits developments. Meanwhile the horsemen have been gradually lessening the distance between themselves and the sportsman, and the latter advances quietly along the track, being guided by their gesticulations as to where the lion is. Finally when he gets within 30 or 40 yards, the lion usually breaks, and the hunter then gets his chance. As may be expected, it is almost invariably a snap shot, and lions rounded up in this way will generally charge. Fairly open country is necessary for this method of hunting, and it is chiefly in vogue in the "Haud" after rain has fallen, when there are nomad villages about, from which horsemen can be readily obtained. Somalis always endeavour to conduct lion shikar in this way if they can. In the first place they enjoy it themselves, it being akin to their own method of hunting lions and elephants, and enabling them to show off their equestrian accomplishments; and secondly, it is for them the most lucrative method, as they expect to be fed like fighting cocks while riding for you, and to be liberally rewarded for each lion bagged.

We now come to the third method—sitting up at night over a natural kill or a bait. From the number of zareebas one now sees all over Somaliland, it is evidently a practice pretty generally resorted to, but this is a pity, and I think it should be reserved for occasions when other methods are not feasible.

To the Indian sportsmen, uninitiated in the mysteries of Somali shikar, the idea of shooting lions at night out of a thorn shelter savours *primâ facie* of poaching, but there is something more in it than the mere fluky pot shot at the lion, and, taking all things into consideration, I do not see that, except when unnecessarily resorted to, it is any more poaching than sitting in a safe machan or other coign of vantage for a driven tiger. In either case the chances are you do not kill him dead, and eventually have to track him up and finish him. At times the zareeba, as it is called, is the only way of getting at the lion at

all. On our present trip, for instance, we arrived at a place where there were a good many villages, of which the inhabitants possessed large herds of cattle. Three or four lions had taken up their abode in the neighbourhood, and levied almost nightly toll on their cattle. We looked forward to getting good sport there, but on arrival we soon perceived the reason both for the presence of these blackmailers and for their immunity from reprisals on the part of the villagers. The chief feature of the locality was a big dry "Tug" or watercourse, fringed with long strips of dense reeds 8 or 9 feet high. The lions used to come out at night, usually in couples, obtain their dinner by fair means or foul, and then return to their fastness, from which it was impossible to dislodge them. We tried burning the reeds without success, they were too green and moist to burn; next we endeavoured to get our herd of camels in, but they altogether refused to come to the scratch, and the patches were too big to beat with a few men.

Here then there was no way of getting at them except by sitting over a bait, and we did account for one in this way, but not without a good deal of trouble. We had a long morning's work the next day, ending with a very businesslike charge at my companion, before the lion was finally brought to bag. The place in question was the exact counterpart of the tiger-beat so often met with in our Indian Terai, — one of those that provide a fresh tiger, season after season — and it is sure to hold a lion or two for a long time to come. What one would have given worlds for was a line of Indian elephants, but unfortunately the education of the African species has been entirely neglected in this as in all respects.

At present, I should say there were as many lions in the area known as "The Aden Garrison Reserve" as anywhere else in the Protectorate, and I really think the said Reserve might well be thrown open to all British officers on leave, as the Aden garrison would appear of late to have made very little use of their privilege, and consequently there are many parts of it that have not been shot for years. Moreover now that the Administration of the Protectorate has been transferred from the Indian Government to the Foreign Office in London, the special claims of Aden's very migratory garrison seem no longer to exist.

Lions in Somaliland are of two very distinct types. There is first the bold, bad variety that lurks about in the vicinity of nomad villages, and follows their movements from one grazing-ground to another. His physiognomy and the size and shape of his "pugs" are familiar to every mother's son of the community, and time after time he levies tribute upon their livestock, and only resorts to stalking antelopes when the more convenient source of supply temporarily fails him. The annual mortality among Somali cattle from this cause must be enormous, but the people are so used to the visitation, and it is such an ever-present form of excitement and theme of conversation, that I really think they would miss it if they did not get it. At any rate it is

quite certain they could put a stop to it almost entirely if they chose, simply by building their thorn zareebas double the height at present in vogue : but no, they prefer to go on from generation to generation building them of just such a height that a lion or an active leopard can conveniently jump in and out of them.

The second type is the game-hunting lion. You find him in the most isolated and unlikely places, many miles from water ; and he seems to adhere to a certain locality or a particular beat, although game is at times so scarce there that he must often be at his wits' end for a square meal. This class of lion is very difficult to bag, except in a thoroughly good tracking country. Unlike the village lion, who is at once attracted to a newly-arrived Kurria, or a sportsman's encampment, and to whom the voice of man is a thing of joy, associated in his mind with the presence of fat kine and other delights, the game hunter seems to shun one's zareeba like a pestilence ; to fight shy of baits, and to prefer spending whole nights on the run, now after an Oryx, now a Gerenuk, to feeding himself more sumptuously and with much less trouble, at your expense.

After having heard a lion calling all round camp during the early hours of the night, I have been out at daybreak to visit the "ties" and have found tracks within a few yards of the bait, and within sight of our camp fires and have then followed them away for miles, and found that the lion had proceeded to hunt other game for the rest of the night.

Some long hours tracking of this kind with my trusty little Midgan tracker boy, Mahomed, have been among the pleasantest of my experiences of Somali shikar.

The portrait of this young specimen of "jungle produce" is worth sketching, though I fear I can do scant justice to it. We picked him up in this wise. My companion was out one morning after Oryx—our first day in a new locality—and was tracking up a large herd, when he overtook two Midgans (of whom Mahomed was one) bent on the same errand. They were armed with the usual Midgan bow and quiver of arrows, and were leading three pariah dogs. They accompanied the Doctor for the rest of the morning, in the course of which he wounded an Oryx, and they proved themselves so expert in the tracking of it that my companion brought them back to camp, and we offered to take one of them and one dog permanently into our service. Domestic difficulties prevented the elder from accepting, but the younger, Mahomed, a slight short youth of about 15, was willing to come, so we took him on, together with the best of the three dogs, which, however, we had to buy. The Doctor already had one Midgan gun-bearer, and as I was short of a man at the time Mahomed was told off to follow my fortunes, and most invaluable I found him. I can only call to mind one man in my experience who could touch him as a tracker and natural shikari ; that was a young Gond in the Central Provinces. Both possessed those invaluable attributes

for a tracker, silent coolness and self-reliance. They went about their work in a perfectly quiet and confident way, whether on the trail or in the presence of game. It was the greatest pleasure to me to follow a trail with this boy—the spoor and the jungle were to him an open book, “who runs may read,” and the ease and accuracy with which he did it were an education. When I came to anything I did not understand, I would give him a nudge, and he would stop and explain the situation to me in a whisper. On one occasion I remember, when we were following the trail of a lion throughout his previous night’s wanderings in search of a meal, we came to a point where the tracks of a leopard and a Gerenuk (*Gazella walleri*) became mingled with his; a little further on there was some dry blood, and the signs of a struggle.

I should have taken a month of Sundays to make out the puzzle, but Mahomed had very soon deciphered it, and taking me back a little way along the track he demonstrated to me how the leopard had overtaken and killed the Gerenuk early in the night, and how the lion, having hit off their track quite recently, had surprised the leopard at his meal and fought with him for it. He seemed to be right, for the leopard had taken his departure at this juncture and had gone empty away, and there was no longer any trace of the Gerenuk being dragged as before. Making a cast round this spot we soon picked up the tracks of the lion going in the opposite direction, and we had scarcely gone another half-mile when we put him up out of a clump of grass, where he was devouring the scanty remains of the Gerenuk. This was evidently not his “kill,” but the leopard’s, as Mahomed had rightly surmised, for the state of it showed that it had been killed early in the night, and a good deal of it eaten then.

The boy never boasted of his accurate expositions on such occasions; he would simply give a quiet smile of satisfaction when the sequel proved his deductions to have been right.

The pair of lions which I mentioned when discussing the Rhino, furnish a good instance of the precarious existence which these game-hunting gentlemen often lead. At the time we met with them we were encamped on the southern edge of the Haud, whither we had gone especially to hunt Rhino. It was the driest and hottest season of the year—March—when all the water pools are exhausted, and remain so till the coming rains refill them. There were consequently no human beings about, and antelopes at the time were very scarce, so much so that we had the greatest difficulty in getting anything in the shape of meat to eat; yet there were lion tracks about in abundance and more or less recent. We had been encamped in the same spot for three days, and two nights out of three had heard the roaring of a lion quite close to camp, as it seemed to us. Each morning I had gone out expecting to find a kill, or at any rate to pick up the tracks of a lion at no great distance, but without success; our “ties” were never touched, and the animal that we had heard calling seemed to be a spirit, for each day,

though I took a different point of the compass and went for a long tramp, I could find no traces of him.

My companion was at this time on the sick-list, but by the fourth day I had got very tired of seeing nothing, and as he felt just well enough to get along on his riding-camel, we decided to make a short 12-mile march. I had fairly scoured the country by this time so did not go out on my own account, but I walked along quietly a few yards ahead of my companion, hoping to pick up a Digdig for the larder. We had been marching thus about an hour and-a-half, in a bee-line southwards, and must have covered quite 4 miles, when we hit off the previous night's tracks of two lions, crossing our path at right-angles. It was hard to believe that the owners of these footprints had been responsible for the roars we heard, but it was impossible to come to any other conclusion. This morning, and in fact every morning since our arrival at our last camp, eight men had started out in pairs at dawn to the four points of the compass to search the ground for lion tracks, arranging their several beats in such a way that between them they made a complete circuit, with a radius of a couple of miles, round our camp; and I myself was wont to await their return before making my plans for the day. This morning there was no doubt that the southern segment of the circle had been completed, because the scouts had all returned before we started, and we had in fact taken the tracks of the couple which had gone southwards to save ourselves the trouble of picking a new path through the bush, and these tracks we had long ago left at the point where the men had finished their 2-mile radius and had turned off to the right along the circumference. As these scouts had reported having seen no lion tracks, it was practically certain that the lions had not come within the 2-mile circle, and here was their fresh spoor, travelling in a general direction of west to east four miles south of last night's zareeba! Our trackers expressed no doubt whatever that these were the two lions that we had heard calling, and seemed to think that it was quite natural for their roars to have been heard distinctly at this distance, and even at a greater distance still. The country in question was perfectly level plain, covered with fairly close bush jungle and patches of grass, and the nights had been perfectly clear and still. I admit that four miles seems to me an unconscionable distance for a lion's roar to penetrate even under the most favourable conditions of wind and ground, but I do not remember ever having seen the question discussed before, or any approximate distance mentioned, and as it is a point upon which it is obviously useful for a shikari to have accurate knowledge, I should be much interested to hear the opinions of others on the subject, which is after all simply a question of acoustics.

But this by the way. The hill under which our next camp was to be was in sight, and the lion tracks led right away from it, so I left my invalid companion and the caravan, and leaving orders for my riding camel to come on behind, started off with my trusty little Midgan to follow the spoor.

The soil was soft and sandy—excellent for tracking—but the going was slow owing to the vagaries of the lions, who behaved in the most erratic and frivolous way. It almost seemed as if they knew they were being tracked and were laying themselves out to confound us. They would walk in company for a few yards, then they would separate and describe mazy circles to the flanks ; then they would join forces again and have a gambol together, and then perhaps take a short siesta as shown by the imprint of their forms in the bare sand. After regaining their breath and composure they would wander on once more, sedately but aimlessly, till some feckless Digdig or Gerenuk discovered itself, when one of the pair would try his luck with a short burst in pursuit. On these occasions, like the Hunting Cheetahs of our Indian Rajahs, they seemed to give up the chase at once if their bolt was shot without immediate success ; in spite of the fact, in this case, that they were apparently very hungry, and were finally driven to make the best of what I should think was very unusual fare for them.

About an hour before coming into view, which we did after three hours walking, the track of a small leopard struck the path, and the lions had apparently changed direction and followed it. The “pugs” soon led into thick grass and bushes, and presently the footprints of the leopard ceased altogether, the lions reverting to their old track. We had not gone much further, however, when the trail took us into the shade of a dense laurel bush, and there the story of poor little “Spot’s” disappearance was unfolded to us. The couple had caught and eaten him, and not a morsel remained except the part of the jaws containing the teeth, and the four paws ! They had evidently caught him just before daybreak, as the rejected scraps just mentioned were still damp with the moisture of their mouthings, and moreover within the next half-mile I put them both up together, bagging the lioness who broke towards me, but missing the lion, who unfortunately bounded away in the opposite direction. She proved to be a fine lioness in the prime of life, and her intestines were full of the skin and meat of the leopard. The male, which Dr. Donaldson-Smith subsequently bagged, was the same which I have previously spoken of as having returned and feasted on the dead body of his wife. They must have been an odd couple with strangely cannibal tastes.

#### THE LEOPARD.

(*Felis pardus*).

Leopards are very common all over Somaliland ; there is scarcely a village that does not involuntarily maintain one or more of these expensive “hangers-on,” but one hardly ever gets an opportunity of trying conclusions with them in the daytime, and the only other way of getting at them, sitting in a village zareeba over a live goat, is an amusement that very soon palls upon me, and I have nothing interesting to chronicle on the subject of this animal.

## THE CHEETAH, OR HUNTING LEOPARD.

*(Cynelurus jubatus).*

Although the Cheetah is not one of the *Felidae*, it seems natural to consider him after the Leopard. Like the latter he is very common, much more so than would ordinarily be believed, as the sportsman in Somaliland so seldom meets with the species in the flesh; but the number of cubs (or kittens, as one would like to call them), that used to be brought into Berbera and Bulhar a few years back, afforded sufficient evidence of the fact that they were by no means scarce. Since then, the export of live animals from the country has, I think, been put a stop to, and consequently the supply has ceased with the demand, but I remember when the recognized price for a pair of cheetah cubs was 3 rupees. They make the most charming pets as readers of the Journal must have gathered from Major Rodon's interesting note on the subject. I had two of them for nearly a year, and they were great favourites with everyone, but their digestions suddenly went wrong without any apparent reason, and both died of the same symptoms within a few days of each other. They were most good tempered creatures and never did any harm, but could never resist stalking the family milch-goat in a playful way when opportunity offered. She seemed to realize too that they did not mean business, and allowed them to take great liberties before she thought of using her horns. At the same time that we had the two cheetahs, a friend of ours, Lieut. Stafford, R.E., was bringing up a young lioness, and very often brought her over for a visit to our pets; the meetings between them were most edifying. Directly they were confronted, the cheetahs would fly into a violent rage, and endeavour to get at her, evidently spoiling for a fight: the lioness on the other hand, though she was much bigger and heavier than they were, and had she wished could have given them a thrashing in no time, seemed to be utterly cowed by them, and used to endeavour to slink away directly she caught sight of them. Unlike the leopard, the Cheetah is a very inoffensive animal as far as human beings and their flocks are concerned, and seems to confine himself to the legitimate chase of wild game.

## ANTELOPE.

*THE BEISA (Oryx beisa).*

Oryx are still plentiful in suitable localities throughout the Protectorate, once you get beyond the Maritime Range; but in close country, though the ground may be a mass of tracks, they are very difficult to find. They hear you before you see them, and have a tantalising habit of waiting and watching for you behind a thick bush, and then galloping off without your knowing it until the tracks reveal the fact. I remember one day when we were very hard up for fresh meat, I got on to the track of an Oryx which began behaving in this way, and I was determined to persevere to the utmost, as unless I bagged him I knew I should have to face the prospect of dispensing with a square meal that day, as well as of the aggrieved

lamentations of the cook, who, simple being, used to state his morning wants as regards meat as if it only had to be ordered from the bazaar round the corner. In spite of my good intentions, however, I had eventually to give up the chase. The buck stopped every half-mile or so, and seemed to be simply fooling me. As soon as I had tracked up to within 200 yards of him, I was informed of his proximity by a clatter of hoofs ahead of the thickest bush in front of me: the same thing was repeated time after time, but I could never get a view of him, and eventually had to give up the pursuit as a bad job. My experience is that they are much easier approached collectively than singly, and that if you want to make sure of a good head or two, you must hunt them on the Marar Prairie, or other open expanse of country, where you can see them in large herds, and pick your animals—a much easier matter with the Mannlichers and Lee-Metfords of to-day than it was with the “Expresses” of old.

#### SWAYNE'S HARTEBEEST.

(*Bubalus swaynei*).

These ungainly antelope are still plentiful in one or two places, but are very locally distributed. In the dry season, before the rains, which begin in April or May, all the hartebeest in the country seem to migrate westwards towards the Harrar highlands, where the grass has still some life and nourishment left in it. At this time unless you have a “permit” for shooting in Abyssinian territory, it is useless looking for them; but directly rain has fallen, and from then until the grass once more loses its moisture, they may be found in great numbers all over the belt of open prairie stretching eastwards from Jifu to Toyo. There are none in the Reserve, and I do not know of any other ground within the present boundaries of the Protectorate, which they frequent, except the above, while at no great distance further south the Somali form (*B. swaynei*) is replaced by Coke's Hartebeest, so that the distribution of the former is very limited.

While scouring the Marar Prairie, on the present occasion, in the hope of picking up a stray specimen of *B. swaynei*, I had a curiously interesting morning, falling in with some old acquaintances out on the open “ban” in the most unexpected manner possible. I had left the head-quarters of the expedition for a fortnight on the lightest “field-service scale,” with the object of obtaining a Hartebeest. It was very dry at the time, and water being 20 miles or more away I was encamped near a zareeba of herd-camels, in order to get the benefit of their milk. I could not remain on the “ban” or grass belt, itself, as it was about 10 miles further still from water, and it would have been too great a strain for my already hard-worked baggage-camels, to be going frequently such a long tramp to the wells and back. To compensate for this I had to be up very early in the mornings and to trot down to the plain on my riding-camel, before the work of the day began. On the morning in question I had been tramping the mirage-girt plain for two or three

hours without seeing the vestige of any Hartebeest, when I came across a confiding herd of Aoul (Soemmering's gazelle), and being short of food in camp shot a buck for the common larder. As I was walking up to him I saw in the dancing haze of the distance the figure of a Somali running towards me, evidently having heard the shot. A few minutes later, while the necessary "Bismillah" was being muttered over the dead buck, he came panting up, and in spite of his unkempt locks and altered, jungly attire, the unique and aggressive squint with which his eyes greeted me told me instantly that he could be none other than my old camel-syce, Adan, who had been in my service up to the time I left the country four years before. He was equally quick to recognize me, and while he assisted to skin the gazelle we had a talk over old times. He told me that when I had left the Somali Coast he had gone back to his tribe in the interior and had never visited the Ports since, but had been doing a little trade on his own account, and that when he heard my shot he was hurrying across the "ban" to catch up his caravan which was then en route to Harrar with trade-goods. When he gave me the direction I could just make out a series of tiny black specks on the trembling horizon, representing his string of camels. It would have been death to him to lose his party on this thirsty prairie, so as soon as the buck was cut up I presented him with my blessing and as much meat as he could carry, and we went our several ways, each thinking, I expect, of the unlooked for coincidence of our meeting.

But yet another surprise was in store for me that morning. I must have been walking for quite three hours after parting with Adan, and was beginning to feel inclined for some lunch, (in this case a stick of chocolate,) when I descried with my glasses, far away on the open ban, a small black object which puzzled us a good deal. We knew there were no village encampments for many miles around, and it could not be a halting caravan, because the spot was nowhere near any of the camel-tracks crossing the Haud, and yet, after another good look, we came to the conclusion that it could be nothing else than a Somali hut; but what was it doing in such a place at this inhospitable season? Another half-hour's walk would decide, so we trudged on towards it.

As we got nearer it became evident that it was a rough shelter of sorts, and must be inhabited, for after going a little further we put up a Spotted Hyæna out of the grass, and he was not likely to be in such close proximity for nothing. Sure enough when we got up to within 20 or 30 yards we made out two Somalis asleep beneath a rough awing consisting of two or three camel-mats stretched over four upright sticks, and as, awoken by our approaching footsteps, they got up and peered around, what was my surprise to be greeted with "Good morning, Sir," in excellent English, and to recognize in the speakers two Midgan shikaris who had been formerly well known to me. One of them had been severely mauled

by a lion four years before when in the company of an English sportsman and had been for months under my eye in the Berbera Hospital, recovering from his wounds. The other, who was the brother-in-law of the first, had also been a shikari, and as such had been one of the best trackers among his craft, but having been reported by more than one sportsman for funking in the presence of dangerous game, he was not subsequently allowed to serve as "first shikari." Being too proud, I presume, to go in a humbler capacity, as he might have done, he and his crippled kinsman had joined forces, and having reverted to the primitive habits of their tribe, were hunting and trapping for their livelihood, in the Haud. At the present time they were engaged in the doubtful pastime of killing ostriches by snare and poison, as they had to confess. Just beyond their little shelter, in a slight dip in the surface of the plain, they had put up a tiny zareeba, wherein were their grass vessels of water and the other scanty necessities of their frugal existence; there too were the results of their labours, a number of Ostrich eggs, in rows beneath the thorn fence, and a few strips of the meat of the great bird, in the form of "biltong," (which was their only food) spitted to dry on the thorns thereof. The two camels which completed their ménage, and which they sent for water every ten days or so, were now away with their women at the wells, a day and-a-half's journey distant.

I remonstrated with them regarding the poaching character of their present occupation, but after all, as they ventured to point out, they must live, and this was the only life they knew, a precarious one enough in all conscience; moreover they were in Abyssinian territory, where some one else would poach the ostriches if they did not; so I did not feel able to say much. The following were their methods, and I confess to being much interested in the details of them.

No. 1. When one of the party, in the course of his rambles over the prairie, alights on the nest of a pair of ostriches, (which, except for the absence of water in close proximity, is very similar in appearance to that of *Grus antigone*, the Indian Sarus) he entwines the coarse stalks of the nearest tussock of grass, so as to form a small screen or lair, wherein he squats with his bow and poisoned arrows and awaits the return of the old birds. Then if all goes well and nothing awakens the suspicions of these wariest of bipeds, the insidious poison of a single arrow fairly planted anywhere in the flesh, slowly but surely does its work, and the unlucky bird is eventually brought to bag.

No. 2. This is the more scientific device if more unscrupulous in its ingenuity. A number of bright yellowish-green berries or pods are collected, of which ostriches are very fond, and which in size and appearance very much resemble the outer green shell of the horse-chestnut; these are filled with the same "Wabai" or poison that is used for the arrows, and of which prussic acid is, I imagine, the chief element, as it is obtained by

boiling down the leaves of a laurel growing on the Golis Range and other high altitudes. Its efficaciousness depends entirely upon its freshness and the care with which it is prepared. The plan of action is then as follows: filling their pockets with the poisoned berries the Midgans start out at dawn, each leading a camel. As soon as an ostrich is sighted (they are almost invariably feeding at this early hour), a bare patch of ground is selected, near which the unsuspecting quarry is likely to pass, and the shikaris then separate, and by keeping at a sufficient distance and driving their camels judiciously but naturally along, themselves concealed on the off side of them, they endeavour to head the birds imperceptibly towards the berry-strewn patch. Ostriches, as is well known, are very long and quick-sighted birds, and once they desery the bright berries, they make at once towards them. The effect of the poison is narcotic; after swallowing one or more of the berries the bird soon becomes drowsy, and in the course of time gets the staggers and sinks to the ground, when the Midgans come up and either find it dead or put an end to it. They told me that once a berry had been swallowed they seldom lost a bird, but that they sometimes had to follow for many hours before the final collapse.

I endeavoured to take a photo of the deeply scored and shrunken shoulder of the individual who, as before mentioned, had been mauled by a lion, but I am sorry to say it was a failure. I got a very good picture, however, of their characteristic little zareeba and its quaint contents. By the time I had taken my photos and they had cooked a repast from my venison for my followers and themselves, the day was far gone, so after a short but unsuccessful attempt to stalk a herd of Oryx which had meanwhile grazed into view, I said goodbye to my hosts and set out again across the "ban" towards home. The day's work had been very unproductive as far as Hartebeest were concerned, but I would not have missed it for a great deal. As for the latter, the Midgans, who knew the ground thoroughly, assured me that I might search the Haud over and over, but should not see a Hartebeest again till the next rains fell; they had all migrated westwards to the Abyssinian highlands where grass and water still existed, I had been under the impression that Hartebeest, like most other African antelope, did not require water, but according to the Midgans an occasional drink is a necessity to this species, when the grass gets too dry.

#### THE GREATER KOODOO.

(*Strepsiceros koodoo*).

This grand beast is, and always will be, so long as the race survives, the finest trophy to be obtained in Somaliland. They are still numerous on the slopes of the Golis Range, and are to be found, less plentifully, in suitable hill country all over the Reserve. Out of this circumscribed tract, and supposing that the latter is intended to embrace both the northern and southern slopes of the Golis,—(this point is not made clear in "The Rules

for Sportsmen" as at present worded),—I know of no locality where one can any longer count on meeting with them, so that without special permission to shoot in the said Reserve the sportsman has little chance of obtaining a specimen.

Even granted the "special permission," the old buck Koodoo, like his parallel the Markhor of the Himalayas, is at all times a very difficult beast to circumvent. He lies up all day in the thickest cedar forest he can find, and only comes out at night to feed, returning to his shady retreat by sunrise. Tracking him up, except in rainy weather, is excessively difficult and fluky, as the crackling of your footsteps on the dry leaves and undergrowth warns him of your presence long before you can see him, and time after time your labour is only rewarded by the sound of his horns crashing through the brushwood as he gallops away out of sight. I have been out morning and evening for a week together, putting up two or three in this way every day, without ever setting eyes on one. On the other hand, the females and small bucks that you do not want to see constantly appear in the open at all hours of the day.

#### LESSER KOODOO.

(*Strepsiceros imberbis*).

The Lesser Koodoo are, I think, on the whole less plentiful now than their bigger brethren. As with the latter there are very few in the present Protectorate except in the Reserve, where, however, in one or two localities they are still fairly common.

Captain H. G. Swayne, I see, speaking of the Lesser Koodoo in his "Seventeen Trips through Somaliland," mentions that the finest buck that he has seen or heard of carried horns measuring between 27 and 28 inches, and that "the average length of a good buck's horns is about 25 inches." I hesitate to differ from him, but cannot help thinking that in this latter remark he rather over estimates the average. What with the trophies brought in by numerous shikar-parties, and other horns passing through the Customs Houses at the Ports, I have seen a large number of Lesser Koodoo heads, but with the exception of the pair mentioned by Captain Swayne I know of no others touching 27 inches, and anything over 24 I should consider very rare now-a-days. An average head I should put as low as 21 inches.

Hitherto I had always associated the Lesser Koodoo with scenery forming a fitting background to his handsome presence;—green, shady glades, and fresh pastures; but recently I met with them in such unlikely spots that I could hardly believe my eyes when I saw them. On both occasions it was far into the Haud, and at a season when there was not a drop of water for thirty or forty miles, nor an atom of verdure—nothing as far as the eye could reach but a boundless expanse of parched prairie, studded here and there with a patch of mimosa trees or umbrella-shaped bushes, innocent of a single green leaf, and thirsting like the soil on which they grew, for the rain that

seemed to be never coming. Truly the graceful buck, as he waded through that undulating sea of sun-bleached grass, appeared utterly out of keeping with his surroundings.

There seems to be a good deal of confusion among travellers in Somaliland as to the distinctive names for Koodoo and Lesser Koodoo, and this is not to be wondered at, for Somalis themselves often confound the two in the most aggravating and ignorant way. The reason, I think, is that the haunts of both species in many places overlap; that is to say, the Lesser Koodoo frequents the shady tree-jungle fringing the bases of the same hills whose heights are tenanted by his greater congener, and the latter again, especially the herd bucks and females, come down at night into the low country to feed. Thus I have myself come upon a buck of the larger species when in search of the smaller on the flat below the range of hills from which the venturesome individual had probably strayed.

When living in Somaliland I took a good deal of pains to clear up the confusion of names abovementioned, and my endeavours brought me to the following conclusions:—

(1) "GODIR" applies to the Greater Koodoo in general, both male and female.

(2) "GORIALEH" or "GORIALEH GODIR" are the terms used to particularise a fully furnished buck of the larger species.

(3) "ADER YU" or "ANDERIO" is generally used for the Lesser Koodoo, but is frequently applied to the females and small fry of both species.

(4) "ARREH." Finally, if you wish to make a Somali understand that you want a Lesser Koodoo buck with good horns, you must employ yet another term "Arreh," pronounced with a strong roll of the "r"s.

#### THE GAZELLES.

I will take these in the order given in the latest authoritative work on the subject, Selater and Thomas's "Book of Antelopes," still in course of publication in parts. This is a work which an intending visitor to Somaliland should lose no opportunity of studying. He will find therein the most recent information regarding the various Somali antelopes, and will learn at the same time in what way he can be useful to science without much extra trouble to himself.

#### THE BOTTLE-NOSED GAZELLE (*Gazella spekei*)

and

#### THE LOWLAND GAZELLE (*Gazella pelzelni*).

With regard to these two varieties there is likely to be some perplexity in the minds of those familiar with Mr. Inverarity's note on the Mammalia of Somaliland in Vol. V. of this Journal. At that time the Gazelle found in the maritime plain was known as *G. spekei*, later on, however, on the subject being gone into afresh, the type of Speke's discovery was found to be of the "bottle-nosed" kind, and so the names had to be changed about, being now accepted as above.

I shall refer to them here by the names by which they seem familiarly known among sportsmen, *viz.*, the "Bottle-nosed" and the "Lowland," respectively. Lafarook, about 40 miles from Berbara, on the way to the Jerato Pass, is approximately the point at which the Lowland variety ceases to be met with and the range of the other begins; in fact, while encamped near the wells of that name we found the two kinds indiscriminately. On the isolated plateaux in the neighbourhood, I saw the Bottle-nosed in great numbers when hunting Baira, while at the foot the Lowland species was predominant. On one occasion, when stalking some Baira, I came across a herd of at least 40 of the former, including some very fine heads, and they allowed me to come quite close up to them, but I was too anxious about the rarer antelope at the time to fire at any of them.

The marked difference in the appearance of females of the two varieties has not, I think, been sufficiently explained and drawn attention to in books on the subject. Their horns are altogether unlike. In the case of the Lowland Gazelle the does' horns are very thin and smooth and much straighter than the bucks', and as a rule hardly show at all in life, being hidden by the ears; whereas, in the case of the Bottle-nosed, the females' horns are exactly like the males, only slightly less massive; in fact, among a herd in the field, I defy anybody, without a prolonged use of the field-glasses, to distinguish a buck with medium-sized horns, from a doe.

SOEMMERING'S GAZELLE (*Gazella soemmeringii*).

"Aoul," as they are commonly called, are still plentiful in the Bulhar Plain, and in flat country throughout the Protectorate.

CLARKE'S GAZELLE OR DIBATAG (*Ammordorcas clarkei*).

WALLER'S GAZELLE OR GERENUK (*Lithocranius walleri*).

BAIRA ANTELOPE OR BAIRA (*Dorcotragus megalotis*).

It so happens that Messrs. Selater and Thomas complete their monograph of all the known Gazelles with these three species of the Somali Fauna, and oddly enough each has been considered to constitute a distinct Genus. In this connection I take the liberty of quoting *in extenso* the interesting remarks with which the Authors of this delightful work preface their account of the Baira Antelope. They write:—

"We will conclude the long series of Gazelles with three abnormal forms, each constituting a genus of itself, which, curiously enough, are all restricted to N.-E. Africa. As regards the first two of them, there can be no question, we believe, of their close alliance to the Gazelles, *Ammordorcas* being in several respects intermediate between *Gazella* and *Lithocranius*, and leading on to that most specialized form of the group. About the correct position of the Baira, however, there is considerable doubt, and it is quite possible that a more natural place for it in the Antelopine series may be hereafter discovered."

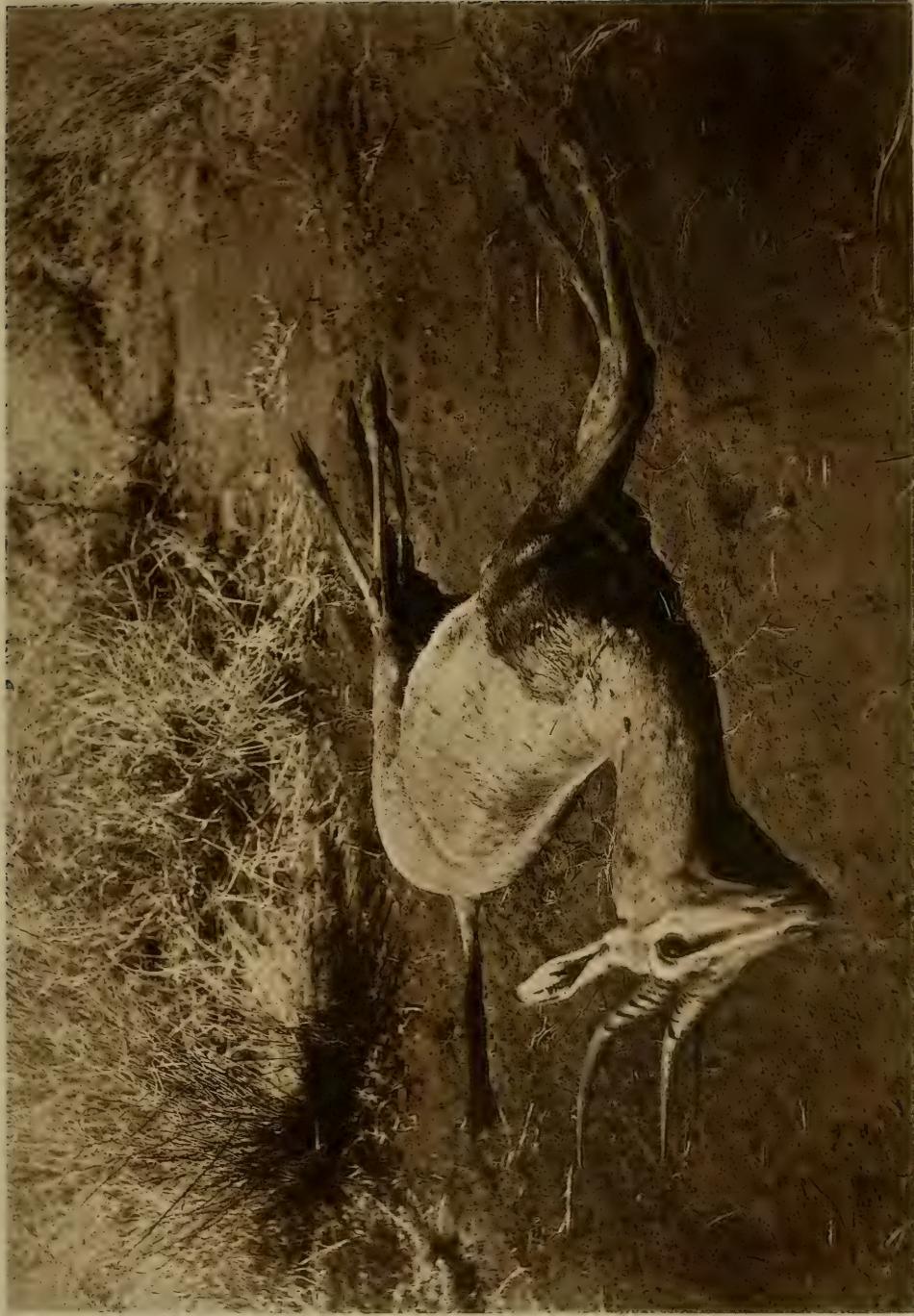
About the Dibatag and the Gerenuk I have little to tell that has not already been told by others. The latter seem to be ubiquitous throughout the country, excepting the summits of the mountain ranges. In the "Book of Antelopes" there are beautiful plates of both animals in the most life-like attitudes, but the colouring of the Dibatag therein lacks a little the distinct bluish-grey tint which pervades the animal as one sees it in life but which is in a great measure lost in the made-up skin.

The known range of this antelope has extended considerably since the Australian sportsman after whom it was named first obtained specimens of it in 1890. On our present expedition we began to meet with it about 20 miles north of Darror, on the southern edge of the Haud, and continued to find it westwards as far as Awaré, near Milmil. South of that line it has been traced almost to the River Shebeyli, and now Messrs. Selater and Thomas tell us that it has turned up again near Mount Kilimanjaro in German East Africa, so that we may reasonably expect that some intermediate habitat exists and will be brought to light before long.

The high grass prairie, studded with open tree jungle and mimosa bushes, which, in Somaliland at all events, forms the usual haunt of the Dibatag, is just the sort of country through which the Rhino, too, delights to wander; and I have little doubt that when the distribution of this interesting antelope has been fully ascertained, it will be found that where the Dibatag is, there is the Rhino also.

In such ground as I have mentioned as being the favourite resort of the Dibatag, it is naturally very difficult to see them on foot, and one may easily pass or put up animals, quite close at hand, without knowing it. I would accordingly recommend any sportsman who treats himself to the luxury of a riding-camel, to bring the latter into requisition when hunting Clarke's Gazelle. You will certainly see many more of them from the back of your camel than you would from the ground, and so far as my own experience goes, you will find it much easier to get shots, for the chances are that instead of putting up the animal at very close quarters and getting a difficult, "flying" shot, as he bounds away through the long grass, you will see him with your glasses before he sees you. You can then quietly slip down from the back of your camel and do a careful stalk (in the course of which an occasional ant-hill of the obelisk pattern will very often assist you much in keeping your direction) and the result will be a much more steady and satisfactory shot than would otherwise have been the case.

On an emergency you may even try a shot from your perch, as the ordinary riding-camel is quite indifferent to the report of a rifle fired from his back. The only objection is that when you slacken the rein to take the shot, the faithful "ummin-bird" has an aggravating knack of squirming his neck round to watch the interesting operation.



Photographed by Capt. P. Z. Cox.

**CLARKE'S GAZELLE.**  
(*Ammodorcas clarkei*.)



The Dibatag is, I think, the only important Somali antelope which has not been represented in this Journal, so a photograph of it accompanies these notes.

As regards the size of its horns, 12 inches on the curve, without following the crenulations, seems to be the outside measurement; in fact, I have seen nothing longer than a pair of horns which I sent to the Society's Museum some years back, and which, if I remember right, just taped that amount. The female carries no horns.

*The Baira.*—Soon after our expedition left the coast we were passing through that part of the Guban, or low country, where I had met with the Baira in 1895, and I made a point of spending a couple of days on the top of one of those inhospitable-looking tablelands, whereon it has elected to dwell, in the hope of extending my slight acquaintance with this puzzling little antelope. I am glad to say I was not disappointed.

The plateau selected was a large one, and game was more plentiful than I expected; in fact during the two days I spent there, I must have seen quite 40 animals altogether. They were as wild as hawks, however, and I only succeeded in obtaining a single specimen, but chiefly owing to my bad shooting. I was using a Mannlicher that I had only just received from England, and though I afterwards got to like it exceedingly, at this time I was quite at sea with it and could not hit a haystack; but my second introduction to the Baira, if not very successful from a marksman's point of view, was otherwise most interesting, and I was able to learn a good deal of their habits. They seemed to be always in families of 5, 6 or 7, and to graze, for choice, out upon the rock-strewn surface of the tableland. When disturbed, they invariably kept to the flat as long as possible, only taking to the steep side when finally driven to it. On such occasions, once over the crest and out of sight of their pursuers, they would lie up in the most artful manner, under any rock or shrub that came in their way, and if no such haven was available they would stand or crouch perfectly motionless, in the open; even then it was almost impossible to detect them, so exactly does their colouring match the general tint of their surroundings. One of them tried to pursue these tactics on the open plateau, in full view of me. I had been stalking a family of them which I had seen grazing out on the crest, but they had descried me almost as quickly, and at once galloped away towards the end of the plateau; there, however, they apparently found the scarp too precipitous, for they pulled up suddenly and streamed away to my left. The crest at this point was very narrow, and I did a sprint at my best pace in the hope of cutting them off before they disappeared down the slope, but they all eluded me except one, which, evidently thinking it had not sufficient time to make the edge before me, stopped and crouched like a frightened hare behind a boulder, hoping, I suppose, to escape observation. She proved to be a doe, and let me watch her for two or three

minutes and finally walk right up to her, before she made up her mind to jump to her feet and scamper off for dear life after her companion.

Baira are to my mind the most difficult to approach of all the Somali antelope, racing away for all they are worth the moment they are disturbed by man or beast—so different from the Bottle-nosed Gazelles which haunt the same plateaux, and which on this occasion I found in greater numbers and more confiding than I have ever seen them before: owing no doubt to the fact that on these barren-looking expanses of black shingle, they are very seldom disturbed by the hunter.

The Plate of the Baira or “Beira,” (as the authors spell the word) in the the “Book of Antelopes” seems to me to be quite perfect, both in shape and colouring.

Two more forms complete the Antelopine group, as represented in Somaliland, namely the Klipspringer; and the Digdig, in three varieties.

OREOTRAGUS SALTATOR (*The Klipspringer*).

I have little to add to what has already been recorded about this beautiful little creature—“Alakud,” as the Somalis call him. He is not much shot, and therefore has not perceptibly decreased in numbers. Wherever you find the Larger Koodoo, there you may expect the Klipspringer; he also inhabits the precipitous sides of the same tablelands which form the favourite haunt of the Baira; but, unlike that species, confines himself entirely to the steepest slopes, whereon he loves to skip from crag to crag in the most break-neck fashion possible: I have never seen him take to the flat under any circumstances.

MADOQUA PHILLIPSI,

MADOQUA SWAYNEI.

MADOQUA GUNTHERI.

Thus are the three varieties of the Sand Antelope or Digdig designated by zoologists; Somalis distinguish them by the names “Goyu,” “Golass,” and “Gussli,” respectively. Captain Swayne has given an accurate description of them all, upon which I cannot improve. They are excellent eating and very plentiful, and consequently nearly every sportsman shoots a goodly number of them, but to the majority they are all “Digdig” simply, and as such are only looked upon as pleasant additions to the often monotonous bill-of-fare. There is still, however, a good deal to be done in the way of determining the limits of the distribution of each of the three varieties, and in this travellers could materially assist by keeping the skins and skulls of those shot, and carefully ticketing them with a brief note of the sex, date and locality. We obtained specimens of all three varieties between Berbera and Milmil, the first and second overlapping in one locality and the second and third in another. I cannot recall the name of the camping-place in the former case, and have not present access to the skins for

reference, but I find from my diary that a small isolated hill called "Sugul," a few miles N.-E. of Milmil, was the most northerly point at which we met with *Madoqua guntheri*, and there its presence was confined to the slopes and immediate vicinity of the hill itself, whereas *M. waynei* was the commoner form in the surrounding neighbourhood. The first two varieties are not always easy to be distinguished, without specimens or skins for comparison, but the "Gussli" is at once recognizable by its abnormally long snout, its larger proportions, and by the rattling "guss-guss-guss" (giving rise to its vernacular name) which it utters when disturbed, and which is quite different from the shrill whistle of the other two.

#### MISCELLANEOUS.

In the foregoing pages I have touched upon all the larger Mammals usually included in the collections of expeditions that do not penetrate further than the River Shebeyli, but there are still a few more interesting animals, that the traveller in Somaliland hears little about, because so rarely met with by human beings; though not necessarily rare in themselves, they are worth passing mention.

(1) The Lynx (*Felis caracal*), the "Gududonneh" of the Somalis. Dr. Donaldson-Smith and I saw one specimen of this species whilst riding one day ahead of the caravan to a new camp, but by the time we had dismounted it had disappeared in some grass where tracking was impossible.

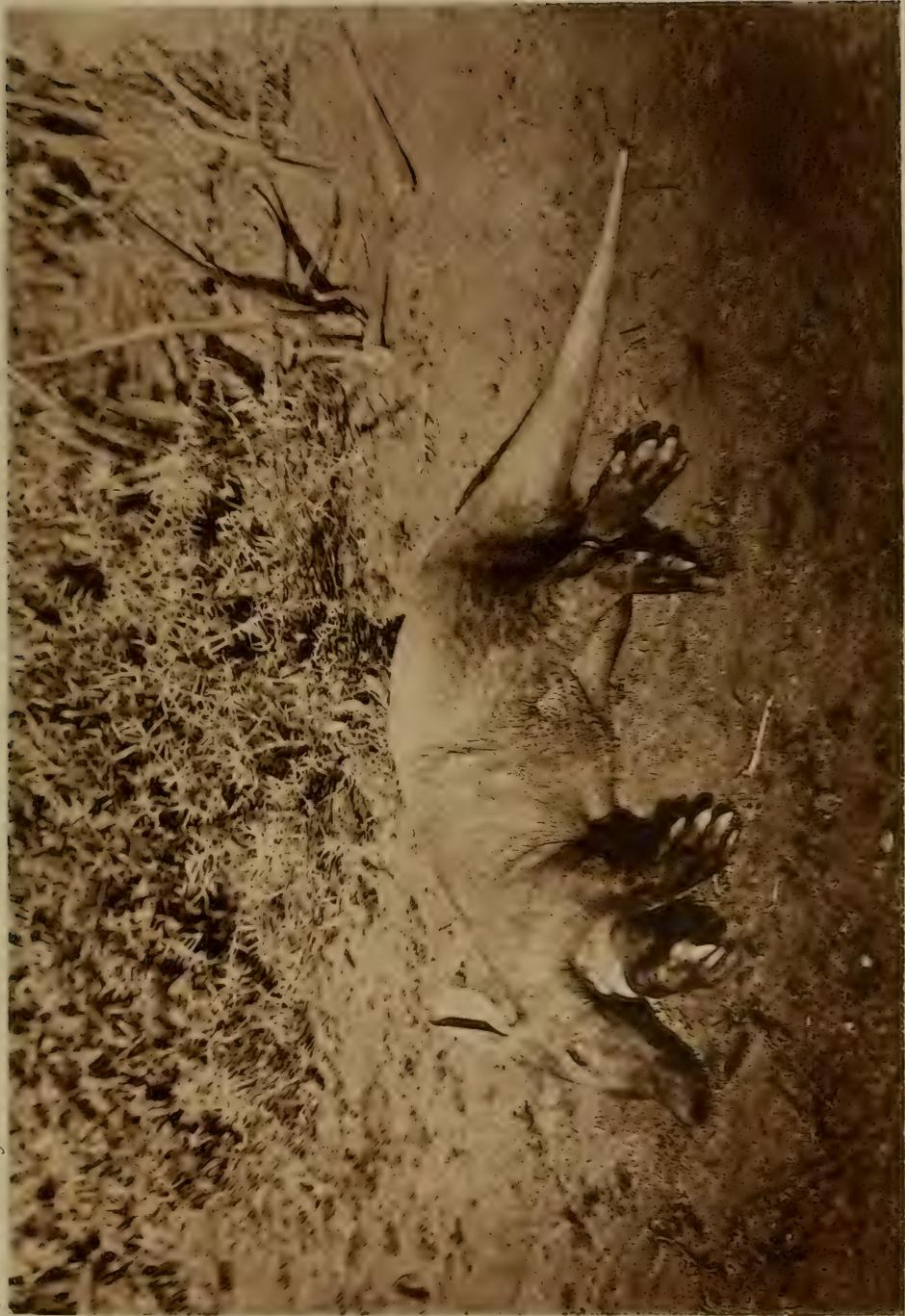
(2) The Serval Cat (*Felis serval*). The Somalis have given the name "Shebeyli Adari" (another form of "Harrari") to one of the cat-tribe with which they are acquainted, and I think it must be this species, which is known in Abyssinia also, but I have never been able to make quite sure, only having had a skin to illustrate my inquiries by; I think there is little doubt, however, that the animal is fairly common in the Protectorate, and although none of us actually saw one on our recent expedition, one of our number, Mr. Carlyle Fraser, who was familiar with it further south, on several occasions, told us that he had come on its tracks.

(3) The Aard-wolf (*Proteles cristatus*). Here again I am in uncertainty as to the Somali name. The animal frequents open ravine-country, similar to that in which one finds the Chinkara in India. I have never obtained a specimen but have twice seen them; they are not unlike a Striped Hyæna in miniature.

(4) The Ant-Bear (*Orycteropus æthiopicus*) or "Kharendi" of the Somalis. This curious animal, the subject of one of the Plates, is very common indeed in many localities, but being entirely a night-feeder it is hardly ever seen. Before I met with the creature I had often come across numbers of deep, round, and apparently purposeless holes, sometimes dug right along a camel-track at almost regular intervals, but from the explanations of my followers I had come to the conclusion that they referred the pitfalls to the Badger, which last exists in the country, and it was only when this specimen came into our

hands that I discovered with certainty what the "Kharendi" was. We obtained it in a curious way. Dr. Donaldson-Smith was sitting outside his tent one day, waiting for me to return to breakfast, when some Midgans passed, driving and dragging this poor beast along. On being stopped and questioned, they told him that it had got caught in a snare which they had set for Oryx, and that they were going to take it into Berbera to sell. They appeared to be very rough with it but it did not bear any outward marks of injury, and seemed to be only paralysed with fright and exhaustion, so we negotiated for the purchase of it, and finally obtained it on the understanding that we would pay double the price now settled, if we succeeded in transporting it to the Coast alive. The poor beast never rallied, however, and died a few hours later, and on skinning it we found that it had been injured internally, and was badly bruised about the back and hind-quarters as well.

The Ant-Bear is classed by the faculty among the "Edentata" or toothless mammals, but this adjective is not altogether applicable to him, for although he is not furnished with canine teeth or incisors he does possess a set of back teeth of sorts, and is not therefore under the necessity of swallowing his food whole; not that it would necessarily give him indigestion if he did, for his food consists almost entirely of termites, for the collection of which nature has provided him with a long thin slavery tongue, which, like the lizard, he can extend to a great distance and can penetrate with it the holes and crevasses into which the ants take refuge. His skin is thick and coarse, resembling a pig's, and covered sparsely with grey hairs, which get darker and thicker on the thighs and legs, in fact he has been sometimes called the Earth-pig or Ant-pig for this reason. Altogether, with his abnormally long snout and ears, and extraordinarily massive tail he is an uncanny object to look at. The tail, as may be imagined from its thickness at the root, is almost rigid, and the animal cannot apparently call upon it to perform the usual offices of a long tail, such as flicking off flies or acting as a punkah. He could hardly have been endowed with such a peculiar appendage except for some special purpose, and the extraordinary development of muscle on the underneath part of the root leads to the conclusion that he extends it straight out behind him and rests his whole weight on it, in order to steady himself while engaged in digging, with those powerful curved claws of his, for the ants which form his staple food. Of these claws he has four on each foot in front and five behind, and they are either very uncomfortable to walk upon, or else the owner is afraid of getting them blunted unnecessarily, for he walks only on the outside of the sole, turning the claws inwards and upwards so that only the digit corresponding to our little toe touches the ground. As might be expected the Ant-bear lives in a burrow which he excavates for himself, but it is said that he is not always allowed to enjoy the fruits of his labours, for the Hunting Dog sometimes annexes it, and in South Africa the Steinbok, according to one writer, takes refuge



Photographed by Capt. F. Z. Cox.

**THE ETHIOPIAN ANT-BEAR.**  
(*Orycteropus aethiopicus*.)

Mintern Bros. Photo-imp. London.



therein when pursued. These facts bring one's thoughts to the question of self-protection. How is the Ant-Bear endowed in this respect? I confess it is rather a puzzle. The thought exercised us much when the subject of the photograph was alive in our possession; he seemed so harmless and helpless in every way and yet looked so fat and succulent withal, that one would expect him to be an easy and desirable prey to any carnivorous animal stronger than himself, including man. He has no teeth which he could use for biting purposes, nor scales to preserve his own skin, like others of his persuasion, and, during life at all events, there was no unpleasant smell attached to him; we found however when we began to skin him and prepare his skeleton, that the flesh did give off a very pungent and sickening smell, and if the flavour of it is at all in proportion, the creature's apparent immunity from the attentions of other better-armed animals is partly, though insufficiently, explained.

The Ant-Bear is found from the Cape to Abyssinia, the southern form being known as *Orycteropus capensis* and the northern as *O. æthiopicus*, the differences between them are however very slight, I believe, and when more specimens are available for comparison, they will probably resolve themselves into mere local variations. The one obtained by us is presumably the form *æthiopicus*.

I have said nothing about the Hyænas and Foxes or the Wild Dog, nor is there much to be said. With the Hyænas, Striped and Spotted, most people are familiar as they are to be seen in every Zoo; the latter variety is much the most common in Somaliland, and is a more or less constant nuisance to travellers, ever ready as he is to prey upon any unwary camel or other animal straying from the caravan. The Wild Dog of Somaliland I have never seen alive, and I do not think that in this part of Africa, at all events, he exists in such numbers as his Indian cousin does with us. If he does he certainly lives a much more retired life, and does not scare game to the same extent. As regards Foxes, sportsmen might help a good deal, as in the case of the Digdig, by shooting a specimen occasionally and making a note of the locality. Unless there is an unusual margin of difference in the colour and texture of the coats of individual specimens dependent on season or locality, I am inclined to think the country is responsible for more species than is generally supposed. We were under the impression that we obtained three varieties, exclusive of the pretty little black species, which always hunts in couples, and is known by Somalis as the "Gol-waraba," the word "Waraba" being used by itself for the Spotted Hyæna. Our collections of skins, however, are still under examination, so I cannot say anything authoritative on the subject.

About the small mammals, Birds and Insects, which we collected I can say little or nothing for the same reason, namely, that the collections are still under examination. Among the former the Hares and Conies ("Bowna" in Somali)

are each represented in two or three varieties, and are interesting to the collector ; and of the second of these two families, besides what we actually obtained, I saw a single specimen of another variety which I have never heard of before in Somaliland, and which I believe to be that known further South as Burchell's *Hierax*. I put it up at my feet on the same solitary hill, "Sugul" by name, which I mentioned as being the spot where we first met with Günther's Digdig: I had an Express rifle with me at the time, so the funny little creature escaped destruction, and though I revisited the place two or three days in succession, in the hope of meeting with him again, or one of his relations, I was never successful.

Excepting the Eagles and Vultures, which seem to travel the world over, the Ornithology of Somaliland possesses so little in common with that of this continent that it could have no interest for any but specialists in that branch of Natural History, and moreover any observations from me would be premature, pending the classification of our collections by competent authority.

The same remarks apply to the results of our labours in the collection of Reptiles, Insects, etc., in dealing with which I should be very soon out of my depth. Even were it not so, these notes have already reached such alarming proportions that I should fear to trespass longer on the patience and indulgence of my readers.

## LES FORMICIDES DE L'EMPIRE DES INDES ET DE CEYLAN.

PAR AUGUSTE FOREL,

PART VII.

(Continued from page 65 of this Volume.)

4me TRIBU PONERII.

7me Genre CENTROMYRMEX, Mayr.

= *Spalæomyrmex*, Emery.

*C. feæ*, Emery.

♀. Fourmi de 4.5 à 5 mill. (forme typique) ou de 4.3 à 4.6 mill. (var. *ceylonicus*), reconnaissable facilement à son métanotum, dont la face basale est profondément creusée en selle, à son pédicule pétiolé devant et surmonté derrière d'une écaille très épaisse (var. *ceylonicus*) ou d'un noeud (forme typique), à son abdomen proprement dit sans ressèment appréciable après le 1er segment, à ses funicules épais, dont les articles, plus larges que longs, ne forment pas de massue distincte et à ses mandibules encore triangulaires, mais étroites, allongées et faiblement ou à peine denticulées à leur bord interne. Antennes de 12 articles. Pas d'yeux.

Roussâtre, médiocrement poilue. Luisante. Tête et thorax assez fortement ponctués. Abdomen lisse sauf les points piligères.

♂. (De la var. *ceylonicus*). L. 4.3 mill. Mandibules très courtes, triangulaires, sans dents. Antennes courtes. Tête arrondie. Yeux médiocres. Epistome très convexe. Thorax court et large. Mésonotum grand, à sillons convergents. Le métanotum forme une forte convexité. Pédicule avec un pétiole déprimé et, derrière, avec une écaille assez mince, échancrée en haut. Abdomen à peine rétréci après le 1er segment. Valvules génitales extérieures triangulaires, larges, dirigées en bas. Pygidium sans pointe. Ailes courtes, n'atteignant pas l'extrémité de l'abdomen, hyalines, pubescentes, à tache marginale et nervures brunes, ayant deux cellules cubitales, une cellule radiale fermée et une discoïdale.

Tête et thorax assez luisants, irrégulièrement sculptés; abdomen lisse. Pilosité brunâtre, assez abondante. Noir. Pattes et antennes brunes.

Pris avec les ♀ par M. Yerbury à Ceylan. Sans cela on douterait presque de l'identité générique.

Bhamó, Schwegoo, Prome, Palon en Birmanie (Fea) (forme typique). Ceylan, ♀ et ♂ (Yerbury, Simon): var. *ceylonicus* nov. var. Cette variété se distingue par sa taille plus petite, par ses mandibules presque sans trace de denticulations à leur bord terminal, par ses antennes d'une idée plus courtes et plus épaisses, et par le noeud du pédicule qui est bien plus transversal ou squami forme (deux fois plus large que long; 1½ fois à peine chez le *Feæ*).

8me Genre LEPTOGENYS, Roger.

= *Lobopelta*, Mayr (Subgenus).

Tableau des ouvrières.

- Mandibules linéaires, sans bord terminal, très longues, laissant, même fermées, un fort espace entre elles et le bord de l'épistome ..... 1. (*S. G. Leptogenys*, sens. strict.—Roger.)
- Mandibules plus ou moins étroites, tout au plus sublinéaires, ayant au moins un bord terminal court, plus ou moins distinct, et s'appliquant assez exactement contre le bord de l'épistome, lorsqu'elles sont fermées... 2. (*S. G. Lobopelta*—Mayr.)
1. Tête bien plus large que longue, élargie devant; rétrécie derrière. Mandibules courbées sur toute leur longueur, quoique moins fortement au milieu. Deux dents courbées sous le bord antérieur de la tête, devant. Epistome triangulaire devant, avec un rebord membraneux très étroit. Une grosse ponctuation espacée, assez superficielle, mais fort distincte sur le thorax, moins sur la tête et le pédicule. L. 6·8 à 7·3 mill..... *L. falcigera*—Roger.
- Tête aussi longue que large, à peine plus large devant que derrière. Mandibules courbées vers leur base et vers leur extrémité, mais pas dans leur partie moyenne. Le bord antérieur inférieur de la tête n'a que deux très petites dents droites et fort latérales. Lobe antérieur de l'épistome assez arrondi, faiblement festonné et portant un assez large rebord membraneux jaunâtre. Tout le corps mat, très finement sculpté, sans aucune grosse ponctuation espacée. Les yeux sont presque aussi éloignés de l'angle antérieur de la tête que leur diamètre (moins chez la *falcigera*). Entièrement couverte d'une fine pubescence grise, pruinéuse. L. 6·8 à 7 mill..... *L. pruinosa*, nov. spec.
2. Articles 3 à 6 des funicules beaucoup plus larges que longs. Long. 4·5—4·7 mill. Roussâtre. Très luisante, lisse, poilue. Mandibules assez courtes, à bord terminal tridenté. Yeux très petits. Tête rectangulaire. Dos du thorax à peine convexe, sans échancrure. Ecaille très épaisse, nodiforme, arrondie en haut ..... *L. crassicornis*—Emery.
- Articles 3 à 6 des funicules au moins aussi longs que larges ... 3
3. Pédicule surmonté d'une écaille large, tout-à-fait comprimée, n'ayant qu'un seul bord obtus. Tête large. Corps robuste. 4
- Pédicule surmonté d'un noeud ou d'une écaille très épaisse, nodiforme, ayant un bord antérieur et un bord postérieur. Tête en général étroite; corps plus ou moins étroit et allongé ..... 6

4. Lobe antérieur de l'épistome terminé devant, au milieu, par trois dents. Tête luisante, abondamment et fortement ponctuée. Articles 3 à 6 des funicules aussi larges ou presque aussi larges que longs. L. 5·5 à 5·8 mill... *L. dentilobis*, nov. spec.  
 Lobe antérieur de l'épistome sans dents. Tête n'ayant que des points épars. Poilues, luisantes ..... 5
5. Articles 3 à 8 des funicules beaucoup plus longs que larges. Epistome terminé devant par un angle obtus et arrondi, sans rebord distinct. D'un brun de poix foncé. L. 7·5 à 9 mill ..... *L. ocellifera*—Roger.  
 Articles 4 à 8 des funicules aussi larges ou plus larges que longs. Epistome terminé devant par une portion médiane subtronquée qui forme un rebord lamelliforme d'un roux transparent. Couleur roussâtre. L. 6·8 à 7·5 mill ... *L. birmana*, nov. spec.
6. Premier segment de l'abdomen (après le pédicule) sculpté, tout au moins abondamment fourni de gros points enfoncés ou fossettes..... 7  
 Premier segment de l'abdomen lisse et très luisant..... 8
7. L. 9·4 à 9·6 mill. Tête rugueuse et mate, sans rides transversales, avec des rides longitudinales devant ... *L. binghamii*, nov. spec.  
 L. 6·75 mill. Tête transversalement ridée derrière. Thorax, pédicule et premier segment de l'abdomen grossièrement rugueux ..... *L. aspera*—André.  
 L. 5·5 mill. Entièrement ponctuée, sauf quelques rides sur la face déclive du métanotum. Lobe antérieur de l'épistome triangulaire, arrondi à son angle antérieur..... *L. punctiventris*—Mayr.
- L. 4 à 4·4 mill. Même sculpture, à peu près, que la précédente. Lobe antérieur de l'épistome avec une portion médiane fort rétrécie, fort avancée et tronquée à l'extrémité. *L. hysterica*, nov. spec.
8. Pédicule surmonté d'une écaille très épaisse, plus ou moins tronquée devant et derrière, mais toujours plus large ou au moins aussi large que longue (sauf chez une race de la *L. diminuta*)..... 9  
 Pédicule surmonté d'un noeud comprimé latéralement, toujours plus long que large, tronqué et élargi derrière, lentement rétréci et abaissé d'arrière en avant. Epistome avec une carène aiguë. Lisses, luisantes, noires ..... 16
9. Tête entièrement lisse et luisante comme le reste du corps ; à peine quelques stries effacées tout près de l'articulation des

- antennes. Relativement assez robuste. Avant derniers articles des funicules un peu épaissis, presque aussi larges que longs. Mandibules assez larges, avec 4 dents plus fortes vers l'extrémité du bord terminal et 6 très petites vers sa base. Brunâtre, finement poilue. L. 4·5 mill. *L. lucidula*—Emery.
- Tête lisse et luisante, mais avec une ponctuation assez grossière, régulière, fort abondante qui manque à la *lucidula*.
- Reste du corps lisse et luisant. Petites espèces ..... 10
- Tête densément striée en long, au moins devant. Lorsqu'elle est lisse derrière, la ponctuation régulière et abondante du groupe 10 fait défaut. Poilues ..... 12
10. Lobe de l'épistome très court et arrondi, prolongé en avant par une membrane jaunâtre, transparente, obtusément triangulaire ..... *L. roberti*, nov. spec.  
 (a) L. 3·5 à 3·6 mill.; tête à angles plus arrondis. *L. roberti*, i. spec.  
 (b) L. 3·9 mill.; tête plus rectangulaire, plus allongée. *L. roberti*, r. *coonoorensis*, nov. st.
- Lobe de l'épistome triangulaire, de forme ordinaire ..... 11
11. Mandibules ayant six dents très distinctes à leur bord terminal et environ cinq denticules plus ou moins distincts à leur bord interne qui n'est pas fort bien délimité du premier. L. 4·3 à 4·7 mill. Ecaïlle plus mince que chez ses voisines. *L. dalyi*, nov. sp.
- Mandibules ayant 3 ou 4 dents très obliques et peu distinctes à leur bord terminal et le bord interne inerme. L. 4·4 à 4·7 mill. .... *L. yerburyi*, nov. sp.
12. Epistome sans carène. Taille plus robuste et plus forte. Tête et thorax densément striés avec un éclat soyeux. Mandibules tranchantes. Sutures distinctes. Thorax échancré entre le mésonotum et le métanotum ... *L. kitteli*—Mayr.  
 (a) L. 9 mill. Une incisure forte et distincte entre le pronotum et le mésonotum. Ce dernier fort convexe, le métanotum aussi. Ecaïlle très élevée, dépassant le métanotum, aussi longue que large. Un reflet métallique à l'abdomen. Lobe de l'épistome subtronqué devant, au milieu. Funicules rougeâtres, avec les articles pénultièmes plus longs que chez la suivante..... *L. kitteli*—Mayr, r. *altisquamis*, nov. st.  
 (b) L. 8 à 8·5 mill. L'écaïlle ne dépasse pas le thorax; elle est plus large que longue et pourtant plus épaisse en haut que chez la précédente. Incisure pro-mésonotale faible; mésonotum et métanotum moins

- convexes. Pas de reflet. Lobe de l'épistome arrondi. Funicules brunâtres ..... *L. kitteli*—Mayr, i. sp.  
 (c) L. 7 mill. Du reste comme la *Kitteli*, i. sp ... var. *L. minor*, nov. var.
- Epistome caréné ou sub-caréné. Sculpture variable, mais le devant de la tête toujours strié en long. Plus grêle... 13 *L. diminuta*—Smith.
13. Taille plus robuste. Les scapes ne dépassent l'occiput que d'à peine un tiers de leur longueur. Tête aussi large derrière que devant, sauf tout-à-fait en arrière, à l'occiput, où elle se rétrécit rapidement ..... 14
- Taille grêle. Les scapes dépassent l'occiput de plus des 2/5 (près de la moitié) de leur longueur. Tête lentement, mais distinctement rétrécie d'avant en arrière, surtout depuis les yeux (du moins chez la *L. hodgsoni*) ..... 15
14. L. 6·2 à 6·8 mill. Epistome distinctement caréné. Ecaille aussi longue que large. Tête entièrement striée; stries transversales sur l'occiput. Des rugosités ou rides éparses, irrégulières sur le thorax et souvent sur l'écaille r. *L. diminuta*, i. sp. Smith.  
 (a) L. 6 à 6·6 mill. Derrière de la tête et vertex lisses et luisants. Thorax et écaille plus lisses, var. *læviceps*—Smith.  
 (b) L. 7 à 7·5 mill. Sculpture de la *læviceps*, mais un peu plus robuste ..... var. *sarasinorum*, nov. var.  
 (c) Pédicule mat, à fines rides transversales; du reste comme le type ..... var. *opacinodis*—Emery.
- L. 7·0 à 7·6 mill. Epistome sub-caréné ou indistinctement caréné (passant un peu à celui de la *kitteli*, sans y arriver). Taille un peu plus robuste que chez la *diminuta* typique. Sutures autour du mésonotum fortement imprimées. Du reste comme la *diminuta*, i. sp. .... r. *L. palliseri*, nov. stirps.
- L. 5·0 à 5·5 mill. Thorax plus robuste et bien moins échancré que chez la *diminuta*, i. sp. Les sutures autour du mésonotum sont plus nettes. Ecaille plutôt plus large que longue. Sculpture striée à la tête et en partie au thorax. Stries un peu irrégulières et entremêlées de points microscopiques ..... r. *L. striatula*—Emery.
15. L. 6·2 mill. D'un brun jaunâtre ou rougeâtre. Tête ovale. Pilosité très éparsée. Pubescence nulle. Lobe de l'épistome très avancé en triangle, presque auminé; carène très aiguë. Devant et côtés de la tête striés; face basale du métonotum ridée transversalement (comme chez

toutes les races). Quelques rugosités sur les côtés du mésonotum et du métanotum. Tout le reste lisse et luisant. Thorax très fortement et largement échancré. r. *L. wood-masoni*—

Forel

- L. 6·2 à 7 mill. Noire, pattes et antennes brunes. Pilosité abondante. Lobe de l'épistome avancé, mais nullement acuminé à son extrémité qui est arrondie et un peu translucide. Carène très distincte. Tête striée comme chez la *diminuta*, i. sp., mais plus fortement. Thorax et écaille fortement rugueux ou striés. Thorax très fortement échancré et rétréci au milieu; mésonotum bas et mal délimité. Ecaille un peu plus longue que large... r. *L. hodgsoni*, nov. stirps.
16. Noeud du pédicule très allongé, environ  $1\frac{1}{2}$  fois plus long que sa hauteur postérieure et trois fois plus long que large derrière. Corps extrêmement grêle et étroit. Second article du funicule plus de deux fois plus long que le premier; articles pénultièmes presque trois fois plus longs que larges. Tête très étroite, distinctement rétrécie d'avant en arrière. Lobe de l'épistome triangulaire, sans dents. L. 6·5 à 6·7 mill..... *L. assamensis*, nov. spec.  
Noeud du pédicule plus court et plus élevé tout au plus d' $\frac{1}{4}$  plus long que haut derrière et deux fois plus long que large. Plus robustes. Poilues ..... 17
17. L. 8 à 9·5 mill. Le lobe antérieur, triangulaire de l'épistome a de chaque côté deux crénaux ou festons de forme assez variable et se termine au milieu par une figure rectangulaire qui, parfois, se transforme en deux dents. Un reflet métallique un peu bleuâtre ..... *L. chinensis*—Mayr.  
Bien plus petites. Lobe de l'épistome sans dents, ni crénaux, triangulaire, assez pointu au milieu. Articles pénultièmes du funicule seulement deux fois plus longs que larges ..... 18
18. Un reflet métallique bleuâtre, comme chez la *chinensis*. Mandibules relativement grandes et assez larges, avec un bord terminal assez long et sinueux. Lobe de l'épistome grand. Le noeud du pédicule, à peine plus long que haut derrière, forme devant un pan assez manifestement distinct de sa surface supérieure inclinée. Scapes plus longs et tête plus allongée que chez l'espèce suivante. L. 6 à 6·8 mill. *L. minchinii*, nov. spec.  
Pas de reflet métallique. Mandibules très étroites, à bord terminal très court. Lobe de l'épistome plus petit aussi.

La surface supérieure du noeud s'abaisse, et se courbe sans former de pan antérieur manifeste. Les scapes ne dépassent pas très fortement l'occiput ..... *L. peuqueti*—André.

(a) L. 6 mill. Noeud du pédicule à peine plus long que sa hauteur postérieure et moins de deux fois plus long que large. Yeux situés aux  $\frac{2}{5}$  antérieurs. Tête seulement un peu plus longue que large (sans le lobe de l'épistome)... *L. peuqueti*, i. sp.—André.

(b) L. 5 mill. Noeud du pédicule d'un quart plus long que haut derrière et  $2\frac{1}{4}$  fois plus long que large. Yeux situés au milieu des côtés. Tête beaucoup plus longue que large (sans le lobe de l'épistome) ..... *L. peuqueti*, r. *watsoni*, nov. stirps.

Liste des espèces du genre *Leptogenys*.

I. Subgen. LEPTOGENYS, sens strict., Roger.

1. *L. falcigera*, Roger.

Ceylan (Nietner). Roger a décrit l'espèce sur ce type de Ceylan. Dalla Torre indique Ceylan aussi comme une patrie de la *L. maxillosa*. Mais je ne sais d'où vient cette donnée qui me paraît sujette à caution.

2. *L. pruinosa*, nov. spec.

Ceylan (Yerbury). Voir tableau.

II. Subgen. LOBOPELTA, Mayr.

3. *L. crassicornis*, Emery.

Carin Chebá, 900 à 1100 mètres (Fea).

4. *L. dentilobis*, nov. spec.

Coonor (Daly); Kanara (Wroughton); Travancore (Ferguson); Thana (Gleadow). Voir le tableau.

♀. La tête est plus large que longue, plus large devant que derrière. Les mandibules n'ont, à part la pointe, que deux dents distantes au bord terminal. Thorax avec quelques grosses fossettes ou points épars, du reste lisse et luisant ainsi que l'écaille et l'abdomen. Médiocrement poilue. Brune, souvent mêlée de roussâtre. Derrière de l'abdomen plus clair. Pattes et antennes rougeâtres.

5. *L. ocellifera*, Roger.

= *L. distinguenda*, Emery, var. *andrei*, Emery.

Kanara (Aitken, Palliser, Wroughton, Bell); Poona (Wroughton); Pooree (Walsh); Raipur (Betham); Orissa (Taylor); Trevandrum (Ferguson); Ceylan (Yerbury, Simon); Calcutta (Rothney); Himalaya (Smythies); Travancore (Rothney, Ferguson); Belgaum et S. Konkan (Wroughton); Bangalore et Mysore (Rothney).

♂. L. 7.5 à 10 mill. Les mandibules étroites et terminées par une pointe très acérée, se touchent lorsqu'elles sont fermées. Tête rétrécie devant, élargie derrière. Les scapes atteignent les ocelles postérieurs. Antennes

longues. Le pronotum dépasse à peine le mésonotum qui n'a pas de sillons convergents. Face basale du métonotum fortement inclinée, légèrement concave vue de profil. Ecaïlle cunéiforme, ayant l'air d'un cône lorsqu'on la voit de profil. Ailes brunes, pubescentes, atteignent le 4<sup>me</sup> segment abdominal.

6. *L. birmana*, nov. spec.

=*L. distinguenda*, Emery, Ann. Mus. Civ. Genova, Vol. XXVII, 1889, p. 498, nec Emery, Ann. Mus. Civ. Genova, Vol. XXV, 1887, p. 430.

La tête est bien plus large, que chez la *L. ocellifera*, v. *distinguenda*, Emery, de Borneo et n'est pas rétrécie derrière. Les scapes sont bien plus courts dépassant à peine l'occiput. La tête est au moins aussi large que longue. Les yeux sont plus plats. Voir du reste le tableau.

M. Emery a reconnu que sa *L. distinguenda*, v. *andrei* était synonyme de l'*ocellifera* de Roger. Mais sa véritable *distinguenda* de Borneo ne diffère guère de l'*ocellifera* que par la couleur et ses antennes un peu plus grêles. Elle est par contre entièrement différente des types de Birmanie rapportés par Fea et que M. Emery a rapportés à sa *distinguenda*. Il faut donc faire de ces derniers une nouvelle espèce (*birmana*), dont nous avons indiqué les caractères. La *L. mutabilis*, Sm., est beaucoup plus petite (5·5 à 6·5 mill.), plus grêle, a le bord interne des mandibules denticulé, et le bord antérieur de l'épistome festonné.

La *L. birmana* a été trouvée à Assam (Long), et en Birmanie (Bingham et Watson); Ye Valley, Birmanie (Bingham); Bhamo, Palon, Carin, etc., Birmanie vers 1200 mètres (Fea).

7. *L. binghamii*, nov. spec.

Birmanie (Bingham).

♀. (Voir tableau). Mandibules densément et finement striées, sans dents, de largeur à peu près égale d'un bout à l'autre. Lobe de l'épistome triangulaire et caréné. Thorax assez robuste, presque pas échancré. Suture meso-métanotale presque nulle. Noeud du pédicule cubique arrondi, distinctement plus long que large, tronqué devant et derrière. Tête extrêmement mate, très densément, irrégulièrement, et assez grossièrement, rugueuse. Les rugosités sont plutôt transversales. Thorax mat, plutôt ridé strié (une ponctuation microscopique au fond). Face déclive du métonotum à grosses rides transversales. Pédicule grossièrement rugueux et mat. Premier segment de l'abdomen densément ridé en long, mat, avec de grosses fossettes espacées. Le reste de l'abdomen lisse et luisant, avec une ponctuation espacée assez abondante. Pilosité courte, fine, jaunâtre, assez abondante partout. Noire; antennes, pattes (sauf les hanches), mandibules et bord postérieur des segments abdominaux d'un brun roussâtre.

Cette espèce est fort remarquable.

8. *L. aspera*, André.

Annam (d'après, André).

9. *L. punctiventris*, Mayr.

Calcutta (Rothney).

10. *L. hysterica*, nov. spec.

Ceylan (Yerbury) ; Belgaum (Wroughton) ; Kanara (Wroughton).

♀. (Voir tableau). La tête est encore plus densément et plus finement réticulée que chez la *punctiventris*. Le thorax est très densément et finement réticulé ponctué avec des rugosités très irrégulières au lieu des gros points ronds, espacés de la *punctiventris*. Poilue. Brune, avec les pattes (sauf les hanches), les mandibules et les antennes rougeâtres. Extrémité de l'abdomen jaunâtre ou roussâtre.

11. *L. lucidula*, Emery.

Carin Chebà, 900 à 1100 mètres (Fea).

12. *L. roberti*, nov. spec.

Khasia Hills, Assam (Smythies).

♀. (Voir tableau). Les mandibules ont environ 5 petites dents sur leur bord terminal, jusque sur le bord interne. Yeux au tiers antérieur. Tête étroite, allongée, rectangulaire, à angles arrondis. Les scapes dépassent à peine le bord postérieur de la tête. Dos du thorax presque droit. Suture méso-métanotale obsolète. Ecaille fort arrondie en dessus, un peu moins épaisse et bien moins cubique que chez le groupe *diminuta*.

Médiocrement poilue. D'un noir ou d'un brun de poix ; abdomen souvent plus clair. Pattes, antennes, et mandibules, sauf le milieu des scapes, des hanches et des cuisses plus ou moins roussâtres.

*R. coonoorensis*, nov. st. Coonoor (M. Robert Wroughton, auquel je dédie l'espèce).

13. *L. dalyi*, nov. spec.

Coonoor (Daly, Wroughton) ; Kanara (Wroughton) ; Cochinchine (Ferguson).

♀. (Voir tableau). L'écaille est si peu épaisse au sommet, qu'elle sort presque du groupe 6 de notre tableau. Mais l'espèce n'a d'ailleurs aucune affinité avec le groupe 4, dont l'écaille est du reste encore bien plus mince. La tête est rectangulaire arrondie ; la face déclive du métanotum a une gouttière médiane, longitudinale. Suture méso-métanotale peu distincte. Très lisse et très luisante, mandibules assez faiblement striées. Pilosité, peu abondante, oblique sur les tibias et les scapes. D'un noir de poix. Funicules et tarsi roussâtres ; articulations et mandibules brunâtres.

14. *L. yerburyi*, nov. spec.

Ceylan (Yerbury) ; Kanara (Aitken) ; Travancore (Ferguson).

♀. (Voir tableau). La gouttière de la face déclive se prolonge plus ou moins nettement sur la face basale tout de son long. Tête rectangulaire, allongée. Suture méso-métanotale distincte. Moins lisse que la *dalyi*. Ecaille plus épaisse. Pilosité dressée assez abondante, aussi sur les pattes et les scapes qui sont en outre ponctués et pubescents. Couleur de la *dalyi*.

15. *L. kitteli*, Mayr.

(a). r. *L. kitteli*, i. sp.; Barrakpore (Rothney); Birmanie (Bingham); Assam (Smythies et Lindgren); Tenasserim (Fea); Himalaya (Schlagintweit).

(b). var. *minor*, nov. var.; Calcutta (Rothney). (Voir tableau.)

(c). r. *altisquamis*, nov. st.; Thaungyin Valley, Birmanie (Bingham). (Voir tableau.)

16. *L. diminuta*, Smith.

(a). r. *L. diminuta*, i. sp.; Coonoor (Daly, Wroughton); Darjeeling, Thana, Nilgiris (Wroughton); Moulmain, Birmanie (Hodgson); Orissa (Taylor); Assam (Smythies).

♀. Malgré le nombre considérable d'espèces de *Leptogenys* répandues dans le monde entier, c'est en vain qu'on a jusqu'ici cherché leur ♀. On dirait qu'elle n'existe pas, comme l'a supposé M. Emery, et que les ♂ la remplacent. Sur ma demande, M. Wroughton a ouvert très profondément une immense fourmière de *L. diminuta* et cherché en vain parmi des milliers et des milliers de ♀. Tout ce qu'il a pu découvrir a été une ♀, dont l'abdomen était assez considérablement distendu par les ovaires. Cette ♀ ne diffère du reste absolument en rien des autres, et son abdomen n'a rien même de fort extraordinaire. Ce résultat semble parler pour l'opinion d'Emery. Cependant des recherches ultérieures sont absolument nécessaires. Je rappelle que la ♀ du genre *Eciton*, femelle aveugle et aptère, est restée bien longtemps inconnue, et que ce n'est que cette année (1899) que je l'ai découverte dans le nid, avec les ♀, chez l'*E. carolinense*.

♂. L. 5 à 5.6 mill. Mandibules courtes, obtuses, fort loin de s'atteindre l'une l'autre. Scapes courts, guère plus de deux fois plus longs que larges. Tête arrondie. Ecaille plus atténuée et plus arrondie en haut que chez l'ouvrière, du reste de même type. D'un brun noirâtre. Ailes pubescentes, enfumées de brun, avec deux cellules cubitales une radiale fermée et une discoïdale. Tête et thorax irrégulièrement sculptés; écaille et abdomen lisses et luisants.

(b). Var. *L. laeviceps*, Smith; Dehra Dun (Smythies); Himalaya (Smythies); Poona (Wroughton); Sivaliks (Rogers); Palon, Birmanie (Fea).

♂. Identique à celui de la forme typique.

(c). *L. diminuto-laeviceps* (passages de la *diminuta*, i. sp. à la *laeviceps*); Poona (Wroughton); Orissa (Taylor).

(d). Var. *sarasinorum*, nov. var.; Ceylan (Yerbury et frères Sarasin). (Voir tableau.)

(e). Var. *opacinodis*, Emery; Thagatá, Tenasserim (Fea).

(f). r. *palliseri*, nov. stürps; Kanara (Palliser, Wroughton). (Voir tableau.)

♂. L. 6 à 6.3 mill. Scapes trois fois plus longs que larges. Lobe de l'épistome plus grand. Du reste comme la *diminuta*, i. sp.

(g). r. *L. striatula*, Emery ; Carin Ghècu, 1300 à 1400 mètres (Fea) ; Birmanie (Watson).

(h). r. *L. wood-masoni*, Forel ; Sibsagar, Assam (Wood-Mason). Malheureusement j'ai dû, en son temps, renvoyer le seul exemplaire de cette forme à l'Indian Museum de Calcutta, de sorte que je ne l'ai plus pour comparaison. En comparant la description aux formes voisines, je crois devoir en faire une race de la *diminuta* (provisoirement du moins) ; la forme suivante semble justifier cette opinion.

(i). r. *L. hodgsoni*, nov. stirps (voir tableau) ; Moulmain, Birmanie (Hodgson) ; Birmanie et Thaugyin Valley, Birmanie (Bingham).

17. *L. assamensis*, nov. spec.

Garò Hills, Assam (Long).

♀. (Voir tableau). Mandibules fort étroites, lisses et luisantes, avec quelques gros points allongés. Epistome un peu chagriné ; le reste très luisant et lisse. Médiocrement et finement poilue. Poils des scapes et des tibias obliques. Noire ; extrémité de l'abdomen jaunâtre. Scapes, mandibules et pattes brunes. Funicules, tarsi, articulations, extrémité des scapes et des mandibules rougeâtres.

18. *L. chinensis*, Mayr.

Poona, Belgaum (Wroughton) ; Orissa (Taylor) ; Thana (Gleadow) ; Calcutta Barrackpore, Madras, Travancore, Bangalore, Bombay (Rothney) ; Cochin, Travancore (Ferguson) ; Ceylan (Yerbury, Simon) ; Inde centrale (Betham) ; Kanara (Aitken) ; Mysore (Lee).

♂. L. 8.5 à 9.5 mill. Mandibules étroites, très minces, loin de s'atteindre l'une l'autre, obtuses au bout. Tête allongée et fortement rétrécie derrière les yeux ; la collerette articulaire forme son bord occipital. Elle est bien plus longue que large et a les bords parallèles devant les yeux. Les scapes assez longs, atteignent presque le bord occipital. Le mésonotum a deux sillons convergents ; il est dépassé devant par le pronotum. Métanotum allongé, à face déclive à peine distincte. Noeud analogue à celui de l'ouvrière, mais plus arrondi et un peu plus large. Reflet métallique à peine visible ici et là. Pattes et antennes longues. Corps étroit et allongé. Fort poilu. Très luisant et assez lisse. Noir ; pattes et scapes bruns ; funicules, mandibules, tarsi, articulations et extrémité de l'abdomen roussâtres. Ailes pubescentes, enfumées de brun, n'atteignant, fermées, que le 4<sup>me</sup> segment abdominal. Nervures et tache marginale brunâtres.

Des ♂ bien plus petits, d'environ 7 mill., aux ailes presque subhyalines, à peine pubescentes, à tête bien moins allongée, du reste fort semblables, provenant des mêmes parages, mais pris sans les ♀, se rapportent sans doute à quelque forme très voisine.

19. *L. minchinii*, nov. spec.

Calicut (Rothney) ; Barrackpore (Rothney) ; Burmah (Minchin). (Voir tableau.)

♂. L. 6 à 6.3 mill. Scapes n'atteignant pas les ocelles postérieurs. Tête moins allongée et plus rapidement rétrécie par une courbe derrière les yeux. Métanotum plus court que chez la *chinensis*, avec ses deux faces assez distinctes. Noeud du pédicule bien plus court, à peine plus long que haut, arrondi dessus. Ailes à peine teintées de jaunâtre, avec la tache et les nervures brunes. Côtés de la tête parallèles et assez longs devant les yeux.

Les ♂ isolés cités à propos de la *chinensis* ont le noeud assez allongé et les côtés de la tête très courts devant les yeux.

20. *L. peuqueti*, André.

Hué, Annam (Peuquet); Bhamo, Birmanie (Fea); Ceylan (Simon).

r. *Watsoni*, nov. stirps.; Birmanie supérieure (Watson). (Voir tableau.) Est-ce bien une race de la *Peuqueti*? Je n'ai pas voulu risquer une espèce sur un seul individu, dans ce groupe difficile.

9<sup>me</sup> Genre ODONTOPONERA, Mayr.

1 *O. transversa*, Smith.

= *O. denticulata*, Smith.

♀. Caractères du genre. L. 8.5 à 10 mill. Tête grande, avec de grosses stries divergentes; thorax avec de grosses stries transversales. Les stries sont très régulières et ont un aspect soyeux. Métanotum avec deux arêtes dentelées à sa face déclive. Ecaille mince, tranchante, profondément échancrée au sommet, avec des rides transversales. Abdomen ponctué. Poilue et pubescente. Noire; mandibules, antennes, pattes et pygidium bruns. Espèce robuste.

Myingin, Birmanie supérieure (Watson); Dehra Dun (Smythies); Himalaya (Smythies); Thaungyin Valley, Birmanie (Bingham); Assam (Smythies, Long, Lindgren); Siwaliks (Rogers); Moulmain, Birmanie (Hodgson); Minhla, Birmanie (Komotto). Birmanie partout, de la plaine à 1500 mètres (Fea); Siam (Sigg). Annam (Musée de Lyon).

10<sup>me</sup> Genre PLATYTHYREA, Mayr.

Tableau des ouvrières.

- Noeud armé derrière de deux fortes protubérances, échancré au milieu. Métanotum fortement bidenté. L. 6.5 à 6.9 mill. .... *Pl. sagei*, nov. spec.
- Noeud inerme, ou avec une apparence de trois festons. Beaucoup plus petites ..... 1
1. L. 3.5 mill. Portion médiane de l'épistome étroite, aussi longue que large, mal délimitée derrière; arêtes frontales étroites, ne recouvrant pas entièrement l'articulation des antennes. Au bord postérieur du noeud, on reconnaît trois légers festons ..... *Pl. wroughtonii*, nov. spec.
- L. 4.2 à 4.5 mill. Portion médiane de l'épistome large, plus large que longue, nettement délimitée derrière. Les arêtes frontales recouvrent entièrement l'articulation des antennes.

Vu d'en haut, le bord postérieur du noeud est arrondi, à peine avancé au milieu:..... *Pl. wroughtonii*, r. *victoriae*, nov. stirps.

Liste des espèces du genre *Platythyrea*.

1. *Pl. sagei*, nov. spec.

Dharmasala (Sage et Fulton); Belgaum (Wroughton).

♀. (Voir tableau). Mandibules larges, densément ridées et réticulées-punctuées, armées de 5 fortes dents et de 5 petites, situées entre les grosses. Epistome assez convexe, avancé devant en lobe subacuminé, assez nettement délimité derrière. Yeux gros, situés un peu en avant du milieu des côtés. Tête ovale-rectangulaire, à côtés très convexes, échancrée derrière, où elle est rétrécie, comme devant. Les scapes dépassent beaucoup l'occiput et les articles des funicules sont tous beaucoup plus longs que larges. Suture pro-mésonotale très forte; la place de la suture meso-métanotale obsolète est marquée par une dépression transversale du dos du thorax. Le métanotum a deux fortes dents obtuses, nullement lamelliformes; sa face déclive n'est pas bordée. Hanches postérieures sans dent. Le noeud du pédicule est long et étroit, plus d'une fois et demie plus long que large, subtronqué devant, tronqué derrière obliquement de telle façon que la surface tronquée est surplombée et dirigée d'en haut derrière en bas en avant. Il est fortement échancré au milieu de son bord postérieur avec une forte protubérance de chaque côté de l'échancrure. Abdomen court, pas ou à peine échancré après son premier segment. L'aire frontale est longue, étroite et distincte.

Tout l'insecte mat, densément et finement ponctué sauf l'abdomen qui est finement réticulé et subopaque ou assez luisant. Quelques points épars un peu plus gros à peine visibles sur la tête. Pilosité dressée nulle; une pubescence pruineuse pas très fine, roussâtre, abondante partout. D'un noir brunâtre. Hanches et cuisses brunes. Mandibules, antennes, tibias, tarsi et extrémité de l'abdomen roussâtres.

2. *Pl. wroughtonii*, nov. spec.

Travancore (Ferguson), Mysore (Léé).

♀. (Voir tableau). Mandibules très densément et presque microscopiquement réticulées ridées, à éclat un peu soyeux, finement denticulées à leur bord terminal. Epistome arrondi devant. Yeux situés en avant du milieu des côtés. La tête est allongée, rétrécie devant, du reste rectangulaire et échancrée derrière. Scapes atteignant à peine le bord occipital. Articles moyens du funicule bien plus larges que longs. Suture pro-mésonotale distincte. Suture méso-métanotale obsolète. Face déclive du métanotum bordée en dessus et de côté d'une petite arête qui forme de chaque côté un angle subdentiforme; cette surface est lisse et luisante. Le noeud du pédicule, un peu plus long que large, forme, à son bord supérieur, trois festons faibles, mais assez distincts. Abdomen fortement rétréci après le 1er segment.

Sculpture densément ponctuée et à peu près mate; sur la tête des points espacés plus gros, mais encore assez fins, irréguliers, distincts.

Pilosité nulle. Pubescence pruinuse extrêmement fine et jaunâtre.

Noire ; épistome brunâtre, ainsi que les arêtes frontales. Pattes, antennes, mandibules, et extrémité de l'abdomen roussâtres,

r. *Pl. victoriæ*, nov. stirps. Diffère par sa taille plus grande. Le bord postérieur du noeud montre bien une apparence de festons latéraux, mais ils sont repoussés sur les côtés, et ne se voient pas de dessus. Les articles moyens des funicules sont à peine plus larges que longs. L'arête du bord de la face déclive subopaque et finement réticulée ne forme pas d'angle subdentiforme ; elle est seulement plus grande de côté. Pubescence pruinuse un peu plus forte. Cuisses et hanches brunes. Voir du reste le tableau.

Bangalore et Barrackpore (Rothney). Inde septentrionale (Wroughton).

11<sup>me</sup> Genre ECTATOMMA, Smith.

Sous Genre *Stictoponera*, Mayr.

Tableau des ouvrières.

Second segment de l'abdomen proprement dit (après le pédicule)  
avec de fortes stries ou côtes longitudinales très-grossières.

L. 6.0 à 7 mill. .... 1

Second segment de l'abdomen lisse et luisant, avec quelques  
points épars. Plus petites ..... 2

1. Sculpture plus fine ; les fossettes en partie confluentes sur  
le thorax. Art. 5 à 8 des antennes un peu plus longs  
qu' épais. L. 6 à 6.4 mill ..... *E. coxale*, Rog.

Sculpture plus grossière, les fossettes du thorax non conflu-  
entes. Art. 5 à 8 des antennes plus épais que longs. L. 6.5 à  
7 mill. .... *E. costatum*, Em.

2. Yeux situés au milieu des côtés de la tête. Noeud du pédi-  
cule un peu plus large que long. Funicules assez épais ;  
leurs articles 3 à 5 plus larges que longs. L. 4.1 mill. ... *E. bin-*  
*ghamii*, nov. sp.

Yeux situés assez en arrière du milieu des côtés de la tête.

Noeud du pédicule aussi long que large, rétréci devant.

Funicules plus grêles ; leurs articles 3 à 5 un peu plus longs

que larges. Tête rougeâtre. L. 5.5 à 6.3 mill. .... *E. bicolor*, Em.

Tête d'un noir brun, sauf l'épistome. L. 4.7 mill. Métano-  
tum inerme..... *E. bicolor*, Em, var. *minor*, nov. var.

Liste des espèces du genre *Ectatomma* (*S. G. Stictoponera*.)

1. *E. costatum*, Emery.

Thagatà, Tenasserim (Fea). Se trouve en outre aux îles de la Sonde.

2. *E. coxale*, Rog. Ceylan (Nietner.)

3. *E. bicolor*, Emery.

*Ectatomma rugosum*, Smith, est une espèce douteuse.

(a) *bicolor*, i. sp, E. Emery ; Bhamó, Teinzo, Shegoo, en Birmanie (Fea) ;  
Meetan, Tenasserim (Fea), Assam, Cherrapunji et Khasia Hills (Smythies) ;

Hong Kong, Victoria Pit (Dr. Ris). Ces derniers exemplaires ont le vertex et l'occiput d'un brun noirâtre.

(b) Var. *minor*, nov. var. Non seulement sa petite taille et sa tête d'un noir brunâtre (rouge, comme le thorax, chez le type), mais le manque total de denticules au métanotum rend cette variété assez caractéristique.

Birmanie (Bingham).

4. *E. binghamii*, nov. spec.

Birmanie (Bingham).

♀. (Voir tableau). Diffère encore du *bicolor* par les caractères suivants. Sillon central de l'épistome court, mat au fond. Tête rétrécie derrière, moins profondément échancrée, ne formant pas deux cornes occipitales. La sculpture est moins grossière et forme sur la tête et le thorax de gros points très rapprochés, avec quelques rides, plutôt que des réticulations. Une portion lisse et luisante au milieu du pronotum (au milieu du mésonotum chez le *menadense*). Les angles antérieurs du pronotum sont droits et ne proéminent pas. Un petit denticule lamelliforme de chaque côté de la face déclive du métanotum. Les funicules plus épais et le noeud plus court et plus large du pédicule sont caractéristiques. Du reste forme et sculpture comme le *bicolor*.

Pilosité plus fine, du reste identique à celle du *bicolor*. D'un brun rougeâtre sombre; abdomen d'un brun de poix. Mandibules, antennes et pattes d'un brun roussâtre.

Peut être rapproché du *menadense*, Mayr, de Sumatra, mais plus petit, et avec les gros points du 1er segment de l'abdomen dessus et de côté (seulement de côté chez le *menadense*). Le *menadense* n'a pas non plus de dents au métanotum; il a la tête élargie derrière et la sculpture plus grossière.

12<sup>me</sup> Genre DIACAMMA, Mayr.

Tableau des ouvrières.

Pédicule fortement comprimé, à peu près tectiforme, beaucoup plus long que large. Premier segment de l'abdomen proprement dit sans stries. L. 14 à 16 mill. Tête, thorax et pédicule fortement et régulièrement striés; stries du pronotum transversales et circulaires. Epines de l'écaille très rapprochées et longues ..... *D. scalpratum*, Smith.

(a) Tout le corps avec un reflet métallique violacé ou pourpre ... var. *violaceum*, nov. var.

Pédicule beaucoup moins comprimé, non tectiforme, à stries exactement longitudinales (un peu obliques chez le *scalpratum*). Stries du pronotum longitudinales. Pas de stries sur le 1<sup>er</sup> segment de l'abdomen. L. 13 mill. *D. longitudinale*—Emery.  
Premier segment de l'abdomen avec de fortes stries, effacées devant chez le cyaniventre. Pédicule peu ou pas comprimé. 1

1. Noeud du pédicule un peu plus long que large, un peu comprimé latéralement, peu convexe, s'abaissant rapidement d'arrière en avant, muni de deux longues épines très écartées et divergentes qui continuent directement ses côtés. Pronotum strié longitudinalement. L. 11'5 à 12, 2 mill ..... *D. assamense*—Forel.  
 Noeud du pédicule plus large ou aussi large que long, nullement comprimé latéralement, plus ou moins convexe, avec deux épines beaucoup plus courtes, moins écartées, toujours dépassées latéralement par les côtés du bord postérieur du noeud. Longueur ne dépassant guère 11'5 mill. au plus ..... 2 *D. rugosum*—Le Guillou et races.
2. Premier segment de l'abdomen proprement dit luisant, avec un reflet bleu métallique, avec des rides superficielles qui s'accroissent seulement sur la partie postérieure ..... r. *D. cyaniventre*—André.  
 Premier segment de l'abdomen avec des stries longitudinales divergentes, entourées en avant de stries transverses arquées. Pubescence abondante; 2<sup>me</sup> segment de l'abdomen proprement dit strié en long, au moins sur le dos..... r. *D. ceylonense*—Emery.  
 Premier segment de l'abdomen avec de fortes stries arquées... 3
5. La sculpture du thorax, du pédicule et de l'abdomen consiste en rides plus irrégulières ou contournées, très grossières et rabotées. Les épines sont minces des leur base et forment un angle avec la surface dorsale du noeud. Pubescence abondante. L. 10 à 11'5 mill..... r. *D. rugosum*—i, sp. Le Guillou,  
 (a) Pubescence et pilosité entrêmement éparse, presque nulles. D'un beau noir. Tête assez luisante; thorax et abdomen plutôt mats. L. 10 mill ..... v. *rothneyi*—nov. var.  
 Sculpture régulièrement striée partout. Les épines, larges à la base et aiguës à l'extrémité, continuent directement le plan de la surface dorsale postérieure du noeud. Pubescence un peu moins abondante que chez le *rugosum* typique ..... 4
4. Stries du vertex plus faiblement convergentes en avant. Celle qui est tangente à l'oeil se rend en général à la fossette antennaire. Stature plus forte et plus robuste. L. 9½ à 11 mill. Pubescence plus faible, couleur plus noire, stries plus fortes, plus profondes que chez le *sculptum*. Second segment de l'abdomen lisse..... r. *D. geometricum*—Smith, var. *anceps*, Emery.

(a) Epines très courtes ; noeud large et court. L, 8.5 mill .....*D. geometricum*—Em., var. *brevispinum*, nov. var. L, 8.5 à 10 mill. Stries du vertex fortement convergentes ; celle qui est tangente à l'oeil rejoint l'arête frontale derrière la fossette antennaire. Stature grêle. Pubescence forte. Couleur bronzée plutôt claire. Stries moins profondes que chez le *geometricum*. Second segment de l'abdomen lisse .....r. *D. sculptum*—Jerdon.

(a) Sculpture plus forte. Des stries ou rides longitudinales sur le second segment de l'abdomen profondément dit .....var. *birmanum*—Emery.  
*Liste des espèces du genre Diacamma.*

1. *D. scalpratum*, Smith.

Sikkim (Musée de Munich) ; Assam (Long) ; Khasia Hills, Assam (Jewett) ; Assam (Ind. Museum) ; Thagatà, Tenasserim (Fea) ; Rangoon, Palon, Tikekee, Birmanie (Fea).

Var. *violaceum*, nov. var : Moulmein, Birmanie (Hodgson) ; Thaungyin Valley, Birmanie (Bingham).

2. *D. longitudinale*, Emery.

Cochinchine (Emery).

3. *D. assamense*, Forel.

= *D. tritschleri*, r. *assamense*, Forel.

Nissor, Assam (Smythies).

La faille beaucoup plus robuste, la tête bien moins allongée, plus large, à côtés plus convexes, surtout derrière les yeux, la pilosité et surtout la pubescence bien plus forte, jointes au noeud plus court et plus élevé ainsi qu'au pronotum strié grossièrement en long et non en travers m'engagent à élever cette forme au rang d'espèce, si dangereux que cela puisse paraître dans le genre *Diacamma*. Le 2me article du funicule est au moins deux fois plus long que le premier (1½ fois plus long seulement chez la *tritschleri*).

4. *D. rugosum*, Le Guillou.

La révision du genre *Diacamma* par Emery a produit une synonymie fort complexe, mais c'est avec raison que l'auteur réunit tant de formes comme races au *rugosum*. J'y ajoute encore le *cyaniventre* d'André.

(a) r. *D. cyaniventre*, André, Koimbetore près de Cochin (d'après André).

(b) r. *D. ceylonense*, Emery, (= *D. geometricum*, Roger, nec Smith), Ceylan (Nietner).

(c) r. *D. rugosum*, i. sp., Le Guillou (= *D. versicolor*, Smith = *D. geometricum*, r. *versicolor*, Emery).

Travancore (Ferguson) ; Ceylan (Simon, ma coll.) ; Cochin, Barrakpore, Bangalore (Rothney) ; Inde Centrale (Betham).

Var. *rothneyi*, nov. var., Cochin (Rothney).

(d) r. *D. geometricum*, Smith (= *javanum*, Emery).

La forme typique, venant des îles de la Sonde, n'a pas encore été prise en Inde; chez elle la strie tangente à l'œil va vraiment tout à fait en dehors de la fossette antennaire.

Var. *anceps*, Emery: Carin, Birmanie (Fea); Pic Victoria, Hong Kong.

(Dr. Ris).

Var. *brevissimum*, nov. var: Moulmain, Birmanie (Hodgson).

(e) r. *D. sculptum*, Jerdon (= *D. vagans*, Emery, Forel, nec Smith). Quoique la description de Jerdon ne permette pas de savoir s'il s'agissait de cette race ou de la *rugosum*, i. sp., qui toutes deux se trouvent dans les régions dont il décrit la faune, on peut, avec M. Emery, adjuger son nom à la forme la plus commune de l'Inde, qui est sans contredit celle-ci.

Ceylan (Yerbury); Kanara (Aitken, Wroughton, Bell); Calcutta, Calicut, Barrackpore, Bombay (Rothney); Orissa (Taylor); Assam (Smythies, Long); Pooree (Walsh); Birmanie (Bingham, Watson, etc.), Bangkok (Sigg).

♀. M. le Colonel Bingham, l'éminent hyménoptérologiste auquel nous sommes redevables de fournis si intéressantes, a capturé deux ♀ du *D. sculptum*, dont l'une s'est malheureusement perdue. Elles étaient ailées, un peu plus grandes que les ♀, et leur étaient très semblables. Nous ne pouvons donc plus douter de l'existence de ♀ ailées chez les *Diacamma*. Jusqu'ici la seule ♀, décrite par Smith, paraissait douteuse.

(a) var. *D. birmanum*, Emery. ♀ diffère de la forme typique par le 2<sup>me</sup> segment de l'abdomen proprement dit qui est strié.

Minhla, Birmanie (Comotto).

13<sup>me</sup> Genre BELONOPELTA, Mayr:

1. *Belonopelta amblyops*, Emery.

= *Trapeziopelta amblyops*, Emery.

Assam ♀ (Smythies); Ye Valley, Birmanie ♀ (Bingham); Bhamô, Palon, Carin Cheba, Birmanie (Fea); Singapore (Haviland).

♀. L. 6 mill., d'un jaune rougeâtre. Ponctuée; subopaque, abdomen luisant. L'épistome a un lobe en trapèze, plus court que celui des *Trapeziopelta*, mais analogue.

♀. L. 7 mill.; ailes teintées de jaune. Du reste comme l'ouvrière. M. Emery avait placé cette espèce dans le genre *Trapeziopelta*. Mais il est évident qu'elle ne diffère pas génériquement des *Belonopelta*. M. Emery ayant reçu la *Trapeziopelta maligna* qui est complètement différente, ce dernier genre doit être maintenu et seulement l'espèce *amblyops* rapportée au genre *Belonopelta*.

2. *B. darwini*, Forel.

Var. *indica*, nov. var. ♀. L. 4.5 à 4.6 mill. Une courte pointe au milieu de l'épistome. D'un jaune un peu rougeâtre. Densément ponctuée, mate; abdomen subopaque. Les yeux touchent presque le bord antérieur de la tête. Ne diffère de la *darwini* typique de Fort Darwin au N. Ouest de l'Australie

que par sa tête plus courte, presque carrée, légèrement rétrécie derrière. Chez la *B. darwini*, elle est plus rectangulaire, plus allongée, plutôt d'une idée rétrécie devant. Je ne puis trouver d'autre différence et ne puis en faire qu'une variété, malgré la différence de patrie.

Poona et Kanara, ♀ (Wroughton).

14<sup>me</sup> Genre ECTOMOMYRMEX. Mayr.

Tableau des ouvrières.

- Ecaille très épaisse, simplement tronquée devant et derrière, arrondie en haut. Epistome caréné et subacuminé au milieu de son bord antérieur. Tête réticulée-punctuée. Ecaille grossièrement rugueuse. Premier segment de l'abdomen fortement sculpté (strié et réticulé-punctué). L. 7 à 7·8 mill ..... *E. leeuwenhæki*, Forel.
- Ecaille, verticalement tronquée et horizontalement convexe devant, avec un bord presque tranchant et une surface postérieure courbée de haut en bas (comme chez *Pachycondyla*). Epistome échancré et fortement imprimé au milieu, devant. Tête striée ..... 1
- I L. 12·3 à 13 mill. Abdomen mat, très densément punctué ou réticulé-punctué ..... *E. sundaicus*, Mayr.
- L. 9 à 11 mill. Abdomen très luisant, faiblement pointillé..... *E. javanus*, Mayr.
- (a) Pronotum convexe, avec de faibles rides plus ou moins transversales. Mandibules avec environ 11 dents assez égales. Tête très large, à côtés très convexes ..... r. *E. javanus*, i. sp., Mayr.
- (b) Pronotum subdéprimé, avec des rides arquées, disposées concentriquement autour du milieu du bord postérieur. Mandibules avec environ 7 grosses dents et 4 ou 5 petites entre deux. Tête moins large, à côtés moins convexes ..... r. *E. maternus*, nov. stirps.
- L. 5 mill..... *E. annamitus*, André.

Liste des espèces du genre *Ectomomyrmex*.

1. *E. leeuwenhæki*, Forel.

Il est assez curieux que ni moi-même, ni aucun myrmécologiste n'ayons jusqu'ici remarqué que ma *Ponera:leeuwenhæki*, baptisée il y a 14 ans, est non pas une *Ponera*, mais un *Ectomomyrmex* pur sang !

Sibsagar, Assam (Wood-Mason) ; Assam (Smythies) ; Rangoon, Teinzó, Malewoon, Birmanie (Fea) ; Calicut et Cochin (Rothney).

2. *E. sundaicus*, Mayr.

Assam (Smythies) ; Plapoo, Tenasserim (Fea) ; Mte. Mooleyit ; Carin Cheba 900—1100 mètres ; Carin Ascini Ghecù 1400 à 1500 m. (Fea) ; Assam (Shillong).

3. *E. javanus*, Mayr.

Carin Chebà, Carin Ghecù, Carin Ascini Ghecù (Fea)—d'après M. Emery (est-ce la forme typique de Java ?).

r. *maternus*, nov. st. Nissor, Assam (Smythies); Khasia Hills, Assam (Smythies). (Voir tableau).

4. *E. annamitus*, André.

=*Ponera annamita*, André, Revue d'Entomologie, Février, 1892, p. 48.

Hué Annam (d'après André).

Je crois pouvoir rapporter cette espèce au genre *Ectomomyrmex*, en admettant qu'André n'a pas fait attention aux troncatures de la tête qui se voient chez la variété suivante, laquelle est un *Ectomomyrmex* pur. Sinon la var. *arcuatus* serait une espèce nouvelle.

Var. *arcuatus*, nov. var. ♀. L. 6.3 mill. Tête tronquée derrière et sur la moitié postérieure de ses côtés. Dos du thorax déprimé, formé presque dans son tiers antérieur (un peu moins) par le pronotum. Ecaille comme chez *l'annamitus* ♀. Face déclive du métanotum avec de belles stries arquées, concaves en haut, très régulières et fortes. Face postérieure de l'écaille striée de même, mais les stries sont convexes en haut. Le pourtour de l'écaille est transversalement ridé. Sa face antérieure est fortement striée; les stries sont arquées et convexes en haut, comme à la face postérieure. Tête et thorax, ainsi que les  $\frac{3}{4}$  antérieurs du 1er segment de l'abdomen densément réticulés-punctués et mats. Ailes légèrement teintées de brunâtre, à nervures et tache marginale brunes. Pilosité et pubescence courtes et roussâtres, médiocres, assez abondantes sur l'abdomen. Du reste comme l'ouvrière *annamitus*. Noire; avec les antennes, les mandibules, les pattes, et l'extrémité de l'abdomen roussâtres.

Calicut (Rothney).

Ce n'est pas sans certains doutes que je rattache cette forme comme variété à *l'annamitus*.

15<sup>me</sup> Genre PONERA, Latr.

Tableau des ouvrières.

- Suture méso-métanotale nulle ou obsolète; pédicule surmonté d'un noeud ou d'une écaille fort épaisse, plus ou moins nodiforme.....1. S. G. *Bothroponera*, Mayr.
- Suture méso-métanotale distincte. Pédicule surmonté d'une écaille .....6. S. G. *Ponera*, sens strict., Latr.
1. Aveugle. L. 2.6 mill. Mésonotum formant un enfoncement.  
Noeud du pédicule presque aussi épais que long. D'un rouge jaunâtre ou brunâtre. Assez luisante, ponctuée. *P. ceylonensis*, Mayr.  
Des yeux. Plus grandes..... 2
2. Les mandibules ont à leur côté externe un sillon qui part du devant de leur base et se dirige en dehors, obliquement vers leur extrémité ..... 3

- Mandibules sans sillon oblique à leur côté externe ..... 4
3. L. 6·5 à 7 mill. Pilosité éparsée. Plus densément ponctuée. Face déclive du métanotum en général plus nettement bordée. Noire ; mandibules, funicules et tarsi rougeâtres.  
*P. tesserinoda*, Mayr.
- L. 8 à 11·5 mill. Pilosité abondante. Moins densément ponctuée, abdomen plus luisant. Face déclive moins nettement bordée en général. Même couleur.....*P. sulcata*, Mayr.
- (a) L. Environ 8 mill. Caractères intermédiaires...  
 var. *P. sulcato-tesserinoda*, nov. var.
- (b) L. 10 mill. Moitié postérieure de la tête parsemée de grosses fossettes espacées fort distinctes (rares et effacées chez la forme typique et la *tesserinoda*). Sur le pronotum, des fossettes plus petites, moins nettes..... var. *fossulata*, nov. var.
4. L. 5 mill. Abdomen finement et densément ponctué, sans côtes élevées. Face déclive obliquement tronquée. Brunâtre ; pattes, antennes, mandibules, extrémité de l'abdomen et souvent la tête et même une partie du thorax rougeâtres. Ecaille très épaisse, tronquée devant et derrière.....  
*P. rubiginosa*, Emery.
- L. 13 à 15 mill. Rugueuses. Premier et second segments de l'abdomen proprement dit couverts de fortes côtes longitudinales, élevées et parallèles. L'écaille, très large, tronquée devant et derrière, a à sa face postérieure un fort rebord multispineux ou multidenté en haut. Entre ce rebord, la face postérieure concave est lisse et luisante, souvent avec un fort reflet bleuâtre ..... 5
5. Métanotum armé de deux fortes épines émoussées à l'extrémité, un peu lamelliformes..... *P. bispinosa*, Smith.  
 Métanotum inerme ; sa face déclive nettement bordée en haut et de côté..... *P. rufipes*, Jerdon.
6. L. 7 à 8 mill. Premier article du funicule plus court que le second. Mandibules très longues et très étroites, à bord terminal armé de 12 à 14 dents. Yeux relativement assez grands, plats. Métanotum subtectiforme, à face déclive élargie et obtusément bordée. Ecaille à bord tranchant, mais épaissie en bas, convexe devant, tronquée derrière. Abdomen sans rétrécissement. Pilosité dressée nulle. D'un noir brunâtre ; pattes, antennes, mandibules, et extrémité de l'abdomen roussâtres. Pruneuse .....*P. melanaria*, Emery.  
 Bien plus petites. Premier article du funicule plus long que le second. Mandibules plus courtes..... 7

7. Thorax fortement étranglé après le mésonotum. La face basale du métanotum subtectiforme est située beaucoup plus bas que le mésonotum et le pronotum. Yeux relativement grands, ayant au moins une quarantaine de facettes. Ecaille convexe devant et un peu concave derrière. Abdomen à peine rétréci après le 1er segment..... 8
- La face basale du métanotum n'est pas située plus bas que le mésonotum ; thorax non étranglé. Yeux petits ou très petits ..... 10
8. L. 5 à 5·5 mill. Tous les articles des funicules bien plus longs que larges ( $d' \frac{1}{3}$ ). Scapes dépassant l'occiput d' un quart de sa longueur. Luisante, noire. Yeux plus grands...*P. nigrita*, Emery. Plus petits. Les articles pénultièmes du funicule aussi larges ou plus larges que longs. Scapes ne dépassant pas beaucoup l'occiput ..... 9
9. L. 3·5 à 4 mill. Pronotum épaulé, et subdéprimé, large. Yeux encore grands, ayant environ 90 facettes. Scapes dépassant l'occiput de près d' un sixième de leur longueur. Articles pénultièmes des funicules aussi larges que longs. Face basale du métanotum aussi longue que la face déclive. Ponctuation plus dense et plus forte .....*P. luteipes*, Mayr.
- L. 3·0 à 3·2 mill. Pronotum convexe, ni épaulé, ni subdéprimé, plus étroit. Yeux bien plus petits, ayant une quarantaine de facettes. Scapes dépassant à peine un peu l'occiput. Tête à côtés un peu moins convexes. Articles pénultièmes des funicules un peu plus larges que longs. Face basale du métanotum un peu plus courte que la face déclive. Ponctuation plus faible; un peu plus luisante.....*P. jerdonii*—nov. spec.
10. L. 3 à 3·5 mill. Yeux plus grands que dans le groupe *coarctata*. Ecaille grande et fort mince. Carène de l'épistome bifurquée devant. Densément ponctuée. Brune ou d'un brun noirâtre, (d'après Mayr et Emery).....*P. truncata*, Smith. Pas plus de 3 mill. Ecaille plus épaisse. Yeux ayant au plus 5 ou 6 facettes ..... 11
11. Ecaille très épaisse, peu élevée. L. 2·2 à 2·5 mill. Face basale du métanotum large, presque carrée, passant par une courbe rapide à la face déclive qui est un peu plus courte. Les scapes sont loin d'atteindre le bord occipital. Les articles médians du funicule très transversaux, 2 à 3 fois plus larges que longs ; les quatre derniers forment une épaisse massue. Tête rectangulaire, fort allongée. Pronotum plus large que long ; mésonotum subdéprimé. D'un jaune un peu roussâtre. Une bande transversale

diffuse, souvent très indistincte, assez étroite, près du bord postérieur de chaque segment de l'abdomen.....*P. gleadowii*, Forel. Ecaille moins épaisse (un peu moins que chez la *punctatissima*).

L. 2.5 à 3 mill. Yeux de 5 à 6 facettes, un peu plus en arrière que chez la *punctatissima*, au cinquième ou au quart antérieur de la tête. Le scape atteint le bord occipital. Métanotum bien plus étroit que chez la *punctatissima*, presque subtectiforme, ou au moins à face basale fort étroite. Luisante, bien plus faiblement ponctuée que la *punctatissima*. Sculpture, forme du thorax et taille plus svelte comme chez la *trigona*, Mayr, mais la tête est bien plus rectangulaire, à côtés moins convexes, les scapes sont plus courts, et les mandibules moins longues. Ecaille et face basale du métanotum très luisantes; cette dernière assez bordée de côté et subtriangulaire. Finement pubescente. Presque pas de pilosité dressée. D'un roux ferrugineux, avec les pattes et les antennes testacées ... .. *P. confinis*, Rog., v. *aitkenii*—n. var.

(a) D'un brun de poix. Pattes, antennes, mandibules et extrémité de l'abdomen d'un jaune brunâtre. Face basale du métanotum plus convexe d'avant en arrière et un peu plus longue que chez la var. *aitkenii*..... *P. confinis*, Rog., v. *wroughtonii*—n. var.

Ecaille plus épaisse que chez la var. *aitkenii*. L. 3 mill. Métanotum plus large, comme chez la *punctatissima*. Densément ponctuée comme cette dernière; tête subopaque. Taille plus robuste, moins svelte. Yeux situés encore plus en arrière que chez la var. *aitkenii*, avec 5-6 facettes..... *P. confinis*, i. sp., Rog.

Liste des espèces du genre *Ponera*.

1er subgen. BOTHROPONERA, Mayr.

1. *P. ceylonensis*, Mayr.

Ceylon (Madarász).

2. *P. tesserinoda*, Mayr.

Kanara (Aitken et Wroughton); Pooree (Walsh); Orissa (Taylor); Calcutta, Madras, Calicut, Barrackpore, Bangalore, Bombay (Rothney); Bombay, Thana, Belgaum (Wroughton); Mysore (Lee); Cochin (Ferguson); Assam (Long); Dehra Dun (Smythies); Ceylan (Madarász).

♂. L. 5.8 à 6 mill. Tête un peu plus allongée et yeux un peu plus basale du que chez la *sulcata*. Pubescence moins forte. Plus luisant. Face petites métanotum un peu plus accentuée. Ailes à peine un peu teintées de jaunâtre. Le pronotum dépasse un peu le mésanotum devant. Silions convergents indistincts. Hypopygium non échancré. Du reste comme *sulcata*.

3. *P. sulcata*, Mayr.

Poona, Thana (Wroughton); Calcutta, Madras, Delhi (Rothney); Pooree (Walsh); Orissa (Taylor); Dehra Dun, Himalaya (Smythies); Inde centrale (Betham).

♂. L. 10 à 10·5 mill. Palpes maxillaires de 6, labiaux de 4 articles. Mandibules rudimentaires, rectangulaires, minces, plates, très loin de se rencontrer au milieu. Antennes longues; scapes très courts,  $1\frac{1}{2}$  fois plus longs que larges; 1er article du funicule plus large que long. Tête ovale, large; yeux et ocelles grands. Pronotum vertical, ne dépassant pas le mésonotum devant. Ce dernier avec deux sillons convergents. Pédicule surmonté d'une écaille haute, très épaisse, un peu plus large que longue, subtronquée devant et derrière, arrondie en haut. Abdomen allongé et étroit, rétréci après le 1er segment. Pygidium en longue pointe courbée. Hypopygium échancré à l'extrémité, presque en plaque. Valvules génitales extérieures arrondies, plutôt petites. Thorax assez robuste.

Tout le corps subopaque, finement ponctué. Ailes faiblement teintées de jaune. Pubescent.

(a) var. *sulcato-tesserinoda*, nov. var. : Madura et Calicut (Rothney).

(b) var. *fossulata* nov. var. : Madras (Rothney).

4. *P. rubiginosa*, Emery.

Poona (Wroughton); Birmanie, Moulmein (Fea.)

5. *P. bispinosa*, Smith.

Dehra Dun (Wood-Mason); Sibsagar, Assam (Wood-Mason); Bhamò Thigyaux, Metanja, Birmanie (Fea).

6. *P. rufipes*, Jerdon.

Thana (Wroughton); Siwaliks (Rogers); Singhboom, Bengale (Stebbing); Ceylan (Yerbury); Kanara (Aitken); Orissa (Taylor); Dehra Dun, Assam (Smythies); Thaungyin Valley, Birmanie (Bingham); Teinzò, Metanja, Palon, Malewoon, Carin Ghecù 1300-1400 mètres (Fea).

2me Sub-genus PONERA, sens. strict., Latr.

7. *P. melanaria*, Emery.

Kanara (Wroughton); Ceylon (Madarasz, Simon).

8. *P. nigrita*, Emery.

Darjeeling (Wroughton); Carin Chebá, Carin Ghecù 500-1,500 mètres (Fea).

9. *P. luteipes*, Mayr.

N.-W. Himalaya (Rogers); Dharmasala (Sage); Coonoor (Daly); Mussoorie, Barrackpore, Pachmarhi, Delhi, Bombay (Rothney); Kanara, Belgaum, Bombay (Wroughton); Dehra Dun, Assam (Smythies); Travancore, Cochin (Ferguson); Birmanie (Bingham et Hodgson); Travancore (Ingleby); Ceylan (Yerbury, Madarasz, Simon), Carin Ghecù, Carin Ascini Ghecù, 1300-1500 mètres; Thagatà, Tenasserim (Fea).

♂. L. 4 mill, environ. D'un testacé jaunâtre, sale. Mandibules très rudimentaires. Thorax assez fort et convexe; le mésonotum, sans sillons conver-

gents, n'est pas dépassé par le pronotum. Métanotum court, convexe. Ecaille mince et large. Abdomen non rétréci après le 1er segment. Le pygidium a une pointe assez courte et peu aiguë. Ailes longues, légèrement jaunâtres; nervures et tache marginale d'un jaune brunâtre. Assez glabre; subopaque; faiblement pubescent. Funicules bruns.

Pris avec les ♀ par le Dr. Ris à Hong Kong.

10. *P. jerdoni*, nov. spec.

Poona (Wroughton); Calcutta, Calicut, Barrackpore (Rothney); Assam (Smythies).

♀. (Voir tableau). Couleur noire de la *luteipes*; avec les funicules, les pattes, les mandibules et l'extrémité de l'abdomen roussâtres. Distincte par la forme du pronotum, sa petite taille et ses petits yeux.

11. *P. truncata*, Smith.

Carin Chebà, Carin Ghecù, Carin Ascinii Ghecù, 900 à 1500 mètres (Fea).

12. *P. gleadowii*, Forel.

Poona (Wroughton); Orissa (Taylor); Dehra Dun ♀ et ♂ (Gamble); Rangoon (Fea); Matale, Ceylan (Simon).

♀. (Voir tableau.)

♀. L. 2.2 mill. Les scapes atteignent presque l'occiput. Le dos du thorax est déprimé et formé devant par une partie du pronotum. Ecaille plus mince que chez l'ouvrière; du reste même conformation et même couleur. Ailes hyalines; nervures et tache pâle.

♂. L. 2.3 mill. Scapes très courts. Mandibules courtes et pointues, yeux assez gros, mais tout à fait en avant, touchant le bord antérieur de la tête. Derrière les yeux, la tête est à peu près semicirculaire. Pronotum dépassant un peu le mésonotum devant. Ecaille assez mince, à bord supérieur rectiligne. Pygidium sans pointe. Ailes comme chez la ♀. D'un jaune d'ocre pâle.

13. *P. confinis*, Roger.

(a) Var. *aitkenii*, nov. var.

Kanara ♀ (Aitken); Pooree ♀ (Walsh); Barrackpore ♀ (Rothney). ♀. (voir tableau).

♀. L. 3.5 mill. Le pronotum forme une bonne partie du dos du thorax. Absolument semblable à l'ouvrière, tête aussi luisante. Ailes légèrement brunâtres, avec les nervures et la tache plutôt pâles. Quoique prise isolée dans de toute autres provinces, je crois pouvoir rattacher cette ♀ à coup sûr à l'ouvrière.

(b) Var. *wroughtoni*, nov. var.; Kanara ♀ (Wroughton). Les yeux ont 6 à 7 facettes.

(c) Var. *confinis*, i. sp., Roger. Ceylon (Nietner); Kandy, Ceylan (Simon, Madarász).

Une petite ♀ de Kanara (Wroughton) me paraît se rattacher à cette forme, mais la tête est assez faiblement ponctuée.

Les espèces *processionalis*, *pumila*, *affinis* et *stenocheilos*, Jerdon, sont indéchiffrables, étant absolument insuffisamment décrites. Il en est de même des ♂ décrits par Smith sous les noms de *pallida*, *iridipennis* et *reticulata*. Cela peut être tout au monde.

16me. Genre CRYPTOPONE, Emery.

*C. testacea*, Motsch.

Nawalapitya, Ceylan (Simon).

♀. L. 2½ mill. Mandibules étroites, longues, sans bord terminal distinct, avec 5 dents. Aveugle. Epistome caréné, arqué, inerme. Arêtes frontales rapprochées. Antennes de 12 articles. Sutures du thorax distinctes. Pétiole inséré vers le tiers inférieur du 1er segment abdominal, nodiforme. Pattes courtes, épaisses.

Testacée, pubescente, subopaque, densément ponctuée.

17me Genre MYOPIAS, Roger.

*M. amblyops*, Roger.

Ceylan (coll. Roger).

♀. L. 4-4.5 mill. Ferrugineux, ou d'un brun rouge; scapes et pattes roussâtres. Luisante, poilue, fortement ponctuée. Arêtes frontales petites, assez épaisses et proéminentes.

Antennes de 12 articles. Yeux petits, près du bord antérieur de la tête qui est carrée. Ecaille épaisse, cubique-arrondie, séparée du 1er segment de l'abdomen. Abdomen tronqué devant, rétréci après le 1er segment. Crochets des tarsi simples.

5me TRIBU CERAPACHIL.

18me Genre SPHINCTOMYRMEX, Mayr.

Sous genre EUSPHINCTUS, Emery.

1. *S. furcatus*, Emery.

Palon, Birmanie (Fea).

♀. L. 6.5 à 7 mill. Ferrugineux foncé, luisant. Tête seulement légèrement plus longue que large. Pas d'yeux. Arêtes latérales de la tête fortement concaves en dedans, convergeant en arrière vers les arêtes frontales. Face déclive du métanotum bordée en haut et de côté d'une arête. Noeud du pédicule plus long que large. Pygidium concave dessus, bordé, bifurqué in l'extrémité. Antennes de 11 articles.

De grosses fossettes ombiliquées, espacées sur la tête. Des points épars moins gros, sur le reste du corps.

2. *S. taylori*, nov. spec.

Orissa (Taylor).

♀. L. 5 mill. Outre sa taille bien plus petite et plus étroite que celle du *furcatus*, il en diffère encore par les caractères suivants. Mandibules plus courtes, plus faiblement ponctuées. Tubercule latéral de l'épistome très comprimé de haut en bas. Arêtes latérales faiblement concaves en dedans,

presque parallèles aux arêtes frontales. Tête beaucoup plus longue que large, assez rectangulaire. Vers le milieu du côté de la tête, une très petite tache pigmentée, sans facette, marque la place des yeux. La face déclive du métanotum n'est bordée d'une arête que latéralement, vers le bas. En haut, elle passe à la face basale par une courbe rapide. Noeud du pédicule aussi large ou un peu plus large que long. L'extrémité du pygidium est bien moins profondément échancrée. D'un brun roussâtre uniforme et luisant.

Les antennes ont 11 articles, ce qui paraît être le seul caractère distinctif du *S. G. Eusphinctus*.

19me Genre SYSCIA, Roger.

*S. typhla*, Roger.

Ceylan (d'après Roger).

♀. Mandibules triangulaires. Ecaille épaisse, nodiforme, cubique arrondie. Pédicule inséré au milieu du 1er article de l'abdomen. Thorax sans sutures. Premier segment de l'abdomen tronqué, subexcavé.

L. 2.75 mill. D'un brun rougeâtre obscur. Antennes, mandibules et pattes d'un rouge testacé. Subopaque, densément ponctuée, poilue.

20me Genre OOCERÆA, Roger.

*O. fragosa*, Roger.

♀. L. 2.8 mill. Ferrugineuse—obscur, avec les pattes et les mandibules testacées. Mate; tête et thorax fortement ponctués; abdomen et noeud un peu plus finement ponctués. Poilue. Tête oblongue rectangulaire, déprimée. Pattes courtes. Yeux situés un peu en avant des côtés de la tête. Face déclive du métanotum bordée.

Ceylan (d'après Roger).

*O. caeca*, Mayr.

♀. L. 2.7 mill. Pas d'yeux. Tête plus fortement excavée derrière que chez l'*O. fragosa*. Du reste semblable.

Ceylan (Madarász.)

21me Genre LIOPONERA, Mayr.

*L. longitarsus*, Mayr.

Calcutta, Travancore (Rothney); Poona, Thana, Belgaum (Wroughton).

♀. L. 3.5 à 4 mill. Tête seulement un peu plus longue que large. Thorax, pédicule et premier segment de l'abdomen proprement dit rouges. Tête et reste de l'abdomen noirs. Mandibules, pattes et antennes d'un brun rougeâtre. Distinctement ponctuée. Premier article des tarses postérieurs (métatarse) aussi long que le tibia.

♂. Près de 4 mill. Très semblable à l'ouvrière. Mandibules triangulaires, larges. Yeux relativement petits et scapes relativement longs. Arêtes frontales comme chez l'ouvrière; de petites arêtes latérales entre les yeux et les fossettes antennaires. Tête plus ou moins carrée-arrondie, un peu rétrécie derrière. Pronotum dépassant un peu le mésanotum. Pas de sillons convergents. Face basale du métanotum bordée d'une arête, comme chez

l'ouvrière. Noeud du pédicule cubique-arrondi. Premier segment de l'abdomen proprement dit extrêmement étroit et resséré, carré-arrondi, formant même plus que chez l'ouvrière comme le 2<sup>me</sup> noeud d'un pédicule. Couleur comme chez l'ouvrière, de même que la longueur des tarse. Ailes subhyalines, avec les nervures très pâles et une grande tache marginale brune, arrondie. Pygidium sans pointe. Hypopygium profondément échancré en incision étroite et anguleuse.

La structure du ♂ des *Lioponera* et des autres formes de la tribu des *Cerapachii*, (*Acanthostichus* et *Cerapachys*, voir plus bas) est à mon avis une preuve anatomique décisive de ce que ce groupe se rattache aux *Ponerinae* et non aux *Dorylinae*. Chez ces derniers, le ♂ et la ♀ ont un pédicule uniaarticulé, de forme très caractéristique, des mandibules fort spéciales, etc., dont nous ne retrouvons rien ici. Le fait que les ♀ des *Enictus* et des *Eciton* ont deux articles très ressérés au pédicule n'a aucun effet corrélatif chez le ♂, ni chez la ♀. Chez les *Cerapachii*, nous voyons au contraire les particularités du 2<sup>me</sup> segment abdominal vrai qui fait le passage d'un 2<sup>m</sup> article de pédicule à un 1<sup>er</sup> article d'abdomen proprement dit, sans être ni l'un ni l'autre, se répéter chez le ♂, la ♀ et l'ouvrière également, avec une corrélation parfaite. J'en conclus que l'analogie des ♀ *Cerapachii* avec les ♀ *Dorylinae* n'est pas suffisante pour justifier une fusion. Il est fort probable que les *Dorylinae* sont dérivés du groupe *Cerapachyi* des *Ponerinae*. J'accorde ceci à M. Emery, qui me semble bien l'avoir démontré, mais je ne puis aller plus loin. Du reste les *Cerapachii* ♀ ont encore des yeux acettes ordinaires, tandis que les vrais *Dorylinae* ♀ ont à leur place des ocelles souvent de fort grande taille et entièrement différents des facettes atrophiées de divers *Ponerinae*. C'est encore un fait très caractéristique de ce singulier groupe.

*R. L. parva*, nov. stirps.

Calcutta (Rothney); Orissa (Taylor); Barrackpore, Madras (Rothney); Dehra Dun (Smythies); Poona (Wroughton); Belgaum (Wroughton).

♀. L. 2.4 à 2.6 mill. Tête sensiblement plus étroite et plus allongée que chez la forme typique. Les 3 derniers articles du funicule sont plus fortement renflés et aussi longs (ensemble) que le reste du funicule (plus courts et moins renflés chez la forme typique). Premier segment de l'abdomen proprement dit (2<sup>me</sup> du pédicule!) bien plus large et plus grand que le pédicule (seulement d'une idée plus large chez la forme typique).

D'un brun roussâtre; abdomen proprement dit, moins son 1<sup>er</sup> segment, noirâtre. Pattes, antennes et mandibules testacées. Ponctuation plus fine et plus espacée que chez la *longitarsus* typique. Les couleurs sont plus ternes et moins tranchées.

♂. L. 2.3 à 3 mill. Mêmes différences que chez l'ouvrière. Brunâtre, luisant. Abdomen proprement dit, moins son 1<sup>er</sup> segment, d'un brun foncé ou d'un brun noirâtre.

Les différences me paraissent d'une valeur et d'une constance assez relatives pour justifier une race.

22me Genre CERAPACHYS, Smith,

Tableau des ouvrières.

Tête et thorax lisses et luisants (à part les points épars).

Antennes de 12 articles ..... 1

Tête avec de grosses fossettes ou de grossières réticulations ... 2

1. Dernier article de l'antenne peu renflé, un peu moins long que les trois précédents réunis. L. 6·7 à 9 mill. Noeud du pédicule avec des rides ou stries longitudinales grossières. Face déclive du métanotum bordée latéralement seulement d'une arête distincte. Mandibules fortement striées. Abdomen lisse et luisant. Noir ; pattes, antennes et mandibules rougeâtres ; cuisses brunes. Extrémité et lisière postérieure des segments abdominaux roussâtres. Médiocrement poilu..... *C. sulcinodis*, Emery.

Dernier article de l'antenne renflé, notablement plus long que les trois précédents réunis. L. 5·8 mill. Face déclive du métanotum bordée sur tout son pourtour (donc en haut aussi) d'une arête distincte. Mandibules sans stries, faiblement chagrinées, avec quelques points. Plus poilu que le *sulcinodis* ; du reste tout-à-fait identique.....*C. risii*, Forel.

2. L. 6·8 à 7 mill. Entièrement luisant. Antennes de 11 articles. Tête, thorax, pédicule et 1er segment de l'abdomen luisants, couverts de grosses fossettes rondes, rapprochées, peu profondes, comme coupées à l'emporte pièce, çà et là réticulaires. D'un rouge un peu brunâtre ou jaunâtre. Abdomen, sauf le 1er segment, noirâtre, avec le bord des segments jaunâtre. Pattes et antennes d'un brun foncé. Tarses, front et vertex d'un brun rougeâtre. Pédicule cubique-arrondi. Face déclive du métanotum entièrement bordée d'une arête en demi-cercle. Pilosité assez abondante. Yeux vers le milieu des côtés.....*C. fossulatus*, Forel.

L. 4 à 4·7 mill. Tête subopaque ; le reste luisant, Antennes de 12 articles ; les articles 2 à 6 des funicules extrêmement courts et transversaux. Sculpture analogue au précédent, mais la tête est en partie plutôt réticulée-punctuée et subopaque, surtout devant. Sur le thorax et le 1er segment de l'abdomen au contraire, les grosses fossettes sont remplacées par une forte ponctuation espacée, ordinaire. Abdomen proprement dit, sauf le 1er segment, le front et vertex d'un noir brunâtre. Tout le reste rougeâtre ; extrémité de l'abdomen et le bord des segments

roussâtres. Pilosité fine, longue, jaunâtre et abondante

*C. aitkenii*, nov. spec.

Liste des espèces du genre *Cerapachys*.

1. *C. sulcinodis*, Emery.

Mte. Mooleyit, Tenasserim ; Carin Chebà, 900 à 1100 mètres (Fea).

2. *C. risii*, Forel.

Victoria Pic, Hong-Kong (Dr. Ris) ; Carin Chebà, 900 à 1000 mètres (Fea).

3. *C. fossulatus*, Forel.

Ceylan (Nietner, Musée de Berlin).

4. *C. aitkenii*, nov. spec.

Kanara ♀ (Aitken) ; Kanara ♀ ♂ (Bell).

(♀. Voir tableau.)

♂. L. 4.6 à 5 mill. Mandibules luisantes, lisses, triangulaires, à bord terminal tranchant, assez long, légèrement concave. Antennes de 13 articles, très semblables à celles de l'ouvrière. Comme chez elle, le funicule a à la base un article arrondi, assez épais, plus long que le 2me, et comme enchâssé dans les deux pans de l'articulation du scape. Les deux articles suivants sont aussi extrêmement courts et transversaux. Yeux médiocres. Tête, arêtes frontales, etc., conformées tout-à-fait comme chez l'ouvrière. Mésonotum peu convexe, un peu dépassé par le pronotum, sans sillons convergents. Face déclive du métonotum tronquée, bordée d'une arête, comme chez l'ouvrière. Pédicule comme chez l'ouvrière. Premier segment de l'abdomen proprement dit rétréci et étroit comme chez l'ouvrière, et au moins autant que chez elle, ressemblant à un 2me noeud de pédicule. Pygidium arrondi. Hypopygium profondément échancré, terminé de chaque côté par une longue épine, grêle dès sa base, et fort écartée de l'autre.

Fort luisant ; sculpture de l'ouvrière, mais bien plus faible ; de forts points espacés au lieu de fossettes. Abdomen à points épars. Pilosité comme chez l'ouvrière. Ailes plutôt courtes, hyalines, avec les nervures brunes, une grande tache marginale ovale d'un brun foncé et une seule cellule cubitale. Organes génitaux cachés.

Entièrement noir. Funicules, mandibules et tarsi brunâtres. Premier article des funicules et bord postérieur des segments abdominaux roussâtres.

Dans la 1ère partie de la description, j'ai donné les caractères génériques du ♂, autant que j'ai pu le faire.

DESCRIPTIONS OF TWO NEW LIZARDS FROM SELANGOR.

BY G. A. BOULENGER, F. R. S.

[With a Plate.]

(Read before the Bombay Natural History Society on 16th Jan., 1900.)

Among some Reptiles submitted to me by Mr. A. L. Butler, Curator of the Selangor Museum, Kuala Lumpur, I had the pleasure of finding examples of two undescribed Lizards, *viz.*, a Gecko and a Skink, which that gentleman has kindly handed over to me for publication. I have great satisfaction in connecting his name with one of the new species.

GEHYRA BUTLERI, n. sp.

Body elongate, limbs short. Head oviform; snout a little longer than the distance between the eye and the ear-opening, which is rather large and suboval; head covered with finely granular scales, which are larger on the snout; rostral twice as broad as deep, with a short median cleft above; nostril pierced between the rostral, the first upper labial, and two or three nasals, the upper of which is large and in contact with its fellow behind the rostral; 8 upper and 6 or 7 lower labials; two pairs of elongate chin-shields, the inner nearly twice as long as the symphysial. Scales uniformly granulate on the back, limbs, and throat, larger, flat, and imbricate on the belly. Digits with a rudiment of web, the basal part granulate beneath, the distal part strongly dilated, with curved or angular lamellæ, the two or three last of which are divided by a median groove; 5 lamellæ under the first toe, 7 under the fourth. Tail depressed, with angular, finely serrated lateral edge; a ventral series of enlarged scutes. Reddish-brown above, with whitish dots and three longitudinal series of dark brown spots; a dark brown streak on each side of the head, passing through the eye.

Total length 57 millim.; from snout to vent 32; head 9; width of head 5.5; fore limb 9; hind limb 11.

I have examined three specimens from Kuala Lumpur.

LYGOSOMA SURDUM, n. sp.

Section *Siaphos*. Body much elongate; limbs well developed, pentadactyle, widely separated when pressed against the body; the distance between the end of the snout and the fore limb is contained nearly twice in the distance between axilla and groin. Snout short, pointed; lower eyelid with an undivided semitransparent disk; nostril

pierced in the centre of a single nasal ; no supranasal ; frontonasal broadly in contact with the rostral and with the frontal ; præfrontals small ; frontal narrow ; a little longer than the frontoparietal, which is single ; parietals forming a suture behind the interparietal ; three pairs of nuchals ; fourth and fifth upper labials below the eye. Ear hidden under scales, indicated by a mere depression. 20 smooth scales round the body, the two dorsal rows largest. Præanals scarcely enlarged. The length of the hind limb equals the distance between the nostril and the fore limb. Fourth toe longest, with 15 lamellæ inferiorly. Uniform dark brown above, greyish beneath.

Total length 117 millim. ; from snout to vent 50 ; head 10, fore limb 10 ; hind limb 14.

Two specimens were obtained by Mr. Butler. The first in October, 1898, on the Sungsi Buloh River, among the roots of a large epiphytic plant ; the second in August, 1899, at Kuala Lumpur, under the dead fibre round a Palm tree.

#### EXPLANATION OF THE PLATE.

Fig. 1. *Gehyra butleri*, natural size.

- |     |                                        |   |                          |
|-----|----------------------------------------|---|--------------------------|
| 1a. | „                                      | „ | Upper view of head, × 3. |
| 1b. | „                                      | „ | Side view of head, × 3.  |
| 1c. | „                                      | „ | Chin, × 3.               |
| 1d. | „                                      | „ | Lower view of foot, × 6. |
| 2.  | <i>Lygosoma surdum</i> , natural size. |   |                          |
| 2a. | „                                      | „ | Upper view of head, × 3. |
| 2b. | „                                      | „ | Side view of head, × 3.  |



2b.



1b.



2.



1a.



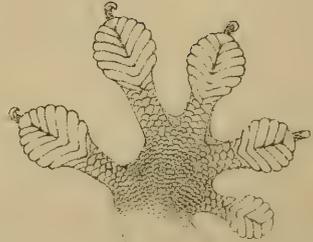
1.



2a.



1c.



1d.



DESCRIPTION OF A NEW LIZARD FROM THE BATU  
CAVES, SELANGOR.

BY G. A. BOULENGER, F. R. S.

(Read before the *Bombay Natural History Society* on 10th July, 1900.)

LYGOSOMA SCOTOPHILUM, n. sp.

Section *Hinulia*. Habit lacertiform ; the distance between the end of the snout and the fore limb not much less than that between axilla and groin. Snout moderate, obtusely pointed ; eye large ; lower eyelid scaly. Nostril pierced in a single nasal ; no supranasal ; rostral forming a broad suture with the frontonasal, which is broader than long ; præfrontals just meeting in the middle ; frontal very narrow behind, as long as frontoparietals and interparietal together, in contact with the first, second, and third supraoculars ; five supraoculars, first longest ; nine supraciliaries ; frontoparietals and interparietal distinct, subequal in size ; parietals forming a short suture behind the interparietal ; no nuchals ; fifth and sixth labials largest and below the eye. Ear-opening oval, tympanum feebly sunk, smaller than the eye-opening ; no auricular lobules. 30 smooth, scales round the body, dorsals largest. A pair of feebly enlarged præanals. Limbs slender ; hind limb reaching the shoulder ; digits long and slender, feebly compressed ; subdigital lamellæ smooth, 23 under the fourth toe. Dark brown above, with darker and lighter spots ; a dorso-lateral series of round whitish spots ; sides and limbs blackish, with small whitish spots ; lips white, spotted with black ; white beneath.

|                  |            |                      |                |
|------------------|------------|----------------------|----------------|
| Total length ... | 90 millim. | Fore limb...         | ... 14 millim. |
| Head ...         | 9 ,,       | Hind limb            | ... 20 ,,      |
| Width of head.   | 5 ,,       | Tail (reproduced)... | 54 ,,          |
| Body ...         | 27 ,,      |                      |                |

The unique specimen, caught by Mr. A. L. Butler under a limestone rock in the Batu Caves, is preserved in the Selangor Museum at Kuala Lumpur.

DESCRIPTION OF A NEW SNAKE FROM THE PERAK  
HILLS.

By G. A. BOULENGER, F. R. S.

(Read before the Bombay Natural History Society on 10th July, 1900.)

LYCODON BUTLERI, n. sp.

Closely allied to *L. fasciatus*, Anderson, but with a larger eye and more strongly angulate ventral and subcaudal shields. Body slightly compressed. Rostral twice as broad as deep, hardly visible from above; internasals three-fifths the length of the præfrontals; frontal a little longer than broad, as long as its distance from the end of the snout, shorter than the parietals; loreal more than twice as long as deep, bordering the eye below the single præocular; two postoculars; temporals 2 + 2; eight upper labials, third, fourth, and fifth entering the eye; five or six lower labials in contact with the anterior chin-shields, which are as long as the posterior. Scales in 17 rows, dorsals very feebly keeled. Ventrals 228, strongly angulate laterally; anal entire; subcaudals 88 pairs. Blackish-brown above and beneath, with 43 rather irregular annuli of whitish spots or light edges to the scales.

Total length 540 millim.; tail 115.

A single female specimen from the Perak hills, at an altitude of 5,000 feet. Preserved in the Selangor Museum, after whose Curator the species is named.

## SPORT AND NATURAL HISTORY IN NORTHERN GUJARAT.

BY CAPT. C. G. NURSE, 13TH BOMBAY INFANTRY.

DURING the past three years, with the exception of some eight months spent in the Panjab during the Tirah expedition, my head-quarters have been at Deesa, and it may, perhaps, interest others if I give a short account of the sport and natural history of this delightfully sunny spot. During the months of December, January and February only is the climate pleasant; in the hot weather, *i.e.*, from March to June, and again in October and November, one is baked, and during the rains one is boiled. But, hot as it is, I personally much prefer the dry heat, which rises sometimes during the hot weather to 120°, to the moist and enervating climate of Bombay. The life has some compensations. There is small game shooting of some kind or other during most of the year, the country round is admirable for riding, and there is big game shooting to be obtained within reasonable distance.

I will begin with the Mammalia. The only monkey we see in a wild state is the common Langur, and it is not nearly so numerous here as it is near Ahmedabad, where it is a perfect nuisance. The Lion has of course long ago disappeared from this neighbourhood; the last was, I believe, killed in 1878 near the village of Bhojen, about two miles from Deesa. The larger *Felidæ* have been more than usually numerous this year; the famine has driven all the animals, both wild and domesticated, towards the streams, there being no grazing elsewhere, and Tigers and Panthers have naturally followed them. Of the smaller *Felidæ*, the Jungle Cat (*Felis chaus*) is common. I have several times set a trap in the hope of getting the Indian Desert Cat (*Felis ornata*) but without success, as the specimens caught have always belonged to the former species. The Mongoose is, of course, abundant. I fancy there are two kinds, but I never killed one for identification.

The Wolf is common, and I have seen them within three miles of Cantonnments. Jackals of course swarm, and, thanks to a sporting Colonel of Native Cavalry, who imported several foxhounds and beagles, have shown us good sport. Two kinds of Foxes occur, one with a black tip to its tail (*Vulpes bengalensis*), and one with a white tip (*Vulpes leucopus*), and both have given good runs occasionally. The Otter is fairly common; I once saw a whole family at Malana tank, about 18 miles from Deesa; there were seven or eight altogether, and they jumped into the water one after the other, so I had a good view of them. The Indian Sloth Bear of course occurs in the wooded country towards Mount Abu. Hedgehogs are common, but I fancy they all belong to one species. I once caught a specimen, and wanted to identify it. He, however, refused to unroll, so I chloroformed him, and finding him to be the common *Erinaceus pictus*, gave him his freedom as soon as he got over the effects of the anæsthetic.

Mr. Wroughton's recent interesting paper on Bats in the Society's Journal makes me wish that I had paid some attention to these interesting mammals.

I only once tried to identify a specimen, which proved to be the common *Nycticorax kuhli*. Flying foxes are not usually numerous, but in October and November, 1898, there seemed to an extraordinary quantity about. I presume that some fruit must have attracted large numbers from elsewhere, as I have never seen so many anywhere as I saw then. The common Squirrel (*Sciurus palmarum*) is a perfect nuisance to anyone having a garden, as it does considerable damage by eating off young shoots. The article in the Fauna of India Series on this species seems to leave it doubtful whether it destroys birds' eggs or not. I have not the least doubt that it does so whenever it finds them unprotected, and on one occasion I purposely left an egg on the ground where it could be seen by a squirrel, with the result that it was sucked dry before my eyes in a few minutes. Rats and Mice are of course common enough, but I never tried to identify any of them. A *Gerbillus*, but whether *G. indicus* or *G. hurrianae* I am not sure, is extremely common. I often wonder how they fare in the present famine year, but they seem as numerous as ever.

The Porcupine is apparently common, but owing to its nocturnal habits, seldom seen. Hares are very numerous in some places; they all seem to belong to one species, the common *Lepus rusticaudatus*. On one occasion two guns shot twenty-five, besides other game, in a day's sport, but this was of course exceptional. Nilgai are extremely common and very tame, but are not allowed to be shot. During the past cold weather they have always seemed in good condition, although nearly all the cattle in the country have died of starvation. I have several times seen them feeding at night in jowari fields, notwithstanding the fact that the latter are fenced all round and generally watched day and night. This is probably the reason that they appear so fat and well, as there is little or nothing for them to eat in the jungle.

Black buck are scarce in the immediate vicinity of Deesa, but Chinkara are common enough, though somewhat wild. Sambar are numerous in the hills round Abu; I am told that many of them have died of famine during the past year, and the shooting, which had become more easy than usual, owing to the thinness of the jungles, has consequently been stopped. Chital I have not personally come across, but I believe that they are not uncommon in suitable localities near the foot of the hills. The "Mighty Boar" is not nearly so numerous as many of us could wish, and pigsticking, which once flourished in this neighbourhood, is at present at a somewhat low ebb.

As regards Birds, Butler's list in "Stray Feathers" of the avifauna of this neighbourhood is pretty exhaustive, and I made no attempt to add to it. Birds, in fact, appealed to me more as a sportsman than as a naturalist. Though I had heard of Bustard on several previous occasions, I did not come across them until the past cold weather, when I saw two and shot one. Houbara were also numerous this season, though they had hitherto been very scarce. I came across a shikari who was a perfect artist in driving both

these species in whatever direction he wished. Leading a camel, and walking in a circle, he would leave the guns behind any convenient bush, and then proceed till he got to the far side of the game. He would then begin to walk in a zigzag direction towards the guns, driving the birds, which would almost invariably fly overhead well within shot. I much preferred this way of shooting them to the usual method of shooting from the back of a camel. Florican are fairly numerous at the beginning of the rains. I always have some qualms of conscience about shooting both Florican and Rain Quail at this season, but one is glad of a change from inferior mutton and bazaar *murghi*, and I fear that it is with me as with many others a case of—

“Video meliora proboque, deteriora sequor.”

Of Sandgrouse we usually get only two kinds in the immediate vicinity of Deesa, *viz.*, the Common and the Painted. But during the past cold weather, the large Sandgrouse appeared in considerable numbers, and a good many were shot. Peafowl of course swarm, but are considered sacred. Jungle and Spur Fowl are pretty common at the foot of the hills. The Grey and Painted Partridge are both fairly abundant, and six kinds of Quail may be obtained, though, from the sportsman's point of view, only the Grey and Rain Quail are worth taking into consideration. The former appear in countless thousands in September; large numbers remain till the end of October, when most of them apparently go south; they reappear about the end of December, and from that time to the middle of March one can generally succeed in obtaining a fair bag. The Rain Quail appear from about the middle of June, and are plentiful enough till the end of July. After this time they are not so much *en evidence*, as the grass has become fairly high by the beginning of August, and they are thus able to breed unmolested, so far as their human enemies are concerned.

Deesa can scarcely be considered a good locality for Duck, as there is no large tank within fifteen miles. I have, however, seen or shot fifteen different kinds of Duck and Teal in the neighbourhood, chiefly during the past season. As regards Snipe, the best ground is some distance from Deesa, and here, two seasons ago, a sporting and popular doctor shot over a hundred couple to his own gun in a day. Such a day's sport is of course exceptional, but it shows what may be done under favourable circumstances.

A few Rails, which I have not taken the trouble to identify, complete the list of game birds.

The cold weather of 1899-1900 has, owing to the famine, been an abnormal one on this side of India. Most of the usual migratory birds have scarcely appeared at all, or have come in greatly diminished numbers, and birds of prey have consequently been much fewer than usual. I have not seen a dozen Grey Quail during the whole of the cold weather. Duck and Snipe, however, which in ordinary seasons are few and far between in the immediate neighbourhood of Deesa, have frequented

every likely and unlikely spot in the river Banas, although the latter is in most places only a few yards wide and a few inches deep. Demoiselle Crane, too, appeared in large flocks in October, flying up and down the river seeking food, but after about a month they disappeared, and I have not seen them since.

The non-migratory birds must have had a very poor time, and it appears marvellous that thousands of them have not perished of hunger. The struggle for existence during such a year as the present one must be terrible, and I often wonder how some species find any food at all. Except in Cantonments, and along the bed of the river, where there is a little cultivation, there is scarcely a green leaf or a blade of grass or corn for miles, and yet every morning shortly after sunrise, and every evening about sunset, enormous flocks of the common Rose-ringed Paroquet may be seen, leaving or returning to the trees where they pass the night. Where do they all obtain food? There are no wild fruits, and the little grain that is being cultivated with the help of irrigation is carefully watched and guarded.

Among the Reptiles, I need hardly say that the common "Mugger" (*Crocodylus palustris*) is fairly abundant. Of the *Chelonia* I have only come across *Testudo elegans*, which is very numerous during the rains in the grass bhirs. The commonest house Gecko appears to be *Hemidactylus leschenaulti*. On one occasion I saw one make a dash at a feather, which was blowing along the floor, mistaking it for an insect. Another time I was setting insects, and I accidentally dropped one on to the floor; before I could pick it up it was swallowed by a gecko. I then purposely dropped a small bee, with a short entomological pin through its thorax. This was also swallowed and the gecko seemed much astonished at the pin, and made several unsuccessful attempts to get rid of the insect. He probably had severe indigestion for some time afterwards.

Among the Lizards, a species of *Varanus* is common. The lowest caste natives eat its flesh, and make drumheads of its skin. The so-called "Blood-sucker," (*Calotes versicolor*), is extremely common, but I have scarcely ever seen one in the cold weather. I presume they hibernate in holes in the ground. The commonest Lizards are *Sitana pondiceriana* and *Charasia ornata*; the latter may generally be seen sitting outside its holes in the evenings during the hot weather.

Snakes are fairly numerous; the Cobra swarms in the grass bhirs in the rains. The Russell's Viper is common, and also *Echis carinata*. One of the most abundant snakes here is *Dipsas trigonata*, which, as Boulenger says, bears an extraordinary superficial resemblance to *Echis carinata*. I have frequently seen *Dipsas trigonata* curled up on the top of cactus hedges. The elegant *Psammophis leithii* is also common, as are two, if not three, species of *Zamenis*. The plebeian-looking *Eryx johnii* occurs, and I obtained

a specimen of some species of *Typhlops* from beneath some rubbish in my garden.

Frogs and Toads I have not attempted to identify, and the same may be said as regards the few species of Fish that are obtainable in the neighbourhood. We get Murrel and Mahseer occasionally, but they generally have a muddy taste, and the only local Fish which is, in my opinion, worth eating is a so-called "country whitebait," but I have not the least idea to what species this belongs.

About 50 species of Butterflies occur, chiefly in the rains. The most interesting are, perhaps, the various species of *Teracolus*, which is chiefly, if not exclusively, a desert genus. Some half a dozen species occur here, and some of them positively swarm during the rains. Moths are fairly numerous, but I have not yet attempted to identify those I collected, though I obtained a fair number.

One amusing incident I recall; one evening at the beginning of the rains several death's-head moths flew into the room, and settled on the ceiling. There were a great many geckos about, most of them with their abdomens considerably distended from the number of small insects they had consumed. A gecko, bolder than the rest, rushed up to one of the death's-head moths and seized it by a leg; another rushed up from the opposite side, and seized another leg. Then commenced a tug of war, which ended in the moth flying away, and both geckos falling on the floor. I could not see whether the moth got off without the loss of a leg or not.

When I first arrived at Deesa, I noticed that there seemed to be more *Hymenoptera* than any other order of insects, and though I had hitherto paid little or no attention to this branch of Entomology, I determined to collect and identify as many species as possible. Bingham's volume dealing with a portion of the *Hymenoptera* in the Fauna of India Series had just been published, and the author kindly assisted me when I was in doubt, and described in this Journal some new species obtained by me. Since then I have found the study of this order of absorbing interest, and have devoted a considerable part of my spare time to the collection and identification of specimens. Even in this barren locality I have succeeded in obtaining well over 150 species, not including Ants or *Hymenoptera parasitica*. A large proportion of these are apparently new species, and have yet to be described.

The parasitic *Hymenoptera* are not numerous, except the *Evanidæ*. This genus is supposed to be parasitic on *Blattidæ*, (Cockroaches, &c.), but I once bred a species of *Evania* from a larva of *Teracolus pleione* at Aden, so some of them are evidently parasitic on *Lepidoptera*.

I collected a fair number of *Diptera*, which I sent to England to be identified. One of the most interesting was the Horse Bot-fly, which I bred from larvæ passed by a horse. I do not yet know if it is the same species that occurs in Europe

Among the *Orthoptera* two species of Locusts are fairly common: a reddish and a yellowish kind. The latter sometimes arrives in small swarms at the beginning of the rains; but fortunately we have not had any large swarms in addition to our famine troubles. The so-called "milk-bush" (*Calotropis gigantea*), which is extremely abundant here, is frequently stripped quite bare by a species of locust, but this does not appear to be migratory, and so far as I am aware, does little or no damage to other plants.

White ants are only too numerous. Dragonflies are plentiful, and it has always been a puzzle to me where they can all come from in such a dry locality. They breed, of course, in water, and, though there is only one small stream here, and a few wells, yet at whatever time of the year I go into my garden, I can always see several species. Ant-lions are plentiful, and their pitfalls may be seen almost anywhere. I notice that the Cambridge Natural History states that "The imago is considered to be carnivorous." This I can confirm, as I have frequently seen a species of *Myrmeleon* common at Deesa catching small moths and beetles round a lamp at night.

Spiders do not seem to be very abundant, especially the larger kinds. The little red velvety species which appears at the beginning of the rains is one of the most striking. I have been told that a decoction of these is used by natives in Kathiawar, and possibly elsewhere, as an aphrodisiac.

In conclusion I may say that I have been able, thanks to a taste for Natural History to pass many a "Long, long, Indian day" without boredom, even in the hot weather. I hope, later on, when I have had an opportunity of comparing my *Hymenoptera* with those in the British Museum and other collections, to supplement this somewhat discursive paper by a more scientific one, in which the new species collected will be described.

NOTES ON *OPHIDIA* COLLECTED IN BURMA FROM MAY  
TO DECEMBER, 1899.

BY CAPT. F. WALL, I.M.S., and VET. CAPT. G. H. EVANS, A. V. D.

(Read before the Bombay Natural History Society on 10th July, 1900.)

The following is a list of the Ophidian Fauna collected by us in this Province, from 15th May to 31st December, 1899.

Following the methods of description used by Boulenger in his work on this subject, we venture to record only departures from his text, which we have observed in specimens that have come before us, in preference to writing full descriptions, which would necessitate useless repetition. It will be noticed that many of these departures represent peculiarities found in abnormal specimens. We append to these, various other matters of interest concerning habits, breeding, &c.

1. *Ablabes porphyraceus* :—One specimen, obtained from Tiddim in the North Chin Hills, Upper Burma.

Length—37 inches ; tail  $6\frac{1}{2}$  inches.

2. *Bungarus cæruleus* :—Two specimens, obtained from Insein, L.B.\*, and Monywa, U. B.†

Anterior Chin Shields :—Larger than posterior, and in contact with four labials (2).

Colour.—In one there are pure white cross bands, implicating two or three scales in the length of the snake. These bands are therefore much wider than in the usual Indian type, and this is without doubt the "*semi-fasciatus*" of Günther.

In the second the colour is widely different from any description we have seen, and is as follows :—

The snake is surrounded with broad uniformly light bands, in which the lateral margins of the scales are edged white, so that each band is streaked longitudinally black and white. The broadest streak is white and occupies about the middle third of the vertebral row. These light bands involve six to eight scales vertebally in the length of the snake, and increase towards the flanks, so as to join at the edges of the ventrals, thus enclosing large oval black islets. These oval spots or islets are eight to twelve scales broad vertebally. There are eleven light bands on the body, and two on the tail.

Belly—Uniform white.

Upper lips, and lore white.

Tail—Mottled slatish beneath.

The black colouring exhibits the usual cærulean blue on reflected light.

Since the beginning of this year, we have received two more specimens identical in colour to this second variety, one from the Southern Shan States, with fourteen light bands on body, and two on tail : and one from Meiktila,

\* Lower Burma.

† Upper Burma.

U. B.† with twelve light bands on body, and two on tail. We have examined and compared these very closely with the usual Indian type.

One noticeable feature is the early enlargement of the vertebral row, as compared with the common Indian type, and this is constant in all three specimens, where the breadth of the vertebrals exceeds the length in the eighth scale twice, and in the ninth scale once. On the other hand, reference to our only three Indian specimens shows that the 19th and 22nd vertebral in two partial specimens are not broader than long, and that the 29th is about the first scale broader than long in the third specimen.

The snake, at first sight, appears so entirely distinct, as to suggest a separate species, however, it accords so exactly in the arrangement, and size of its head and body scales with *B. caeruleus* that we do not think the one difference referred to above, sufficient to justify it being considered a new species, especially as we have so few specimens of the usual Indian type with which to compare it.

3. *Bungarus fasciatus*:—Nineteen specimens, obtained from Rangoon, Maulmein, and other Districts L.B.,\* also from U.B.†

Anterior Chin Shields—Contact with four lower labials (6). Three labials (13).

Subcaudals (30).

A very common snake, frequently haunting the dwellings and precincts of man. Burmans generally believe that its bite is not fatal, and we think credence may be permitted in this particular instance, owing to the distinctive coloration of the snake, whereby it could not be mistaken for anything else. Being as common as it is, it seems more than likely that people are bitten by it frequently; and were its effects fatal, the Burmans would have a very different conception of its danger.

It would appear to be of a pacific disposition, as one of us met with one whilst riding on a "maidan" in the district one evening by moonlight, and having no weapon at hand, called to his servants in the rear to bring a stick, and proceeded to "head" the creature, walking in a circle, and continually turning its direction, till a servant after some interval, at least five minutes, arrived, and it was despatched. The creature could have undoubtedly hastened away, by displaying very little more energy, but was content to move in a leisurely way to and fro, and even without offering menace, and we can recall other instances where under considerable provocation, this species has failed to menace. We have only had two specimens over four feet long.

4. *Callophis maculiceps*:—Two specimens, obtained in Rangoon.

Frontal—greater than distance to end of snout (1).

Ventrals—201.

Colour—Subcaudals are jet black, or grey, with no special arrangement of the two colours, belly coral-pink during life.

\* Lower Burma.

† Upper Burma.

5. *Cerberus rhyncops*:—Nine specimens, obtained in the Rangoon river and neighbouring creeks, and the Hlaing river.

Labials—11 R and L (1), 11 R (1), 11 L (1), 12 R (1). 5th. touches the eye, R(1).

Ingesta—one caught swallowing an eel.

Much the commonest *Homalopsid* about here.

6. *Chrysopelea ornata*:—Eleven specimens, obtained from Rangoon, and Districts of L. B.,\* and Mandalay, U.B.†

Frontal—equals distance to end of snout (6), greater (2).

Labials—nine, with the 5th and 6th touching the eye (7).

Temporals—1+2 L (1).

Ventrals—The last is invariably bifid like the anal.

Subcaudals—100.

Scales—At first sight, the black median line on the scale conveys the idea of keels being present; but a more careful scrutiny shows this keeling to be indistinct, in fact it is a difficult matter in some specimens to decide whether keels are present or not. We, however, decided that keels were present in seven out of eight specimens specially examined.

Colour—All our specimens correspond to type B, except two, in which orange vertebral spots were fairly distinct (type C). In adult specimens, there is often a tendency for the black and gold to distribute themselves in such a way as to form alternate transverse bars, but these are very indistinct. In the young, however, there are very distinct alternate bars in the entire length, the black are broader than the golden, and the golden vary so that each alternate one is slightly thicker, and more distinct.

It has been captured several time on trellis work round tennis courts, and in verandahs, and sometimes in the grass. We have seen one perched on a thick naked limb of a tree, about thirty or forty feet from the ground, which rose almost perpendicularly. Here it lay apparently watching some prey, with its head downwards, and its body thrown into a broad S, whereby it obtained a remarkable grasp on the trunk.

Ingesta—gecko (1).

7. *Coluber radiatus*:—Seven specimens, obtained in Rangoon, and Districts L. B.,\* and Myingyan U.B.†

Length 5' 2".

Temporals—1 + 3 R (1), 2 + 3 L (2), 2 + 4 R (1).

Ventrals—246.

Subcaudals—51 to 106.

Ingesta—A full grown rat (1).

Ova, one killed on 15th July, 1899, contained nine eggs with no trace of embryo.

8. *Cylindrophis rufus*:—One specimen, obtained from Wuntho, U.B. †

9. *Dendrophis pictus*:—Three specimens, obtained in Rangoon, and Districts of L. B.\*

\* Lower Burma.

† Upper Burma.

Length—4' 3".

Internasal suture—less than præfrontal suture, (3)

Frontal—greater than distance to end of snout, (3).

Temporals—2+3. R. and L. (1).

Labials—8, with the 4th and 5th touching the eye, R. (1).

It is not nearly the common snake here that it is in parts of Southern India, (*i.e.* Trichinopoly).

10. *Dipsas cyanea*:—One specimen, obtained from Insein, Rangoon District. Already recorded in this Society's Journal, on page 188 (No. 1) of this Volume (XIII).

11. *Dipsas hexagonotus*:—One specimen obtained in Rangoon.

Ingesta—A large lizard, probably *Calotes mystaceus*.

12. *Dipsas multimaculata*:—Sixteen specimens, obtained from Rangoon, and Districts, L. B.\*

Length—3' 3¼", tail 8¾".

Frontal—less than distance to end of snout (2).

Antoculars—2 L. (1).

Postoculars—3 R. and L. (1).

Temporals—1+3 R. (1). 1+2 L. (1).

Labials—9, with 3rd, 4th and 5th, touching the eye, R. and L. (1); 9 with 4th, 5th and 6th touching the eye L. (1).

Anterior chin shields—contact with three labials (1); 5 labials (7), 6 labials (3).

Ventrals—256.

Subcaudals—109.

Ingesta—Lizards (3), all appeared to be *Calotes mystaceus*.

One of the commonest snakes we have in Rangoon, frequenting the compounds in Cantonments. Sometimes it climbs the trellis work in verandahs, at least on one occasion with a view to facilitating the sloughing process, since the cast slough was found wound in and out of the fenestrations. We have known it come into the house, upper and ground floors, and stables.

13. *Distira cyanocincta*:—Two specimens, obtained from Myaungmya L. B., about fifty miles from the sea; and Watiya, Hlaing river, forty miles from the sea.

14. *Distira lapemidoides*:—Three specimens, obtained from Watiya, forty miles from the sea, and Rangoon river, twenty miles from the sea.

15. *Dryophis frontocinctus*:—Eight specimens, obtained from Watiya, L. B.\* and Rangoon river and creeks.

Frontal—less than distance to end of snout (2); greater (2); less than parietals (4).

Labials—usually eight, with the 6th only touching the eye, frequently seven, with the 5th only touching the eye.

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\* Lower Burma.

Chin shields—usually three pairs, the middle and posterior are often confluent, on one or both sides ; anterior in contact with five lower labials (1).

Ventrals—181 to 196.

*Ova*—One killed between 24th and 28th November, contained seven eggs, varying from  $\frac{1}{2}$ " to  $\frac{3}{4}$ " in length, and with no trace of embryo.

For most of our specimens, we are indebted to Mr. Lidderdale, who took much trouble on our behalf. Living on the river, and having many coolies under his supervision, he organized beats with a view to driving these creatures from the bushes bordering the river bank, but found that they usually escaped into the water when flushed, and got away. Subsequent beats however undertaken at very low tide, caused the creatures when making a bid for the water, to throw themselves into the soft mud, which so hampered their movements, as to permit of their easy capture.

16. *Dryophis mycterizans* :—Two specimens, obtained in Rangoon, and Toungoo, L. B. \*

Frontal—less than distance to rostral, (2).

Loreal—one R. and L. (1).

Ventrals—201.

Subcaudals—92.

Not nearly the common snake about Rangoon that it is in many parts of India.

17. *Enhydrina valakadien* :—One specimen, obtained from Watiya on the Hlaing river, forty miles from the sea.

Temporals—anterior 2 R. and L. (1). (Four labials are large, the fifth very small with a scale above it, which does not touch the parietal, and we therefore regard it as a lower temporal).

Ventrals—270.

18. *Fordonia leucobalia* :—Four specimens, obtained from Watiya, Hlaing river.

Postoculars—one (L). (1).

Temporals—2+3 L. (1).

19. *Hipistes hydrinus* :—three specimens obtained from Watiya, Hlaing river.

Anterior chin shields—contact with six lower labials, L. (1).

Scales—43 rows (1).

Ventrals—168.

Subcaudals—21.

Colour—alternate yellow and black dorsal bars of equal width extending to tail, 36 on body (3), 5 to 7 tail. Flanks and belly uniform dull buff. Head uniform greyish, with small punctiform spots on temporals, and parietals, and for some way behind these. The colours on the back are bright, and scales glazed liked enamel.

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\* Lower Burma.

The scales are peculiar in that the interstitial skin is visible for a considerable interval between the apex of one scale and the base of the next in the same series, and these intervals being depressed, produce a honey-combed effect most marked in the flanks.

Two specimens obtained in September were discovered to be pregnant, one containing four, and the other three embryos apparently perfect. Each embryo by two kinks was folded into three, the folds being firmly compressed upon one another, and a scanty dryish *smegma* (spirit specimens) partially covered them, more abundant in the folds.

Of four measured, two taped 6", and two 5 $\frac{1}{2}$ ".

They differed from the parents in lacking the wonderful glazing of scales, and in having the canary bars replaced by buff.

20. *Homalopsis buccata*:—One specimen obtained from Rangoon river.  
Loreals—3 R.

Labials—14 R., sixth just touching the eye.

Subcaudals—65.

21. *Hypsirkina enhydris*:—Two specimens obtained from Hmawbi, L. B.\*  
Frontal—greater than distance to end of snout (1).

Antoculars—2 R. (1).

Temporals—2+2 L. (1).

Labials—seven, 4th touching the eye L. (1).

Anterior chin shields—in contact with three labials R. and L. (2).

These were discovered "in copulâ" on the 16th November, and unfortunately killed. They were in swampy ground, some distance (about a quarter mile) from a creek, and three miles from the Hlaing river, (tidal).

22. *Hydrophis spiralis*:—Two specimens, obtained from Myaungmya river, L. B.\* about fifty miles from the sea.

23. *Lycodon aulicus*:—seventeen specimens, obtained in Rangoon, and Districts, L. B.,\* and Magwe, U. B.†

Temporals—2+4 R.(1), 2+4 L. (1).

Ventrals—181.

Subcaudals—53.

Ingesta—mouse (2), gecko tail (1). It would appear that in the latter case, the quarry had escaped, leaving its tail in possession of its would-be captor.

As common in this locality as it is in India.

Ova—One killed on the 20th December was found to contain five eggs, with opaque contents, and no trace of embryo.

24. *Naia bungarus*:—One specimen, obtained from a juggler, said to have been caught in this Province.

25. *Naia tripudians*:—(*monocellus*)—eleven specimens, obtained from Rangoon, and Districts, L. B.\*

\* Lower Burma.

† Upper Burma.

Three of these were dug out of the same hole, where one had been seen to take refuge on the 8th July. Two of them were males, and one a female with her ovarian follicles enlarged to a length of about  $\frac{1}{2}$ ".

One, containing twelve eggs with no trace of embryo, was killed on the 5th August.

26. *Naia tripudians (binocellus)*:—One specimen obtained in Myaungmya, L. B.\*

The Cobra is not nearly such a common snake here (Rangoon) as we have known it in India, especially in the south; and most of the specimens we get are of the monocellate variety: still in certain localities, such as on the Sittang plains, cobras are extremely common, one of us having on two or three occasions, killed as many as five in a day.

27. *Psammodynastes pulverulentus*:—One specimen, obtained from Wumbezat, L. B.\*

Temporals—2 + 4 R and L.

28. *Python molurus*:—One specimen, obtained from Pyinbongyi, L. B.\*

Antoculars—3 L.

Ventrals—269.

Lower labials—19 R. 20 L.

We have already published notes concerning this species, in the Society's Journal, on page 190 (No. 1) of this Volume (XIII).

29. *Simotes cruentatus*:—ten specimens, Rangoon, and districts, L. B.\*

Frontal—greater than distance to end of snout, (6).

Anterior chin shields—in contact with five labials, (5).

Ventrals—171.

Subcaudals—27 (1); less than 30 (6).

Colour—Olive-brown above, with four dark linear longitudinal lines. The two median are separated by three rows of scales, and extend to end of tail. The lateral run two and a half rows above the ventrals, and end at the vent. In a well-marked specimen, there is a dark transverse band before the eyes continued below them as a subocular streak, a dark collar incomplete below, which throws forward a median process to the frontal and a lateral obliquely to the parietals. In many specimens these marks are indistinct, or modified to a mottling. Belly canary-yellow in life, with large black squarish spots often confluent behind, where they are more numerous. A post-anal black mark 3-4 subcaudals wide, and often another black band at or near tip, these two sometimes connected laterally by a black line; subcaudals otherwise yew-berry crimson, or sealing-wax red. Anal often tinged the same colour.

On two occasions we have been present when this snake was flushed, and the degree of "animus" it displayed in trying to avoid capture was remarkable, and for so small a snake almost laughable. One, however, in

\* Lower Burma.

spite of its few inches, succeeded in scaring a party of Burmans, whose womankind seized their children and fled, the men declaring from its vehemence, that it must be a young cobra. On the other hand, one we had sent into us, alive, and apparently unhurt, when loosed behaved with great timidity, hiding its head beneath its coils, and refusing to strike or menace on the greatest provocation. This had however been imprisoned in a bottle for some hours previously.

30. *Simotes cyclurus*:—thirteen specimens, obtained from Rangoon, and Districts, L. B.\*

Post-nasals—divided into two superposed scales, R. (2); L. (1).

Frontal—greater than distance to end of snout, (8).

Antoculars—one R. and L. (1), (*i.e.*, the subocular of Boulenger is absent.)

Temporals—1+1 (3), 1+2 (5).

Labials—seven with 3rd, and 4th touching the eye L. (1).

Anterior chin shields—in contact with five labials R. and L. (1).

Subcaudals—34 (2).

Colour—Very variable, from light cocoatina to dark café-au-lait, and at least two specimens were exactly the colour of a boiled shrimp; others the dusky variety of shrimp.

31. *Simotes theobaldi*:—One specimen, obtained from Myingyan, U. B. †

Ventrals—167.

Subcaudals—40.

32. *Simotes violaceus*:—Four specimens, from Rangoon, and Districts, and Arakan Hills, 4,000 feet, L. B.\*

Frontal—greater than distance to end of snout, (4).

Antoculars—1 R and L (1), (*i.e.*, the subocular of Boulenger is absent), 3 L (1).

Temporals—2+2, R and L (2).

Labials—Seven, with 3rd and 4th, touching the eye R and L (1). This last feature has been already recorded in the Society's Journal, Vol. XII, No. 4, page 766.

33. *Trimeresurus gramineus*:—Ten specimens, obtained from Rangoon, and Districts, L. B.\*

Temporals with modified keels, *i.e.*, tectiform; or shaped like the carapace of a tortoise (8) not recorded (2).

Subcaudals—44.

Length—3' 8"; tail 6½".

We have seen this species strike, and its method is remarkable. It fixes itself by its caudal extremity firmly to a branch, leaving most of its body free, which it suddenly throws forward in its endeavour to reach an offending agent. This failing, by some extraordinary muscular power it is able to sustain itself without support in a more or less horizontal position; the body

\* Lower Burma.

† Upper Burma.

is thrown into an S. shape, thereby causing a retraction of the head, and the creature poises so, preparatory to another lunge forward.

We have known two cases of bites, both of which recovered after much local pain, and swelling, and some constitutional disturbance.

Its favourite haunt is undoubtedly bamboo, with which its colour harmonises so perfectly as almost to defy detection. It is not uncommon in the bamboo hedges surrounding gardens in Cantonments. One was killed on a beam in a native hut, having swallowed a small rat.

34. *Tropidonotus stolatus*:—Twenty-three specimens, obtained from Rangoon, and Districts L. B.\*

Frontal.—Less than parietals (18), no record (5).

Loreals.—Two superposed, R and L (1).

Postoculars.—4 R (5), 4 L (2).

Temporals.—1+3 R and L (1), 1+3 L (1).

Labials.—Seven, with 3rd and 4th, touching the eye, L (2); eight, with 4th and 5th, touching the eye R (2).

Subcaudals.—86.

Ingesta.—Small frogs (2).

Ova.—July 7th, one killed contained seven eggs.

August 11th, one in captivity laid nine eggs, one of which hatched on 10th, September, six others on 11th September, the remaining two did not hatch.

October 8th, one killed contained six eggs.

November 22nd, two eggs found in grass in the compound, and kept, hatched out.

Measurement.— $\frac{3.5}{45}'' \times \frac{2}{30}''$ , rent made by one  $\frac{1}{35}''$ .

Hatchlings measured from  $5\frac{1}{2}''$  to  $6\frac{3}{4}''$ .

As common here as it is elsewhere in India. It not infrequently haunts the dark and damp recesses about flowerpots in verandahs, and porches, where it meets with the food it fancies in abundance. From here it sometimes finds its way into the bungalow. It is a very active little snake, and when flushed, vigorous and hasty in its attempts at escape.

35. *Tropidonotus subminiatus*:—Three specimens, obtained from Rangoon.

Temporals.—1 + 2 R. (1).

Labials.—Nine, with 4th, 5th and 6th touching the eye L. (1).

36. *Tropidonotus punctulatus*:—One specimen, obtained from Watiya, L. B.\*

Temporals.—1 + 2 R. (1).

37. *Tropidonotus piscator*:—Thirty-six specimens, obtained in Rangoon, and Districts, L. B.\*

Labials.—Eight, with 3rd and 4th touching the eye R. (1); nine with 4th only touching the eye R. and L. (2), R. (1).

As common here as it is elsewhere in India.

\* Lower Burma.

We recognize three colour varieties :—

- (a) Olive-brown with large sub-equal quincuncial spots in six rows, (the median two often confluent) all equally distinct and continued on to tail, diminishing from before backwards. Ventrals uniform white or with faint, or distinct, black transverse streaks. A black chevron collar, or not.
- (b) Olive-brown, with one or two lateral rows of black spots, large and distinct in neck, and anterior part of body, becoming indistinct or lost, ventrals with black transverse streaks, or not.
- (c) Olive-brown, with black spots as in (b), the intervals with sealing-wax red blotches (more pronounced in flanks), sometimes only in neck, in others for nearly or whole body length, a chevron collar, below which the neck is ochraceous or canary-yellow. Head sage green, or bright olive-green. Ventrals with transverse black streaks.

All three types with characteristic subocular oblique streak between 6th and 7th labials, and oblique streak from eye to behind gape.

- (a) And (b) are the commonest types. Some specimens tend to combine the characters of two types more or less.

Ingesta.—Usually frogs, for which it shows a great partiality. We have seen it swallowing a mud fish once.

It is very active, and strong, moving rapidly on land, and in water. Excepting *Echis carinata*, we think it is perhaps the quickest and fiercest snake we know. It will strike an offending object with great malice, dilating its neck, and rearing its head and front part of the body off the ground, for some distance. In one case a snake measuring 2'-10" raised its head 9" at least.

38. *Typhlops diardi*:—Four specimens obtained in Rangoon.

39. *Xenopeltis unicolor*:—Eighteen specimens obtained in Rangoon, and Districts, L. B.\*

Præfrontals.—Asymmetrical, left invariably larger.

Frontal.—Equals distance to end of snout (4).

Subcaudals.—Invariably a pair, succeeded by an entire scale, behind which 25 to 27 pairs.

Length.—3'-5½"; tail 3½".

Pupil.—Difficult to distinguish in fresh state, owing to the very deep blackish-brown colour of the iris.

Body.—Ventre-vertebrally compressed.

Ingesta.—Mouse (1), field rat (1), snake *T. stolatus* (1). This last was 18" long, of which 11½" had been swallowed.

We procured most of our specimens in the rains, July (5), August (5), September (2). No doubt, owing to the water-logged condition of the soil compelling retirement from their usual subterranean abodes.

\* Lower Burma.

40. *Zamenis korros*:—Nine specimens obtained in Rangoon, and Districts, L. B.\*

Frontal.—Less than parietals (4).

Temporals.—2+3 R. and L. (1), R (2).

Anterior chin shields.—In contact with four labials, (1).

Ventrals.—186.

Length.—7'-2½'', tail 2'-3¾''

Ova.—One killed 3rd June, contained nine eggs with no trace of embryo.

Colour.—One small one 12¾'' long, was so different to the adult in colour, as to mislead us at first sight. It was blackish, with thin white transverse bands, in the anterior two-thirds of the body; (25 in all), and a white collar. Under parts dirty white. Upper labials, antoculars, and postoculars dull white.

41. *Zamenis mucosus*:—Twenty-six specimens, (including thirteen young hatched from a cluster of eggs already recorded by us in the Society's Journal, page 189 (No. 1) of this Volume (XIII), obtained in Rangoon, and Districts, L. B.\*

Frontal.—Less than distance to end of snout, (8 of 10 adults).

Loreals.—5 R, 4 L. (1) 4 L. or R. (3).

Antoculars.—3 L (1), (including the so called subocular of Boulanger).

Temporals.—2+3 R (2); 2+1 R and L (1).

Labials.—Nine, with 5th, and 6th touching the eye R and L (1); R (1).

Anterior chin shields.—In contact with four labials R and L (1); six labials one side (1).

Ova.—Thirteen hatched, December 9th, 1899.

42. *Vipera russellii*:—eleven specimens obtained in Rangoon, and Districts, L. B.,\* and Yamethin, U. B.†

Ventrals.—153.

Subcaudals.—41.

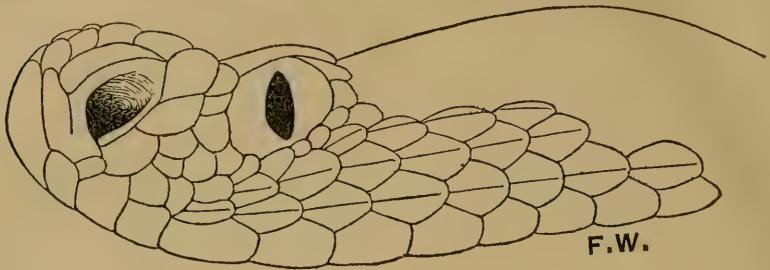
Supraoculars.—4 to 6 scales intervene in front, 8 to 10 behind.

Nostril.—We do not concur with the remark that the nostril is situated between three shields. The invariable arrangement is as follows:—It is contained in a single, large, irregularly-formed scale. The anterior two-fifths is extranalar, and forms a bold vertical pillar, bifid above, where the anterior part of a crescentic scale dips down. The anterior limb of this pillar ends abruptly behind the upper part of the rostral, the posterior limb passes obliquely backwards and upwards to become lost in the roof of the nostril, and is bounded below for a short distance by a fissure, which is itself lost in the roof. At the base of the pillar, a limb passes backwards and upwards to become lost at the back of the nostril, and is skirted above by a fissure which also becomes lost in the scale. The nostril is placed behind the pillar, and between the two oblique limbs just referred to. It is large and roughly funnel-shaped.

\* Lower Burma.

† Upper Burma.

We append a figure :



(*Vipera russelli*,  $\times 3$ , to show peculiarity of nostril and nasal scale.)

This snake is very common, especially so in certain parts of the Province, notably Mahlaing, Magwe, and Myo-thit, all in U.B.,† where it is so abundant that the Burmans in these localities make themselves shoes with grass or mat uppers when busy in the crops, for the sole purpose of protecting their feet from this dreaded creature. We have known them come into the bungalow, and out-houses even in thickly populated parts.

In the aggregate, we have had 302 specimens, and these include forty-two species. A very large number of these reached us fresh, some freshly preserved in spirit, and a few were old specimens, which had been in spirit for an uncertain period. Comparatively few were sent in, or procured by us alive.

The comparative measurements of scales referred to above, were determined with pin point compasses and lens.

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† Upper Burma.

## FISHING IN INDIAN WATERS.

### PART VI.

#### OPEN DEEP SEA FISHING.

BY F. O. GADSDEN, R. I. M.

*(Read before the Bombay Natural History Society on 10th July, 1900.)*

In this, which I propose shall be the concluding article of this series, I intend drawing the attention of my readers to some fishing which can only be indulged in on the deep sea, away from land, and generally speaking must be carried on when the vessel is travelling at a fair speed. Although numbers of large fish inhabit the open ocean, still often times in travelling, you may go for days and see no sign of life, unless it be an occasional flying fish or a lone whale blowing; while on the other hand, if the weather be propitious, very often in some latitudes and in some seas not a day passes, but what numbers of the larger ocean mackarels, such as albacore, bonito, tunny and dolphins and porpoises, are seen sometimes in considerable numbers, and occasionally they will come round and play quite close to the ship. In the good old days of sailing ships, when things were taken easier all round, men on the ships used to lay themselves out to catch them, but nowadays when steamers so largely predominate, and when the tendency is to rush and scurry, to get from one port to another as quickly as possible, these quiet chances do not so often occur; and however willing the master of a mail steamer might be to indulge in the pastime himself, or give his passengers a chance of doing so, still the fact of his vessel being a steamer and expected to do the voyage in a given time is greatly against him. The noise caused by a steamer, the thud, thud, thud, caused by the screw, with the accompanying vibration transmitted to the surrounding water, as she goes at full speed, tends to frighten away any fish that may be near, who cannot understand what all this commotion may mean, so different is it to the quite lapping kissing noise caused by the stately sailing ship as she lazily rolls on her way, dipping every now and again her bows into the sparkling sea, and shaking off the feathery spray as she rises, behaving in many ways as if she were a light hearted gambolling leviathan herself. It has been my fate in life to have had experiences of both steam and sailing ships. As a boy I served some time in a crack sailing ship belonging to a Northern Line and running in the Colonial trade, and many years later, after having been for years in steamers of all sizes, I was appointed to and served for about two years in a small paddle steamer, and our sole duty there was marine surveying, and in these two ships more than in any others I had several and varied opportunities of seeing this deep sea fishing carried out and made acquaintance with many wonders of the deep.

I do not know that anybody has dealt at all in detail with this class of fishing, and it is impossible for me here to go very fully into the matter. In the sea-fishing volume of the Badminton Library there is described very

plainly and clearly the principles of the ship's "sea rod," and I am told that there is also a description of the ship's "sea rod" in the "Practical Letters to Young Sea Fishers" by John Bickerdyke. However, as the above-mentioned author was principally responsible for the greater part of the first mentioned book, I have no doubt that the two descriptions are very much alike. Those sailor men who do fish at sea have each and every one of them their own rigs-up and each thinks his own the best. I have seen and tried several, and I do not know that there was a great deal of difference among them. While I am on this subject of authorities, there comes into my mind the name of one man, pre-eminently fitted by his early training, who I am sure could deal with this subject in a manner that would fascinate his readers if only he would. I refer here to the talented author of the "Cruise of the Cachelot," "The Ways of a Ship," and other articles, all dealing with life at sea, and I hope that if this should meet his eye that he will seriously consider it. I read the "Cruise of the Cachelot" shortly after it was published, and was perfectly fascinated and entranced, and I hope sincerely that some day or other he may be induced to give us a companion volume dealing with this subject. The principle underlying this deep sea-fishing is, however, in all cases the same. The larger ocean fish are all piscivorous, and the only way to induce them to take a bait is to offer them a decent imitation of some small sea fish.

Many and wondrous are the imitations that are made, and yet they nearly always consist of bunting, red or white, or perhaps both. One of the best and most successful baits I have ever come across was originally shewn to me by Lieut. E ———, R. N., who concocted it himself and who I believed seldom used anything else, and he is one of the most successful of our deep sea-fishers. It was a weird and wonderful *tout ensemble*. A hook about six inches in length, with the body wrapped and dressed with cotton stuffing till it assumed the shape of a large cigar, the whole was then covered with silver paper or tin foil, and finally wings were added of white bunting with a dash of red underneath. When completed it looked something like a huge "Alexandria," only with the wings, red and white, instead of the blue-green of the orthodox fly. I passed on this dressing afterwards to one or two special chums, who are still at sea, and who had the chance occasionally of testing its merits, and the photographs of some of the fish they have from time to time caught, will give some idea of what can be done when fishing under these circumstances. I cannot definitely state whether they were all taken with this particular lure, but it may be taken for granted that the bait did not differ very materially from that described above, except that occasionally, instead of the red and white wings, blue bunting was used for the upper pair and white for the lower, and in this case the wings were brought down along the body and tied together at the bend of the hook, to give it a more fish-like appearance.

The following photographs will be found in the album of this Society, as it was impossible to reproduce them here :—

Nos. 1 and 2 are those of the so-called "Sea Pike" (*Sphyræna acutipennis*) caught above Socotra near Zeila. Weights  $10\frac{1}{2}$  and  $3\frac{1}{2}$  lbs. respectively. Speed of vessel from  $5\frac{1}{2}$  to 7 knots. Taken with the bunting bait.

No. 3 represents a take of eight fish, caught on the run between Berbera and Bulhar, on the Somali Coast, and were all caught inside of three hours. The weight of the fish counting from the left of the picture are, first, two bonito (*Thynnus pilamys*) of 7 and 9lbs.; then two dolphin (*Coryphæna hippurus*) of 10 lbs. each; one seer fish (*Cybium guttatum*) of 15 lbs.; and again bonito of  $8\frac{1}{2}$ , 8 and  $7\frac{1}{2}$ lbs. respectively. These were all caught with this bait towing astern, the speed of the ship varying from 8 to 10 knots.

No. 4 represents four out of a total catch of nine fish (dolphin) which were caught in five hours in the Gulf of Aden. The total weight of the whole catch was 95 lbs. These were the four largest, and scaled from 11 to 12lbs. apiece. Speed of the vessel between 8 and 9 knots.

No. 5 is the picture of an exceptionally fine dolphin (*Coryphæna hippurus*), caught in the Gulf of Aden near Zeila. Weight 28 lbs.

No. 6 is that of a much larger fish, a bonito weighing 69 lbs., caught in the Gulf of Aden. Speed of vessel about 9 knots. In one of my former articles, *viz.*, in that dealing with "Aden and the adjacent Waters," I related the incident of my capture of a 73 lb. bonito in Aden Harbour. The photograph of that fish was never taken, but the fish here pictured might have been the same fish, so that you can form a very fair idea from this what the former one was like, and may also be able to realise to some extent the sport to be obtained when such a fish has fastened.

In all the six cases above referred to, the bait which was taken was being towed astern with a good long line, and in every case was taken from a screw steamer. This is the usual practice on steamers, but in the old days in the sailing ship almost invariably was the line put over the bows. A much shorter drift of line was used, in fact only just sufficient to keep the bait bobbing on the water, and all our fish were caught in this manner, and hardly ever did one put out the line astern. Probably the fact that most steamers are straight stemmed and have no overhanging bow from which the line can depend, has a great deal to do with the practice of towing the bait, but the fact remains, that as a general rule sailing ships fish from the bow, while steamboats tow their lines.

Under these conditions the better sport is very often to be looked for when fishing from a steamer; but on the other hand there is one bit of fishing which is rarely if ever obtained in the normal manner from a steam boat, but which is often enough to be had from a sailing ship.

I refer to shark fishing at sea. Sharks are very seldom seen from a ship except in calm weather, and it is just then, when a sailing ship is lying almost

becalmed, with hardly enough wind to fill her sails and give her steerage way, that the best chances occur. It is in weather of this sort that these brutes come up to the surface and bask in the sun or roam about leisurely in search of food. Generally the first intimation of their presence is the sight of the black triangular dorsal fin moving through the water, and thereafter if it be kept steadily in sight, the fish will be found roaming about in irregular courses. Gradually his curiosity or hunger will bring him nearer and nearer to the ship, until eventually, when he sees there is nothing very dreadful or terrifying about her, he will take up a station under her quarter, and oftentimes if not caught, will remain there for hours, or, if the calm weather continues, for days. But no sooner does a shark take up this position than an intense desire and longing pervades the whole ship's company to catch him, and at once the line or rope is got ready, the short length of chain which connects, the hook to the rope is bent on, and the hook sharpened and baited. There is unfortunately on board a sailing ship no great variety of baits to choose from. The bunting bait is here useless. Fresh meat is much too precious, even if it were there, so that we are forced to go to the "harness cask" for a chunk of either salt beef or pork. The latter is perhaps the better; so choosing a nice square fat chunk, we put it on to the hook, and making it a bit extra secure with a twine lashing, we lower it carefully over to our friend and await results.

There are occasions of course (and I remember one well when a school of rather small-sized sharks came alongside, and when we caught nine out of twelve or thirteen fish one after another) when they are really ravenous, and when no sooner is the bait well in the water than it is taken, and at once the fun commences, but such occasions are the exception rather than the rule, and also the fish on these occasions when they appear in schools are never so large as the lone fish. The real excitement begins when a large fish, say from 18 feet to 22 feet in length, takes up the position described, attended by four pilot fish. Such a fish is by nature and experience cautious and wary, and in addition to his natural cunning, he has the intelligence of his smaller friends to fall back upon, and he will give you many an anxious moment, before he finally succumbs to temptation. The procedure on a favourable occasion is somewhat as follows: on the bait being lowered, it may for some time be left severely alone, or it may at once attract the attention of the pilot fish. In the latter case they will come up and prospect it, at first from a distance, then circle round and round, until finally one bolder than the rest will make a dash at it and rip out a mouthful. This the others can no longer stand, and together they will assault the bait until you will begin to think that shortly there will be very little left for the principal guest. In time, however, they will retire to their patron and inform him that there is something toothsome not far away and he, who has probably been watching the whole performance, and has been waiting patiently for their report will begin to show some signs that he intends taking a hand in the next deal.

Imperceptibly he will fall back, until he is a few yards away, and then gradually he will sink out of your sight, and you may think that he has gone. Well perhaps he has; peradventure there has suddenly flashed through his dull brain some faint reminiscence which has come back to him at the very last moment of another fine fat piece of pork very similar to the present one which he once upon a time in the long gone days before had tried to sample, and which had brought him nothing but labour and sorrow, and which, when he had got rid of it, had left him curiously enough (as he thinks) with a sore jaw. If such has ever been the case, then indeed will he have gone, but it may be otherwise. If he has made up his mind, upon the reports of his small friends, to try his luck, his behaviour would be such as I have attempted to describe. As his mouth is so to speak placed under his chin, he requires to get quietly underneath whatever it may be that he may wish to seize, and then with an upward dart, during which time he turns half round upon his back, he is in full sight open-mouthed, and if in earnest, has closed his terrible jaws upon the bait before you have had time to realise what has happened. The subsequent proceedings interest the pilot fish no more. There is a firm belief among sailors that if a shark is once hooked and gets off, that he metes out condign punishment upon them for having misled him; they are therefore off and you will never see them again. Once hooked, it is purely a matter of brute strength; you hang on to your fish, getting in the rope little by little in spite of his struggles, until his head is hove up out of the water, when either a running bowline is put on the line and lowered down over his head until in position near the tail, then tightened up as soon as it is possible, then heave away on both lines and drag him struggling on board; or else before attempting to lift him, you quiet him once for all with a rifle bullet through his brain. I give the above as a typical instance of how a large fish of this sort is usually caught and killed, but often enough instead of taking the bait offhand as described he will play around, make false rushes, and dally and toy with it in a most aggravating manner, pushing it with his nose, and sometimes turning round and lashing out at it with his tail until your patience is well nigh exhausted; and then when you have almost given up all hope of seducing him into committing the desired indiscretion, he makes up his mind, makes his rush, and with a thrill of excitement you realise that after all you have really got him. But even in this fishing, there is still often the proverbial "slip between the cup and the lip" and in his struggles he may break loose, and you cannot count upon your fish until he is landed.

Once in board he is triced down as soon as possible, and if still alive a *coup de grace* is given him by cutting off his tail with an axe, and until this is done, he is a most awkward customer to go anywhere near. Sailors seem to have an inborn hatred of sharks, and nothing pleases them so much as the death of such a one as I have described. Once dead, his head and tail

are generally cut off and kept (the former for the sake of the jaws and teeth) as trophies, and sometimes you will find some one energetic enough to take out the backbone, part of which, when dried and cleaned, is made into a walking stick, by threading the various joints upon a stout piece of iron or steel wire. The rest of the body is generally thrown overboard.

Having dealt with the above different modes of catching the ocean fish, I come now to quite a different class of fishing which is never to be obtained in Indian waters, and which perhaps on that account I ought not to include here, but as this paper is intended to deal with open sea fishing, I must be excused for touching on it. I mention it here, but at the same time I should like to say, that I do not approve of it, and deprecate the practice on every possible occasion. I refer to the practice so common among passengers and seamen alike of fishing for the ocean birds. Sailing ships bound from the United Kingdom for the Australian Colonies and New Zealand generally go out by the Cape of Good Hope route and return *via* Cape Horn. This is done in order to take advantage of the prevailing winds. When you get away south into the "roaring forties," you experience a strong westerly wind, which is nearly always blowing pretty hard. Down in these southerly regions, hundreds of miles from any land, you come upon the home of many of the finest and most beautiful of the sea-birds—gulls large and small, frigate-birds, boobies, molly-hawks, and last but certainly not least the noble albatross. All these birds congregate near the ship, and wheel and soar and scream about her from day's end to day's end, and nothing is thrown overboard that is not at once taken if fit for food.

Hence it is that as a rule it is so easy to catch these creatures. I always maintain that it is a useless and cruel practice, as they are not wanted, in fact are not fit for food, and unless it be that an occasional specimen may be required for some scientific purpose, there is no excuse for the practice. There is no more beautiful sight to be seen than these wild sea-birds, wheeling and turning and soaring above the foam-crested waves in dark and gloomy weather, and I have watched them for hours with the keenest delight. Perfectly at home amid the tumultuous elements, alighting at times on the breakers, and floating as easily as a fragment of cork or as lightly as a bubble, they sport in and out of the tempest-tossed seas, and give one the impression of being as much ocean-born creatures as the very fish themselves. All of them from the smallest to the greatest can be caught. A small piece of pork put upon the hook, and let out with a good long length of line will nearly always be all that is required. No sooner is it over than the birds make a swoop, several perhaps at a time, and fight over it until the strongest prevails, seizes the morsel and pays the penalty. They are quickly hauled on board, the hook taken out, rebaited, and the same thing goes on again. Very few of these ocean birds when put down on deck are able to rise and fly away, on account of the length of their wings and the shortness

of their legs; and nearly all suffer severely from sea sickness when first caught and put down. It is not every day, however, that an albatross can be caught, but still they are hooked at times and in the same way. Sailors generally keep the breast feathers, the wing bones, and the feet and beaks of these birds. The breast feathers make a handsome boa or muff; the wing bones are supposed to make the best of pipe stems; the feet when skinned and stretched out are converted into fancy tobacco pouches, and the beak is sometimes turned into an ornamental handle for a walking stick. An albatross in size and weight is not much if any larger than a good-sized turkey, but he has an enormous spread of wing. Very ordinary birds measure from 7 to 9 feet across, and there are records of much larger ones measuring from 12 to 14 ft. across from tip to tip.

When once on board the albatross is very nearly as awkward a customer to deal with as the shark, and he can keep several men at bay with his powerful wings and beak. I shall never forget one day many years ago, when I was quite a boy, one had been caught, and was sitting quietly tied up by the leg to the ship's rail. I ventured a little too close to the prisoner, and he apparently not relishing my appearance on the scene, let out with his wings, and caught me full on the legs, knocking the feet from under me, and landing me on my back. At the same time, he made a vicious dig at me with his beak, and very nearly took the piece clean out of the calf of my leg. I left him alone after that.

I had intended when I began this paper to deal not only with open sea-fishing, but also to dwell for a little while upon some wonders of the deep, with which I made acquaintance during my time in the marine survey ship, but space will not admit of this just now, and I must reserve that for some future occasion. Sailors, I know, are said to be very apt to draw the "long bow," but there are so many wonderful things continually to be seen at sea, that a sailor man in relating his experiences may appear to the *innocent* landsman to be exaggerating when in reality he is certainly keeping strictly to the truth.

I always think that King David, who is said to have employed a large fleet of merchantmen, must have been fond of sending for his ship's Captains, and listening to their sea tales, and it was probably after some more than usually stiff "yarn" had been spun to him by some hoary-headed old "shell-back," that the proud monarch of Israel exclaimed "They that go down to the sea in ships, that do business in great waters, these men see the works of the Lord and His wonders in the deep."

## MISCELLANEOUS NOTES.

### No. I.—NOTE ON A WHOOPER SWAN (*CYGNUS MUSICUS*) SHOT ON THE RIVER BEAS, PUNJAB.

The Society's Museum has been enriched by a gift from General W. Osborn, I. S. C., which is almost unique, namely, the well-preserved head and feet of a Whooper Swan shot by himself on the river Beas in the Hoshiarpur district of the Punjab. The Common Swan (*Cygnus olor*) is not uncommonly seen in the Punjab, but until now there was only one instance on record of any other species occurring within the limits of British India. This was a bird obtained by Hodgson in the Nepal valley in the year 1829. Hodgson preserved the skull and a foot of this bird, which are now in the British Museum, and also executed a drawing, from which Mr. A. O. Hume identified it as Bewick's Swan (*C. bewicki*), under which name an account of it and a coloured plate appeared in Vol. XI of our Journal. This, however, called forth a letter from Mr. W. T. Blanford, printed at page 306 of the same volume, in which he said that a careful examination of the skull and foot in the British Museum had convinced him that Major Hodgson's bird was not Bewick's, but the Whooper (or Hooper) Swan (*C. musicus*). The relics presented to us by General Osborn therefore represent the second specimen of this fine bird which has been obtained within the limits of British India. General Osborn contributed to *The Asian* the following account of the way in which he obtained it:—

“While duck shooting with a friend on the river Beas, on the 6th of January last, at a point just opposite Tulwara in the Hoshiarpur district, we saw four wild swans on the opposite side of the river. As there was no means of crossing, and the swans were too far and too wary to be reached even by my 4-bore duck gun, we sent back to camp for our .303 rifles, and with these weapons we managed to secure one of the four. When we secured the bird we found it to be undoubtedly a Whooper (*Cygnus musicus*), and its weight and measurements were as follows:—Weight 20 lbs.; length from tip of bill to end of tail 4 feet 8½ inches; spread of wings 7 feet 5 inches.”

To these measurements may be added here that the length of the bill from gape is exactly 4 inches, and of the tarsus 4½ inches. In a letter to our Ornithological Secretary, General Osborn has given some further particulars which are interesting in connection with the well-known legend that the swan, so silent all its life, sings like a siren in the hour of death. “The bird,” he says, “was only winged and swam about on the river for a considerable time before I could get a man to secure it, and as long as its three companions remained in sight, it continued to utter its long, loud, musical, trumpet-like call.” That this was not the Mute Swan does not make much difference in the poetry of the situation, for the ancients probably confounded the two.

E. H. AITKEN.

BOMBAY, April 1900.

No. II.—INDIAN *TERMITES*.

Will any member of the Society, who may have made a study of the Indian *Termites*, kindly inform me whether there are varieties of these pests, and if all construct a dome-shaped nest above the ground? I suffer a good deal from the depredations of these restless creatures, both in my bungalow and garden; but although I have looked everywhere I am unable to discover any nest belonging to them above ground, either in my garden or compound. From consulting certain books on the life-history of *Termites*, I have been led to believe that a Termitarium was constructed altogether above ground, and that it was divided into four stories; that nearest the point of the cone being empty; then came the Royal Nursery, followed below by a large Hall supported by pillars, supposed to be used as a sort of Gymkhana Station Club, without a liquor bar; below this again, on the ground-floor of the building, was constructed the King and Queen's apartment surrounded by various rooms for the attendants, and Commissariat Godowns. Now having duly written and obtained permission from a friend, whose large grass compound is dotted over with a number of fine residences belonging to the termite community, which, however, he professed no special interest in preserving, I started early one hot morning accompanied by two gardeners to dissect a Termite detached villa of moderate size, rising some three feet nine inches above the ground. My attendants duly informed me, that H. H. the Ranee's room was built below the ground; but I stoutly maintained that according to authority—"The Industries of Animals," by Houssay, (Contemporary Science Series), the Royal apartment must be above the ground, or just on a level with it, and to prove all this, I showed them a beautiful picture of the interior of a termite's home, but which picture I rather doubt if they understood, although they left thumb marks on the margin of the page. We then set to work, first cutting the house down from the top to the ground floor, very carefully with a hatchet, so as to obtain a good section. The top story in this villa proved to be solid earth with very narrow passages running here and there vertically through it. Very few termites at first appeared, and these judging from their "nippers," were of the soldier caste. It was not until we had chopped two feet three inches from the top, that the Royal Nursery was reached; and this proved only a detached room. Like all other rooms lower down, it was fitted up with a beautifully formed comb, of the shape and texture of a fine sponge; this was constructed of brown earth; all its small cells were the same size, and it felt cold and damp to the touch. The comb was dotted over with small white specks which I supposed to be eggs; there were a number of white attendants about, with a few soldiers just to keep good order. We then passed through some more solid earth and narrow passages, and close to the level of the ground came on a number of closely-connected Nurseries full of attendants and soldiers. No sign as yet of the Club Hall or Royal Bed-room. So we started to dig a trench, and

reached two and a half feet below ground without, however, finding any sign of Her Majesty. We passed a large number of nurseries, and close to some of these turned out several young queens or kings, these wore a creamy-white costume, and had very small non-perfected wings on the back. As the morning by this time had become very hot, I decided to defer further work till next day, covering over what I had already done with matting. Next morning I found all the exposed combs of the nurseries under the matting had been covered over with fresh earth by the *Termites*. I started work on the opposite side of the cone, which, as this proceeded, became gradually demolished; at last, when digging some two feet below the surface of the ground, and immediately adjoining a large nursery, we came on the long looked-for White Queen in her small room. No king could be found, but Her Majesty was surrounded by a large number of subjects, mostly workers. She had quite a bright and happy expression. Her body was of enormous size, and appeared in a constant movement of expansion and contraction. After a little while I had Her Majesty carefully put back in her apartment, and again covered all over with matting. On the following morning I found the Queen's room was completely roofed over and not one of her people to be seen. I had the two trenches filled in, as my friend is very particular as to the appearance of his compound, and finally left Her Majesty with her most faithful and ever attentive subjects in peace. From what I saw throughout this experiment in termite house-breaking, the great mass of the nurseries would appear to be under the level of the ground covered by the cone; and except for narrow passages here and there, there were no large empty halls in this particular house, either as air reservoirs or Gymkhana Clubs. I regret to add that one of my attendants showed no respect or reverence towards the White Queen, but coolly remarked that the "Ranee" was often "eaten" by natives as a strengthening tonic.

G. S. RODON, MAJOR.

Dharwar, April, 1900.

No. III.—THE WHITE-BREASTED KINGFISHER  
(*HALCYON SMYRNENSIS*) IN CAPTIVITY.

Although in no part of the world can the Kingfisher be said to be a common cage-bird, on account of the difficulty in catering for its appetite, yet anyone who really values gorgeous colours in a bird can, with very little more trouble than is ordinarily bestowed upon an insectivorous bird, keep the Kingfisher in perfect health and plumage.

The first two White-breasted Kingfishers which I reared were fed entirely upon pieces of fish, cut up to about half the size of a hazel-nut; also, on small whole fish, when procurable, alive or dead. These birds were procured when just ready to leave the nest, and kept in good health for four months, when I presented them to the Calcutta Zoological Gardens. That was in 1897, and they were the first specimens the Zoological Gardens had ever had.

The London Zoological Gardens, however, purchased a single specimen as long ago as 1884. Unfortunately a civet cat killed the two birds at the Calcutta Zoo a few days after their arrival.

Last summer, having obtained another White-breasted Kingfisher, I determined to adopt a different method of feeding it. Small pieces of raw lean meat were pushed down the bird's throat, until, in a day or two, it took the meat of its own accord. This meat diet was varied with pieces of fish, the bird always striking its food (as it would have done a live fish) upon its perch three or four times before swallowing it. This was done with a jerking movement of the whole body. Lizards, shrimps and grasshoppers are greedily accepted as dainty morsels by this bird. Although I have had the bird about nine months, yet I have never seen it drink. Its meat and fish are always placed in a jar containing three or four inches of water, into which it plunges its massive beak to take out its food. I might also add that the bird sometimes immerses its beak in the water, instantly withdrawing it with a shake of the head, even when not feeding.

For some weeks the Kingfisher was kept in an aviary containing a number of other birds, such as minivets, white-bellied drongos, black-headed orioles, golden-backed wood-peckers, &c., with all of whom it agreed perfectly, but owing to the fact that other birds used to eat any meat or fish scattered by the Kingfisher, and as this upset their digestions, I had to remove the latter bird to a separate cage.

It greets me with a faint cry accompanied by other signs of pleasure when I offer it any food. It is tame enough to sit upon my finger; but in the presence of strangers at close quarters, evinces a certain amount of fear. The bird's plumage is perfect, and quite as bright as that of a wild bird. Mr. F. Finn, B. A., F. Z. S., Deputy Superintendent of the Indian Museum, who saw the bird, said, "it is a distinct triumph." The bird is extremely fond of bathing as might be expected. When I think it requires a bath, I stand the cage in a tub of water a foot deep, removing the lower perch of the cage. It plunges in head first, sometimes a dozen times in as many minutes. The ejection of pellets of fish-bones and other indigestible matter is preceded by a few minutes gaping and straining. The average weight of food eaten in one day is  $1\frac{3}{8}$  ounces, or equivalent to about 21 minnows.

E. W. HARPER, F. Z. S.

CALCUTTA, April, 1900.

#### NO. IV.—ON THE MATING INSTINCT IN MOTHS.

BY ALFRED GOLDSBOROUGH MAYER.

During the past summer the author carried out a series of experiments to determine the nature of the mating instincts of *Collosamia promethia*.

A large number of cocoons of this moth were kindly collected for the author by W. L. Tower, Esq., in the neighbourhood of Cambridge, Massachusetts,

and others were found by the writer at Maplewood, New Jersey. Altogether 449 cocoons were obtained during the winter of 1898-99. These were allowed to remain out of doors in Cambridge (Mass.), where they were exposed to the winter's cold, and then on May 5th they were taken to Loggerhead Key, one of the Dry Tortugas Islands, Florida.

This situation was most favourable for the prosecution of the experiments, for this insect does not extend south of the Carolinas, and thus the moths were separated many hundreds of miles from others of their species. Moreover, Loggerhead Key is a small sandy island surrounded by many miles of ocean, and thus no interference with the experiments could come from the outside.

The cocoons were hung under the shade of some trees, where they were protected from the direct rays of the sun. It was remarkable that all but five of the moths (three females and two males) issued from the cocoons during the early morning hours between sunrise and 11 o'clock.

The following table will show the rate at which the moths issued from their cocoons :—

| Date, |       |        | Number<br>of males, | Number<br>of females, | Total |
|-------|-------|--------|---------------------|-----------------------|-------|
| May   | 18... | ... .. | 1                   | 2                     | 3     |
|       | 19... | ... .. | 1                   | 2                     | 3     |
|       | 20... | ... .. | 1                   | 2                     | 3     |
|       | 21... | ... .. | 1                   | 0                     | 1     |
|       | 22... | ... .. | 1                   | 0                     | 1     |
|       | 23... | ... .. | 0                   | 0                     | 0     |
|       | 24... | ... .. | 1                   | 0                     | 1     |
|       | 25... | ... .. | 1                   | 1                     | 2     |
|       | 26... | ... .. | 0                   | 0                     | 0     |
|       | 27... | ... .. | 1                   | 1                     | 2     |
|       | 28... | ... .. | 0                   | 0                     | 0     |
|       | 29... | ... .. | 2                   | 1                     | 3     |
|       | 30... | ... .. | 0                   | 1                     | 1     |
|       | 31... | ... .. | 0                   | 0                     | 0     |
| June  | 1...  | ... .. | 5                   | 2                     | 7     |
|       | 2...  | ... .. | 6                   | 2                     | 8     |
|       | 3...  | ... .. | 3                   | 3                     | 6     |
|       | 4...  | ... .. | 2                   | 3                     | 5     |
|       | 5...  | ... .. | 4                   | 1                     | 5     |
|       | 6...  | ... .. | 3                   | 2                     | 5     |
|       | 7...  | ... .. | 3                   | 3                     | 6     |
|       | 8...  | ... .. | 1                   | 1                     | 2     |
|       | 9...  | ... .. | 6                   | 1                     | 7     |
|       | 10... | ... .. | 13                  | 3                     | 16    |

| Date.         | Number<br>of males. | Number<br>of females. | Total. |
|---------------|---------------------|-----------------------|--------|
| June 11... .. | 10                  | 1                     | 11     |
| 12... ..      | 7                   | 3                     | 10     |
| 13... ..      | 5                   | 3                     | 8      |
| 14... ..      | 10                  | 2                     | 12     |
| 15... ..      | 8                   | 5                     | 13     |
| 16... ..      | 2                   | 9                     | 11     |
| 17... ..      | 3                   | 3                     | 6      |
| 18... ..      | 4                   | 1                     | 5      |
| 19... ..      | 2                   | 1                     | 3      |
| 20... ..      | 2                   | 1                     | 3      |
| 21... ..      | 1                   | 1                     | 2      |
| 22... ..      | 1                   | 2                     | 3      |
| 23... ..      | 0                   | 0                     | 0      |
| 24... ..      | 0                   | 1                     | 1      |
| 25... ..      | 0                   | 0                     | 0      |
| 26... ..      | 0                   | 0                     | 0      |
| 27... ..      | 0                   | 1                     | 1      |
| Total... ..   | 111                 | 65                    | 176    |

It will be seen that 63 per cent. of the moths were males, and 37 per cent. were females.

As is well known, in this moth the wings of the female are reddish-brown in colour, while in the male they are black ; also the antennæ of the males are large and bushy, and of the females small and slender.

The male possesses the ability to seek out the female even though she be at a considerable distance.

The males usually fly towards the females in the afternoon hours between 2 o'clock and sunset, and it is a common thing to observe several dozen males fluttering about the place where the female is resting.

In seeking the female the male flies up against the wind until he comes into her near presence ; then he often flutters to and fro in a bungling manner that for want of better words we might designate as " stupid " and " aimless." Often he may fly into the immediate neighbourhood of the female, and even then he will often flutter away without attempting to mate with her. At other times, however, he will fly at once to her and mate immediately.

After issuing from the cocoon, the female generally remains quiescent for some hours, until she is fertilized, after which she flies actively about and deposits her eggs.

During her period of rest the female remains with wings closed over her back ; but when a male moth, or indeed any large object, comes near her

within range of her vision she slowly and majestically opens and closes her wings several times.

The males when resting act in a similar manner, but are by no means so sensitive as the females.

In captivity the moths lived from three to five days.

*Observations and Experiments.*

The first experiments were directed to determine whether the male was attracted by the sight of the female, or whether he merely perceived an odour emanating from her.

Five females were placed in a clear glass battery-jar, having a wide open mouth; the mouth was covered with a coarse-meshed mosquito-netting, to allow a free circulation of air between the interior of the jar and the outside.

Five males were liberated about 100 feet away from the jar; they immediately flew to it and fluttered about the mouth.

The jar was then inverted (placed mouth downward) and sand packed around the open end, so as to prevent the air escaping from the interior.

Thus the females remained visible through the glass, but no scent could come from them. Under these circumstances all the males flew away at once and some disappeared from sight.

When, however, the jar was turned open-end up again all the males reappeared, flying excitedly round the mouth.

This experiment was often repeated, and always with the same result. The males never pay the least attention to females which are enclosed in a hermetically sealed preserving jar of clear glass.

Assuming that the males are able to see through glass which appears transparent to us, we may conclude that sight alone is not sufficient to attract the male towards the female, or even to retain him in her presence when he is within a few inches of her.

Another experiment, which seems to show that the male depends solely upon scent in seeking the female, may be performed as follows:—A female is wrapped in loose raw cotton, so as to be invisible and yet allow a scent to emanate from her. The males then fly to the cotton and, crawling all over it, flutter their wings excitedly and grasp the cotton repeatedly with their abdominal claspers.

In another series of experiments, the females were enclosed in a wooden box having a paper chimney rising from one end, the other end being open and covered with mosquito-netting.

This box was so arranged that a current of air blew in through the open end and out of the chimney. The females were invisible from the outside, and yet any scent from them would be carried up the chimney into the outer air.

When the males were liberated they flew to the mouth of the chimney and fluttered about in its neighbourhood. None came to the large open end of the box, into which the air was blowing.

I then poured some  $CS_2$  in to a large, flat, evaporating-dish, and placed it near the open end of the box, in such a manner that the fumes passed up the chimney and mingled with the scent from the female moths. The males, however, paid no attention to the new odour, and still fluttered around the chimney; nor did they seem to be disturbed by the fumes of ethyl mercaptan, which possesses a most nauseating and putrid odour. Evidently the scent arising from the females is sufficient to overpower the fumes of  $CS_2$  or ethyl mercaptan, if, indeed, the males have any perception of the latter odours.

The entire abdomens of five females were cut off and placed upon a table, while the males were placed in a large mosquito-net cage about 5 feet away. Two males were liberated within five minutes of the time when the abdomens were cut off. They both flew to the recently severed abdomens and paid no attention to the abdomenless females in an adjacent cage.

I repeated this experiment many times, but in all subsequent trials the males paid no attention either to the severed abdomens or to the mutilated females. So far as positive results go, however, it appears that the scent which attracts the males emanates from the abdomen of the females.

When the eggs are cut out of the female she no longer attracts the males, nor do the detached eggs attract them.

Dead or dying females have no attraction, nor do the males come to the empty cocoon from which a female has issued.

When a female remains for some time in any place she seems to impart an odour to the locality, for males will continue to come to it for about two hours after she has left.

It is interesting to notice that the females increase in attractiveness as they grow older. This was repeatedly demonstrated as follows:—

Several females, all of which were about six hours old, were confined in a large cage made of mosquito-netting, thus allowing a free circulation of air. The same number of females about thirty hours old were placed in another similar cage about six feet away from the younger females. Out of thirty-seven males thirty-five came exclusively to the cage containing the older females. Of the two remaining males one came to the younger females and one divided his attention between both cages. When the females are made to exchange cages the males will still go to the cage containing the older females.

Upon testing females thirty hours old against females fifty-five hours old, it appeared that they were equally attractive. Of seven males three came to the females thirty hours old, one divided his attention between both cages, and three came to the fifty-five hour females. It thus appears that females about six hours old are not so attractive as are females one or two days old.

Virgin females are somewhat more attractive than fertilized ones of the same age. When the virgins are placed in a cage five feet away from a cage containing an equal number of fertilized females the majority of the males fly to the virgins. Thus out of eleven males eight came to the virgin females, two to the fertilized ones, and one to both cages.

Fertilized females are still quite attractive to males, however, and the males will readily mate with them. This last was first observed by Miss Caroline G. Soule in 1894. She had two female *promethia* moths, each one of which was mated with four males, and still remained attractive to other males. In fact, as long as the female remained alive and in good health she held attractions for the male.

One of my males mated four times with three females, and three others mated three times each. The males will make frantic efforts to mate with a female which is at the time coupling with another male.

The male will fly towards the female with normal eagerness even though his entire abdomen be cut off, and he will still seek the female when, in addition to this, the sides of his thorax are covered with impervious glue. It is therefore evident that the spiracles are not the seat of the organs by which the male perceives the female scent.

If, on the other hand, the antennæ of the male be covered with shellac, glue paraffin, Canada balsam, celloidin, or photographic paste,\* he no longer seeks the female, and displays no excitement even though within an inch of her. In five instances I removed the paste by dissolving it in water, and in four of these cases the males readily mated with the females. Upon again covering the antennæ with the paste the males again failed to notice the females when in close proximity to them.

There can be but little doubt that the organs by which the male perceives the female are situated in the antennæ; indeed it has long been recognized that the olfactory organs of insects are found chiefly upon the antennæ. Hauser (1880) and Kraepelin (1883) have given excellent descriptions of the minute anatomy of these organs, Hauser having carried out an elaborate series of physiological experiments to determine their functions. He cut off the antennæ of several species of insects and found that their sense of smell was then either greatly impaired or totally lost; covering their antennæ with melted paraffin gave the same results.

Hauser also found that when the antennæ of the male (*Saturnia pavonia*) were removed the moth never makes any attempt to mate.

Packard (1898) gives an excellent review of all researches relating to the anatomy and physiology of the olfactory organs in insects.

If the eye of a male (*Callosamia promethia*) be covered thickly with pitch or Brunswick black,† so as to preclude the possibility of sight remaining, the male will still mate in a normal manner when placed near the female.

It will be remembered that in this moth the male is black while the female is reddish-brown; in accordance with the well-known theory of Darwin, the peculiar coloration of the male might be due to sexual selection on the part of the female. We might suppose, indeed, that the female preferred dark-coloured males, and thus under the influence of sexual selection the males

\* The photographic paste mentioned was "Stafford's white paste"; probably any impervious paste would serve as well.

† This substance is commonly used as microscopic cement, and is of a pitchy consistency and a dense brown-black colour.

became darker and darker, until the present melanic colour has been attained.

In 1897 the author showed that the melanic colour of the male of this moth is phylogenetically newer than the colour-pattern of the female, and this fact, so far as it goes, lends support to this theory of Darwin's.

In order to test this hypothesis I cut off the wings of a number of females, leaving only short stumps, from which all the scales were carefully brushed. Male wings were then neatly glued to the stumps, and thus the female presented the appearance of a male. Under these circumstances the males mated with the female quite as readily as they would have done under normal conditions.

I then tried the experiment of gluing female wings upon the male. Here again the mating seemed to occur with normal frequency, and I was unable to detect that the females displayed any unusual aversion toward their effeminate looking consorts.

It is also interesting to note that normal males pay no attention to males with female wings.

In another series of experiments the wings were cut entirely off of males and females and the scales brushed off of their bodies; and yet these shabby males were readily accepted by normal females, nor could I see that normal males displayed any aversion to mating with wingless females.

We are therefore forced to conclude that the melanic coloration of the male has not been brought about through the agency of sexual selection on the part of the female. In this connexion it is interesting to notice that Plateau (1897) concludes that insects are attracted only by the odours of flowers, and not at all by their colour.

In conclusion, it gives me great pleasure to express my gratitude to Miss Caroline G. Soule for advice and aid; to W. L. Tower, Esq., for his kindness in collecting many cocoons of the moth; and to Dr. Robert W. Fuller, who provided me with the re-agents used in the manufacture of ethyl mercaptan.

*Summary of Conclusions.*

The male is positively chemotactic toward some substance which emanates from the abdomen of the female, and which he perceives through olfactory organs situated upon his antennæ.

Females thirty to sixty hours old are much more attractive to males than are young females five to ten hours old.

Virgin females are somewhat more attractive than are fertilized ones of the same age.

The male will mate at least four times either with the same or with different females.

Neither males nor females pay any attention to the appearance of their partners.

The melanic colour of the male has not been brought about by sexual selection on the part of the female.

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Harvard University, Cambridge, Massachusetts.

(*From the Annals and Magazine of Natural History.*)

No. V.—NOTES ON TWO SPECIMENS OF *LYCODON FASCIATUS*.

We have lately been fortunate in obtaining two specimens of *Lycodon fasciatus*, a snake hitherto rarely met with, since Boulenger in his work mentions that it has only been twice recorded.

The first we received was obtained at Haka, in the Lower Chindwin Hills in this Province at an altitude of about 6,700 feet. The second was one of a lot collected in the Southern Shan States at an altitude of from 3,000 to 7,000 feet.

The first was badly mutilated about the head, but not so much as to defeat a fairly accurate investigation being made. The second was an abnormal specimen in that the upper præocular (the præocular of Boulenger) was absent, and the præfrontals thus entered the eyes on both sides.

They both accord well with the description given in Boulenger's text except in a few details which we enumerate:—

No. 1. Length—24"; tail—4½". Anterior chins subequal to posterior. Ventrals—210. Subcaudals? tail docked, 69 counted.

No. 2. Upper præocular—absent. Anterior chins subequal to posterior. Ventrals—209. Subcaudils—83. Colour is the same in both,

and as follows:—

The snake is girt with alternate black and yellow bands in its entire length completely encircling its girth, with the exception of the first yellow one which fails to meet on the nape. These bands are well defined, and remarkable in the jaggedness of their outlines. Anteriorly the black bands involve six to eight scales in the length of the snake, and decreased to involve three to

four scales in the posterior part of the body. The yellow bands involve from two to four scales in the whole length.

There are 33 yellow bands on the body in one specimen, and 14 on the tail ; 32 on the body of the other, and 16 on the tail.

Head black, with some yellow mottling on the upper labials.

Chin and throat yellow.

F. WALL, CAPT., I. M. S.,  
GEO. H. EVANS, VETY. CAPT., A.V.D.

RANGOON, *March*, 1900.

NO. VI.—NOTES ON THE BREEDING OF *TROPIDONOTUS*  
*PISCATOR*.

On January 3rd, this year, I had a *Tropidonotus piscator* brought me alive by some coolies, said to have been caught "in copula."

Investigation regarding this statement evoked conflicting accounts. However, though I did not know the sex, I resolved to keep it in case of possible developments, and was rewarded for my trouble on the 9th of March (fifty-five days later), when the sex was made evident by the creature depositing fourteen eggs, all of which were laid between 9 a.m. and 11 a.m. Subsequently ten more eggs were laid at various intervals as follows:—

- 1 [15th] during night of 9th.
- 1 [16th] 5-55 p. m. on 10th.
- 1 [17th] during night of 10th.
- 1 [18th] 10-10 a. m. on 11th.
- 1 [19th] 8-15 a. m. on 12th.
- 1 [20th] 4-15 p. m. on 12th.
- 1 [21st] during night of 19th.
- 3 during night of 23rd, making twenty-four in all.

These eggs were soft-shelled, white, not glossy, had no attachment to one another, and were frequently soiled with the cloacal contents. They varied a good deal in size, *viz.*, from  $1\frac{5}{16}$ " to  $1\frac{11}{16}$ " in length, by  $\frac{1}{16}$ " to 1" in breadth. The tension too varied considerably, a few being very flaccid, and others nearly or quite as firm as the human eyeball. In weight too the difference was remarkable, varying from one drachm twenty-eight grains, to two drachms thirty-seven grains. The poles were alike. The creature lay coiled in a gumlah of water, and all the eggs were discharged into, and sunk in this element.

The eggs were numbered, and stowed away in various places, to await incubation, some on dry saw-dust, some on damp saw-dust, and some left in water, but unhappily no single one hatched. Those on damp and dry saw-dust became shrunken, and dessicated, and those left in the water swelled and became vapid. Some osmosis must have occurred in the latter case, as the water soon acquired a milky opacity, and prior to decomposition asserting itself.

The parent kept good health during her captivity, and partook of frogs, which were supplied her frequently. She was almost always to be seen coiled up in her gumlah of water, and when molested withdrew her head beneath the surface. She sloughed on February 2nd and again on March 13th.

RANGOON, April, 1900.

F. WALL, CAPT. I. M. S.

No. VII.—REPORTED OCCURRENCE OF THE GREATER  
BLACK-BACKED GULL (*LARUS MARINUS*) IN RAJPUTANA.

While shooting on a tank at Deoli (about 56 miles south of this station), I wounded a goose which fell in the middle of the tank. On procuring a boat and starting off to pick up my goose, I noticed a large bird hovering a few feet above it, and who pitched in the water and started eating my bird; once or twice he actually sat on the goose (who by this time was dead) and pecked at it most vigorously and seemed very hungry. He never left the goose till my boat was some twenty yards off when he flew round. I recognised him at once as a Greater Black-backed Gull (*Larus marinus*). I shot him and got him into the boat with the goose, in whose back was a large hole where the gull had evidently started his meal. Not knowing what a rarity I had got I never perserved the gull and he was thrown away. There can be no doubt as to his identity, for I remember laying him out besides the goose (*Anser ferus*) and there was only one or two inches to choose between them. Besides this I am well acquainted with the species in England. The only other Black-backed Gull in India seems to be *Larus affinis*, whose length Blanford gives as 24 inches. Now the length of *Larus marinus* is 30 inches, and of the Grey Lag Goose, male 35 inches and female 30. The measurements of these last two birds are from Howard Saunder's "Manual of British Birds." About *Larus marinus*, Mr. Howard Saunders gives its most eastern range as the Mediterranean and Black Seas, and its most Western limits (from the British Isles) as Baffin Bay, Labrador and Florida; "but," says the same author, "Mr. Seebohm has given me a bird from Hakodadi in the North Island of Japan, which I identified some years ago as a Great Black-backed Gull; and even now, in spite of the discovery of *Larus schistisagus* (a new and little-known species roughly described as intermediate between *Larus marinus* and *Larus affinis*) so near, and the apparent gap in the distribution of *Larus marinus*, I cannot refer this example to any other species. Attention is specially called to the range of this Gull, respecting which we are rather more than usually ignorant." Blanford in his "Fauna of British India" does not mention the species. The bird I shot was fully adult with a fine dark mantle. The date I shot it was November the 16th, 1899. I never realized till the other day that the species was as yet unrecorded from India, when I found out through looking the bird up in Blanford's book. What seems to me so extraordinary is not that the bird should be found in India but that it should be found so far inland.

R. MEINERTZHAGEN,

NASIRABAD, RAJPUTANA, April, 1900.

(ROYAL FUSILIERS).

## No. VIII.—SOME ENTOMOLOGICAL NOTES FROM CEYLON.

A METHOD FOR PREPARING SPECIMENS OF *Lepidoptera* FOR IDENTIFICATION.

Modern classifiers of *Lepidoptera* lay great stress on the neuration of the wings, and yet the method that they usually suggest for cleaning the scales from the wings is the extremely tedious and unsatisfactory one of removing them with a damp paint brush, or of rendering them temporarily transparent with benzine. Now, in my opinion, benzine does not leave the wing transparent long enough, especially when one catches a moth and does not know even in what family to classify it. Sir G. F. Hampson's book has so very few figures comparatively, that unless one has access to a large collection or to some of the expensive books with coloured plates, several hours are often wasted before one finds the name of one's capture. In the Cambridge Natural History, Insecta, Part II, p. 368, there is a passing reference made to Eau de Javelle, but as the method of application is not given in full, I venture to give a way that I have found satisfactory: it was suggested to me at the South Kensington Natural History Museum. I first set the moth or butterfly of which I wish to study the neuration and then I pin it on to the side of a piece of cork or card board with the body parallel to the plane of the cork. I then damp both wings on the right side with spirits of wine so as to make the scales pervious to water. Then into a small gallipot filled with Eau de Javelle, a strong bleaching and corrosing solution which any good chemist can make up (I believe it is composed of Hypochlorite of Potash in water) I put the insect with the spirit-damped wings immersed right to the body.

In a few seconds the colouring matter of the scales is seen dissolving out and after a few minutes the scales themselves are dissolved, at this point the specimen must be taken out of the Eau de Javelle and rinsed in water, as otherwise the solution corrodes the substance of the wing itself.

Before removing the wings from the water used for rinsing them, a piece of clean blotting paper should be inserted under the wings which are now very limp, this will prevent the edges of the wing from bending over and crumpling.

A gentle heat may now be used to dry the wings, perhaps the best plan is to apply hot dry blotting paper until the surplus water is removed; then the wings must be carefully raised off the blotting paper and the moth must be re-set and left on the boards for a few days. One specimen of each species might be dealt with in this way, when the collection would be of great value as showing the affinities of the groups. Amongst other things in a cleared wing, it is interesting to note the difference in structure of different parts underlying especial patterns as, for instance, the white spots of some of the *Papilionidæ* and the white bars of *Neptis*. As the neuration of the costal margin of the hindwing is important in taxonomy, the forewings of specimens devoted to the process should be set well forward. By leaving one side untreated the relations of the markings to the neuration are well emphasised.

Perhaps it would be advisable to keep specimens with the wings on one side denuded in a cabinet by themselves, as they have a bizarre appearance.

FOOD OF THE LARVA OF *Daphnia nerii*.

I found a larva of *Daphnia nerii* nearly full grown feeding on *Vinca rosea*, although its more usual food plants, Oleander and Cinchona, were near at hand. The larva in question refused to eat Oleander when it was removed from the *Vinca*.

\* \* \* \* \*

I have found a modification of the American Moth trap, made locally, very successful, especially on close thundery nights.

C. B. HOLMAN HUNT, B.A., F.E.S.

WATAGODA, CEYLON, April, 1900.

NO. IX.—THE NUMBER OF FEATHERS IN THE TAIL OF THE CHESTNUT BITTERN (*ARDETTA CINNAMOMEA*).

I enclose a tail of *Ardetta cinnamomea* which is interesting as having eleven feathers instead of ten. There are six feathers on the right and five on the left. The bird was shot near Rangoon some time last year, and I only noticed this peculiarity when looking through some old skins to-day, and comparing them with Blanford's descriptions and key. I was puzzled by finding eleven feathers in the tail, and thinking I had made a mistake in identifying it as *Ardetta cinnamomea* and that it really was a twelve-feathered tail with one feather missing, I tried to find something in that group to fit it, but, failing, I examined the tail more closely, clearing away the tail coverts, and found that there never had been more than eleven feathers.

I do not remember to have heard of such variations, and it may be worth while recording this.

H. J. KELSALL, CAPT., R.A.

RANGOON, April, 1900.

NO. X.—CAN A COBRA EJECT ITS POISON.

Yesterday evening as Lieut. Gibson of our regiment was going to his quarters to dress for Mess he saw a snake at which he proceeded to throw a stone. He then called for a light and a stick, and as he was bending down with the light to look for the snake it made a dart at him but fortunately missed its aim. Some of the poison or saliva, however, was ejected into Lieut. Gibson's eye, causing instant and great pain, and the eyelids and parts round swelled up quickly to the size of a large hen's egg. The snake was killed, and was found to be a small black cobra about 3 feet 4 inches in length. Lieut. Gibson went to hospital and after a painful night recovered his eyesight.

M. D. GORING JONES, CAPT.,

2nd Durham Light Infantry.

MANDALAY, 8th March, 1900.

No. XI.—ON A NEW SPECIES OF BHIMRAJ (*DISSEMURUS*),  
WITH SOME OBSERVATIONS ON THE SO-CALLED  
FAMILY DICRURIDÆ.—

By F. FINN, B.A., F.Z.S., DEPUTY SUPERINTENDENT OF THE  
INDIAN MUSEUM.

About three years ago I saw at the establishment of Mr. W. Rutledge, of Entally, a living specimen of a Bhimraj or Racket-tailed Drongo, which at once attracted my attention by its pied plumage, and I purchased it for the Museum. Unfortunately the bird did not long survive, being in poor condition when received, and its skin was transferred to the Museum collection. At the time I regarded it merely as a curious variety, but, taking into consideration the extreme rarity of symmetrical albinism (except in the case of albinoid or pallid varieties), and the fact that the appearance of this specimen is not suggestive of ordinary albinism, but rather of specific difference, I venture to characterize it as new, and shall name it after Major Alcock, I.M.S., Superintendent of the Indian Museum, in recognition of the kind encouragement he has always extended to my ornithological studies.

*Dissemurus alcocki*, sp. nov.

Habit and size of an ordinary example of *Dissemurus paradiseus* with a moderate crest; colour also as in that species; black glossed with steel-blue, with the following exceptions: the upper and lower wing-coverts except the primary-coverts, inner scapulars, axillaries, upper tail-coverts and the lower plumage from the breast downwards, which are white edged with black, and the rump and under tail-coverts, which are entirely white. There are also some white streaks on the lower breast, and a shading of white on the inner webs of the tail-feathers and innermost secondaries, and on the outer webs of the outer secondaries. The black edging of the white feathers is best developed on the greater wing-coverts, where it extends right round the tip of the feather. Soft parts as in *D. paradiseus* of the same age. Bill from gape  $1\frac{1}{2}$  inches; wing 6; shank 1.1.

The tail is unfortunately broken, so that its length, and that of the whole bird, is not worth giving. The resemblance of this individual in all essential structural characters to the ordinary Bhimraj is, however, so great, that I do not doubt that the tail will prove to have a similar form with long racket-tipped outermost feathers.

The bird was a young hand-reared one, like all Bhimrajs I have seen for sale. Whether it would have lost any of the white on its first moult is of course doubtful, but *D. paradiseus*, unlike many other Drongos, is not much marked with white below in its youth, so that it is quite possible that the white lower parts are permanent in this form.

Mr. Rutledge tells me that he has had three similar specimens to that described, and that they all came from Segowli in the Gorakhpur district. The Natives, he says, consider the form distinct, and call it the "King

Bhimraj." Even should it, however, prove to be only a very marked aberration or sport, like the black-winged Pea-fowl (*Pavo nigripennis*) or the Ringed Guillemot (*Uria ringvia*), it is well worthy of note and of the attention of ornithologists, to say nothing of its remarkable beauty of marking, which should recommend it to fanciers, with whom in India the common Bhimraj is so popular.\*—(Extract from the Journal, Asiatic Society of Bengal.)

No. XII.—FURTHER NOTE ON THE OCCURRENCE OF THE BRONZED CAPPED TEAL, (*EUNETTA FALCATA*) IN TIRHUT.

I have now received seven specimens of this teal, only two of which are males. The first one received, as stated in my first note, is not in full plumage, but the second one is a beautiful bird. It is in full plumage, and has the long, narrow, sickle-shaped tertians complete. It was brought me on the 17th of February by the same man who brought all the others, and from the same *jheel*. Fortunately this one had not been damaged by the fowler, all the wing-tail feathers are in perfect condition. The following are the measurements, taken in the flesh:—length, 18.4"; wing, 9.7"; tail, 2.5"; tarsus, 1.4"; bill at front 1.75"; bill from gape 2"; expanse 32". The colours of the soft parts were as follows:—bill, black; iris, dark-brown; legs and feet, olive-grey; webs, brownish. Out of the five females, only two are perfect specimens, the others having their primaries missing.

It appears that in this cold weather this species has not been rare, as, out of the small number of 275 ducks and teals brought me, 7 have been of this species. Considering the *jheel* contained thousands of birds, I think this is a large percentage to be obtained of a rare species.

I was in error calling this species *Kunta sarroo*, this name not being given to this species.

The fowlers say the birds were snared at the same time as common teal and gadwall, and may have been in the same flock.

CHAS. M. INGLIS.

BAGHOWNIE FACTORY, DARBHANGA,

April, 1900.

\* This popularity is well deserved, for the Bhimraj is probably the most accomplished mimic known. Its powers in this respect have been alluded to by Jerdon (Birds of India, Vol. I, p. 49) and I myself have heard a very fine specimen once in Mr. Rutledge's possession imitate the mewling of a cat and the song of a canary to perfection. Mr. R. D. Oldham, of the Geological Survey, told me of one which he heard talk with a perfectly human voice; and the bird used by myself in biological experiments (see J.A.S.B., 1897), after a sojourn of a year or two at the Zoo learnt to imitate, in addition to other sounds, the babbling of a Cockatoo in which one word at least, "Baba," was quite distinctly audible. When I kept several together, before I began experimenting, they displayed a marked partiality for the leaves of *Bougainvillea*, and as the identical bird alluded to above, which was one of them, ate plantsain readily, I am inclined to think that the Corvine bill of this form is connected with a Corvine omnivorousness of habits. The Bhimraj is also very affectionate and fond of notice, and, were it not that it needs (though too generally it does not get it) a very large cage and a good supply of living food, would make an ideal cage-bird.

No. XIII.—OCCURRENCE OF THE BLACK-CAPPED KINGFISHER  
(*HALCYON PILEATA*) IN TIRHUT.

Mr. G. Dalgliesh has very kindly sent me a beautiful specimen of this species, shot by himself on the 25th of last February in the neighbourhood of Dalsingh Sarai, in this district. He has also kindly furnished me with some interesting notes on the specimen obtained. It was a solitary bird, and was shot whilst sitting on a bamboo in the open. This is the only one he has seen, and I myself have not seen it here. The stomach contained the remains of some fish and also some *beetles*, the latter being undigested. The finding of beetles in the stomach is, I think, interesting, showing that its food is similar to that of *H. smyrnensis*.

I think this is the first record of the occurrence of this species in this district, but it has been found at Monghyr.

CHAS. M. INGLIS.

BAGHOWNIE FACTORY, DARBHANGA,  
April, 1900.

No. XIV.—OCCURRENCE OF THE WATER-RAIL (*RALLUS*  
*AQUATICUS*) IN TIRHUT.

A male of this species was shot by Mr. G. Dalgleish on the 12th February, 1898, at Hatauri Fty., which is four miles from here. Never having examined an Indian specimen, I was anxious to do so, and I asked Mr. Dalgleish to kindly let me see this one. He forwarded it to me a few days ago, and I compared it with Blandford's description in Vol. IV, Birds (Fauna, British India). I should certainly say it was this species and not *Rallus indicus*; there being no sign of a brown streak behind the eye. The specimen has been mounted but, unfortunately, is not in very good condition.

I may mention that both Mr. Dalgleish and Mr. Jesse have recorded this specimen in the "Field," but the latter has given a wrong locality.

CHAS. M. INGLIS.

BAGHOWNIE FACTORY, DARBHANGA,  
May, 1900.

No. XV.—LARVA OF *EUBLEMMA AMABILIS*, MOORE, AS  
A LAC INSECT DESTROYER.

This very interesting discovery was made by Mr. D. O. Witt, of the Forest Service, in the Damoh District, Central Provinces, with whom, through the courtesy of the Honorary Secretary of the Bombay Natural History Society, I was put into communication. It adds a second species to the genus *Eublemma*, known to feed on a species of *Coccidæ*. The other described one is *E. coccidiphaga*, Hampson, which is said to feed on the bodies of certain species of *Lecanium* and *Pulvenaria* forming a case of their empty skins. Mr. Witt kindly furnished me with all the information he was able, based on his own observations of the lac insect and its attacker. He was also good

enough to send me specimens of larvæ in spirit, a specimen branch showing the lac incrustations infected with the larvæ of *E. amabilis* and a few specimens of the perfect insects. A summary of his remarks forms a fairly complete history of the insect. He informs me that there are two crops of lac in the Damoh District formed by the young larvæ of *Tachardia lacca*; the first brood swarming out in July and the second in November. The lac in which the larvæ of *E. amabilis* were found, was that produced by the July brood. The lac incrustation of the first brood begins to appear early in August, and Mr. Witt first noticed the attacks on the 26th September, although the larvæ, from which the moths that he procured were formed, were collected in November. Lac is propagated on *Zizyphus xylophyra* (vernac: *Ghaunt* or *Katber*) and *Butea frondosa* (vernac: *Chula*) in Damoh, but the attacked incrustations were only found on the former tree. Mr. Witt, however, had had little opportunity of examining the other tree for it.

The larva of *E. amabilis* is white and apparently unmarked, the head only being dark. It appears to feed upon the soft bodies of the lac larvæ, taking up its abode with them beneath their resinous coating, and forming a webbed covering connected with the outer air by a silk tube woven together with an admixture of reddish excreta. Whether the tube is formed just previous to pupation, as a tunnel of escape for the perfect insect, I am not aware; but it seems probable that this is so, as the tubes attached to the specimen of incrustation sent me were all of the same size and were, therefore, presumably formed by larvæ in the same stage of development. Mr. Witt was unable to inform me about the pupation, but I have found portions of pupa-shell inside the resinous coating, and just beneath the tubes referred to. The perfect insects sent are slightly darker than specimens of the same species which I took in Sikhim, their colouring is rather richer, and their size slightly smaller. *Eublemma amabilis* is only recorded by Sir George Hampson from Ceylon, but, as it occurs in Sikhim and Damoh also, it would appear to have rather a wide distribution.

G. C. DUDGEON, F. E. S.

PALAMPUR, PUNJAB,  
May, 1900.

No. XVI.—OCCASIONAL NOTES ON BIRDS' NESTING ROUND  
POONA AND ELSEWHERE.

The undermentioned notes are sent in continuation of those which appeared in Part 4, Vol. XII of the Society's Journal.

THE YELLOW-THROATED SPARROW, (*Gymnorhis flavicola*), wherever found is breeding. It is not an easy matter to obtain eggs, for one never knows exactly when to open its nest; as a rule, it builds in holes in trees; the usual luck is to find that the bird either has not laid or has young. This is the case with all birds which nest in a similar manner. The nesting hole is not difficult to discover, as the cock generally takes up a position in close

proximity and betrays it by keeping up an incessant twitter. It is amusing to watch the passages at arms which take place between this little bird and the Yellow-fronted Pied Woodpecker and Coppersmith: the latter excavate their own nest-holes, which the sparrow promptly endeavours to appropriate: my experience has been that the lawful owners usually manage to rear their own brood, but that as soon as they vacate, master sparrow steps in and fills the hole up with feathers. Their nests seem to consist of hands full of feathers of all descriptions, and are very soft and snug but a trifle warm. I have found the hen a very close sitter; on cutting open nests, she will not move but crouches down and sulks away. A pair of these birds diddled me completely the other day. I happened to be stopping at a Dâk Bungalow a short time back, and noticed a pair carrying feathers to a nest in the roof. As soon as I thought the eggs had been laid (about a week after), I opened the nest by removing the tiles, when I found there was a chick and two hard-set eggs.

THE INDIAN BLACK ROBIN: (*Thamnobia fulicata*).—My little friend, mentioned at page 778, Part 4, Vol. XII of this Journal, returned to his kerosine tin again this year. I found the old nest repaired, with two eggs in it on the 3rd March. Though the young were hatched, they came to an untimely end. I hope they will have another try.

THE COMMON PIED BUSH CHAT (*Pratincola caprata*) more or less replaces the Indian Black Robin, a near ally, in the Southern Mahratta Country, where I have obtained several clutches of eggs this year. The nest is placed on the ground in a crevice, in a hole, under a rock, or concealed in the roots of a tree. The cock usually does sentry duty in close proximity to the nest, perched on a shrub or rock. On seeing you approach, he utters a warning whistle to his mate, and very soon she puts in an appearance looking most unconcerned. The pair will then hop about or fly from one shrub to another or pretend to feed: if you will have a little patience and watch her from some coign of vantage, she will soon disclose the whereabouts of her nest by returning to it. Four would seem to be the full complement of eggs.

THE INDIAN RED MUNIA (*Sporæginthus amandava*).—In my last notes I spoke about the breeding of this little bird near Poona. I continued my observations after they were written. The colony of 20 odd pairs seemed to gradually dwindle away till finally only two or three were left, these persevered with their domestic duties and deserved success; they seem to possess any quantity of enemies as is testified by the casualties among them. I found the birds fairly common round here, and that they were nesting in sugarcane and grass along the canal. Six eggs seem to be the complement.

THE LARGE PIED WAGTAIL (*Motacilla maderasapatensis*) is very common on the river. He is a cheerful little fellow and jerks and runs about catching flies and insects along the water's edge, stopping every now and then to pipe his little lay. On the 5th March, I saw a pair building, and, on watching others, very soon discovered that the whole community were marrying and

giving in marriage, consequently I have secured several clutches of eggs. They are not over particular as to site. So long as water is handy, most of the nests have been placed on the ground in tussocks of grass, very well concealed. Very favourite places are the little islands which stud the river below the Bund; to obtain the nests one has to wade out. The nests are very massive structures, usually having large foundations of all sorts of rubbish, on which the nest proper is built: the latter is a deep cup well lined with soft material, such as goat's hair, hare's fur, roots, or any other handy article suited for the purpose. They are pugnacious little birds, and will allow nothing within a considerable radius of their home. I have found some nests in clefts of rocks, but they are not nearly such nice abodes as those on the little islands, which latter must be very jolly places to be reared in. Four eggs is the full complement, though three are very often found; they are very like larks' eggs in appearance.

BONELLI'S EAGLE (*Nisaetus fasciatus*) is sparingly distributed throughout the Dekhan. Last January, while on tour in the Sholapur District, I noticed an eagle on the top of a very high Pipal tree, on which there was a nest. The next morning I returned with a climber, whom I directed to go up and see whether the nest contained anything. From below I could see nothing. When the man was within a few feet of the nest, he said that a bird was on it; as he continued to climb she flew off, I fired at and missed her. The nest contained one egg which I told the man to take. Before he had reached the ground, the bird tried to return to the nest, but I shot her for purposes of identification. The nest was composed of sticks but not very big, though sufficiently large to conceal her when she was sitting.

THE YELLOW-FRONTED PIED WOODPECKER (*Liopicus maharattensis*) is fairly common, but the eggs are difficult to obtain as it nests in tree holes. I have found 4 nests this year, three of which contained young; from the fourth I hoped to obtain eggs, as the bird flew off on my approach, but on opening the nest I found eggs had not been laid, rather disappointing! The favourite place seems to be about from  $3\frac{1}{2}$  to 6 feet from the ground in a Babul tree. From my experience, the best time for eggs would appear to be from late in February to about the middle of March, after which nests seem to contain young.

THE RUFOUS-TAILED FINCH LARK (*Ammomanes phanicura*) is common throughout the Dekhan. It is distinguishable by its rufous tail, and its habit of frequenting the roads and dusting itself. Though so widely distributed, it is a clever nester, for I have only found one nest, which was deserted after a single egg had been laid. This nest was placed in a crack in cotton soil, well sunk into the ground, and only visible from one side, being practically in a hole. It was well finished off and carefully lined with roots and hair.

THE SOUTHERN RED-WHISKERED BULBUL (*Otocompsa fuscicaudata*) is common along the Sahyadri Range, where it practically replaces the

Common or Madras Bulbul. It is rather a shy bird, but makes itself noticeable by its resonant voice, which one cannot help hearing. Its breeding season is now in full swing. The nest is not difficult to find. The bird usually selects a small, thick shrub, in a fork of which, some 4 to 6 feet from the ground, it fixes its nest. The latter has usually a foundation of dry leaves, on which a nice compact cup-like structure is built; in this two pretty eggs, smudged and thickly spotted and freckled with carmine, are laid: they do lay three eggs on occasions, but two are more generally found.

THE GREY JUNGLE FOWL (*Gallus sonnerati*) is found all along the Sahyadris. The present being the breeding season, the cock is to be heard crowing lustily at all hours of the day.

It is always a matter of difficulty to catch a glimpse of a jungle fowl; they can always hear you approach, when they scuttle off at their best pace. I found a nest containing five eggs in my last wanderings. The nest was situated in virgin forest, not very far from the edge, against the trunks of three small trees: it was a mere depression, filled with dried yellow leaves and a few feathers. The eggs were very much like those of an ordinary fowl; but it was interesting to notice how nearly their colour assimilated with the dry, yellow leaves.

THE SOUTHERN SCIMITAR BABBLER. (*Pomatorhinus horsfieldii*):—While walking through some heavy forest, south of Satara, a bird flew away from almost under my feet. I immediately instituted a search, when I found a nest of this bird containing three eggs. I am sorry to say I had to sacrifice her for the purpose of identification. The nest was a perfect work of art, being a domed affair, placed against a stone on the ground, not far from a stream in deep jungle; an ideal spot. The exterior was composed almost entirely of dry skeleton leaves, corresponding with the surroundings, in fact it looked like a mass of leaves; had not the bird betrayed herself, I should never have found her home: the interior was neatly finished off and lined. The eggs were a pretty ivory white, with a thin shell.

THE JUNGLE NIGHT JAR (*Caprimulgus indicus*).—The finding of this nest occurred in a curious way. I was out, with a friend, on the Sahyadris; we had a beat for some bears, which were supposed to be lying up in the jungle, but of course did not show. On the conclusion of the beat, I joined my friend, who was lying on the ground, in his position: he informed me that after he had made himself comfortable, a sort of hawk came and settled close to his feet, advanced a foot or so, and squatted: after remaining in this position a short time, it flew away: to his surprise, he found, in the interim, two eggs had been laid! of course I laughed at him. He showed me the eggs in the nest, which was within a yard of his feet. I at once recognized them as those of a Night Jar. I shot the female, which I found to be one of this species. On taking the eggs, there were two, I was sorry to find them on the point of hatching, in fact they were chipped, so that they were of not much

use to me. On referring to Hume's "Nests and Eggs," I find the eggs of this bird have not been often found, so it was a disappointment. On seeing the condition of the eggs, my friend was more or less convinced that they must have been laid some time! They were deposited on the ground, there being no attempt at a nest, under a shrub, in scrub jungle, and were of a salmon-pink colour, speckled with lilac and brownish spots. The measurements of one egg were  $1\cdot08 \times \cdot83$ .

THE INDIAN HOOPOE (*Upupa ceylonensis*).—Although a common bird, its eggs are not often obtained. I was fortunate enough on the 12th April to obtain a nest containing five fresh eggs, which was placed in a hole in a building at Poona. The nest was just a little coir and odds and ends, nothing much for the bird to be proud of; a sickly odour pervaded it, and the eggs, although fresh, had a disagreeable smell, which disappeared on their being cleaned and disinfected. It is curious that this clean-looking bird should have such a dirty house.

THE COMMON WOOD SHRIKE (*Tephrodoris pondicerianus*) is to be met with pretty generally. It commences nesting towards the end of February. Its nest is not difficult to find during construction, as the birds, (they usually move in pairs), draw attention to themselves by their funny little call. They usually select a fork of a tree and wedge their nest in; the outside is composed of twigs covered with bark and cobweb to assimilate it with the tree, and it is lined with thread and such like material. It is a very pretty little nest, but not big enough for the bird. It is wonderful how well the tree, nest, and bird harmonize: the tree usually selected is a babul; the bird is a kind of olive-brown and grey, with a white eyebrow. It is amusing to watch the bird trying to deceive you as you approach the nest; when she is sitting, she sits absolutely motionless, with her head stuck up in the air. On several occasions I have all but been deceived, taking her and her nest for a stump that had been cut away, the resemblance has been so near. This may seem incredible to those who have not seen it, but it is nevertheless true. I find two or three is the full complement of eggs.

While wandering about the Sahyadris, a nest of some bird of prey was spotted in the chief fork of a tree. On sending a man up the bird flew off; owing to the denseness of the jungle, I was unable to shoot. The nest contained two eggs. I left them intending to return next day to shoot the bird and take the eggs. On coming again, I found the nest deserted, the bird absent, and the eggs broken on the ground below. They appeared to be of a bluish-white colour, speckled with yellowish-brown. I think the bird was the Crested Serpent Eagle (*Spilornis cheela*), but of course cannot be sure: she was of a lightish brown, but the glimpse I got of her was very transitory. It was a disappointment as the bird was new to me.

R. M. BETHAM, CAPTAIN,

POONA, April, 1900.

8th Bombay Infantry.

## No. XVII.—A SHOOTING EXPEDITION ON THE PAMIRS.—I.

Ten years ago, when ibex shooting in Kashmir, I came across a trader from Central Asia, who was bringing down among other things two *Ovis poli* heads, the first I had ever seen. Ever since then I have longed to bag one or two of these splendid trophies, but it was not until the spring of 1899 that I at last got an opportunity to do so.

I managed to get the necessary leave and passports, and about the end of April I arrived at a Tarjik encampment on the Pamirs, not far from the place where I first proposed to try my luck with the *O. poli*. We were announced by a deafening chorus from half a dozen rather formidable-looking dogs, and a man, who looked out of the biggest yurt to see what was the matter, came up to us, and invited us to enter. A fine looking old man, who was evidently the head of the family, received us at the door with the usual "Khushamed," literally "Welcome," while the other occupants began to get tea and other luxuries ready for us. In a short time I had placed before me China dishes containing tea, hot milk, cream, and a sort of biscuit, while they pressed on my shikari an enormous wooden bowl full of curds. While doing justice to this fare I looked around and examined the yurt, which was the first one I had been inside.

From the outside these yurts look very grimy and uninviting, and one is surprised on entering them to find how comfortable and comparatively clean they are. They are bell-shape, consisting of a framework of wooden laths, the lower part of which is made on the principle of the "lazy tongs" and folds up into a small space, the whole covered with large pieces of felt. The yurt is absolutely impervious to the icy wind which howls outside, and the first thing which strikes one on entering is the warmth and silence, for the large circular opening in the top of the dome, while admitting plenty of air and light, lets in none of the wind and noise. This opening serves indifferently well as an escape hole for the smoke, but the latter, if the fire is at all big, is generally rather trying. The cooking place is in the middle, while one side is always carpeted with bright-coloured numdahs. I noticed, among other odds-and-ends hanging on the lattice work, half a dozen firearms of sorts. These I was told belonged to the old man's eldest son, Dhe Khan, a great shikari, who had been out since daybreak after a bear which one of his brothers had seen. I had heard of this man before, and had been recommended to get hold of him; so was glad when the old man said that Dhe Khan would be delighted to go after the *O. poli* with me.

The other occupants of the yurt were three young women, daughters or daughters-in-law of the old man. These attended to the cooking and moved about laughing and talking in a natural, unembarrassed way, to the great astonishment of Rakhmat, my shikari, who, I knew, thought it extraordinary behavior in Mahomedans. While I was there several visitors dropped in, and the ladies again produced the great bowl of curds. Two or

three very-good-looking children were playing about, and soon a squall from a cloth-covered box, which I had been making use of to lean against, proclaimed it a cradle containing a baby. Before long noises outside announced the arrival of the flocks and herds, and two sons of the old man, the shepherds of the family, entered, and at once tackled the bowl of curds. At last Dhe Khan himself turned up, bringing, rather to my surprise and to Rakhmat's great disgust, his two dogs in with him. As soon as he had had something to eat I questioned him on the subject of shikar. It was an excellent time of the year, he said, and *O. poli* were plentiful. As to whether I was likely to see any big heads, that, of course, was entirely a matter of "kismet." My baggage at last arrived, and Rakhmat and the young men went out to pitch my tents, while my other servants and the yak drivers were brought inside and fed.

Next morning, accompanied by Dhe Khan, we did a short march up the valley and encamped at the junction of two nullas, both of which I was informed generally held *O. poli*. On the way we found numbers of old heads lying about, and I dismounted and measured any that looked big. Fifty-seven inches was the size of the largest I saw, and I may mention that among the hundreds of old heads I inspected during my stay on the Pamirs very few of them measured much more than this, the best being 63in. Most of these heads were evidently those of beasts which had been killed by wolves, or had been carried off by one of the epidemics of disease, which, I believe, occasionally visit the Pamirs. Those shot by natives could be easily recognised by the part of the skull below the eyes having been chopped off, and these heads were generally quite small ones. I do not think that the local shikaris shoot many big rams: all those I talked to told me that they shot very many more females than males.

Dhe Khan had insisted on bringing his three dogs with him, and as he said they were perfectly trained and would not be in the way, while they would save us a lot of trouble if any beast went off wounded, I had allowed him to do so.

It was terribly cold when I was called next morning, but, with the prospect before me of sighting my first *O. poli*, it did not take me long to get out of my sleeping bag and into my clothes. I found Dhe Khan and Rakhmat waiting for me, both looking like immense bundles of cloth and sheepskin. They had three riding yaks ready, but, heavily clothed as I was, I felt that I should never get warm unless I walked, so handed my yak over to Rakhmat to lead. After going for four or five miles up the nulla on the left, and seeing nothing but a couple of herds of ibex, Dhe Khan called a halt, and said that there was no use going on, as there was no more *O. poli* ground beyond what we could see. I believed him at the time, but now, after some experience of the Pamir shikaris, I imagine that the real objection to going further up the nulla was the deep snow, which would have necessitated a good deal of hard work.

However, we turned back, and on reaching camp I had breakfast while the tents were being struck. After breakfast we started up the other nulla followed by the baggage. The sky had now begun to look rather threatening, and before we had marched an hour we were caught in a heavy snow-storm. The going was also very bad; the yaks could scarcely struggle through the deep snow; so on arriving at a likely looking place for a camp, a small island of bare ground in the middle of an ocean of snow, I gave orders to unload and pitch the tents.

In the afternoon it cleared up slightly, and Dhe Khan, strolling casually into my tent, said "Gulga" (*O. poli*), and asked for the telescope. Out I bolted, and, looking where Dhe Khan pointed, saw five black dots against the snow on the other side of the valley about half a mile off. *O. poli* they were without a doubt, and I was soon eagerly examining their horns with the telescope. One of them looked a big fellow, with horns curling down slightly at the tips, which I took to be a good sign. The ground they were on reminded me very much of *Ovis ammon* country; in fact, without the telescope, one might have imagined one was looking at *O. ammon*. They did not appear to notice our camp, which must have been visible, but continued walking slowly in our direction until they were hidden by a ridge. Meanwhile we had been hurriedly getting on our foot-gear, and, now that the way was clear, started off at once across the snow-covered valley. It was pretty hard work, as the snow was deep and soft, and occasionally one went right through into an icy stream which was flowing underneath. Once across the valley the going was better, and we soon reached the ridge which had hidden the *O. poli* from us. On looking cautiously over nothing was to be seen, and Dhe Khan shook his head and pointed to some fresh tracks in the snow leading away from us. This looked bad, and I was very much afraid we had made a mess of our stalk, when suddenly my eye fell on a brown back which came into view for a moment down below. Motioning to Dhe Khan to follow me, I took the rifle and managed to get within about 400 yards of the *O. poli*. Four of them were laying down on a bare patch of ground, and the one I had seen was moving down to join them. A nearer approach was clearly impossible. Moreover, even if the rams got up, they would not be likely to retrace their steps and come towards us, and the further they moved away the worse matters would get, as the ground beyond them was absolutely level for a long way. Dhe Khan now began to make some suggestions. My knowledge of Persian was extremely limited, and I could hardly understand a word he said; but shikaris all the world over can understand one another, and I saw very well that what he proposed was a drive. The mere word "drive," when applied to mountain game, sounds terribly unsportsmanlike, but I think a drive when there are no stops, and the beaters consist of one man only, is just as sporting as a stalk, requires a perfect knowledge of the habits of the animals, and, as far as my experience goes, is very rarely successful. In this case it really seemed to

be our only chance of getting a shot that day ; so I told Dhe Khan to start. It was bitterly cold and the icy wind seemed to cut through us, warmly clad as we were, but the *O. poli* seemed as happy as if they were basking in the sun. Off went Dhe Khan, and in about half an hour we saw him ploughing through the snow on the other side of the valley. He was plainly visible to us, so should have been to the *O. poli* ; but it was some time before they spotted him. At last first one and then another pair of horns turned in his direction, and the big ram got on his feet. Dhe Khan had now passed the *O. poli* and began to work back towards us ; then soon they were all on their legs, and it was only a question as to which direction they would move. Handing the binoculars to Rakhmat with instructions to keep his eye on the big ram, I got ready with the rifle. The *O. poli*, having now come to the conclusion that Dhe Khan was up to no good, turned round and started off at a good pace up-hill and in our direction. Had it not been for the snow, I should only have got a running shot, but before long the big ram plunged in up to his belly. Now was my chance, and, drawing a careful bead, I fired. "Missed" said Rakhmat, and the rams dashed on through the snow, making nothing of it. Another shot was also fruitless of results, and they were hidden by an undulation of the ground. Rakhmat and I ran to cut them off. We had about 100 yards of snow to cover, all up-hill, and by the time we caught sight of them again we were both absolutely beat. Two rams were standing looking at us about 150 yards off, but I was shaking so terribly that I was quite incapable of using the rifle. They soon disappeared, and when next we saw them they were going over a ridge down below us about 600 yards off.

Rakhmat, who had the glasses, said that the big one was bringing up the rear. As soon as they had disappeared we ran down after them, but we did not see them again. There was no blood in the tracks ; it was a palpable miss, a bad beginning to my shoot.

We both lay down in the snow and were trying to get our breath again, for we were still suffering from the effects of our run up-hill, when a shout from above made us look up. It was Dhe Khan, who evidently wanted to know the result of my shot. We signalled to him to come down, but he continued shouting and waving his arms, so I sent the unwilling Rakhmat up the hill again to see what he wanted. After exchanging a few words with Dhe Khan he also shouted and waved to me. What was the matter ? Perhaps the *O. poli* was wounded after all and they could see him, so I slowly climbed up the snow slope. Rakhmat and Dhe Khan had disappeared when they saw me start, and what was my astonishment on reaching the top of the ridge to see them both sitting over a dead *O. poli* within a few hundred yards of the place where I had fired. It was the big ram ; my second shot had hit him, and he had only moved about twenty yards after it. He had fallen when hidden by an undulation of the ground, and we had just missed him when we ran to cut the rams off. Dhe Khan

had seen the beast fall and had made straight for it, wondering what we were up to. The horns measured  $56\frac{1}{2}$  in., a very fair head, and a good beginning to my shoot. Leaving the shikaris to skin the beast, I returned to camp and sent off some yaks for the meat. The men got in just before dark, and brought news of another flock of "gulga" with two good rams, which they had seen on their way back.

Next morning I was up early, and, opening the fly of my tent to see what the weather was like, I spotted a very big red bear walking along on the other side of the valley. Of course, a bear was very small game when one had "khubber" of two big *O. poli* rams; still, he looked such a fine fellow that I wished he had turned up when I had been at liberty to attend to him. Rakhmat was up on a ridge behind the camp with the telescope, and Dhe Khan told me that *O. poli* were visible from there. On getting up there I turned the telescope on them, and made out two of the flock to be as big or bigger than the one I had shot. They were lying down, but soon after the sun touched them they got up and began grazing down hill. For some hours we watched them until at last they crossed a ridge, and our way was clear. We quickly followed, and on arriving on the same ridge Dhe Khan spotted a small ram just below us. At the same time the flock must have got our wind, as they rushed out of a little nullah they were in and made off up-hill. It was an easy shot if I had been able to distinguish the big heads, but Rakhmat was behind holding the dogs, which Dhe Khan had insisted on bringing out. Putting down the rifle and taking a hasty look with the glasses, I made out one of the big ones. He stood for a second to the shot, and, though he went on with the others, I knew I had hit him. At the next shot he fell, and I turned my attention to the other big ram which I made out bringing up the rear. Two shots at about 300 yards were misses, but the last was more successful. He was evidently hit, and the rest of the flock soon left him behind. Dhe Khan now ran back for his precious dogs, and, though I saw that the *O. poli* would be easily bagged without them, I was rather anxious to see them work. Kneeling in the snow with the three dogs held in a leash by his side, Dhe Khan whispered strange noises and pointed steadily at the wounded ram, who was now moving slowly up-hill, and hard to distinguish against the grey earth. At last a little red dog catches sight of him; Dhe Khan at once sees this and slips him, and the little dog goes off as hard as he can lay legs to the ground straight for the ram. On the way, however, he comes right on to the dead one, but, stopping only an instant to sniff it, goes straight on, and reaching the wounded *O. poli* rushes round it barking furiously, and brings it to bay. The poor beast was unable to go any further even if the dog had let him, so I sent Rakhmat off with a knife to finish him while I went to look at the dead one. The latter measured 58 inches and Rakhmat when he came back said that the other was as large. Dhe Khan now rather astonished me. After I had taken several

photos of the dead ram he pulled out his knife and asked me how I wanted its throat cut. The beast had been dead half an hour, but, to Rakhmat's horror, the meat was quite "halal" in the opinion of Dhe Khan and the yak-drivers. It now struck me that there was still time to look after my friend the bear—so, taking Rakhmat with me, I started off across the valley. We could find no trace of him, however, and before long another snowstorm sent us back to camp.

Next day one of Dhe Khan's dogs distinguished itself by killing a marmot. We were riding along when suddenly Dhe Khan kicked his yak into a canter, at the same time leaning over and slipping one of his dogs. I then saw in the distance a marmot, evidently travelling from one hole to another. It was a close thing. The poor little beast had all but reached his home when the dog ran into it and killed it. By the way, I noticed on three occasions on the Pamirs a curious habit of the marmot which I do not remember to have seen recorded anywhere—that is, that if one suddenly comes upon one of these beasts away from its hole it does not attempt to escape by running, but shams dead. The first time I came across one doing this I was completely taken in, and could hardly believe the Kirghiz who told me it was shamming. It did not stir as we stood over and examined it until the Kirghiz, putting his stick under it, chucked it up in the air, when, on coming to its feet again, it scuttled off as hard as it could.

After this I had no luck for several days, seeing plenty of *O. poli* but nothing worth shooting, so, paying off Dhe Khan and his men, I started for another part of the Pamirs. Here on one of my marches I had rather a curious accident. I was riding a camel which we had taken with us to ford us over several streams we had to cross. The road led across a valley covered with hard snow or ice. This was good enough going, but I noticed in several places wet-looking streaks on the snow, which I did not much like the look of. The Kirghiz who was leading the camel now made straight across one of these streaks. Thinking he knew more about it than I did, I said nothing but prepared for a jump, as I expected that if the ice broke the camel could go down perhaps a foot or so. Nothing happened as the Kirghiz crossed the place, but when the camel got on it there was a crash like thunder, and I found myself lying on my back on the ice, with the camel disappearing into a yawning chasm in front of me. A crack about 4ft. wide now extended for 20 or 30 yards. The camel was in the middle of it, complaining loudly, jammed by his hump, with his forequarters above the surface, while his hinder parts were dangling in the gulf below. The place was nine or ten feet deep, with a shallow river flowing at the bottom. Luckily our baggage was close by, and, with the help of the yak-drivers and all the loading ropes, we at last managed to extricate the unfortunate beast. If it had not been as quiet as a lamb it would never have got out at all, as any struggling would have sent it into the chasm altogether. It seemed to know this, for it never stirred till

we hauled it out. This spill was rather amusing at the time, but the bruises I got from it bothered me for some days after.

Two or three days after this I got another *O. poli*. We were on the march when we came on a large flock of between fifty and sixty rams. They were moving slowly up the hill, having seen our little caravan. Directing the servants with the baggage to go on for a couple of miles, and then pitch the tents, I and the shikaris dropped behind and watched the *O. poli*. The latter stood gazing at the baggage animals till out of sight, and then lay down. They evidently had not noticed that we had stopped behind. It was two or three hours before they got up again, and, though I had had the telescope on them the whole time, I could hardly make up my mind as to whether there was a shootable ram in the lot or not. It is extremely difficult to judge the size of *O. poli* horns, almost impossible unless one gets a straight front or back view, so that to carefully examine every one of the sixty rams took some time. At last I made out a good head, but how to get at the owner of it was the question. The rams were now grazing and covered a large extent of ground, the fellow I wanted being somewhere near the middle of the flock. However, they settled the matter for us by suddenly taking the alarm. What frightened them I cannot think, but they made off up the hill again. They started off in a mass like a flock of sheep, but they soon settled into single file, and having kept the telescope on the big one the whole time I saw that he was leading. They were going quite slowly and coming slightly in our direction, and at last were hidden by a ridge. If they would only give me time to get to that ridge I might get a shot, but it was a long way off, and it seemed very hopeless. However, I thought I would have a try, so started off with Rakhmat and the Kirghiz. It was a steep pull up, and it had to be done as quickly as possible. I noticed that Rakhmat was feeling the rarefied air a great deal, and that, though he could always leave me standing on the hills in his own country, he seemed to have a good deal of difficulty in keeping up here. However, I may mention that long before we left the Pamirs he got accustomed to the air, and soon showed me the way again.

On arriving at last at the ridge there were the *O. poli* on the opposite side of the ravine, still moving slowly up-hill in single file. It was a long shot, but a *O. poli* ram is a big mark, and they showed up very well against the yellow earth they were on. Putting the Lynam at 400 yards, and, taking every advantage of a comfortable position and a rest, I fired at the leader. "Just under his belly" called out Rakhmat, who had the glasses on him. The rams now stood still, unable, I suppose, to localise the report. To the next shot, which I aimed higher up on the beast, Rakhmat called "Hit!" The flock now started off at a good pace, and Rakhmat told me that the big one was still leading. Another shot was also a hit according to Rakhmat, and the rams topped a ridge and were out of sight. To me the big one had shown no signs of being touched, but Rakhmat, who I knew was uncommonly sharp at mark-

ing the shots, assured me that two bullets had hit. It was getting late, so, sending the Kirghiz down for the yaks, Rakhmat and I started off immediately. There was a good deal of blood in the tracks, but no signs of the ram, till on turning a corner we came suddenly on the whole flock standing crowded together about thirty yards off. On seeing us they dashed off, and then we saw the big one, who had been lying down. He got on his feet and tried to follow the rest, but was stopped by a bullet in the neck. While helping to skin him I noticed the rest of the flock right down in the middle of the valley below. They stood for a long time closed up in a bunch; evidently, their leader being gone, none of the others would take the responsibility of showing the way. I have seen Oorial behave exactly in the same way under similar conditions. After measuring the horns (58in.) Rakhmat and I made off for camp, leaving the yak drivers, who we saw arriving, to look after the meat. After this I had no sport for a long time. We saw plenty of *O. poli*, but only once shootable heads. One is more inclined to dwell on one's lucky days than the failures, though perhaps the latter are as interesting and more instructive than the former, so I will give an account of my unsuccessful attempt after these rams.

One day, after riding a long way up a snow-covered valley, we found a large flock of *O. poli* rams under a glacier at the head. There were, perhaps, fifty of them grazing over a large extent of ground. One or two of them appeared to be good heads, and we started to stalk them. Now, up to this time I had been rather lucky with the *O. poli* I had stalked, and had come to have rather a poor opinion of their sharpness of sight and general wariness. I suppose I was careless, for we were spotted almost as soon as we began the stalk, and the rams bolted up-hill. When they got up into the snow, and had settled down into single file, we had a good opportunity to examine the horns. The biggest looked a good head, perhaps 58in. or so. One of the horns was curiously broken or malformed, so I felt certain of recognising him again; another head was very nearly as big. A blinding snowstorm came on as we were watching them, so we left them till next day, and got back to camp as quickly as we could.

Next day it was still snowing hard, and did not clear up till evening. The day after, however, it was fine, and going up the nullah early in the morning we soon sighted the same flock. They were all lying down on the hillside, but some got up and began to graze their way down-hill. When they had gone some distance down, a ridge hid them from us, and before long all except one ram had got behind this ridge. This one was still lying down, and blocked our way. We waited for an hour, but he showed no signs of moving, and then we began to get impatient, and decided to try a stalk in spite of him. "The flock might graze their way over the ridge towards us and quite spoil our prospect of a stalk." That was the excuse I made to myself, but the real reason was that I was sick of sitting still. We had to go about 600

yards, the ground for the first 200 yards or so being in full view of the ram. We had almost got over this dangerous bit when the ram slightly turned his head and we were spotted. Up he jumped and started up-hill, followed at once by the rest of the flock. They were about 400 yards off, and going up a steep slope. I ought to have left them alone, and waited for a better opportunity another day, but, incited by Rakhmat and encouraged by the thought of the lucky flukes of shots I had bagged my last *O. poli* with, I opened fire at the broken-horned one which was leading. Four long shots and the flock disappeared over the hill, and I knew I had made a mess of it. Even then, if I had left them alone, I might have found them again another day, but I now insisted on following them. A couple of hours stiff climb brought us to the top of the hill. There on the opposite side of the nullah were ten rams standing in deep snow. These we made out with the telescope to be the big ones; the remainder of the flock, we saw by a great track in the snow, had taken a road lower down. After standing still for a long time, the ten rams went on to a small bare patch of ground, from which the snow had melted, and lay down. They were about 700 yards off, and I foolishly again attempted a very difficult stalk—twenty yards or so of this had to be done in view of the herd. We were of course seen by them, and this time they evidently made up their minds not to give us another chance. They managed with difficulty to find a way through the snow to the hill-tops, and there, after trying several places, they at the last found a pass, and disappeared over it into another nullah, or, rather, into another empire, for that line of hill-tops was the border between Russian and Chinese territory.

Shortly after this a Kirghiz volunteered to take me over a pass to a place where he said we were certain to find big rams. As my yak drivers protested that the pass would not be practicable for laden yaks, I determined to spend a day in reconnoitring the ground first myself. Taking a load of dried yak dung for fuel, we camped one evening high up just under the pass. It began to snow hard as we arrived, and by morning there was nearly a foot of fresh snow all round. It had cleared up slightly, so taking Rakhmat and the Kirghiz and three riding yaks, we started for the pass. It was a very stiff pull up and the snow was deep, so I preferred walking to flogging a broken-winded yak up the hill; Rakhmat and the Kirghiz, however, went on riding until their yaks refused to go on and they had to dismount. Leading the three yaks, we reached the top of the pass, and were there met by such an icy hurricane that it was as much as we could do to stagger on against it. My Balaclava cap was frozen as hard as a board, and my face felt as if it was being cut to ribbons. Luckily the wind was only bad on the pass itself, and after descending a little we got out of the worst of it. The snow down the other side was deep, the yaks every now and then going in up to their bellies. However, after ploughing on for about a hour we got on to hard snow, and

were able to mount and push on. About five miles down we found a good camping ground—that is to say, a place where there was plenty of the invaluable product of the yak lying about, without which existence on most part of the Pamirs would be impossible. Pushing on further down the valley we dismounted and searched for game, and it was not long before Rakhmat had found a flock of fifty rams, while I spotted a lot of twelve in another direction. Unfortunately there was such a mirage that the telescope was almost useless, and it was impossible to judge the size of the horns. However, the place seemed well worth trying, and the pass was practicable enough with a little hard work; so we returned to camp, intending to cross again with the baggage next morning. We had more snow during the night, and it was still snowing when we started next morning. Luckily there was no wind this time on the pass, and after a good deal of trouble, having to reload each yak two or three times, we got them all through the deep snow on to the good going below. Snow was now falling thick, and, when we arrived at the camping ground we had selected, the yak dung I had been so pleased to see the day before was completely buried. The amount of fuel we were able to collect that evening did not run to more cooking than a cup of tea apiece, and after this and a piece of cold mutton I was glad to turn into my sleeping bag.

Next day it cleared up, and we went after the *O. poli*, but were much disappointed to find, after spending a day stalking them, that the large flock did not contain a head over 50in. That evening we had more bad weather, and it was nearly a week before I was able to examine the smaller flock, which I found also no good. After searching the rest of the nullahs round about and finding nothing shootable, I recrossed the pass.—A. LE M. B. in "*The Field*."

(*To be continued*).

#### No. XVIII.—LAND MOLLUSCA.

The following extract from the President's address to the Malacological Society, delivered by Lieut.-Col. H. H. Godwin-Austin, F.R.S., &c., on the 10th February, 1899, throws more light on the peculiarities of two Bombay species which are referred to in Mr. Blanford's "Note on the Land Mollusca of Bombay," published on page 326 in Vol. XII of the Society's Journal:—

"I have failed to find among any *Macrochlamys*-like shells of Peninsular India the exact similarity of anatomical detail so typical of the genus; there are many shells in this part of India which, up to the present, are included in it, among them being *M. pedina* and *M. platychlamys* from Bombay. The first-named I include in section D of *Macrochlamys*. It has both the right and left shell lobes, but the former is extremely rudimentary, and, judging from analogy and its reduced size in spirit, it cannot be largely protrusible in life. The male organ has become altered in form, its most interesting feature being the replacement of the many-coiled disc

by a simple short bend in a cœcum-like process, the retractor muscle rising beyond and above this."

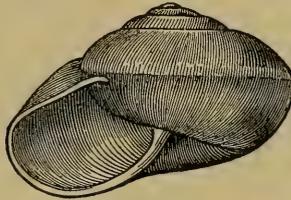
"The other species, *Platychlamys*; presents far greater diversity when compared with species of *Macrochlamys*. The broad shell-lobes cover the shell almost completely in life, and the generative organs are on a very different plan, and comparatively simple in detail. The examination of the Ceylon shell *regulata* presented anatomical characters of the same type, and I have therefore placed these two species in a new subgenus, *Eurychlamys*. The most interesting fact in connection with this particular development is the discovery that a Sikkim and Bhutan species, *planospira*, must be included with them. I previously placed *planospira*, on account of its shell-lobes and shell (besides not taking into sufficient consideration all the details of its internal anatomy), in *Austenia*, but it will be seen that its anatomy does not at all resemble that of the latter genus."

A. J. PEILE, Capt., R. A.

BOMBAY, June, 1900.

#### No. XIX.—LAND SHELLS OF THE GENUS *ARIOPHANTA*.

In the proceedings of the Malacological Society for July, 1899, Mr. W. T. Blanford, after describing a new sub-species, *A. dalyi* (*A. cysis* var.), gives



*Ariophanta Dalyi* (*A. cysis* var.)

the following list of, and remarks on, the Genus *Ariophanta* :—

1. *A. lævipēs*, Müll. Syn. *Helix trifasciata*, Chem. Bombay and its neighbourhood; Eastern Guzerat. Type of the genus *Ariophanta*.
2. *A. laidlayana*, Bens. Western and South-Western Bengal.
3. *A. cadapaensis*, nev. Syn. *Helix nicobarica*, Mart. and Chem. Cud-dapah (not Nicobars).
4. *A. interrupta*, Bens. Syn. *Helix himalayana*, Lea. Bengal, Behar, Orissa, Vizagapatam (not Himalayas).
5. *A. immerita*, Blf. South Canara. Doubtfully separable from the last.
6. *A. bajaderā*, Pfr. Syn. *Helix ammonæa*, Val. Bombay and neighbourhood.

7. *A. intumescens*, Blf. Mahableshtar.
8. *A. cystis*, Bens. Syn. *Helix auris*, Pfr ; *H. cystis*, Rve.; *H. ampullaroides*, Rve., and var. *A. dalyi*, Blf. Southern Sahyadri from Mysore to the Nilgiris,
9. *A. thyraeus*, Bens. Syn. *Helix rhyssolemma*, Alb. Balarangum, Nilgiri and Anamalai Hills, S. India.

"No species is known from either the Himalayas or Ceylon. For this reason the name *himalayana*, applied to a species by Lea, is misleading, and Benson's name *interrupta*, given a year later, should be preferred. For similar reasons the name *nicobarica* is objectionable."

"Theobald, in his Catalogue of the Land and Fresh Water Shells of British India, page 22, includes a species, *A. cyclostrema* from the Sumeysur (Someshwar) Hills at the base of the Himalayas, north of Tirhoot. I have a typical specimen given to me by Mr. Theobald, and I have no doubt that the species belongs to *Planispira* or *Trachia*, a section of *Helix* proper."

"Colonel Godwin-Austen has lately shown reasons for removing the Moulmein *H. retrorsa* from *Ariophanta*, and uniting it to *Hemiplecta*, or some similar generic group. It thus appears probable that *Ariophanta* proper is confined absolutely to the Peninsula of India."

The species represented in the Society's collection are Nos. 1, 6, 7, 8 and 9 of the above list, so that specimens are still required to complete the series of this interesting Indian genus.

A. J. PEILE, Capt., R. A.

BOMBAY, June, 1900.

---

## PROCEEDINGS

OF THE MEETING HELD ON THE 24TH APRIL, 1900.

A meeting of the members took place on Tuesday, the 24th of April, 1900, when Mr. John Wallace, C.E., presided.

### NEW MEMBERS.

The election of the following new members was announced :—Life Member—Sir Sidi Ahmedkhan, Nawab Saheb of Janjira.

Members—Major J. Lloyd Jones, I.M.S. (Bombay) ; Major D. C. Phillott (Kohat) ; H. E. Lord Northcote (Bombay) ; Lieutenant J. Bogle (Mardan) ; Captain A. G. Stuart, A.-D.-C. (Rangoon) ; Mr. Sorab P. N. Wadia (Bombay) ; Mr. Bernard Holyoak (Bombay) ; Mr. D. G. Hatchell (Vizianagram) ; Mr. John A. Balfour (Bombay) ; Mr. Norman Davidson (Shenkottah, P. O.) ; Mr. M. Innes-Ker (Bombay) ; General W. Osborn, I.S.C. (Hoshiarpur) ; The Principal, Presidency College (Madras).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary acknowledged receipt of the following contributions to the Society's Museum since the last meeting :—

| Contribution.                                               | Description.                        | Contributor.              |
|-------------------------------------------------------------|-------------------------------------|---------------------------|
| 1 Striated Bunting .....                                    | <i>Emberiza striolata</i> .....     | Mr. P. B. Allen.          |
| 1 Grey-necked Bunting ...                                   | <i>Emberiza buchanani</i> .....     | Do.                       |
| 1 Great Crested Grebe.....                                  | <i>Podiceps cristatus</i> .....     | Mr. B. S. Carey.          |
| 1 Bronze-capped Teal .....                                  | <i>Eunetta falcata</i> .....        | Colonel H. Keary.         |
| Δ case containing Wild Ducks, &c., mounted for the Society. | .....                               | Mr. Chas. Maries.         |
| 1 Kestrel (alive) .....                                     | <i>Tinnunculus alaudarius</i> ...   | Mr. W. Shipp.             |
| A number of large Mygales (alive).                          | <i>Mygale</i> sp .....              | Mr. W. Copleston.         |
| 1 Small Indian Civet (alive).                               | <i>Viverricula malaccensis</i> ...  | Mr. W. Murray.            |
| 2 Grey Jungle Fowl .....                                    | <i>Gallus ferrugineus</i> .....     | Mr. R. W. Hanson.         |
| Some Spiders from Khaddalla.                                | .....                               | Rev. Fr. Dreckmann, S.J.  |
| 1 Short-toed Eagle.....                                     | <i>Circæetus gallicus</i> .....     | Mr. J. Brand.             |
| 1 Mute Swan .....                                           | <i>Cygnus olor</i> .....            | Mr. F. Field, I.C.S.      |
| 1 Owl (alive).....                                          | <i>Strix flammea</i> .....          | Mr. F. Williams.          |
| 1 Large Pintailed Sand Grouse.                              | <i>Pteroclorurus alchata</i> .....  | Mr. E. P. Close.          |
| 1 Indian Tawny Eagle. ...                                   | <i>Aquila hindhiana</i> .....       | Mr. C. Donald.            |
| 1 Saker or Cherry Falcon.                                   | <i>Falco cherrug</i> .....          | Do.                       |
| 1 Shahin Falcon .....                                       | <i>Falco peregrinator</i> .....     | Do.                       |
| 1 Green Imperial Pigeon.                                    | <i>Carpophaga aenea</i> .....       | Mr. A. C. Hankin.         |
| 1 Flying Squirrel .....                                     | <i>Pteromys civeraceus</i> .....    | Mr. F. D. Whiffin.        |
| 1 Bear's Skull .....                                        | <i>Ursus torquatus</i> .....        | Capt. E. C. Ogilvie, R.E. |
| 1 Brown Fish Owl and 2 Eggs.                                | <i>Ketupa zeylonensis</i> .....     | Mr. W. F. Jardine.        |
| 1 Bronze-capped Teal. ....                                  | <i>Eunetta falcata</i> .....        | Major Strickland, I.M.S.  |
| 1 White-eyed Duck .....                                     | <i>Nyroca ferruginea</i> .....      | Do.                       |
| 1 Ants' Nest .....                                          | <i>Cremastogaster</i> sp .....      | Mr. A. H. Simcox, I.C.S.  |
| 1 Common Wood Shrike....                                    | <i>Tephrodornis pondicerianus</i> . | Mr. W. F. Biscoe.         |
| 1 Jerboa (alive).....                                       | <i>Alactaga indica</i> .....        | Capt. Rickett, I.M.S.     |
| Head and Feet of Whooper Swan.                              | <i>Cygnus musicus</i> .....         | Genl. W. Osborn, I.S.C.   |

MINOR CONTRIBUTIONS.

Mr. J. McNeill, I.C.S., Mr. H. S. Lawrence, I.C.S., and Mrs. Travers.

CONTRIBUTIONS TO THE LIBRARY.

Guide to the Collection of Fishes in the Indian Museum. "Irish Naturalist," Vol. IX, No. 3. "Nature," Vol. 61, Nos. 1582 to 1587. "Canadian Entomologist," Vol. 32, No. 3. "Indian Forester," Vol. 26, No. 3. "Annals of the South African Museum," Vol. I, Part 3. "Thirtieth Annual Report of the Entomological Society of Ontario, 1899." "Bulletin de la Société Zoologique de France, 1899."

PAPERS READ.

The following papers were then read and discussed :—

1. Note on a Whooper Swan (*Cygnus musicus*) shot by General W. Osborn, I.S.C., on the River Beas, Hoshiarpur District, Punjab, by E. H. Aitken.
2. The White-breasted Kingfisher (*Halcyon smyrnensis*) in captivity, by E. W. Harper, F.Z.S.
3. Indian Termites, by Major G. S. Rodon.
4. Can a Cobra eject its poison? by Captain M. D. Goring Jones.

Mr. Aitken gave some notes on birds, not usually found in or near Bombay, which have appeared this year, owing no doubt to the want of water and food in Guzerat and the Deccan, and on others, which have been unusually abundant for the same reason. The following species were mentioned :—The Indian Roller ("Blue Jay"); The European Roller; The Indian Magpie; The Indian Wheatear; The White-breasted Kingfisher; The Bank Myna; The Ringdove; The Little Brown Dove; The Sociable Lapwing; The Sarus Crane; The Demoiselle Crane (*Kullum*); and several Ducks, *e.g.*, the Mallard and Spotted-billed Duck.

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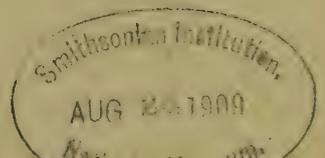
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THE FERNS OF NORTH-WESTERN INDIA, &c.

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*List of errata in instalment published on 29th July, 1900.*

*On p. 236, in 27th line from top, " Lohdardaga " should be " Lohardaga."*

*On p. 241, in 9th line from top, insert a semi-colon after 1896-7.*

*On p. 241, in 17th line from bottom, " Cap-Veneris " should be joined by a hyphen, not by a dash.*

*On p. 242, in 11th line from top, " these ferns " should be " this fern."*

*On p. 245, 13th line from top, insert a comma after S. and W.*

*On p. 248, in 23rd line from top, " Bourbons " should be " Bourbon."*

*On p. 248, in the next line, " ceriaceous " should be " coriaceous."*

Kew, 20th September, 1900.

C. W. HOPE.



## BOMBAY NATURAL HISTORY SOCIETY.

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### NOTICE TO MEMBERS.

---

OWING to the popularity of the subject, the Committee have resolved to publish further illustrations of the Indian Ducks in connection with the paper by MR. E. C. STUART BAKER on "Indian Ducks and their Allies" which was concluded in No. 2, Vol. XIII, of the Journal.

The following have been put in hand :—

- Plate No. XI—The Gadwall (*Chaulelasmus streperus*).  
" " XII—The Pintail (*Dafila acuta*).  
" " XIII—The Garganey or Blue-wing Teal (*Querquedula cirica*).  
" " XIV—The Pochard or Dun-Bird (*Nyroca ferina*).

and they will appear in subsequent numbers of the Journal. The drake and duck will both be figured in these plates.

The coloured drawings have been done by Mr. G. E. Lodge from Indian specimens in the Hume collection at the British Museum, South Kensington. Mr. Ogilvie Grant, of the British Museum, and Mr. E. Comber, the Secretary of our 'Bird and Mammal' section, have kindly supervised the sketches.

The expense of the coloured illustrations is so heavy that the Committee hope that members will try and induce their friends to join the Society, and so enable them to continue publishing these plates which are so greatly appreciated.

W. S. MILLARD,  
*Honorary Secretary.*

SEPTEMBER, 1900.



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Vol. XIII.

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THE BIRDS OF CACHAR.

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

WITH PLATE H.

(Continued from page 510 of Volume XII.)

(Read before the Bombay Natural History Society on 9th Oct., 1900.)

When the first of these articles was commenced I intended merely to compile a catalogue of those birds which inhabited only the hill portion of the district of Cachar known as the North Cachar Hills, but, as time has gone on, and one number after another was written and printed, I found that, with the exception of the aquatic birds and the *Raptors*, there were but few birds found in the plains portion that were not also found in the hills. I have, therefore, incorporated in my articles all and every bird found in the district, whether found in N. Cachar or not, and the title of my articles should therefore stand as the "Birds of Cachar," not of N. Cachar only.

Again, it was not my intention originally to have dealt with the larger birds, such as *Raptors*, *Waders*, &c., but working on and on these too have been taken in with the rest, and I hope that now the catalogue will prove an almost exhaustive list of what is to be obtained in Cachar.

The work has occupied a very large portion of my spare time (furlough and other leave) during the last thirteen years, and it will, at least, serve to show how much there yet remains to be done in field ornithology, even in country worked by such men as Hume, Godwin Austen and others. The final result of my work has been the addition of the following new species, *Elachura haplonota*, *Corythocichia*

*squamata*, *Cyanops rubescens*, and *C. robustirostris*, and a knowledge of the nidification of nearly a hundred species about which nothing was previously on record.

In this final number I have added a few birds not previously recorded, and a few more notes on nidification and other matters which I have obtained since my first articles were written.

The total number of species now enumerated is 695—a very large advance on the species formerly recorded. The area of the whole district of Cachar is 4,200 square miles, and when one compares it with other areas of the same size, or vastly greater, the large number obtained in it is truly astonishing.

In my first introduction I gave a rough description of the country in N. Cachar. In the plains portion the major part is flat ground about 70' to 100' above sea level, much of it under water during the rains, and containing at all times huge sheets of water and lakes which afford quarters for many birds which could obtain no suitable country in N. Cachar. Here and there grass lands, sometimes very extensive, form breeding haunts for certain owls, quail, warblers, etc., found in the hills only as rare stragglers.

Where the hills and plains meet the ground is generally very much broken up, and consists, first, of rolling "tilas," or small rounded hills, running up to a hundred feet or so, and then of more rugged hills, which may reach three or even five hundred feet above sea level. After these the hill ranges are generally decidedly abrupt in the way they abut on the lower hills, and the first main range consists of a series of peaks from 3,000 to 5,000 feet.

(14) PARADOXORNIS GUTTATICOLLIS.—Austen's Crow-Tit.

On the 21st of April, 1895, I was fortunate enough to obtain a nest with two eggs of this bird, trapping a female on the nest. This was the same kind of structure as that of *P. flavirostris*, viz., a deep cup composed of shreds of bark from a yellow grass, equally yellow shreds of bamboo leaves, all extremely neatly and compactly bound together, and lined with very fine dark coloured grasses. The nest only differed, as far as I could see, from those of others of the genus in not being quite so tidy.

The dimensions were, externally 3'60" in diameter by 3'40" deep, and internally 2'2" × 1'9".

The eggs, which were two in number and very hard set, were of a dead glossless white sparsely speckled with tiny spots of light brown and pale neutral tint. The shell was extremely fragile.

The nest was placed on the side of a grass-covered hill in an upright three-pronged fork of a stout weed.

(10) *SUTHORA ATRISUPERCILIARIS*.—The Black-browed Crow-Tit.

A nest was found of this little Crow-Tit on the 7th July, 1893, at Guilang. It was a typical Crow-Tit's nest, but the one egg it contained was of an uniform hedge-sparrow's egg blue. It measured  $\cdot77'' \times \cdot6''$ .

(33) *TROCHALOPTERUM SQUAMATUM*.—The Blue-winged Laughing-Thrush.

I find that what I originally said about there being no birds here of the *T. melanurum* type was wrong. Since then I have obtained numerous examples, and on three occasions pairs, in each of these cases the males having black tails and the females bronze. This showed me that the birds were one and the same, but as, including these three, I now had five males with black tails against three with bronze, I began to think that the difference was sexual and the bronze tails in the males merely a sign of immaturity. Now, however, I have a *female* with a black tail, so that the difference can hardly be sexual, and, as all my other breeding females have bronze tails, it cannot well be that the black tail is assumed by mature birds only.

44 (1) *POMATORHINUS RUFICOLLIS*.—The Rufous-necked Scimitar Babbler.

*Hume, No. 400 ; Blanford, No. 125.*

This Scimitar Babbler is scattered almost throughout the whole of N. Cachar, but is not common anywhere, and in most parts is very rare. In the Khasia Hills it is common, as it is in parts of the Naga Hills, and where N. Cachar adjoins these districts a good many birds may be met with in some years. I have obtained it at about 2,000 feet elevation, and again at nearly 6,000.

44 (2) *POMATORHINUS STENORHYNCHUS*.—The Rusty-cheeked Scimitar Babbler.

*Hume, No. 405 ; Blanford, No. 128.*

Amongst a collection of birds I took home for the Hon'ble W. Rothchild and which I handed over to Mr. Hartert, were a large number

of *P. phayrii*, and amongst these was placed by mistake a specimen of this bird. Mr. Hartert pointed this out to me, and on my return to India I at last succeeded in getting one more specimen, a female, which I shot off its nest, but which was so greatly knocked about as to render preservation impossible. The nest was exactly like that of any other Scimitar Babbler, and the eggs might have been mistaken for those of *P. phayrii*.

(3) POMATORHINUS AUSTENI.—Austen's Scimitar Babbler.

*Blanford, No. 127.*

On the 25th of June, 1899, I found a Scimitar Babbler's nest containing five fresh eggs. I at once set nooses about it, or rather had them set for me by a Naga, and awaited events. Before anything was caught, however, the heavy, persistent rain drove us away, and when he returned the next morning all the Naga found was the remnants of a female, the ants having eaten nearly all the under parts from vent to throat. Fortunately tufts of feathers here and there remained to show me, beyond all doubt, to what species the Babbler belonged, and I had the pleasure of handling my first *P. austeni*.

The nest, which was found on the extreme summit of Hungrum Peak, over 6,000 feet high, was placed on the ground at the foot of a bush growing in mixed tree and scrub jungle.

It was principally composed of very coarse grass-stems, roots and bents, lined with finer and darker-coloured materials of the same kind, and massed all about outside with dead bamboo leaves, broad grass blades, and a few dead leaves of other kinds. The materials were not badly put together, the nest, in fact, being rather stouter than most Scimitar Babblers are; but there was absolutely no *finish* to the nest, all the ends of the material, both lining and outer part, sticking straight into the air. In shape it was a very deep cup, measuring—not including the more straggling pieces—about  $8\frac{1}{2}$ " deep by about 6" wide near the base, whence it gradually, but very slightly, narrowed towards the top. Internally the cup was about 7" deep and about 4" in diameter.

The eggs are like all other Scimitar Babbler's eggs, white and very smooth, though not very glossy; rather broad ovals with the smaller ends obtuse, though distinctly compressed.

(47) POMATORHINUS HYPOLEUCUS.—The Arrakan Scimitar Babbler.

One of these birds, a female, with its nest was brought to me at Guilang, close on 4,000 feet high, so that this Babbler sometimes, at all events, ascends to a good height.

(50) GAMSORHYNCHUS RUFULUS.

I have now taken the eggs of this Babbler and they shew that Oates was right in the place he selected for it; the eggs are very distinctly Timeliine in character and are nearer to those of the *Pellorneum mandelli* type than of any other Babbler, except perhaps *Drymocataphus* which they closely resemble in colour.

In colour they are a pale greyish-green, profusely marked with reddish-brown all over their surface.

They were extremely hard set, and in consequence very fragile.

CORYTHOCICHLA SQUAMATA.—Spec. nov.—The Squamated Babbler.

*Description*.—Above rich brown, more rufescent on upper tail coverts, the feathers of head, back and scapulars edged with dark brown or black, the centres paler and inclined to greyish, and the shafts paler still; lores grey; ear coverts brown with grey centres; *supercilium and patch under ear coverts rich rufous, the feathers of the latter with black specks on the tips; chin and throat pure white, with black specks forming three distinct lines from the chin to the breast as in Accipiter virgatus; breast brown with pale centres and suffused with rufous; flanks the same with the centres forming more distinct striæ; centre of abdomen almost white with faint rufous edges, under tail coverts the same but darker. Wing brown, the outer webs of the quills suffused with dark rufous, the greater and median coverts and secondaries with distinct white tips.*

Upper mandible dark plumbeous, tip and lower mandible paler, tip of lower mandible almost white; irides red; legs pale fleshy-brown, the front of the tarsus a little darker, and the claws still paler.

Length rather less than 4"; wing 2"; tail 75"; tarsus .75"; bill at front 52" and from gape 65".

The tail was measured from a single central tail feather, the others appeared to have been just moulted.

The bird was caught on its nest on the Hangmai Peak at an altitude of some 6,000 feet.

Nest and eggs exactly resembled those of *C. striata*, but the latter were smaller.

This new form of *Corythocichla* is most nearly allied to *C. brevicaudata*, but differs from that bird in being very much smaller. It is also much lighter on the lower plumage and has a bright rufous supecilium, not an ashy one, and has a distinct rufous patch under the ear coverts. The chin and throat also are pure white, not ashy white.

The bird was discovered on the 26th May, 1898.

72 (5) RIMATOR MALACOPTILUS.—The Long-billed Babbler.

*Hume, No. 335 ; Blanford, No. 185.*

Much to my pleasure and also to my surprise I came across this rare Babbler in June this year, 1899.

In the dusk of the evening a Naga brought in a small bird, together with a nest and eggs, which taking from him and just glancing at, I thought were the nest and eggs together with a specimen of *Corythocichla striata*. In the light inside the house, however, I soon found I had something else than a *Corythocichla*, the long bill at once attracting my attention, and it proved to be a fine female of the above species.

The colours of the soft parts I noted as follows, and it will be seen they do not agree with Jerdon as quoted by Blanford.

Iris light red-brown ; upper mandible very dark horny, blackish at the base, paler towards the tip ; gape and edge of lower mandible blackish-horny, remainder pale plumbeous ; legs pale livid fleshy with no tinge of red, but the tarsi tinted brown ; the soles, claws and joints very pale.

The lax plumage and general colouring of the bird is wonderfully like that of *Corythocichla striata*, and the nest and eggs help to carry out the general likeness.

The nest is an ill-formed globe of dead leaves, grasses, a few old fern fronds and bents very loosely interwoven, and lined with more dead leaves, the colour of all of the materials being of a dark or blackish-brown. In height the nest was about  $8\frac{1}{2}$ " , and at its widest part, close to the base, about 6" across. The entrance, high up near the top, was about 2" in diameter.

The eggs were four in number and very hard set, but just blowable. The ground-colour is a very faint pinky-white, the pink being of a

sienna-pink tinge. The markings, rather profuse at the larger end, though sparse elsewhere, consist of small dots and blotches of reddish-brown, mostly surrounded by a pale washed-out shade of the same, looking as if the colour had run. Here and there also a few scraggly and entangled lines of very deep red-brown. The markings form ill-defined caps, or rings, at the larger ends.

In shape the eggs are a very regular oval, neither particularly long nor broad in proportion to their size. The surface is not very smooth, but has a very faint gloss, and the texture is fine and close, and the shell exceptionally stout.

The nest was placed on the ground in amongst the dead leaves and other rubbish at the foot of a large tree standing in forest composed principally of small ones and having a dense undergrowth of *Bigonias*, bracken, and miscellaneous green bushes. It was taken on the 24th June on a peak near Hungrum at about 6,000 feet elevation.

The bird has a sweet chirping whistle, which it uttered repeatedly as it lay in my hand.

(To be continued.)

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM  
AND BHUTAN.

BY G. C. DUDGEON, F.E.S.

WITH NOTES BY H. J. ELWES, F.Z.S., F.E.S., &C.,

AND

ADDITIONS BY SIR GEORGE F. HAMPSON, BART., B.A., F.E.S., &C.

PART IX.

(Continued from page 268 of this Volume.)

Family LASIOCAMPIDÆ.

Genus BHIMA, Moore.

900. *B. undulosa*, Wlk.

Sikhim, 1,800 to 5,000 feet. I took a mass of cocoons of this species at Tukvar and obtained several males from them. I subsequently took one female and another male; the latter attracted to light at Punkabaree. It is not a common species; the larvæ, however, feed gregariously, and the cocoons are formed of a light network in masses of ten or twelve together. The moth emerges in September and October.

Genus TARAGAMA, Moore.

901. *T. dorsalis*, Wlk.

Sikhim, 1,800 feet. I took one male of this species at Punkabaree in August. I have not seen another. (I have never got it in Sikhim, and look on it rather as a plains species in Bengal, though in the North-West it goes into the hills.—H. J. E.)

Genus SUANA, Wlk.

903. *S. concolor*, Wlk.

Sikhim and Bhutan, up to 6,000 feet. Occurs rather commonly at 2,000—3,000 feet; the males are often attracted to light. They vary considerably in markings, some having a pale brown subbasal spot on the forewing, others a white spot at the end of the cell on the same wing. I have taken it in April.

Genus LEBEDA, Wlk.

904. *L. nobilis*, Wlk.

Sikhim and Bhutan, 3,000 feet. Occurs in October and November. I have taken it in the Kangra Valley, Punjab, in September. Bhutan specimens are rather darker than Sikhim and Kangra Valley ones.

Genus METANASTRIA, Hübn.

905. *M. aconyta*, Cram.

Sikhim. Neither Mr. Elwes nor I have seen a specimen from the locality. Specimens in the British Museum are marked N. Bengal.

906. *M. nanda*, Moore.

Sikhim. I have two specimens which I think were taken at Badamtam in September.

907. *M. latipennis*, Wlk.

Sikhim, 1,800 feet. I have taken this at light at Pungkabaree in March and May. It is marked similarly to some forms of *M. ampla*, Wlk., but the lines on the forewing are more equi-distant.

908. *M. fulgens*, Moore.

Sikhim and Bhutan, 6,400 feet. I took two specimens of this on Rissoom in April and September. Both are males. I have not seen a female. (I took it rarely at Darjeeling in July.—*H. J. E.*)

909. *M. lidderdalii*, Butl.

Sikhim and Bhutan, 1,800 feet up. I have two males and one female taken in September and October. (According to Knyvett, one of these two, Nos. 909 or 910, feeds on hemp, but I am not sure which, and I am strongly inclined to think they are the same species.—*H. J. E.*)

910. *M. ampla*, Wlk.

Sikhim and Bhutan, 1,800 to 5,000 feet. The larva, which is covered with red hairs, makes an elongate cocoon studded with them among the leaves of *Artemisia* sp. on which it feeds at 5,000 feet at Tukvar. The perfect insects appear in September, October and November. I have specimens from the Kangra Valley, Punjab, which I took in August and September.

912. *M. hyrtaca*, Cram.

Sikhim, 5,000 feet. I have one male of this species taken in September. (Bred at Kalimpong, 4,500 feet, from larvæ which were gregarious on the *Schima wallichii* [*sic* Knyvett].—*H. J. E.*)

913. *M. repanda*, Wlk.

Sikhim, 1,800 feet. I have four males of a species which may be this. The forewing is narrower than that of *M. hyrtaca*, Cram., two pale waved antemedial parallel lines, the exterior greyish-blue, the interspace between them filled in with slate colour as far as vein 2; a large medial sub-quadrate chocolate patch from the costa to just below

vein 2, the veins crossing it slightly marked with slatey, bounded outwardly by a greyish-blue postmedial line converging slightly to the inner margin with another pale brown line running parallel to it, the interspace filled with slate colour from the costa to vein 2; a lunulate submarginal dark line. Hindwing dark brown, reddish at the base. This is very unlike my specimen of *M. hyrtaca*.

914. *M. recta*, Wlk.

Sikhim. I have two females of a species which corresponds with Butler's figure of *M. repanda* ♀, but are paler. Both have vein 8 stalked with 6 and 7 in the forewing. These are probably females of the insect I have described above under *M. repanda*, Wlk.

915. *M. obliquifascia*, Swinh.

Sikhim. I have not seen this. (It was really described by Sir G. Hampson from my collection, and the type named by him is from Möller's collectors, without date or locality.—*H. J. E.*)

949. *M. lineata*, Moore.

Sikhim, 6,800 feet. Apparently a rare species. Occurs in June.

## Genus ARGUDA, Moore.

916. *A. flavovittata*, Moore.

Bhutan (*Hampson*). I have not procured a specimen. Mr. Elwes remarks that it is a distinct species; his specimen was taken in Bhutan in September, 1888.

917. *A. bheroba*, Moore.

Sikhim, 1,800 to 5,000 feet. I have four typical males with the post-medial lines on the forewing nearly straight and erect, and one male with the line much waved and followed by a regular waved submarginal line. I have taken it in June and September.

919. *A. vinata*, Moore.

Sikhim and Bhutan. Occurs in July. (I took a single female at light at Darjeeling on July 20th.—*H. J. E.*)

921. *A. decurtata*, Moore.

Sikhim, 1,800 feet. I took one male at Punkabaree in February at light. The two forewings have the lines dissimilar in my specimen.

## Genus SYRÁSTRENA, Moore.

923. *S. minor*, Moore.

Sikhim. I have not taken this. (I have two males from Möller's collection taken at low elevations.—*H. J. E.*)

## Genus BHARETTA, Moore.

924. *B. cinnamomea*, Moore.

Sikhim and Bhutan, 5,000 to 8,000 feet. A common species, occurring in May and June in Darjeeling. (The female of this species is unknown to me, though the males come freely to light at Darjeeling.—*H. J. E.*)

## Genus ALOMPRA, Moore.

929. *A. ferruginea*, Moore.

Sikhim and Bhutan, 1,800 to 2,500 feet. One male and one female. The latter sex has the head, thorax, abdomen and hindwing bright ferruginous-red; the forewing fuscous, with a large bright ferruginous patch at the base crossed by a row of six or seven black dots, a similarly coloured patch at the end of the cell, a darker red patch in the cell, and streaks between the nervures as far as a wavy red postmedial line, beyond which the veins themselves are red. It seems a rare species, occurring in September. (I have never seen this, which must be a very rare or local species.—*H. J. E.*)

## Genus KOSALA, Moore.

930. *K. sanguinea*, Moore.

Sikhim. I have not seen this. (The only one I have is a female from the Atkinson collection labelled Darjeeling. The male, which I have from the Khasias, is very unlike it.—*H. J. E.*)

933. *K. flavosignata*, Moore.

Sikhim. (A single male taken by Knyvett on 25th June, 1889, without indication of locality, is the only one I have.—*H. J. E.*)

## Genus TRICHIURA, Steph.

934. *T. khasiana*, Moore.

Sikhim. I have never procured a specimen. (This was not rare in 1886 at Darjeeling at light in July and August; there were also plenty in Möller's collection, but I have never seen a female, which is, I think, undescribed.—*H. J. E.*)

## Genus CRINOCRASPEDA, Hmps.

935. *C. torrida*, Moore.

Sikhim and Bhutan. I have a specimen from the latter locality taken in September. (The only one I have from Sikhim, a male, is smaller and probably distinct from that found in the Khasias and Manipur, but is not fresh or perfect enough for description.—*H. J. E.*)

## Genus TRABALA, Wlk.

936. *T. vishnu*, Lef.

Sikhim and Bhutan, 1,000 to 6,000 feet. This species occurs at the higher elevation in the larva state feeding on *Polygonum orientale*, and all the females I have reared from these high-elevation larvæ have been pale green with a sub-basal purplish blotch. I have repeatedly taken males and females at low elevations *in copula*, but here the female is invariably bright chrome-yellow with a reddish sub-basal patch, and with greenish antemedial and medial lines on the forewing. The males of both forms are pale green, the margins of both wings of the lower elevation form being more crenulate, and with the cilia purplish-brown. It occurs in February, May, July and August. A female, recently taken in the Kangra Valley, Punjab, at 4,500 feet, is of the bright yellow form.

## Genus ESTIGENA, Moore.

941. *E. pardalis*, Wlk.

Sikhim and Bhutan, 1,800 feet up. Common in May, July and September.

## Genus ODONESTIS, Germar.

942. *O. lata*, Wlk.

Sikhim, 1,800 to 5,000 feet. The larva feeds on grasses and forms an oval cocoon. The perfect insect emerges in August. It is not common. (I have only once taken this at light on Tongloos at 10,000 feet, so it must have a very wide range of elevation. I have a distinct species which agrees with the type (?) of *O. decisa*, Wlk., in B. M. It has a grey patch in centre of forewing above, and no oblique band on forewing.—*H. J. E.*)

943. *O. divisa*, Moore.

Sikhim. (Both sexes were in Möller's collection, but I have never taken it myself. Sir G. Hampson's remark as to a Sikhim specimen differing in having the inner area of the forewing suffused with yellow only applies to one of my two males.—*H. J. E.*)

944. *O. castanea*, Hmps.

Sikhim. I do not know this species. (I also have never seen it.—*H. J. E.*)

(♂ ♀, Darjeeling, in B. M.—*G. F. H.*)

945. *O. signata*, Moore.

Sikhim and Bhutan, 4,000 feet. This occurs rarely in May. (I found it in Mr. Gammie's collection which was mostly made at Mongpoo.—*H. J. E.*)

945a. *O. lidderdalii*, Druce.

A. M. N. H. (7), 3, p. 471 (1899).

Sikhim (*Hampson*).

947. *O. pyriformis*, Moore.

Sikhim, 5,000 feet. I have taken this at light in August. (Not rare on Tongloo at 10,000 feet in July. I have never seen the female, however.—*H. J. E.*)

948. *O. plagifera*, Wlk.

Sikhim and Bhutan, 1,800 to 3,000 feet. A rather common species, occurring in May, July and October.

Genus GASTROPACHA, Ochs.

951. *G. sinuata*, Moore.

Sikhim. I have not seen a specimen.

952. *G. divaricata*, Moore.

Sikhim. Not procured by me. (A male taken by Knyvett on 1st April, 1890, which Sir G. Hampson has put with my female, from Möller's collection, is very unlike it in size, shape and colour, and I think must belong to another species, but there is still much to be done in this family of moths, of which the existing descriptions and figures are very incomplete.—*H. J. E.*)

Genus STENOPHYLLOIDES, Hmpsn.

953. *S. sikhima*, Moore.

Sikhim. (I have never seen this rare species.—*H. J. E.*)

(2 ♂, 2 ♀, Darjeeling, in B. M.—*G. F. H.*)

Family PTEROTHYSANIDÆ.

Genus PTEROTHYSANUS, Wlk.

954. *P. laticilia*, Wlk.

Sikhim and Bhutan, 1,000 to 2,000 feet. A very common insect in the lower valleys, occurring in May and June. The females are without the long fringe of hairs to the hindwing, but have both wings sprinkled with isolated long white hairs similar to the male; the hindwing of the female is much rounder and broader, and the black markings on both wings are more pronounced, leaving generally only a few

white spots. It flies by day in thick jungle, and numbers may be seen at the proper season flitting in and out of jungles on the banks of the Ché Chhu and other Daling streams.

Family LYMANTRIIDÆ.

Genus ORGYIA, Ochs.

960. *O. postica*, Wlk.

Sikhim and Bhutan, up to 5,000 feet. I have taken the male commonly at low elevations in February, June, July and September. The larva feeds, among other plants, on rose trees.

960a. *O. nucula*, Swinh.

Sikhim, 1,800 feet. I took one male of this at Punkabaree in November. It is probably a rare species, as I have not seen another.

Genus AROA, Wlk.

971. *A. pyrrhochroma*, Wlk.

Sikhim and Bhutan, 3,000 feet. I have three males taken in August. The width of the border of the hindwing is variable. (I have taken this at 3,000 feet below Mongpoo in May.—*H. J. E.*)

973. *A. atrella*, Hmps. n.

Sikhim and Bhutan, 2,500 to 3,000 feet. Occurs rarely in July and August.

Genus LÆLIA, Steph.

982. *L. exclamationis*, Koll.

Sikhim. I have not seen this from this locality. It is a common species in the Kangra Valley, Punjab. (I have it from Möller's and Gammie's collections.—*H. J. E.*)

984. *L. litura*, Wlk.

Sikhim (*Hampson*); Bhutan, 2,500 feet. I have a male of a species which has a narrower forewing than *L. exclamationis*, Koll. The palpi, head and thorax are fiery orange, the legs pale yellow; the forewing is dark brown and the hindwing black, both unmarked. It may be a new species. I took it in September. It resembles *Hampson's* figure of *Cretonotus* (*Phragmatobia*) *fumipennis*, Hmps. n., even in the shape of the wings, but vein 8 of the hindwing does not rise out of 7 but is converged towards it before the middle of the cell.

985. *L. venosa*, Moore.

Sikhim. I have not seen this. (Neither have I from Sikhim.—*H. J. E.*)

(Khásis, Andamans, Singapore, in B. M. I believe many species recorded from Sikhim in Lep. Atk. really came from the Khásis.—*G.F.H.*)

986. *L. atestacea*, Hmpsn.

Sikhim. I have two females, one named *Procodeca testacea*, Moore, by Mr. Moore and another (?) *Laelia testacea*, ♀, 'very large,' by Sir George Hampson. The former measures 48 millimetres, and the latter 70 millimetres. I took them in May, 1889, and June, 1890, respectively.

(This I feel sure refers to *L. testacea*, Wlk.—*G. F. H.*)

Genus PANTANA, Wlk.

988. *P. bicolor*, Wlk.

Sikhim and Bhutan, 5,000 feet. Occurs in April, June, July and August, and flies during the day. Females are scarce. Numbers of males may be seen in June at Tukvar.

991. *P. interjecta*, Swinh.

Sikhim and Bhutan. Occurs rather rarely in May.

992. *P. albifascia*, Wlk.

Sikhim and Bhutan. Commoner than the last, occurring in February, May, June and September. Intermediate forms between true *P. albifascia* and var. *subfascia* are found.

Genus THIACIDAS, Wlk.

993. *T. postica*, Wlk.

Throughout India (*Hampson*). I have never seen a Sikhim specimen. It is common in the Kangra Valley, Punjab. (A single specimen from Knyvett is in my collection, which must have been taken in Sikhim or the Duars.—*H. J. E.*)

Genus CIFUNA, Wlk.

995. *C. locuples*, Wlk.

Sikhim. I took one male in September, 1888, at Tukvar, but have never received another.

996. *C. cervina*, Moore.

Sikhim and Bhutan, 2,500 to 5,000 feet. I have taken this in April, May and June. It is not common.

Genus MALACHITIS, Hmpsn.

996a. *M. melanochlora*, Hmpsn. (PLATE I, FIG. 7, ♀.)

Sikhim and Bhutan, 1,800 to 2,500 feet. I obtained three males of this specis at Fagoo at light in March and May, 1895, and one female in September at Punkabaree, also at light. The latter sex differs in

having the wings broader and rounder, the pectinations of the antennæ smaller, the forewing with a prominent waved white line from the apex to the posterior angle and beyond the postmedial line. The hindwing bears traces of a pale submarginal band nearer the anal angle. The type male is in the British Museum and the female in my own collection.

Genus *DASYCHIRA*, Steph.

997. *D. complicata*, Wlk.

Sikhim, 6,000 to 8,000 feet. This occurs in Darjeeling, but females are considerably more scarce than males. I have taken it at light. (Common on Tongloo at 10,000 feet in July.—*H. J. E.*)

998. *D. lineata*, Wlk.

Sikhim and Bhutan, 2,500 feet. Common in May, June and July at Fagoo. The male differs only in being smaller, and having the postmedial, and sometimes the submarginal waved lines more distinct.

999. *D. horsfieldi*, Saund.

Sikhim and Bhutan, 1,000 to 7,000 feet. The larva, a bright yellow insect with a dorsal black band between the 4th and 5th somites, and with five tufts of yellow hair on the 4th to 7th and 11th. somites, is often seen on tea bushes, the leaves of which it eats. The moth appears in March. (I have a ♀ from Möller taken in February.—*H. J. E.*)

1001. *D. albescens*, Moore.

Sikhim. I do not recognise this species. (I found it at light at Darjeeling in July and August.—*H. J. E.*)

1002. *D. cinctata*, Moore.

Sikhim. (Also taken at Darjeeling at light, and well distinguished from the last by its larger size and black-ringed abdomen.—*H. J. E.*)

1003. *D. strigata*, Moore.

Sikhim. (I have only two from Möller's collection.—*H. J. E.*)

1004. *D. varia*, Wlk.

Sikhim, 6,000 feet. The larva feeds on *Leucosceptrum canum*, and is pale green covered with green hairs. I have only once reared a female insect from it, which emerged in February.

1006. *D. brunnescens*, Moore.

Sikhim. I do not know this species.

1008. *D. vtrescens*, Moore.

Sikhim, 5,000 feet. I believe this is common about Darjeeling, though I have only one specimen in my collection. (I never took it at Darjeeling; my specimens from Möller are dated March, in which month I never collected there.—*H. J. E.*)

1009. *D. flavimacula*, Moore.

Sikhim and Bhutan, 6,000 to 8,000 feet. I took three males at light at Rissoom on the 30th April, 1894, another in Darjeeling in August, 1898, and have one female from somewhere below Lingtu.

1011. *D. bhana*, Moore.

Sikhim and Bhutan, 1,800 feet to 7,000 feet. I have taken this in May, July, August, September, October and November. It is a common species. The larva is dark brown covered with black hairs, and feeds on several herbaceous plants. I have taken a male in the Kangra Valley, Punjab, in June. (Very abundant at light at Darjeeling.—*H. J. E.*)

1013. *D. mendosa*, Hübn.

Sikhim, 1,800 to 3,000 feet. I have four well-marked forms of the male: var. *fusiformis*, Wlk., with a pale round patch beyond the sub-basal line; var. *basalis*, Wlk., with a dark brown or black patch in the same place; var. *divisa*, Wlk., with the whole costal half of the forewing, except a small patch on the costa near the apex, white; and another variety having these white markings replaced by red-brown ones. They occur in June, July, August and October. My females bear the dates of January, February and October.

1014. *D. inclusa*, Wlk.

Sikhim and Bhutan, 1,800 to 3,000 feet. *D. dalbergice*, Moore, seems to me to be distinct from *D. inclusa*, Wlk., as also does an insect in my collection marked *D. inclusa*, Wlk., var. *asrata*, by Sir George Hampson. I have specimens taken in March, June, July and August.

1014*b*. *D. angulata*, Hmps. (PLATE I, FIG. 13.)

Sikhim and Bhutan, 6,000 feet. A rare species, of which I only obtained one other beside the type, which is in the British Museum. The specimen in my collection was taken in August.

*D. sp.* near *inclusa*.

Sikhim, 1,800 feet. I took six males of a species named thus by Sir George Hampson. The forewing is brown, with a paler subbasal

spot bounded by a black line, and followed by a slightly metallic green or blue suffusion nearly as far as the waved postmedial line, which is inwardly oblique, the inner and outer margins of the wing are in an almost continuous curve. My specimens were all taken at Punkabaree in June, July, August and December.

(1 ♂ doubtfully distinct from *D. inclusa* in B. M.—*G. F. H.*)

1550b. *D. nigra*, Hmps. (PLATE II, FIG. 19.)

Sikhim and Bhutan. Described as *Selca nigra* under the Subfamily *Nolineæ*. Occurs in June, July and August at Punkabaree.

Genus MARDARA, Wlk.

1016. *M. plagidotata*, Wlk.

Sikhim. I have never taken this species. (Though I have never taken this myself, I have it from Möller's collection dated 19th May, 1888, and from Knyvett. In the Naga Hills it occurs at about 6,000 feet.—*H. J. E.*)

1017. *M. irrorata*, Moore.

Sikhim, 1,800 to 3,000 feet. A rare species, occurring in September. *Euproctis flavimacula*, Hmps., is a synonym of this.

1018. *M. caligramma*, Wlk.

Sikhim and Bhutan, 6,000 to 8,000 feet. Fresh specimens have the markings on the forewing pale green. The female is similar to the male. Occurs in April, May and September.

1018a. *M. ruficeps*, Hmps.

Bhutan, 2,500 feet. I took one female at light, and have not seen another. This specimen is the type in the British Museum.

Genus NUMENES, Wlk.

1020. *N. siletti*, Wlk.

Sikhim and Bhutan, up to 7,000 feet. I have seen males only at the higher elevation. The female is much more often taken, and is quite common at from 1,800 feet to 2,500 feet in June and July. I have males from Bhutan taken in the same months. (The differences in size, shape, pattern and colour between the sexes in this and the next species are extraordinary.—*H. J. E.*)

1021. *N. patrana*, Moore.

Sikhim and Bhutan, up to 7,000 feet. Rarer than the last. I have a male taken in Darjeeling station, and a male and female taken at 2,500 feet in Bhutan. (I should have said much commoner than the last, of

which neither Möller nor I have ever taken the male, and the female very rarely.—*H. J. E.*)

Genus PIDA, Wlk.

1022. *P. apicalis*, Wlk.

Sikhim. I have only one taken in June. (I have never seen the female, which seems to be undescribed.—*H. J. E.*)

1023. *P. strigipennis*, Moore.

Sikhim, 3,000 feet. I have a pair, the female of which I took at Badamtam in February, 1890. The male has the whole inner half of the hindwing thickly striated with fuscous. (My only pair were taken in March.—*H. J. E.*)

*P. decolorata*, Wlk., Char. Undes. Het., 1869, p. 96. (I have a ♀ of this from Möller's collection taken in June which agrees with a pair of *Cyclidia decolorata*, Wlk., from the Khasias.—*H. J. E.*)

Genus DAPLASA, Moore.

1024. *D. variegata*, Moore.

Sikhim, 9,000 feet. I have never taken this myself, but have a specimen from Colonel Pilcher dated July, 1895, and marked with the above elevation. (A single ♂ only from Möller.—*H. J. E.*)

1025. *D. irrorata*, Moore.

Sikhim. I have not seen this. (I know it only from the Khasias, and doubt its being congeneric with the last.—*H. J. E.*)

Genus HERACULA, Moore.

1026. *H. discivitta*, Moore.

Sikhim (Gnatong), 10,000 feet ; Bhutan. I have six specimens in my collection which were obtained at high elevations in June and July ; they are all apparently males, but have the antennæ minutely ciliated. The patch at the base of the forewing is umber-brown edged with white, and there is only an edging of the same colour to the white-curved postmedial line. (Taken at Darjeeling and Tongloo by me in July and August, but I do not know the ♀.—*H. J. E.*)

Genus LYMANTRIA, Hübn.

1030. *L. rhodina*, Wlk.

Sikhim, 1,800 feet. One male taken in August. I am not sure whether some of the insects I have included as females of the next species may not belong to this, or possibly this may be another variety of the variable *L. obsoleta*, Wlk. (I think it most likely that what I

have as *L. rhodina* and *L. obsoleta* are the same species, but the genus is very hard to understand without breeding.—*H. J. E.*)

1031. *L. obsoleta*, Wlk.

Sikhim and Bhutan, up to 5,000 feet. My specimens were taken in March, June and July.

1033. *L. concolor*, Wlk.

Sikhim and Bhutan, 3,000 to 7,000 feet. I once came upon a quantity of wings of this insect scattered on a shady road between Labah and Rissoom. The insects had been captured by bats and brought to one place to be eaten. I have specimens in my collection taken in May, June, August and September.

1034. *L. similis*, Moore.

Sikhim and Bhutan, 1,800 to 5,000 feet. I have four males and one female taken at light in May and July.

1036. *L. beatrix*, Stoll.

Sikhim, 1,800 feet, and Bhutan. Occurs in October and December.

1037. *L. grisea*, Moore.

Sikhim. I have not seen this. (I have two males and a female from Sikhim which agree with Moore's plate.—*H. J. E.*)

1038. *L. mathura*, Moore.

Sikhim and Bhutan, up to 4,000 feet. Common at 1,800 feet from June to October. The variety *aurora*, Butl., is also common, but I have only males of it.

1042. *L. lepcha*, Moore.

Sikhim, 1,800 feet. I have three males only which I took at Punka-baree in July, August and October. I have never seen the female.

1043. *L. bivittata*, Moore.

Sikhim. I have not seen a specimen. (I have two females which are so named from Möller's collection, they are very unlike any other species I know. The male seems undescribed.—*H. J. E.*)

1044. *L. semicincta*, Wlk.

Sikhim. I have only two females, one of which was taken in August. (A rare species, of which I only know the male. I do not believe it is congeneric with *Lymantria*, the abdomen being very different.—*H. J. E.*)

Genus *IMAUS*, Moore.

1045. *I. mundus*, Wlk.

Sikhim and Bhutan, 1,000 to 3,000 feet. A common species in the low valleys of Daling. Occurs in April, May and July.

*I. albus*, Moore.

Sikhim and Bhutan, 3,000 feet. Not so common as the last. Taken settled on trunks of trees in June, also at light in the same month.

Genus *HIMALA*, Moore.

1047. *H. argentea*, Wlk.

Sikhim. I have not seen a specimen. (I also have never seen it from Sikhim.—*H. J. E.*)

(Darjeeling, from E. India Museum in B. M.—*G. F. H.*)

Genus *GAZALINA*, Wlk.

1048. *G. apsara*, Moore.

Sikhim, 5,000 feet up. I have specimens of the form *venosata*, Wlk., taken in June. (Common in May and June at light at Darjeeling. The form *G. venosata* as figured by Butler seems distinct from the Naga Hill form, and many specimens have distinct transverse black lines on the forewing as in *G. chrysolopha*. I am not sure whether the two species in Sikhim can be separated, though in the Nagas they are very different.—*H. J. E.*)

1049. *G. chrysolopha*, Koll.

Sikhim and Bhutan, 1,800 to 7,000 feet. I took a single pair at light at Punkabaree in May. It is extremely common in the station at Darjeeling in August, September and October.

1050. *G. transversa*, Moore.

Sikhim. A single male taken in May. It seems to be scarce. (A rare species, of which I have a pair only from Möller.—*H. J. E.*)

Genus *EUPROCTIS*, Hübn.

1053. *E. negrita*, Hmps.

Sikhim. I have not seen this. (The type is the only one I have seen, but there were several males in Möller's collection, some of which were dated in June.—*H. J. E.*)

1055. *E. divisa*, Wlk.

Sikhim and Bhutan, 3,000 to 6,500 feet. I have taken it in March, June, September, October and November. (Common at Darjeeling in June.—*H. J. E.*)

1056. *E. latifascia*, Wlk.

Sikkim and Bhutan. Occurs at moderate elevations from March to October. The larva has appeared lately in large numbers on tea in Darjeeling, completely stripping the old leaves off the bushes in the spring, feeding chiefly at night and hiding under clods of earth during the day.

1057. *E. subfasciata*, Wlk.

Sikkim and Bhutan, up to 5,000 feet. Found everywhere from May to October. I do not think it is separable from some forms included in the last species, and the two species may eventually be found to represent one variable one.

1058. *E. bimaculata*, Wlk.

Sikkim and Bhutan, 2,500 to 4,000 feet. Rather scarce. I have both varieties, *E. bimaculata*, Wlk., and *E. immaculata*, Moore. It is found in May and June.

1061. *E. venosa*, Moore.

Sikkim, 1,800 feet. I have one male taken by me at Punkabaree in April. It is a well-marked species and easily recognisable.

1062. *E. rhoda*, Swinh.

Sikkim, 1,800 feet. One male taken in March. I have not seen another.

1063. *E. inconcisa*, Wlk.

Sikkim and Bhutan, 3,000 to 6,000 feet. May and July. Rather scarce at the lower elevations.

1066. *E. postincisa*, Moore.

Sikkim. I have no specimens of this. (A single pair from Möller's collection dated 7th November, 1888, are all I have seen.—*H. J. E.*)

1070. *E. varians*, Wlk.

Sikkim, 1,800 feet. I have one male taken in June. It is rather an insect of the plains I think.

1074. *E. arenacea*, Hmpsn.

Sikkim and Bhutan, 2,500 feet. Six males of this well-marked species were taken by me at light at the latter locality in May and August.

1074b. *E. flavicosta*, Hmpsn. (PLATE II, FIG. 18.)

Sikkim and Bhutan, 1,800 to 2,500 feet. I have taken only four specimens at light at Punkabaree and Fagoo in June, August and

December. It is a small fuscous-brown insect, with the costa and subapical portion of the outer margin yellow.

1075. *E. vitellina*, Koll.

Sikhim, 1,800 feet ; Bhutan, 2,500 feet. I have specimens taken in June, August and September. They differ from Punjab specimens in having the medial band yellow, widened towards the inner margin, and powdered with dark scales on either side of the submedian nervure only, with no submarginal black spots.

1076. *E. digramma*, Guér.

Sikhim and Bhutan, up to 3,000 feet. A common species, occurring in May, July, August and November. There may be one, two or three subapical black spots on the forewing.

1077. *E. guttata*, Wlk.

Sikhim, 1,800 to 3,000 feet. Rarer than the last ; taken by me in March and August only.

1080. *E. antiphates*, Hmps. n.

Sikhim, 1,800 feet. I took one female at Punkabaree in April, 1898, and have not seen another.

1083. *E. plana*, Wlk.

Sikhim and Bhutan, 1,800 to 2,500 feet. Not common. Taken at light in June and July.

1086. *E. madana*, Moore.

Sikhim. Neither Mr. Elwes nor I have seen this.

1087. *E. varia*, Wlk.

Sikhim, 6,000 feet. I have only one specimen in my collection. I believe it is not uncommon in the station of Darjeeling.

1089. *E. marginata*, Moore.

Sikhim, 6,800 feet. Only one male taken in June.

1090. *E. albopunctata*, Hmps. n.

Sikhim, 3,000 feet. I have two females of a large *Euproctis* which I take to be this species. They were taken in June, 1890, and expand 68 millimetres each.

1091. *E. albodentata*, Moore.

Bhutan, 3,000 feet. I took a fine specimen of what I believe to be this species at Fagoo in August. The forewing is olive-brown with the veins whitish ; a white antemedial line from the costal to the inner margin angled inwardly on the subcostal and outwardly on the median

nervures; a discocellular white line connected to the antemedial line by a white line along the median nervure; a curved postmedial white line, and a complete marginal series of triangular white marks.

1092. *E. lativittata*, Moore.

Sikhim, 1,800 feet. A pair taken at light in July, differing from *E. albodentata*, Moore, in the marginal series of triangular marks being incomplete and reduced to two subapical and two posterior white marks; a black spot on the discocellulars; antemedial pale line further from the base, and angled only once on the median nervure; a dusky lunule on the discocellulars of the hindwing.

1093. *E. variegata*, Hmps. n.

Bhutan, 2,500 feet. I have three specimens taken in July, August and September which correspond with Hampson's figure, except that the orange mark is replaced by an indistinct fuscous one.

1094. *E. nigripennis*, Hmps. n.

Sikhim, 1,800 feet. I took a single female in April at Punkabaree.

1097. *E. bipartita*, Moore.

Sikhim. I have not taken this. (A single pair were taken by Knyvett in March and April.—*H. J. E.*)

1099. *E. uniformis*, Moore.

Sikhim, 1,800 feet. I have three males and a female taken at light at Punkabaree in July and September. The hindwing varies in the width of the yellow band, which sometimes covers the whole outer area of the wing.

1101. *E. scintillans*, Wlk.

Sikhim, 1,800 feet; Bhutan, 2,500—3,000 feet. Common in February, March, June, July, August, September and November. The insect is a variable one, both in the form of the outer edge of the brown portion of the forewing and the colour of the hindwing. The outer edge of the brown patch is more or less marked with silvery scales.

1102. *E. basalis*, Moore.

Sikhim. I have not seen this.

1102a. *E. bidentata*, Hmps. n.

Sikhim. I have not seen this. Sir George Hampson remarks that it is quite distinct from others of the genus.

1103. *E. bipunctapex*, Hmps. n.

Sikhim, 1,800 feet; Bhutan, 2,500 feet. I have six specimens in my collection taken at light in January, February, May, June, August, and October. One specimen has a single black spot at the apex of the forewing.

Genus PORTHESIA, Steph.

1106a. *P. stigmatifera*, Hmps. n. (PLATE I, FIG. 23.)

Bhutan, 2,500 feet. I have one female in my collection taken at Fagoo in August.

1107. *P. aurantiaca*, Hmps. n.

Sikhim. I have not seen this.

Genus LEUCOMA, Steph.

1110. *L. comma*, Hutton.

Sikhim, 1,800 feet. I took two males at Punkabaree attracted to light in September and October. The forewings are slightly tinted with yellowish, and on the underside the hindwings have a small black mark on the discocellulars.

1111. *L. submarginata*, Wlk.

Sikhim, 1,800 feet; Bhutan, 2,500—3,000 feet. I have taken this in August, September, October and November. The pupa is green, with black patches on each side of the thorax, rather flattened and curved, suspended in a few light webs.

1113. *L. divisa*, Wlk.

Sikhim; Bhutan, 2,500 feet. I have only taken this in July and November. At Fagoo in 1894, I reared several males from pupæ. (I have taken this, or a species very close to it, on Tongloo and up to 12,000 feet; but I must confess that I think there are more species in the genus than are admitted by Sir G. Hampson.—*H. J. E.*)

1114. *L. diaphana*, Moore.

Sikhim, 1,800 feet; Bhutan, 2,500 feet. Occurs rarely in June and July. I have not seen a female. (Males were taken at Darjeeling in July and August. What I take to be the ♀ I only have from the Naga hills.—*H. J. E.*)

1115. *L. thyridophora*, Hmps. n.

Sikhim, 3,000 feet; Bhutan, 2,500 feet. I have only two females, which I took at each locality in July. It seems a rare species. *L. diaphana*, Moore, although unlike it, may possibly be the male of it.

(This appears to be a very distinct species, but we only know the ♀, and it must certainly have its male under some other name.—*H. J. E.*)

1117. *L. subvitrea*, Wlk.

Bhutan, 3,000 feet. I have only one female taken in May. My specimen is an abnormal one in neuration, having a bar between veins 6 and 7 on the right-hand forewing. The costa is slightly folded over as in *Caviria costalis*, Moore.

## Genus CAVIRIA, Wlk.

1118. *C. cygna*, Moore.

Bhutan, 1,000—3,000 feet. I have a species which I identify as *C. cygna*, Moore. It differs from *C. clara*, Wlk., in having three crenulate silvery bands more erect than the two in the latter species. My specimens, both females, were taken in March and August.

1119. *C. clara*, Wlk.

Sikhim and Bhutan, 7,000—8,000 feet. I have seen numerous wings of this insect, the bodies of which had been eaten by bats at 7,000 feet on the road from Labah to Rissoom. I have taken it in August and September at Pasheteng.

1120. *C. sericea*, Moore.

Sikhim, 1,800 feet to 10,000 feet. I have a male from Punkabaree taken in March, and a female from Yatung with no date. These I take to be opposite sexes of the same species. I have some doubt about the correctness of the locality of the female. (This and the last were both common at light at Darjeeling.—*H. J. E.*)

1121. *C. ochripes*, Moore.

Sikhim, 1,800 feet. I took a female in June at Punkabaree, but have not seen another.

1123. *C. costalis*, Moore.

Sikhim and Bhutan, 3,000 feet. One male of this distinct species taken in June.

Both the genera, *Leucoma* and *Caviria*, seem to me to require more study; the form of palpi and neuration are both often irregular.

## Genus DENDROPHLEPS, Hmps.

*D. semihyalina*, Hmps.

Bhutan, 2,500 feet. I took a single female in August at Fagoo. Both wings, the thorax and the abdomen are white; there is a row of six black spots on the abdomen, and three black spots on the thorax.

Neuration similar to the male, cell not so long in the hindwing, and veins 3 and 4, and 5 and 6 on shorter stalks. Two veinlets only between 1a and the inner margin. *Exp.* 68 millim.

Genus *CISPIA*, Wlk.

1125. *C. punctifascia*, Wlk.

Sikhim ; Bhutan, 2,000 feet. A pair taken at the latter locality in May. (I am not at all confident that this species is distinct from the next, of which some of my specimens seem intermediate.—*H. J. E.*)

1126. *C. venosa*, Wlk.

Sikhim and Bhutan, 3,000—6,000 feet. Occurs in April and May. I have taken the pupæ, which resemble those of *Lymantria*, being formed in a light web cocoon, and having the body rather curved, and the dorsal part of the thorax and abdomen tufted into short tufts of hair.

1129. *C. flavipes*, Hmps. n.

Sikhim. I have not seen a specimen. (Of this curious insect, which to my mind hardly comes into the same genus as *C. venosa*, I have only a single specimen, which I found in an old collection at Darjeeling.—*H. J. E.*)

Family RATARDIDÆ.

Genus *RATARDA*, Moore.

1130. *R. marmorata*, Moore.

Sikhim. I have never seen a specimen in any collection, but I once saw what I believed to be the species flying by day at Potong. It resembled a species of *Chalcosiinae*, and I may have mistaken some species of the latter subfamily for this. (A very rare and curious species, of which I have a single female from Möller's collection. This has the antennæ short and simple, quite unlike those of the ♂ as figured by Sir J. Hampson.—*H. J. E.*)

(*To be continued.*)

## NOTE.

POUR SERVIR A L'HISTOIRE DES *LAMPYRIDES* DE L'INDE.

PAR ROBERT DU BUYSSON.

*(With a Plate.)*

Monsieur R. C. Wroughton, du service des Forêts aux Indes Anglaises, m'a envoyé trois espèces de *Lampyrides*, venant du North Konkan. Mon ami, M. Ernest Olivier, qui connaît spécialement ce groupe de *Coléoptères*, a bien voulu les déterminer.

L'une est la *Luciola chinensis*, Linné ♂ (Syst. Nat. I. 2, p. 649) que Linné indique de Chine et que Fabricius et Dejean ont décrite provenant de l'Inde (Fabr., Syst. Ent. II, p. 103, et Dej. Cat. 1 ed., p. 36). Je crois que cette *Luciola* habite également le Japon, d'après ce qui j'ai lu dans les Catalogues.

Les deux autres *Lampyrides* envoyés par M. R. C. Wroughton étaient encore inconnus. Ce sont des mâles. M. E. Olivier les a décrits récemment dans le Bulletin de la Société Entomologique de France (14 Février 1900, p. 47 et 48). Voici leur description.

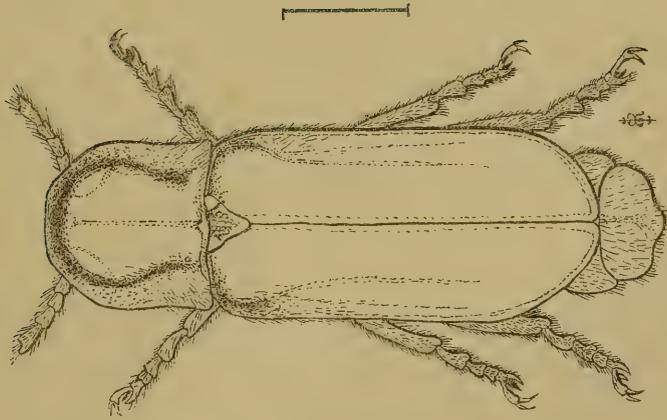
*Diaphanes seminudus*, Ern. Olivier.—♂. "Elongatus, parallelus; piceus; antennis brevioribus, flavis; prothorace flavo, marginato, antice rotundato, in medio longitudinaliter vix sulcatulo, angulis posticis acutis et profunde foveolatis; scutello triangulari, flavo; elytris nigris, costulatis, punctulatis, sutura tenuissime picea, intus dehiscentibus, brevibus, tertio abdominis segmento haud longioribus; abdomine piceo, in medio infuscato, ultimis segmentis cereis, ultimo leviter emarginato. Long. 10-13 mill.; lat. 3-4 mill.—♀ ignota."

Cette espèce est très remarquable par la conformation de son pronotum et de ses élytres; elle représente un type tout particulier.

*Diaphanes wroughtoni*, Ern. Olivier.—♂. "Oblongo-elongatus, niger; antennis pilosis, brunneis, ultimo et duobus articulis primis piceis; prothorace flavo, basi recte truncato, margine antica erecta, macula basali quadrata, nigra, et duabus plagis anticis vitreis, in medio longitudinaliter costato, crebre punctato, angulis posticis fere rectis; scutello flavo, triangulari; elytris prothorace latioribus, oblongis, rugosulis, tri-costulatis, fuscis, flavo tenuiter limbatis; pectore, femoribus, pygidio et tribus ultimis ventris segmentis flavis. Long. 15-16 mill.; lat. 5.5-6 mill.—♀ ignota."

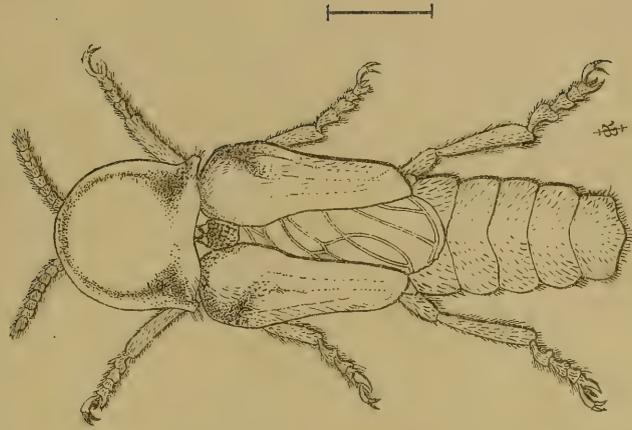
"Cette jolie espèce," ajoute le descripteur, "est voisine du *D. plagiator*, E. Oliv. Elle s'en distingue nettement par sa forme plus allongée, par le prothorax taché de noir et dont les angles basilaires sont beaucoup moins obtus, presque droits, par la couleur des élytres, bruns entourés d'une fine bordure flave, par les côtés des élytres et celle du prothorax plus saillantes." Je suis heureux que M. E. Olivier l'ait dédié à M. Wroughton. La Planche la représente ainsi que le *D. seminudus*.

Il est à supposer que l'Hindoustan doit posséder bien d'autres nouveautés dans cette famille qui est une des plus curieuses parmi les *Coléoptères* lumineux. J'espère que cette simple note invitera les Entomologistes de la colonie Anglaise à en poursuivre l'étude.



*Grossé, 9 fois.*

*Diaphanes Wroughtoni, Ern. Oliv.*  
♂



*Grossé 9 fois 1/2.*

*Diaphanes seminudus, Ern. Oliv.*



## THE FLORA OF WESTERN INDIA.

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## PART VIII.

(Continued from page 526 of Vol. XII.)

## CLXIII.—PALMEÆ—(contd.)

33. *Borassus*.

*B. flabellifer*, Linn., F.B.I.—VI-482. *Tad.* Konkan. Planted.

34. *Cocos*.

*C. nucifera*, Linn., F.B.I.—VI-482. *Narel. Coconut Tree.* Konkan Planted.

## CLXIV.—PANDANEE.

1. *Pandanus*.

*P. furcatus*, Roxb., F.B.I.—VI-484.

*P. fascicularis*, Lam., F.B.I.—VI-485. *Keura.* N. Kanara. Planted widely.

## CUCULANTHACEÆ.

*Carludovica*. (Tropical America.)

*C. palmata*, Ruiz. and Pav. *Syst.* 291. *Nich. Dic. Gard.* 268. Gardens. Nov.-Feb.

## CLXV.—TYPHACEÆ.

1. *Typha*.

*T. elephantina*, Roxb., F.B.I.—VI-489. *Mota pan-kanis.* Planted, Bombay.

*T. angustata*, Chaub. and Berry., F.B.I.—VI-489. *Pan-kanis.* Poona. Aug.

## CLXVI.—AROIDEÆ.

*Cryptocoryne*.

*C. retrospiralis*, Kunth., F.B.I.—VI-493. Penn River. *Dalzell.* Nov.

*C. spiralis*, Fisch., F.B.I.—VI-494. Deccan. Nov.

*C. cognata*, Schott., F.B.I.—VI-494. Konkan. *Mr. Law.*

*C. Roxburghii*, Schott., F.B.I.—VI-494. Poona. Nov.

*C. Dalzellii*, Schott., F.B.I.—VI-495. This remarkable plant is represented at

Kew by half a sheet of fruits in various stages, and a drawing of a leaf, evidently sessile, having measures about  $2\frac{1}{2}$  by 1 inch, lanceolate, with serrulate margin and three nerved. The fruit is ovate, about  $\frac{1}{2}$  inch by  $\frac{1}{3}$  inch on a solitary stalk 2—3 inches in length. The specimen is marked *Dalzell*, Bombay, and the plant probably grows in the bed of a river.

2. *Lagenandra*.

*L. toxicaria*, Dalz., F.B.I.—VI-495. *Vutsunab.* Konkan, Belgaum. *Dalzell.*

(Goessi, N. Kanara. *Talbot, March.*)

3. *Pistia*.

*P. Stratiotes*, Linn., F.B.I.—VI-497. Poona, widely. July-Nov.

4. *Ariseama*.

*A. tortuosum*, Schott., F.B.I.—VI-502. Panchgani. July.

*A. Leschenaultii*, Bl., F.B.I.—VI-504. Western-Ghats.

- A. Murrayi, *Hook*, F.B.I.—VI-508. Shinvaghad. July-Sept.  
 A. caudatum, *Engler*, F.B.I.—VI-508. Konkan. Stocks.  
     5. *Sauromatum*.  
 S. guttatum, *Schott*, F.B.I.—VI-508. Nurki. Mawal. April.  
     7. *Typhonium*.  
 T. bulbiferum, *Dalz.*, F.B.I.—VI-511. S. Konkan. Stocks.  
     8. *Theriphonum*.  
 T. Dalzellii, *Schott*, F.B.I.—VI-513. Kalyan, Konkan. Karwar. Aug.  
     9. *Amorphophallus*.  
 A. campanulatus, *Bl.*, F.B.I.—VI-513. Suran. Cult.  
 A. bulbifer, *Bl.*, F.B.I.—VI-515. Londa. In flower April. (In leaf June-  
     July.)  
 A. commutatus, *Engler*, F.B.I.—VI-515. *Shewla*. *Sooringudell*. Marmagao.  
     (Shewdi, nr. Bombay. Aug.-Sept.)  
     10. *Synantherias*.  
 S. syloaticus, *Schott*, F.B.I.—VI-518. Marmagao. May.  
     13. *Ariopsis*.  
 A. peltata, *Nimmo*, F.B.I.—VI-519. Narel. Sept.  
     16. *Remusatia*.  
 B. vivipara, *Schott*, F.B.I.—VI-521. Lanoli. July-Aug.  
     18. *Colocasia*.  
 C. Antiquorum, *Schott*, F.B.I.—VI-523. Gardens.  
     19. *Alocasia*.  
 A. indica, *Schott*, F.B.I.—VI-526. Gardens.  
 A. macrorrhiza, *Schott*, F.B.I.—VI-526. Gardens.  
 A. portia, *N.E.B.* Gardens.  
     25. *Rhaphidophora*.  
 R. pertusa, *Schott*, F.B.I.—VI-546. Gardens.  
     31. *Pothos*.  
 P. scandens, *Linn.*, F.B.I.—VI-551. Kadgul, N. Kanara. Nov.  
     32. *Acorus*.  
 A. Calamus, *Linn.*, F.B.I.—VI-555. *Vehkand*. Gardens.  
     CLXVII.—LEMNACEÆ.  
     1. *Lemna*.  
 L. gibba, *Linn.*, F.B.I.—VI-556. Nil. Boshri, nr. Poona. Sept.  
 L. polyrrhiza, *Linn.*, F.B.I.—VI-557. Poona. Sept.  
     2. *Wolffia*.  
 W. arrhiza, *Wimm.*, F.B.I.—VI-557. Tanks, Konkan. Deccan.  
     CLXIX.—ALISMACEÆ.  
     1. *Alisma*.

There is a good specimen of *A. renforme*, Don., in Dalzell's Bombay Herbarium at Kew, without locality. Its occurrence in Western India as an indigenous plant is questionable.

2. *Limnophyton*.

*L. obtusifolium*, *Mig.*, F.B.I.—VI-560. Nulkoot. Ankleshwar. Guzerat. Feb.

3. *Sagittaria*.

*S. sagittifolia*, *Linn.*, F.B.I.—VI-561. Malwan. Sept.

4. *Wisneria*.

*W. triandra*, *Mich.*, F.B.I.—VI-562. Malwan, *Dalzell*. Aug.

5. *Butomopsis*.

*B. lanceolata*, *Kunth.*, F.B.I.—VI-562. Godra. Nov.

## CLXII.—NAIADACEÆ.

2. *Aponogeton*.

*A. monostachyon*, *Linn.*, F.B.I.—VI-564. Godra, Samasgi, Dharwar. July-Dec.

3. *Potamogeton*.

*P. indicus*, *Roxb.*, F.B.I.—VI-566. Poona. Dec.

*P. perfoliatus*, *Linn.*, F.B.I.—VI-566. Poona. Dec.

*P. crispus*, *Linn.*, F.B.I.—VI-566. Poona.

*P. pectinatus*, *Linn.*, F.B.I.—VI-566. Poona, Sind. Aug.

4. *Ruppia*.

*R. rostellata*, *Koch.*, F.B.I.—VI-568. Mahim. Dec.

5. *Zannichellia*.

*Z. palustris*, *Linn.*, F.B.I.—VI-568. Moola River, Poona. March.

6. *Najas*.

*N. minor*, *All F. Pedem.* Poona. March.

## CLXXI.—ERIOCAULEÆ.

1. *Eriocaulon*.

The following list is compiled from specimens at Kew:—

*E. capillus-naiadis*, *Hook.f.*, F.B.I.—VI-572. Konkan. Oct. Dec.

*E. odloratum*, *Dalz.*, F.B.I.—VI-574. Konkan, widely. Kulgi. Supa. Aug.

*E. breviscapum*, *Koern.*, F.B.I.—VI-575. Anmode, N. Kanara. *Talbot*. Nov.

*E. Wightianum*, *Mart.*, F.B.I.—VI-576. Konkan, *Dalzell*. Gairsoppa. *Talbot*. Nov.

*E. lanceolatum*, *Mig.*, F.B.I.—VI-577. Supa, N. Kanara. *Talbot*. Nov.

*E. Sieboldianum*, *Sieb. & Zucc.*, F.B.I.—VI-577. Karwar, *Talbot*. Sept.

*E. stellulatum*, *Koern.*, F.B.I.—VI-579. Konkan. *Stocks*.

*E. sexangulare*, *L.*, F.B.I.—VI-580. Konkan & Western Ghats. Sept.

*E. minutum*, *Hook.f.*, F.B.I.—VI-579. Konkan, *Mr. Law*.

*E. Dalzellii*, *Koern.*, F.B.I.—VI-580. Konkan, *Stocks*, Oct. Dec.

*E. cuspidatum*, *Dalz.*, F.B.I.—VI-581. Siddapore, *Talbot*. Nov.

*E. luzulifolium*, *Mart.*, F.B.I.—VI-582. Konkan, *Stocks*.

*E. trilobum*, *Ham.*, F.B.I.—VI-583. Konkan, *Stocks*.

*E. xeranthemum*, *Mart.*, F.B.I.—VI-584. Karwar, *Talbot*. Sept.

## CLXXII. CYPERACEÆ.

I. *Kyllingia*.

- K. triceps*, *Rottb.*, F.B.I.—VI-587. Poona. Sept.  
*K. monocephala*, *Rottb.*, F.B.I.—VI-589.

2. *Pycneus*.

- P. laticpicatus*, *C.B.C.*, F.B.I.—VI-590. Mawal. Poona. Sept.  
*P. malabaricus*, *C.B.C.*, Linn. Soc. Jour. XXXIV-12. Khandala. Lanoli. Sept.  
*P. sanguinolentus*, *Nees.*, F.B.I.—VI-590. Khandala. Sept.  
*P. nitens*, *Nees.*, F.B.I.—VI-591. Kanara. Lanoli. Mawal. Sept.  
*P. pumilus*, *Nees.*, F.B.I.—VI-591. Sion. Bombay. Sept.  
*P. globosus*, *Reichb.*, F.B.I.—VI-591. Poona. Nov. Jan.  
*P. globosus*, var. *Nilagirica*, *C.B.C.*  
*P.* „ „ *stricta*.  
*P. polystachyus*, *Beauv.*, F.B.I.—VI-592. Malwan. Surat. Dec.  
*P. Baocha*, *Nees.*, F.B.I.—VI-593.  
*P. albomarginatus*, *Nees.*, F.B.I.—VI-594. Londa. Sept.

3. *Juncellus*.

- J. alopecuroides*, *C.B.C.*, F.B.I.—VI-596. Jalodh. Panch Mahals, Deccan.  
Sind. Dec.  
*J. pygmæus*, *C.B.C.*, F.B.I.—VI-596. Surat. Poona. Oct.  
*J. lævigatus*, *C.B.C.*, F.B.I.—VI-596. Kathiawad. Sind. Bombay. Salt  
marshes. Oct.

4. *Cyperus*.

- C. cephalotus*, *Vahl.*, F.B.I.—VI-597.  
*C. castaneus*, *Willd.*, F.B.I.—VI-589. Bombay. Oct.-Dec.  
*C. cuspidatus*, *H. and K.*, F.B.I.—VI-598. Lanoli.  
*C. difformis*, *Linn.*, F.B.I.—VI-599. Khandala. Chinchwad. Oct.-Jan.  
*C. haspan*, *Linn.*, F.B.I.—VI-600. Rutnagiri. Lanoli. Oct.-Dec.  
*C. teneriffæ*, *Poiret.*, F.B.I.—VI-601. Poona. Sept.  
*C. niveus*, *Retz.*, F.B.I.—VI-601. Hyderabad. Sind. Nov.  
*C. leucocephalus*, *Retz.*, F.B.I.—VI-602. Konkan. Mr. Law.  
*C. arenarius*, *Retz.*, F.B.I.—VI-602. Karwar. Talbot. Karachi. Ahmedabad.  
Domus. Nov.  
*C. conglomeratus*, *Retz.*, F.B.I.—VI-602. Sibi. Lace. Ahmedabad. Nov.-Feb.  
*C. pachyrhizus*, *Boeck.*, F.B.I.—VI-603. Porebander. Verawal. Nov.-Dec.  
*C. Atkinsoni*, *C.B.C.*, F.B.I.—VI-603. Jamader. Kallanda near Karachi.  
*C. compressus*, *Linn.*, F.B.I.—VI-605. Poona. Stocks. Sept.  
*C. aristatus*, *Rottb.*, F.B.I.—VI-606. Poona. Sept.  
*C. Iria*, *Linn.*, F.B.I.—VI-606. Khandala. Dec.  
*C. Iria*, *Linn.*, var. *paniciformis*, F.B.I.—VI-606. Khandala. Sept.  
*C. nutans*, *Vahl.*, F.B.I.—VI-607. Khandala. Sept.  
*C. eleusinoides*, *Kunth.*, F.B.I.—VI-608. Mawal. Sept.

- C. malaccensis*, Lam., F.B.I.—VI-608. Goa. Sind. Kalyan. Dec.  
*C. procerus*, Rottb., F.B.I.—VI-610. Goa. Dec.  
*C. bulbosus*, Vahl., F.B.I.—VI-612. Hyderabad, Sind. Dec.  
*C. tegetiformis*, Roxb., F.B.I.—VI-612. Kalyan. Sept.  
*C. corymbosus*, Rottb., F.B.I.—VI-612. Kalyan. Sept.  
*C. tegetum*, Roxb., F.B.I.—VI-613. Konkan. Mr. Law. Lanoli. Sept.  
*C. rotundus*, Linn., F.B.I.—VI-614. Poona. Lanoli. Bhubak, Sind. Sept.  
*C. tuberosus*, Rottb., F.B.I.—VI-616. Poona. Thana. Sept.  
*C. esculentus*, Linn., F.B.I.—VI-616. Poona. Jacquemont.  
*C. exultatus*, Retz., F.B.I.—VI-617. Kurjat. Lanoli. Sept.  
*C. digitatus*, Roxb., F.B.I.—VI-618. Lanoli. Poona. Sept.  
*C. Papyrus*, Linn., Sp. Pl. 47. Gard. Chron. 1875. 78. Gardens. Sept.  
*C. alternifolius*, Linn., Mant. 28. Flor de serre. 1851. 233. Gardens.
5. *Mariscus*.  
*M. bulbosus*, C.B.C., F.B.I.—VI-619. Badami. Dharwar. Oct.  
*M. paniceus*, Vahl., F.B.I.—VI-620. Konkan. Mr. Law.  
*M. Sieberianus*, Nees., F.B.I.—VI-622. Western Ghats. Oct.  
*M. albescens*, Gand., F.B.I.—VI-624. Mhad, Konkan. Oct.
6. *Courtoisia*.  
*C. cyperoides*, Nees., F.B.I.—VI-625.
7. *Eleocharis*.  
*E. plantaginea*, Br., F.B.I.—VI-625. Baroda. Sept.  
*E. fistulosa*, Link., F.B.I.—VI-626.  
*E. spiralis*, Br., F.B.I.—VI-627. Goa. Dec. Salsette. Jacquemont.  
*E. atropurpurea*, Kunth., F.B.I.—VI-627. Godhra. Sept.  
*E. capitata*, Br., F.B.I.—VI-627. Poona. Sind. Stocks. Sept.  
*E. palustris*, Br., F.B.I.—VI-628 $\frac{7}{8}$ . Hyderabad. Sind. Dec.  
*E. chaetaria*, Roem. & Sch., F.B.I.—VI-629. Londa. Dharwar. Dec.
8. *Fimbristylis*.  
*F. tetragona*, Br., F.B.I.—VI-631. Hirdosi. Mawal. Oct.  
*F. polytrichoides*, Vahl., F.B.I.—VI-632. Sion, Bombay. Oct.  
*F. schoenoides*, Vahl., F.B.I.—VI-634. Konkan. Sept.  
*F. dichotoma*, Vahl., F.B.I.—VI-635. Bodeli, Guzerat. Khandala. Oct.-Apl.  
*F. diphylla*, Vahl., F.B.I.—VI-636. Shelarwadi, Konkan. Aug.  
*F. aestivalis*, Vahl., F.B.I.—VI-637. Mawal. Matheran. Sept.-Dec.  
*F. ferruginea*, Vahl., F.B.I.—VI-638. Poona. Hyderabad, Sind. Khandala. Sept.-Oct.  
*F. spathacea*, Roth., I., F.B.I.—VI-640. Karachi. Dec.  
*F. monticola*, Steud., F.B.I.—VI-642. Shelarwadi. Poona. Aug.  
*F. quinquangularis*, Kunth., F.B.I.—VI-644. Baroda. Sept.  
*F. miliacea*, Vahl., F.B.I.—VI-644. Kalyan. Sept.  
*F. complanata*, Link., F.B.I.—VI-646.  
*F.* „ var. *microcarpa*, Hewra, Poona. Dalzell.  
*F. Woodrowi*, C.B. Clark., Ex. Jour. Linn. Soc. XXXIV. 68. Khandala, Malwan. Oct.

- F. junciformis, *Kunth.*, F.B.I.—VI-647. Karli. Nov.  
 F. digitata, *Boech.*, F.B.I.—VI-648. Poona. Marmagoa. *Talbot.* Lanoli.  
 Bilckerry, N. Kanara. Oct.  
 F. monostachya, *Hassk.*, F.B.I.—VI-649. Badami. Poona. *Jacquemont.* July.
9. *Bulbostylis.*  
 B. barbata, *Dalz.*, F.B.I.—VI-651. Badami. July.
10. *Scirpus.*  
 S. supinus, *Law*, F.B.I.—VI-655. Bansda. Kalyan. Sind. Oct.-Feb.  
 S. articulatus, *Linn.*, F.B.I.—VI-656. Konkan. Sind. Oct.-Feb.  
 S. quinquefarius, *Boeck.*, F.B.I.—VI-657. Bhubak, Sind. Umrat, Guzerat.  
 Nov.-Dec.  
 S. corymbosus, *Heyne.*, F.B.I.—VI-657. Goa. Sind. Dec.  
 S. maritimus, *Linn.*, F.B.I.—VI-658. Miraj. Karachi. Bombay. Nov.  
 S. littoralis, *Schrad.*, F.B.I.—VI-659. Sind. *Dalzell.*  
 S. grossus, *Linn.*, F.B.I.—VI-659. Kalyan. Sept.  
 S. „ var., *Kysoor, C.B.C.*, F.B.I.—VI-660. *Kachara.* Bombay, cult. Sept.  
 S. kyllingioides, *Boech.*, F.B.I.—VI-662. Kanara. *Young.*  
 S. Michelianus, *Linn.*, F.B.I.—VI-662. Palee. Konkan, Sind. Bhubak. Oct.  
 S. squarrosus, *Linn.*, F.B.I.—VI-663. Widely. Oct.-Dec.
11. *Eriophorum.*  
 E. comosum, *Wall.*, F.B.I.—VI-664. Junir. Champaner. Oct.
12. *Fuirena.*  
 F. Wallichiana, *Kunth.*, F.B.I.—VI-665. Poona. Sept.  
 F. glomerata, *Lam.*, F.B.I.—VI-666. Godhra. Sawantwadi. Nov.  
 F. uncinata, *Kunth.*, F.B.I.—VI-666. Kanara. *Dr. Thomson.* Dec.  
 F. umbellata, *Rottb.*, F.B.I.—VI-666. Londa. Alandi. Nov.
14. *Rhynchospora.*  
 R. Wallichiana, *Kunth.*, F.B.I.—VI-668. Kalyan. Aug.  
 R. Wightiana, *C.B.C.*, F.B.I.—VI-669. Poona. Khandala. Aug.  
 R. aurea, *Vahl.*, F.B.I.—VI-670. Southern Maratha Country. *Young.*
20. *Remirea.*  
 R. maritima, *Aubl.*, F.B.I.—VI-677. Seashore, Kanara. *Dr. Thomson.*
21. *Hypolytrium.*  
 H. Wightianum, *Boeck.*, F.B.I.—VI-678. *Bhimto.* Castle Rock. Katgul.  
 N. Kanara. Feb.
26. *Scleria.*  
 S. lithosperma, *Swartz.*, F.B.I.—VI-685. Matheran. Dec.  
 S. biflora, *Roxb.*, F.B.I.—VI-687. Matheran. Dec.  
 S. tessellata, *Willd.*, F.B.I.—VI-687. Between Poona and Pannaola. (Pan-  
 wel). *Jacquemont.*  
 S. Stocksiana, *Boeck.*, F.B.I.—VI-687. Talegaon. Bombay. Dec.  
 S. annularis, *Kunth.*, F.B.I.—VI-687. Konkan. *Mr. Law.*  
 S. hebecarpa, *Nees.*, F.B.I.—VI-689. N. Kanara. *Talbot.*

28. *Carex*.

- C. mercarenis*, *Steud.*, F.B.I.—VI-719. Mahableshwar. Londa. Hulgi. N.  
Kanara. *Talbot*. Oct.  
*C. speciosa*, *Kunth.*, F.B.I.—VI-729. Hulgi. N. Kanara. *Talbot*. Oct.

## CLXXIII. GRAMINEÆ.

1. *Paspalum*.

- P. scrobiculatum*, *Linn.*, F.B.I.—VII. *Harika*. Cult. widely. Oct.  
*P. compactum*, *Roth.*, F.B.I.—VII-12. *Kuri*. Kanara. Mahableshwar.  
Lanoli. Sept.  
*P. distichum*, *Linn.*, F.B.I.—VII-12. Seashore, Bombay. Malwan. Oct.  
*P. sanguinale*, *Lamk.*, F.B.I.—VII-13. *Roega*. *Dinohi*. Sind. Parel. Oct.  
*P. pennatum*, *Hook.f.*, F.B.I.—VII-16. Karachi. *Stocks*. Morvi. *J. Beck*. Oct.  
*P. ternatum*, *Hook.f.*, F.B.I.—VII-17. Belgaum. *Ritchie*.  
*P. longiflorum*, *Retz.*, F.B.I.—VII-17.  
*P. Royleanum*, *Nees*, F.B.I.—VII-18. Suwasni Ghat. Dec.  
*P. pedicellare*, *Trin. ex. Steud.*, F.B.I.—VII-19. Konkan. *Stocks*.

2. *Eriochloa*.

- E. polystachya*, *H. B. & K.*, F.B.I.—VII-20. Mahim, Bombay. Oct.

3. *Isachne*.

- I. Lisboæ*, *Hook.f.*, *Bombay Grasses*, *Lisboa*, 6. Mahableshwar. Oct.  
*I. elegans*, *Dalz.*, F.B.I.—VII-23. Lanoli. Poona. Sept.  
*I. australis*, *Br.*, F.B.I.—VII-24. Mahableshwar. Oct.  
*I. miliacea*, *Roth.*, F.B.I.—VII-25. Konkan. Oct.

4. *Panicum*.

- P. Isachne*, *Roth.*, F.B.I.—VII-28. Poona. Sept. Jan.  
*P. flavidum*, *Retz.*, F.B.I.—VII-28. Khandala. Morvi. Porbunder. Oct.  
*P. punctatum*, *Burm.*, F.B.I.—VII-29. Ahmednagar. Poona. Nov.  
*P. paspaloides*, *Pers.*, F.B.I.—VII-29. Munchar Lake. Sind. *Stocks*.  
*P. crusgalli*, *Linn.*, F.B.I.—VII-30. Poona. Bombay. Morvi. Oct.  
*P.*, var. *frumentaceum*.  
*P. colonum*, *Linn.*, F.B.I.—VII-32. *Savri*. Sind. *Pakor*. Londa. Morvi.  
Shikarpur. Oct.  
*P. prostratum*, *Lamk.*, F.B.I.—VII-33. *Pooi*. Sind. *Chimanchara*. Poona.  
Kathiawad. Sept.  
*P. muticum*, *Forsk.*, F.B.I.—VII-35. *Water Grass of Mauritius*. Cult. Kir-  
kee. Surat.  
*P. javanicum*, *Poir.*, F.B.I.—VII-35. *Phadya*. *Gonalya*. E. Khandesh. Poona.  
Badami. Aug.-Nov.  
*P. ramosum*, *Linn.*, F.B.I.—VII-36. Poona. Badami. Aug.-Nov.  
*P. setigerum*, *Retz.*, F.B.I.—VII-37. Poona. Rajkot. Sept.-Dec.  
*P. auritum*, *Presl.*, F.B.I.—VII-40.  
*P. interruptum*, *Willd.*, F.B.I.—VII-40. Sind. Panwel. Vengurla. Oct.-Feb.

- P. indicum*, *Linn.*, F.B.I.—VII-41.
- P. myosuroides*, *Br.*, F.B.I.—VII-42. Sawantwadi. Nov.
- P. nodosum*, *Kunth.*, F.B.I.—VII-43.
- P. turgidum*, *Forsk.*, F.B.I.—VII-44. Rajkot. Deesa. Nov.
- P. miliaceum*, *Linn.*, F.B.I.—VII-45. *Vari.* Cult.
- P. miliare*, *Lamk.*, F.B.I.—VII-46. Cult.
- P. psilopodium*, *Trin.*, F.B.I.—VII-46. Kalyan. Parel. Sept.
- P. trypheron*, *Schult.*, F.B.I.—VII-47. *Bhatur.* Jeur. Sholapur. Mulhargad. Poona. Sept.
- P. maximum*, *Jacq.*, F.B.I.—VII-49. *Guinea Grass.* Cult.
- P. proliferum*, *Lann.*, F.B.I.—VII-50.
- P. obscurans*, *Stapf.* *Tan Sawa.* *Bhatur.* Jeur. Sholapur Dist. Dec.
- P. subeglume*, *Trin.*, F.B.I.—VII-557. Badami. Sept.
- P. antidotale*, *Retz.*, F.B.I.—VII-52. Kathiawad. Sukar. Sind. Londa. Mar.
- P. montanum*, *Roeb.*, F.B.I.—VII-53. *Tokarbund.* Bansda. Dang. Jan.
- P. plicatum*, *Lamk.*, F.B.I.—VII-55. Cult. Nov.
- P. rhachitrichum*, *Hochst.*, F.B.I.—VII-56. Londa, "on a tree." *G.A. Gammie.* Oct.
- P. trigonum*, *Retz.*, F.B.I.—VII-56.
- P. patens*, *Linn.*, F.B.I.—VII-57. Kadgul. N. Kanara. Dec.
6. *Thysanolaena.*
- T. agrostis*, *Nees*, F.B.I.—VII-61. *Barucha.* Dang. Bansda. Feb.
7. *Chamaeraphis.*
- C. spinescens*, *Poir.*, F.B.I.—VII-62. Wangni. Konkan. Sept.
8. *Spinifex.*
- S. squarrosus*, *Linn.*, F.B.I.—VII-63. Kumta. Shriwardhan. Nov.
9. *Axonopus.*
- A. cimicinus*, *Beauv.*, F.B.I.—VII-64. Badami. Dharwar. Oct.
10. *Tricholaena.*
- T. Teneriffæ*, *Parlat.*, F.B.I.—VII-65. Thano Bulo Khan. Sind. Aug.
- T. Wightii*, *Nees*, F.B.I.—VII-65. *Chota Kagli.* Mulhargad. Poona. Sept.
11. *Oplismenus.*
- O. compositus*, *Beauv.*, F.B.I.—VII-66. Kadgal. Matheran. Nov.-Dec.
- O. Burmannii*, *Beauv.*, F.B.I.—VII-68. Panchgani. Parel. Oct.-Sept.
12. *Arundinella.*
- A. avenacea*, *Munro*, F.B.I.—VII-69. Ratnagiri. Castle Rock. Oct.
- A. tuberculata*, *Munro*, F.B.I.—VII-69. Poona. Oct.
- A. setosa*, *Trin.*, F.B.I.—VII-70. Near Bombay. *Ritchie*
- A. agrosoides*, *Trin.*, F.B.I.—VII-71.
- A. tenella*, *Nees.*, F.B.I.—VII-71. Lanoli. Mahableshtar. Nov.
- A. pygmaea*, *Hook. f.*, F.B.I.—VII-72. Crest of W. Ghats. Sept.
- A. metzii*, *Hochst.*, F.B.I.—VII-72. Lanoli. Oct.

- A. brasiliensis*, *Raddi*, F.B.I.—VII-73. Panchgani. Radjouri. Oct. Near  
Poona. *Jacquemont*.
- A. capillaris*, *Hook. f.*, F.B.I.—VII-74. *Kotir*. Parel. Kalanuddee. Oct.
- A. fuscata*, *Nees*, F.B.I.—VII-74.
- A. gigantea*, *Dalz.*, F.B.I.—VII-76. Castle Rock. Konkan. Oct.
- A. spicata*, *Dalz.*, Bombay Flora, 293. Mahableshwar. Nov.
- A. Lawii*, *Hook. f.*, Ceylon Flora.
13. *Setaria*.
- S. italica*, *Beauv.*, F.B.I.—VII-78. *Rala*. Cult. widely.
- S. glanca*, *Beauv.*, F.B.I.—VII-79. *Kolara. Kolada*. Mahableshwar. Oct.
- S. intermedia*, *Roem. and Sch.*, F.B.I.—VII-79. *Pander*. Konkan. *Mr. Law*.  
Poona. Belgaum. *Ritchie*. Aug.-Oct.
- S. verticillata*, *Beauv.*, F.B.I.—VII-80. *Pandar. Dungunee*. Baroda. Morvi. Dec.
14. *Pennisetum*.
- P. typhoideum*, *Rich.*, F.B.I.—VII-82. *Bajri*. Cult.
- P. alopecuroides*, *Steud.*, F.B.I.—VII-84. *Mohl*. Poona. Belgaum. Sind. Oct.
- P. dichotomum*, *Delile*, F.B.I.—VII-85. Sind. *Stocks*.
- P. orientale*, *Rich.*, F.B.I.—VII-86. Abu, *Sir G. King*. July.
- P. pedicellatum*, *Trin.*, F.B.I.—VII-86. Rajkot. Oct.
- P. setosum*, *Rich.*, F.B.I.—VII-87. Hyderabad. Sind. Dec.
- P. cenchroides*, *Rich.*, F.B.I.—VII-88. Rajkot. Near Karachi. Dec.
15. *Cenchrus*.
- C. biflorus*, *Roxb.*, F.B.I.—VII-89. Karachi. Morvi, *J. Beck*. Dec.
18. *Oryza*.
- O. sativa*, *Linn.*, F.B.I.—VII-92. *Nawar. Bhat*. Cult. widely.
- O. coarctata*, *Rowb.*, F.B.I.—VII-93.
19. *Leersia*.
- L. hexandra*, *Sw.*, F.B.I.—VII-94. Londa, *G. A. Gammie*. Oct.
20. *Hygrophiza*.
- H. aristata*, *Nees*, F.B.I.—VII-95. *Devabhata*. Chickhle, Guzerat. April.
22. *Trachys*.
- T. mucronata*, *Pers.*, F.B.I.—VII-96. Badami. Dharwar. Aug.
23. *Tragus*.
- T. racemosus*, *Scop.*, F.B.I.—VII-97. Badami. Bijapur. Rajkot. Poona.  
*Jacquemont*. Sind. *Stocks*. Sept.
24. *Latipes*.
- L. senegalensis*, *Kunth*, F.B.I.—VII-97. 20 miles N. of Karachi. Aug.
26. *Perotis*.
- P. latifolia*, *Ait.*, F.B.I.—VII-98. *Kuras*. Badami. Malwan. Oct.-Aug.
27. *Zoysia*.
- Z. pungens*, *Willd.*, F.B.I.—VII-99. Damaun, *Lisboa*.

28. *Coix*.

C. *Lachryma*, *Jobi*, *Linn.*, F.B.I.—VII-100. *Ran-jondhala*. *Kaseda*. Lanoli. Oct.

29. *Polytoca*.

P. *Cookii*, *Stapf.*, F.B.I.—VII-101. *Kurisal*. Mahableshwar. Sept.

P. *barbata*, *Stapf.*, F.B.I.—VII-102. *Kanta*, *Karwel*. Poona. Sept.

29. *Zea*.

Z. *Mays*, *Linn.*, F.B.I.—VII-102. *Maka*, *Maize*. Cult.

30. *Dimeria*.

D. *ornithopoda*, *Trin.*, F.B.I.—VII-104. *Khap Kurdi*, Khandala. Panchgani. Oct.

D. *Woodrowii*, *Stapf.*, F.B.I.—VII-104. Ratnagiri. Oct.

D. *gracilis*, *Nees*, F.B.I.—VII-105. Lanoli. Dec.

31. *Imperata*.

I. *arundinacea*, *Cyrill.*, F.B.I.—VII-106. Londa. Sind. *Stocks*. Aug.

33. *Spodiopogon*.

S. *albidus*, *Benth.*, F.B.I.—VII-108. Khandala. Salsette. Oct.

34. *Pollinia*.

P. *argentea*, *Trin.*, F.B.I.—VII-111. Lanoli. Ratnagiri. Oct.-Dec.

P. *fimbriata*, *Hack.*, F.B.I.—VII-112. Lanoli. Oct.

35. *Saccharum*.

S. *officinatum*, *Linn.*, F.B.I.—VII-118. *Us*, *Usa Gunderi*. Cult.

S. *spontanum*, *Linn.*, F.B.I.—VII-118. *Bagberi*, *Kamis*, *Khair*. Poona. Karjat. Shikarpur. Nov.

S. *arundinaceum*, *Retz.*, F.B.I.—VII-119. Planted.

S. *fuscum*, *Roxb.*, F.B.I.—VII-120.

36. *Erianthus*.

E. *ravennæ*, *Beauv.*, F.B.I.—VII-121. Karachi. Dec.

E. *fastigiatus*, *Nees*, F.B.I.—VII-125. Belgaum, *Ritchie*.

37. *Ischæmum*.

I. *aristatum*, *Linn.*, F.B.I.—VII-126. *Bherdi*, *Jus*. Salsette. Konkan. Belgaum, *Ritchie*. Oct.-Dec.

I. *rugosum*, *Salisb.*, F.B.I.—VII-127. Poona. Oct.

I. *molle*, *Hook. f.*, F.B.I.—VII-126. Lanoli. Oct.-Dec.

I. *diplopogon*, *Hook.*, F.B.I.—VII-129. Borkus nr. Poona. Matheran. Mahableshwar. Oct.-Dec.

I. *angustifolium*, *Hack.*, F.B.I.—VII-129. *Sabai*, Rajkot. Cult. at Poona, Dec.-Feb.

I. *pilosum*, *Hact.*, F.B.I.—VII-130. *Koonda*, *Nuth*. Widely in black soil. Oct.-Mar.

I. *semisagittatum*, *Roxb.*, F.B.I.—VII-130. Yellapore, Parel, Lanoli. Sept.-Oct.

I. *Conjugatum*, *Roxb.*, F.B.I.—VII-131. Divimana. Konkan. Dec.

I. *Lisboæ*, *Hook.*, I., F.B.I.—VII-133. N. Kanara, *Lisboa*.

- I. ciliare, *Retz.*, F.B.I.—VII-133. *Putena*. Parel. Karti. N. Kanara. *Mr. Young.*  
Oct.
- I. Birdwoodii.
- I. laxum, *Br.*, F.B.I.—VII-136. *Sheda, Chopda, Paunat.* Poona. Sept.
- I. sulcatum, *Hack.*, F.B.I.—VII-137. *Gotud.* *Mr. Young.* Oct. 30th, 1884.
- I. spathiflorum, *Hook. f.*, F.B.I.—VII-138. *Baer, Ber.* Palasdari. Khandala. Sept.  
39. *Pogonetherum.*
- P. saccharoideum, *Beauv.*, F.B.I.—VII-141. *Bamboo Grass.* Gardens, cult.  
Matheran ?
- P. crinitum, *Trin.*, F.B.I.—VII-141. *Sumpkund ; N. Kanara.* July.  
40. *Apocopsis.*
- A. vaginatus, *Hackel* in *Osterr. Bot. Zeitschr.* Vol. 4, page 8. Kalyan, N.  
Kanara. *Talbot.*  
41. *Arthraxon.*
- A. lanceolatus, *Hochst.*, F.B.I.—VII-143. *Harjala, Govindair.* Lanoli. Jam-  
jodhapur. Morvi. Kathiawad. Oct.
- A. inermis, *Hook. f.*, F.B.I.—VII-145. *Vaguarin.* Guz. Matheran. Maha-  
bleshtar. Oct.
- A. ciliaris, *Beauv.*, F.B.I.—VII-145. *Vanguarin.* Chamargaon. Guz. Oct.
- A. microphyllus, *Hochst.*, F.B.I.—VII-147. Parel. Sept.
- A. jubatus, *Hack.*, F.B.I.—VII-147. *Koriacha Kila.* Ambowni, Western  
Ghats. Oct.  
42. *Thelokokon.*
- T. elegans, *Roth.*, F.B.I.—VII-148. *Poona, Bombay, Belgaum.* Sept.  
43. *Lokhopogon.*
- L. tridentatus, *Hack.*, F.B.I.—VII-149. *Poona, Belgaum.* Oct.-Dec.  
44. *Apluda.*
- A. varia, *Hack.*, F.B.I.—VII-150. *Ghagara.* Konkan, Deccan, Guzerat. Oct.-  
Dec.  
46. *Rottbællia.*
- R. compressa, *Linn.*, F.B.I.—VII-153. *Baikah.* Sind. Godra, Shikarpur. Nov.
- R. acuminata, *Hack.*, F.B.I.—VII-155. *Marmagoa, Malwan.* Oct.
- R. divergens, *Hack. f.*, F.B.I.—VII-155. *Marel.* Khandala, Mahableshtar. Sept.
- R. Talboti, *Hook. f.*, F.B.I.—VII-155. *Goa, W. A. Talbot.* Oct.
- R. exaltata, *Linn. f.*, F.B.I.—VII-156. *Bursali.* Poona. Nov.
- R. clarkei, *Hack.*, F.B.I.—VII-156. *Birchy.* N. Kanara. *W. A. Talbot.* Nov.  
47. *Manisuris.*
- M. granularis, *Linn. f.*, F.B.I.—VII-159. *Khandala, Poona, Dharwar.* Oct.  
48. *Ophiurus.*
- O. corymbosus, *Gaertn.*, F.B.I.—VII-160. *Hootia.* Guzerat. Poona. Jeur. Dec.  
50. *Elionurus.*
- E. Royleanus, *Nees*, F.B.I.—VII-161. *Rajkot.* Sind.
- E. hirsutus, *Munro*, F.B.I.—VII-162. *Sain.* Sind. *Stocks.*

53. *Andropogon*.

- A. foveolatus*, *Del.*, F.B.I.—VII-168. *Ghandel.* Poona. Widely. Oct.  
*A. pumilus*, *Roxb.*, F.B.I.—VII-170. *Gondwal, Baerki.* Diwas-Ghat, Surat. Dec.  
*A. compressus*, *Hook. f.*, F.B.I.—VII-172. Mawal. Poona. Dec.  
*A. Woodrowii*, *Hook. f.*, F.B.I.—VII-173. Khorbarsa, Mawal. Dec.  
*A. pertusus*, *Willd.*, F.B.I.—VII-173. Lanoli. Sept.  
*A. concanensis*, *Hook. f.*, F.B.I.—VII-174. Matheran. Oct.  
*A. ensiformis*, *Hook. f.*, F.B.I.—VII-175. Lanoli. Sept.  
*A. Kuntzeanus*, *Hackel.*, F.B.I.—VII-175. var. *pseudointermediata*. Mawal, Konkan. Oct.  
*A. intermedius*, *Br.*, F.B.I.—VII-175. Poona. Mawal. Dec.  
*A. montanus*, *Roxb.*, F.B.I.—VII-176. Suvasni-Ghat. Dec.  
*A. odoratus*, *Dna. Lisboa.*, F.B.I.—VII-177. Mawal. Poona. Oct.  
*A. micranthus*, *Kunth.*, F.B.I.—VII-178.  
*A. assimilis*, *Steud.*, F.B.I.—VII-179. Suvasni-Ghat. Dec.  
*A. Hugelii*, *Hack.*, F.B.I.—VII-180. Poona. Belgaum. Sept.  
*A. filiculmis*, *Hook. f.*, F.B.I.—VII-181. Sirsi. Dhonshi, Poona. Nov.-Dec.  
*A. halepensis*, *Brot.*, F.B.I.—VII-182. *Boru.* Poona. Konkan. Dang. Dec.  
*A. Sorghum*, *Brot.*, F.B.I.—VII-183. Cult.  
*A. purpureo-sericus*, *Hochst.*, F.B.I.—VII-185. N. Kanara. *Young.* Poona. Kohlapur. Nov.  
*A. squarrosus*, *Linn. f.*, F.B.I.—VII-186. *Wala.* The Kuskur Root Grass. Planted widely. Indigenous? Jan.  
*A. aciculatus*, *Retz.*, F.B.I.—VII-188. Karwar. Oct.  
*A. lancearius*, *Hook. f.*, F.B.I.—VII-190. Castle Rock. Oct.  
*A. monticola*, *Schult.*, F.B.I.—VII-192. *Ajiva.* Guz. Poona. Khandala, Kohlapur. Oct.  
*A. montanus*, *Hook. f.*, F.B.I.—VII. Dharwar. *Talbot.*  
*A. Aucheri*, *Boiss.*, F.B.I.—VII-195. Near Karachi. *Stocks.*  
*A. caricosus*, *Linn.*, F.B.I.—VII-196. Belgaum, Mawal, Poona. Dec.  
*A. annulatus*, *Forsk.*, F.B.I.—VII-196. Poona, Sind. *Stocks.* Oct.  
*A. armatus*, *Hook. f.*, F.B.I.—VII-197. Konkan. *Stocks.*  
*A. contortus*, *Linn. f.*, F.B.I.—VII-199. *Kursali.* Poona. Guzerat. Nov.  
*A. Cookei*, *Stapf.*, MSS., New species. Sukkar. Pathar. Lanoli. Oct. 98.  
*A. triticeus*, *Br.*, F.B.I.—VII-200. Mawal. Poona. Dec.  
*A. Ritchiei*, *Hook. f.*, F.B.I.—VII-201. Belgaum. Poona. Mahableshwar. Oct.-Dec.  
*A. polystachyos*, *Roxb.*, F.B.I.—VII-202. Khandala. Nov.  
*A. Iwarancusa*, *Jones*, F.B.I.—VII-203. Karachi. Dec.  
*A.* „ var. *Laniger.* Sind. Widely. July-Dee.  
*A. Schoenanthus*, *Linn.*, F.B.I.—VII-204. *Sirwai.* Poona. Konkan. Sept. Dec.  
*A. Nardus*, *Linn.*, F.B.I.—VII-205. Probably occurs within our limi ts,



- S. arabicus, *Boiss.*, F.B.I.—VII-252. Karachi.
- S. coromandelianus, *Kunth.*, F.B.I.—VII-252. Sind. Nagpur Dist. Jan.
79. *Tristachya.*
- T. barbata, *Nees*, F.B.I.—VII-272. Sind. Stocks.
82. *Avena.*
- A. sativa, *Linn.*, F.B.I.—VII-275. Cult. Hyderabad. Sind.
84. *Microchloa.*
- M. setacea, *Br.*, F.B.I.—VII-283. Dharwar. Aug.
85. *Gracilea.*
- G. Royleana, *Hook. f.*, F.B.I.—VII-284. Konkan. Sind.
87. *Tripogon.*
- T. capillatus, *Jaub. and Spach.*, F.B.I.—VII-285. On trees, Matheran. Sept.
- T. pauperculus, *Stapf.*, F.B.I.—VII-285. On rocks near Karli. Sept.
- T. Lisboaë, *Stapf.*, F.B.I.—VII-286. *Chirana.* Matheran. Oct.
- T. Jacquemontii, *Stapf.*, F.B.I.—VII-287. Poona. Matheran. Sept.
88. *Cynodon.*
- C. clactylon, *Pers.*, F.B.I.—VII-288. *Heraili.* Durva. Throughout India.
89. *Chloris.*
- C. incompleta, *Roth.*, F.B.I.—VII-290. N. Kanara. Feb.
- C. tenella, *Roxb.*, F.B.I.—VII-290. Surat. Bijapur, in shade only. Oct.
- C. villosa, *Pers.*, F.B.I.—VII-291. Sind. Stocks.
- C. barbata, *Sw.*, F.B.I.—VII-292. *Gondvail.* Sind. Deccan. Widely. Nov.
90. *Eleusine.*
- E. indica, *Gaertw.*, F.B.I.—VII-293. *Mahar-nachani.* Poona. Jan.
- E. flagellifera, *Nees*, F.B.I.—VII-294. Sind. Stocks.
- E. verticillata, *Roxb.*, F.B.I.—VII-295.
- E. ægyptiaca, *Desf.*, F.B.I.—VII-295. Rutnagiri. Badami. Sharanpoor Dist. Sept.-Nov.
- E. aristata, *Ehrenb.*, F.B.I.—VII-296. Rutnagiri. Ahmedabad.
91. *Dinebra.*
- D. arabica, *Jacq.*, F.B.I.—VII-297. Poona. Morvi. Surat. Aug.
92. *Leptochloa.*
- L. chinensis, *Nees*, F.B.I.—VII-299. Dr. Lisboa records that he has seen specimens from Parel, and from Guzerat. There are no specimens from Western India in the Herbarium at Poona or at Kew.
95. *Pappaphorum.*
- P. elegans, *Nees*, F.B.I.—VII-301. Khajuri. Karachi Dist. Aug.
96. *Arundo.*
- A. Donax, *Linn.* Gardens.
97. *Phragmites.*
- P. communis, *Trin.*, F.B.I.—VII-303. *Gardener's garter.* Variegated form. Gardens.
- P. Karka, *Trin.*, F.B.I.—VII-304. Dhond; Lisboa.

99. *Elitrophorus*.

*E. articulatus*, *Beauv.*, F.B.I.—VII-306. *Jungli Rala*, Kalyan, Londa, Godhra, Nov.-Feb.

104. *Eragrostis*.

- E. aspera*, *Nees.*, F.B.I.—VII-314. N. Kanara, *Lisboa*.  
*E. ciliaris*, *Link.*, F.B.I.—VII-314. Baroda, Nov.  
*E. tenella*, *Roem. & Sch.*, F.B.I.—VII-315. *Woya*, *Buchraloo*. Sind. Surat, Poona, Nov.  
*E. interrupta*, *Beauv.*, F.B.I.—VII-316. Surat, Bhowden, near Poona, Nov.  
*E. amabilis*, *Wgt. & Arn.*, F.B.I.—VII-317. Parel, Bassein, Poona, Sept.-Nov.  
*E. interrupta*, var. *Koenigii*, *Stapf.*, F.B.I.—VII-316.  
*E. stenophylla*, *Hochst.*, F.B.I.—VII-318. Bhorkus, Mawal, Dec.  
*E. elegantula*, *Steud.*, F.B.I.—VII-398. Bhorkus, Mawal, Dec.-Apr.  
*E. tremula*, *Hochst.*, F.B.I.—VII-320. Guzerat, Deesa, Palanpur, Nov.  
*E. major*, *Host.*, F.B.I.—VII-320. Sind, Poona, Morvi, Nov.-Jan.  
*E. minor*, *Host.*, F.B.I.—VII-321. Godhra, Panchmahals, Nov.  
*E. tenuifolia*, *Hochst.*, F.B.I.—VII-322. Belgaum.  
*E. pilosa*, *Beauv.*, F.B.I.—VII-323. Sind, Dharwar, Waghodi, Poona, Sept.-Oct.  
*E. cynosuroides*, *Beauv.*, F.B.I.—VII-324. *Darbha*, *Kusha*, Mandvi, Hyderabad, Sind, Dec.  
*E. bifaria*, *Wgt.*, F.B.I.—VII-325. Belgaum, *Ritchie*, Khandala, Aug.
106. *Halopyrum*.  
*H. micronatum*, *Stapf.*, F.B.I.—VII-323. Porebundar, Sind, *Stocks*, Nov.
108. *Diplachne*.  
*D. fusca*, *Beauv.*, F.B.I.—VII-329. Rice fields, Matunga near Bombay, Nov.
111. *Centotheca*.  
*C. lappacea*, *Desv.*, F.B.I.—VII-332. Kadgal, Kanara Dist. Oct.
113. *Æluropus*.  
*Æ. villosus*, *Trin.*, F.B.I.—VII-334. Umrat, Guz. Karachi, Nov.-Dec.
127. *Oropetium*.  
*O. Thomeaum*, *Trin.*, F.B.I.—VII-366. Junir, Poona, July-Sept.
121. *Triticum*.  
*T. Speltum*, var. *Khaphi*, *Jod*, *Pumban*. Covered grain wheat, Cult. widely.  
*T. Vulgare*, *Vill.*, F.B.I.—VII-367. *Ghui*. Cult. widely.  
*T. pilosum*, *Dalz. & Gibs.* *Bakshi*, *Kala Kusali*, *Kahno*. Cult. widely.  
*T. monococcum*, *Linm.* Guzerat.

130. *Hordeum*.

- H. vulgare*, var. *Hexastichon*, *Linm.*, F.B.I.—VII-371. *Satu*, *Jau*, Cult. widely.  
*H. „* var. *distichon*, *Jau*, Sind, cult.

H. vulgare, var. nudum, *Ua. Ujan*. Naked or loose grained Barley. Guzerat.  
Sind.

*Bambusa.*

- B. nana, *Roxb.*, F.B.I.—VII-390. *Barik. Bamboo.* Jap. Bamboo. Gardens.  
 B. Vulgaris, *Schrad.*, F.B.I.—VI-391. *Oodha. Bans.* Planted.  
 B. , var. straita, *Bot. Mag.* 6079. Gold and green striped Bamboo.  
Gardens.  
 B. arundinacea, *Willd.*, F.B.I.—VII-395. *Kulluk.* Dang. Widely planted.  
 138. *Oxytenanthera.*  
 O. monostigma, *Bedd.*, F.B.I.—VII-402. N. Kanara. Sukkar-Pathar. Widely  
W. Ghats.  
 O. Stocksii, *Munro*, F.B.I.—VII-403. *Chiwari.* N. Kanara, *Talbot.* Panch-  
gani. Planted. Nov.  
 138. *Dendrocalamus.*  
 D. strictus, *Nees*, F.B.I.—VII-404. *Kania Wans.* Panch Mahals. Planted,  
in Konkan.  
 D. giganteus, *Munro*, F.B.I.—VII-406. Gardens.  
 146. *Ochlandra.*  
 O. stridula, *Munro*, F.B.I.—VIII-419. *Hooda.* N. Kanara, *Talbot.*

## THE FERNS OF NORTH-WESTERN INDIA.

Including AFGHANISTAN, the TRANS-INDUS PROTECTED STATES, and KASHMIR: arranged and named on the basis of Hooker and Baker's *Synopsis Filicum*, and other works, with New Species added.

By C. W. HOPE.

(Continued from Vol. XIII, page 251.)

PART III.—THE GENERAL LIST.—(continued.)

Ord. FILICES.

Sub-Ord. III.—POLYPODIACEÆ.—(continued.)

Genus 13.—**ONYCHIUM**, Kaulf.

1. **O. auratum**, Kaulf. ; Syn. Fil. 143 ; C. R. 458 ; Bedd. H. B. 96.

PUNJAB: *Simla Reg.* ; in Herb. Brit. Mus. a sheet marked—"Simla, Griffith," a pair of fronds, barren and fertile, without stipes : no ticket.

N.-W. P. : *D. D. Dist.*—Jaunsar—near Road from Jumna R. to Chakráta, Mrs. J. Sladen 1880 ; "The Attie Farm" 1500? Mackinnons 1878 ; near bridge over Tons R. 1800? Mackinnons ; Rajpur—above Tollbar 3400', V. A. Mackinnon 1886, Hope 1887 ; Rajpur below 3000', Gamble, V. A. Mackinnon, Hope ; *Kumaun*—Griffith, *vide* Sir W. J. Hooker's writing on sheet in Herb. Hort. Kew : there is also a small ticket with the single word "Kumaon" in ink and "?" in pencil : one plant, all infertile ; *Gorakhpur Dist.*, in a well in forest, Angus Campbell 1887.

DISTRIB.—*Asia* : N. Ind. (Him.), Nepál, *Wallich* ; Sikkim and Bhotan ; Assam "common" ; E. Bengal 0-4000', sometimes far from the hills, Chittagong ; Burma ; Malay Penins. and Isles ; N. Guinea, *Fitzgerald* 1895 ; Formosa, Henry ; China Yunnan, *Hancock* 1893.

The Gorakhpur Station seems to be the only known one between the Dehra Dun and East Nepal or Sikkim, unless Griffith got the plant in Kumaun. A plant named *O. auratum*, in the Calcutta Herbarium, got in Kumaun by Mr. A. O. Hume, is *O. japonicum*, Kze. In the Dun *O. auratum* grows of various sizes, depending upon situation. The situation above Rajpur was dry, shaly rock exposed to the sun ; and a plant I gathered there has perfect tripinnate, fertile fronds, though the whole plant is only  $2\frac{3}{8}'' \times 3\frac{1}{2}''$ . Mr. Mackinnon afterwards found larger plants near that station, but in soil. Mrs. Sladen's Jaunsar specimens also are small.

2. **O. japonicum**, Kze. ; Syn. Fil. 143 ; C. R. 459 ; Bedd. H. B. 96.

PUNJAB: *Chamba*—near Dalhousie, McDonell, Blauf. ; between Chamba town and Kajiár 5000', "abundant on a bank," Trotter ; *Mandi State* 5-7800', Trotter ; *Kullu* 5-7000', Trotter ; *Simla Reg.*—Simla ; the Glen, Bliss 1890 "very rare" : "It has been found near Mashobra, at about 6000" (Blauf. in List).

N.-W. P. : *D. D. Dist.*—Mussooree and Landour, 5-6000', not common, Mackinnons, Duthie, Hope, J. R. Reid ; "*Garhwal*," T. T. 1845 ; *T. Garh.*—Thadiár 3000', Gamble. *Kumaun*—Phurka and Karim 6300', S. and W. ; Davidson, A. O. Hume, near Askot 4-5000' Duthie, near Pithoragarh 5000', Trotter, Rámanga Valley 5-9000', McLeod : "grows in dense grassy undergrowth."

DISTRIB.—*Asia*: N. Ind. (Him.) Nepal; Sikkin 9-10,000', common; *Assam*—Mishmi and Khasia 3-6000'; *Burma*—Ava. Java. Japan. China. Timor! *H. O. Forbes*.

Clarke says—"Tufted," but his own specimens in Kew have a creeping rhizome, with distant stipes, and I have never seen the plant otherwise furnished. The mistake was corrected in Clarke and Baker's paper, Jour. Linn. Soc., 8th Aug., 1888, where the authors say—"Rhizoma semper longe-repens, mediocre nec crassum, frondibus remotis; in var. *multisecta* rhizoma omnino idem."

In Kew there is a specimen, on the same sheet with others from Nepal and Japan, marked by Mr. Baker—"Wild at Bott Head, Salcombe, Devon, *John Luscombe*, Alvington, Torquay, recd. 1-72." This of course must be a case of introduction.

3. **O. contiguum**, Wall. (under *Cheilanthes*), Cat. 72. *O. japonicum*, Kze., var. *multisecta* (sp.), F. Henderson, MS., (*Cheilanthes contigua*, Wall. Cat., 72, *Leptostegia lucida*, Don., Prod. Fl. Nepal, 14), C. R. 459.

KASHMIR: Rattan Pir 8000', Trotter 1888; Pir Panjal 8000', Gammie 1891: marked *O. japonicum* var.

PUNJAB: Hazara Dist., Black Mt., between Sambalpat and Nimmal 7-8000' Duthie, 1888, Machpuri Mt. 9000', Changla Gali 8000', Trotter 1890. *Chamba*—Dalhousie 7000', Clarke 1874, McDonell; *Kangra Valley Dist.*—Dharmasala 8000', Trotter; *Mandi State* 6-10,000', Trotter; *Kullu* Edgew., Trotter 7000'; *Lahaul*—Capt. Hay 1856, in Herb. Hort. Saharanpur; *Simla Reg.*—Simla, Griffith, T. T., Col. Bates, Dr. Bacon, Lady Dalhousie, Gamble, Hope, Bliss and Blanf., who says—"one of the commonest Simla ferns, growing abundantly, on the ground, both in forest and on the open hill-side. It has a creeping root-stock. The range at Simla is from 6000' to 9000'."

N.-W. P.: *D. D. Dist.*—Jaunsar—Rupin Valley 4500', C. G. Rogers, Mussooree, 6-7000', common; *T. Garh.*—Aglar Valley, Duthie; *Kumaun*—Jaquem., Wallich (R. Blink.), Edgew., S. and W., Davidson, Trotter, MacLeod.

DISTRIB.—*Asia*: N. Ind. (Him.) Sikhim, *Hook-fil.* China: Yunnan, *Delavay*.

Colonel Henderson does not appear to have written a description of this species, but he defended it in a letter preserved in the Kew Herbarium. The description in Clarke's 'Review' is as follows:—

"Fertile frond very finely cut, often 5-pinnate; ripe capsules straw-coloured, not numerous; involucre remaining closed over the ripe capsules."

And the remarks are:—

"Frond herbaceous, hardly shining, not coriaceous. This is more easily separated from *O. japonicum* type than is *O. auratum*, and has been estimated a species both by Wallich and F. Henderson, to whose opinion the area lends support. But if it is estimated a species, I do not know to which the next variety should be attached."

This next variety Clarke calls *intermedia*, and describes thus :—

“ Frond lax, more coarsely cut, involucre often  $\frac{1}{4}$  inch—*O. lucidum*”  
Bedd., Ferns Brit. Ind., t. 21.”

A specimen, got by Strachey and Winterbottom in Kumaun, at 7500' alt., marked by Clarke as var. *intermedia*, and a few others so marked—among them one got in Sikkim—Lachen 9-10,000', by J. D. Hooker—are, for me, typical *multisetum*. Mr. Clarke says—“ This form, exactly figured by Colonel Beddome, seems half-way between *O. japonicum*, Kze., and *O. multisetum*, F. Henderson. And he adds—“ After going through the Kew material with me, F. Henderson would still prefer to make *O. multisetum* a species.” After reading this, Beddome, in his Handbook, said that his t. 21 was taken from *multisetum*, and that the two varieties of *O. japonicum* differ very slightly, if at all. A variety which, its author says, is exactly figured by another author, but which that other author says he figured from a specimen of another variety, may safely be said to be non-existent. I have collected specimens of *O. multisetum* from uncongenial localities, comparatively small and narrow, and even with brown instead of straw-coloured involucre, but I have attributed their differences from the full-sized plant grown in good soil solely to circumstances. There is really no passage from *multisetum* to *japonicum*, and if there were, I should prefer to make the latter a variety of the former, because—in the North-West Himalaya at least—it is much the rarer. That *O. multisetum* has been the later recognised plant is no reason for holding that it is a variety of *O. japonicum*. Clarke and Baker may be right in saying, in their joint paper of 1888, that the rhizomes of the two ferns are altogether the same ; but I think that the fronds of *O. multisetum* generally spring up closer together than those of *O. japonicum* do, as they often form dense bushes, or even beds,—as in Simla, where this fern carpets the ground under the Deodars, and even in the open. I have a tuft, from Tehri Garhwal, collected by Duthie, with 5 or 6 fronds in a mass, mounted on one sheet. And it is generally impossible to spread out even a single frond, in pressing it, so that all the pinnae shall be separate and distinct. *O. japonicum*, in N.-W. India, is a shy, solitary plant : *O. multisetum* is bold and gregarious. In one of the few stations for it I have seen in Mussooree *O. japonicum* was growing inside a thorny bush ; and Major MacLeod writes that in the Ramganga Valley, Kumaun, it grows in dense grassy undergrowth. Barren fronds are, perhaps, the more numerous, but I do not think there is any dimorphism. Nor do I find any dimorphism in *O. multisetum*, though Clarke begins his description with—“ Fertile frond very finely cut.”

Clarke says of *O. multisetum*—“ Ripe capsules not numerous.” I should say that the capsules generally ripen, and that most fertile fronds are very

fertile, and that all the pinnae bear capsules on every segment, except at their apices, and at the apices of each pinnule. Taking one pinnule of the lowest pinna of a less than usually crowded frond, 6-pinnate, I count on it 125 capsules. There must be about 500 capsules on that pinna, and probably 4,000 on the whole frond; and I dare say that number is doubled on large fronds.

On a sheet in the Kew Herbarium, from the Himalaya, "Lady Dalhousie" (no ticket), Mr. Baker has written—"a much larger plant than typical *japonicum*."

*O. melanolepis*, Decaisne, got in Arabia, Persia, and Abyssinia, is very like *O. multisectum*, but it is smaller and more delicate.

Genus 14. **CRYPTOGRAMME**, R. Br.

1. **C. crispa**, R. Br.; Syn. Fil. 144; C. R. 459. Bedd. H. B. 98, and Suppl. 23.

AFGHAN. : *vide* Beddome in Suppl. H. B.

KASHMIR: Marbul Pass 11,200' Clarke; 11-12,000' Aitch.; McDonell, Duthie, MacLeod.

PUNJAB: *Hazara*—Makra Mt. 10-10,500' Trotter; *Chamba* 9-10,000' Baden-Powell, McDonell; *Kangra Valley Dist.*—Dharmasala, 11,000' Clarke; *Lahaul*—Rohtang Pass, 12-13,000' Trotter; *Simla Reg.*—near Phagu, Vicary 1831,—“above Simla,” Col. Bates. The Chur Mt., Edgew., 1836 (very long); Hattu Mt., and vicinity, 8,500-10,000', Gamble, Blanford, Hope, Bliss; *Bisahir*—Kunawar, 9000', Lacey.

N.-W. P. : *T. Garh.*—Chachpur Peak, 10,000', Gamble; 11-12,000', Herschel, Duthie; *Brit. Garh.*—12-14,000', Duthie; *Kumaun*—“In Alpibus summis Kumaun, legit Rob. Blinkworth, 1826” (Wallich's writing on ticket on sheet of *C. Brunonian*, Wall., in Herb. Hort. Kew); near Ralam 12,000', S. and W. 10-11,000', Trotter, MacLeod.

NEPAL—W. 11-12,000', Duthie.

DISTRIB.—The “Synopsis Filicum,” following Hooker in the “Species Filicum” recognises three forms—*α. C. crispa*, *European*: distributed from Arctic Europe to Lake Baikal, Mt. Olympus in Bithynia, Etruria, and the Sierra Nevada; *β. C. Brunoniana*, Wall., *Asiatic*; Himalayas at 10-16,000'; and *γ. C. acrosticoides*, R. Br.—*North American*: from Sitka and Arctic Regions southward to Lake Superior, Oregon and California.

The DISTRIBUTION in *Asia* is Sikkim—head of Lachen Valley, *Hook-fil.*, Dankera 2,000', *King's* Collector. China—Hupeh Prov. *Henry*, Szechwan Prov.—Mt. Omei (summit) *Faber*. Japan—*Faurie*.

Beddome, in Suppl. H. B., says—“Gathered by Prain in the Crater on Barren Island, Andamans.” This is a remarkable instance of isolation, and of an Arctic and Temperate Region fern growing in the Tropics, below 12° N. lat.

I do not make out the differences between forms *α* and *β* pointed out by Hooker and Baker; but in the one locality where I have seen the Himalayan

plant growing there were only isolated plants among the herbage and forest undergrowth; and Indian plants seem never to equal British in size. In England and Scotland *C. crispa* generally grows in the open, amongst boulders, or in the stony talus at the foot of cliffs,—sometimes in such beds as to be distinguishable at a distance because of their bright green colour. In the "*Species Filicum*" will be found descriptions of all three forms which Hooker unites under *C. crispa*, and a discussion of the differences between them. After naming the specimen of Blinkworth's gathering, mentioned above (under *Kumaun*), Wallich went on—"Dedecavi speciem conditori generis immortale, animo aestumatissimo."

"N.B.—R. Blinkworth is one of the plant collectors in the employ of the H. C. Bot. Garden at Calcutta under Dr. W. You may translate this into classical latin if you like." On the paper on which this is written is a "frank," by John Wood, London, February 4th, 1829, to Dr. Hooker, University of Glasgow.

Genus 15. **PELLÆA**, *Link., Hooker.*

Sub-genus—CHEILOPLECTON, *Fée.*

1. **P. gracilis**, Hook.; Syn. Fil. 145 (*Pteris Stelleri*, Gmel., oldest name); C. R. 460. *Pellæa Stelleri*, Gmel. (under *Pteris*), Bedd., H. B. 100.

KASHMIR: T. Thomson; Pir Panjal, Dr. Stewart; Baden-Powell; Karakoram, 12,500', Clarke, 1876; above Kilan, 12,500', Aitchison, 1877; MacLeod; Duthie.

PUNJAB: *Hazara Dist.*; Makra Mt. 10-10,500', Trotter; *Chamba* 9-9500' McDonell.

N.-W. P.: *T. Garh*, 11-12,000', Duthie; *Brit. Garh*, 11-12,000', Duthie; *Kumaun*—Champwa 10-13,000', S. and W.; 10,000' Stewart; 11-13,000', Duthie; Trotter; Lessar Pass 16,500', MacLeod.

NEPAL—W. 10-15,000', Duthie.

DISTRIB: *N. Amer.*; Canada to Wisconsin, rare. *Asia*: Lake Baikal Region; Siberia; N.-W. Thibet—Balti 9000', *T. T.* China—Peking Mts. 8000', "very rare," Hancock, 1874.

Sub-genus—ALLOSORUS, *Reel.*

2. **P. nitidula**, Baker; Syn. Fil. 149; C. R. 460; *P. nitidula*, Wall. (under *Pteris*) Bedd., H. B. 101.

TRANS-IND. STATES: *Swat*.—Laram Pass., 7000', Gatacre; *Kohistan*, 6-9000', Duthie, 1888 (while with the Black Mt. Expedition).

KASHMIR: *Poonch*; Chittapani Valley 6000', Lev.; 3-6000', "frequent and plentiful to Chamba," Cl. in Rev.; Kishtwar 5000', Clarke, 1876; Pir. Panjal and Rattan Pir 6000 and 8000', Gammie (very large).

PUNJAB: *Hazara Dist.*—Black Mt. 7000', Oertel 1891; the Gullies 6-7000', and near Kalabagh, Trotter—*Chamba*—Ravi Valley and elsewhere 3500-7000', common, McDonell; *Kullu*, 5-6000', Trotter; *Simla Reg.*—"rocks, Simla," T. T.

N.-W. P. : *D. D. Dist.*—Jaunsar—Rupin Valley 4500', C. G. Rogers; *T. Garh.* 5-8000', Duthie, Gamble; *Brit. Garh.* 5-6000', P. W. Mackinnon; *Kumaun*—Wallich (R. Blink.).

DISTRIB.—*Asia* : Kohistan. China—*Henry, Faber.*

I have not gathered this fern, but I possess and have seen numerous specimens, and I have no difficulty in distinguishing it at a glance from *Cryptogramme crespa* and *Pellaea gracilis*, with both of which Mr. Clarke says it has been much confounded : cutting, texture, habit, and colour are quite different. Large plants somewhat suggest *Cheilanthes subvillosa* in cutting ; but the texture and other characters are quite different. Beddome's drawing, F. B. I., ft. 222, does not adequately represent the plant, the fronds being very short and deltoid, and all infertile.

Sub-genus—PLATIGLOMA, *Jsm.*

3. **P. calamelanos**, Link ; Syn. Fil. 152 ; C. R. 461 ; Bedd., H. B. 104.  
PUNJAB : *Sirmur State*—Tikri, Edgew., 1835.

N.-W. P. : *D. D. Dist.*—Jaunsar 4000', Gamble ; *T. Garh.* 2000', Mackinnons, 4-5,000' Duthie, 4,000' Gamble ; *Kumaun*—Almora 4000', S. and W. ; near Naini Tal, on old Almora Road, Mr. Wilmer, 90th Regt. 1861 (given to Hope on day of collection) ; near Khairna, below Almora, 4-5000', Duthie, J. R. Reid, Mackinnons ; Karan, Ramsukh (Duthie's collector) 1888.

DISTRIB.—*Afr.* : Angola ; Abyssinia ; Somali Land ; Ruenzori Mt. ; Zambesi Land ; Mashona Land—nr. Salisbury, *Boyce* 1896 ; Natal ; Cape Colony ; Bourbon.

Himalayan specimens are only bipinnate, so far as I have seen ; but African specimens are markedly tripinnate, the ultimate segments being distant and petiolate.

Genus 16.—PTERIS, *Linm.*

Sub-genus—EUPTERIS.

1. **P. longifolia**, L. ; Syn. Fil. 153 ; C. R. 461 ; Bedd., H. B. 106.

TRANS-IND. STATES : *Baraul* and *Swat* ; 4-6500', Harriss, 8000', Gatacre.

KASHMIR : *Jhelam Valley*—4000' downwards, "common," MacLeod.

PUNJAB : *Hazara Dist.*—Dhamtaur 4500', Trotter ; Rawalpindi, Aitch. *Chamba*, McDonell ; near Dalhousie 4000', Trotter ; *Mandi State* 4500', Trotter ; *Kullu* 6-8000', Coventry ; *Simla Reg.*—3-5000', Gamble, Collett, Bliss.

N.-W. P. : *D. D. Dist.*—Jaunsar—Dharmigadh 4000', Gamble ; in the Dūn 2500', and upward ; on the Himalaya to above 6000' in Mussocree, Hope ; *T. Garh.*—3-5000' Duthie ; *Kumaun* 1800' to nearly 6000', S. and W., Ramsukh, Davidson, Hope.

DISTRIB.—*Amer.* : Florida, Mexico, W. Ind. and Venezuela. *Europe* : Spain, Italy, Sicily, Dalmatia, Greece, Ionian Isles. *Asia* : Lycia, Syria, Lebanon ; N. Ind.—from Trans-Indus, the Punjáb and Kashmir to Assam and Chittagong, 0-5000', general and abundant on and near the hills ; plains of Bengal, Chutia Nagpur, and streets of Calcutta. Centr. Provs., Ind.—Pachmarhi. S. Ind.—Madras Presidency, in many localities, *Bedd. H. B.* Malay Archipelago, Java, Pacific Isles. "China southwards to Australia." *Afr.* : Algiers, Egypt, Abyssinia, Socotra ; Cape de Verde Islands southward through Trop. Afr. to Angola, Macalisberg, and Marcaren Isles.

Clarke says—"Perhaps the commonest fern of North India, extending over the plains to every village." I suspect he means this to apply to the Lower Provinces of Bengal. I doubt if this fern can be found in many villages in the dry parts of the North-Western Provinces, though I think I used to see it in Rohilkhand. There is a specimen at Saharanpur from Calcutta, collected by Clarke, and I have seen it growing on the walls of houses there. The fern likes water, and in swampy ground grows to a much larger size than is stated in the Synopsis. In Kumaun I have gathered it with fronds 8 feet long: this was by the bed of a stream, on limestone tufa. But *P. longifolia* will grow on dry cliffs, as it does in Mussooree, at over 6,000' elevation. Baker says—"veins close and fine, usually once-branched." A second branching is very frequent, and in two of my specimens, from Rawalpindi and Kumaun, both infertile, I see that the ultimate veinlets frequently unite before they reach the edge—forming loops.

2. *P. cretica*, L.; Syn. Fil. 154; C. R. 462; Bedd., H. B. 106. *P. lœta*, Wall., Cat. 95.

TRANS.-IND. STATES: *Baraul* and *Swât*, 4-6500', Harriss, Gatacre.

KASHMIR: Clarke in "Rev."; "common Jhelam Valley 4000' down," MacLeod in List; Rattan Pir 6000', Gammie.

PUNJAB—*Hazâra Dist.*: Black Mt.—Machai Peak, Gatacre, Trotter (in List of Punjab Ferns). *Chamba*; McDonell (in List); Kajiâr 6500', Trotter; *Mandi State* 5-6000', Trotter; *Kullu* 6-8000', Trotter, Coventry; *Simla Reg.*—"very abundant in certain parts of Simla, especially on the Sutlej side of the spur, between 5500, and 6500'. It disappears above 8000'," Blanf. 3500' Gamble, Collett, Bliss.

N.-W. P.: *D. D. Dist.*—Jaunsar—Deoban Mt., Duthie's Collector; Rupin Valley 4500', C. G. Rogers; Mussooree 6-7000', very abundant in places; *T. Garh.*—Phedi 4-5000', Duthie; Brit. Garh. 4-5000', Duthie; *Kumaun* 3000'—8000', S. and W. Hope, Davidson, Duthie.

DISTRIB.—*Amer.*: Florida, Mexico and Guatemála. *Europe*: Corsica and Sardinia, Italy, Crete, Tyrol, Caucasus. *Asia*: Ural, Arabia, Persia; N. Ind. (Him.) Sikkim, *Hook-fil.* 8-9000'; Assam—Kohima 5500', Clarke; Bengal—0-6000', common, extending far into the Plains, as at Dhâka and Chittagong, Clarke. S. Ind.—Deccan; Madras Presy.—very common, from sea level up to 8000'. Ceylon. Burma. Malay Penins. Philippines. Fiji and Sandwich Isles. *Afr.*: Abyssinia, Natal, Cape Colony, Bourbon.

Clarke says the species is very variable, and he gives an amended description, intended to separate this species from *P. pellucida*, Presl., and *P. crenata*, Sw. I have not seen *P. pellucida* growing, but I can see no resemblance to *P. cretica* in herbarium specimens of it. And *P. digitata*, Wall. (*P. stenophylla*, Hk. and Gr.), which Mr. Baker places as a variety of *P. cretica*, and Clarke as a variety of *P. pellucida* (which does not grow in N.-W. India) is quite distinct from both. I have seen no variation in *P. cretica* except that rarely a fertile frond

has broad pinnæ, and, as rarely, a sterile frond, which normally has broad serrated-edged pinnæ, has some patches of sori on it. The rhizome is creeping : stipes approximate, but in progressive order, not tufted ; and the plant forms large beds.

3. *P. digitata*, Wall. Cat. No. 91. *P. stenophylla*, Hk. and Gr., Ic. Fil., t. 130. *Pteris cretica*, L.,  $\beta$ , *P. stenophylla*, Hk. and Gr., Syn. Fil. 154. *Pteris pellucida*, Presl., var. *stenophylla* (sp.), Hk. and Gr., C. R. 463 ; Bedd., H. B. 107 (as Clarke).

PUNJAB : *Chamba* ; McDonell in MS. List of Chamba Ferns identified at Kew ; *Simla Reg.*—Mashobra, 7000', below Sipi (Sibpur) 5500', Bliss, 1890, 1891, 1892.

N.-W. P. : *D. D. Dist.*—Mussooree, not uncommon, 5-6000' ; near Jharipani 4800' in quantity, Hope ; in the Dún in several places from below 2,500' to 3,000', Hope, Gamble ; *T. Garh.*, Lev. 1872 (named by him *P. dactylina*, Hook.) ; Mussooree and Chakrata Road, Hope ; *Kumaun*—Bageswar 3000', S. and W. 1848, Trotter 1891 ; Sarju Valley and elsewhere, "grows in dense shade," MacLeod 1893.

DISTRIB.—*Asia* : N. Ind. (Him.) Nepál.

As I have already stated, under *P. cretica*, I consider this fern quite distinct from that species, and also from *P. pellucida*. I therefore give it as a separate species, and Wallich's name, *P. digitata*, being the older, must hold good. Wallich's lithographed catalogue, which, on account of the wide distribution made of the plants enumerated in it with lithographed tickets cut out of it, is held by the Kew and other authorities to be equivalent to publication, is dated (the Preface) 1st December, 1828. The "*Icones Filicum*" of Hooker and Greville, in which the plant was described and exactly figured, was published in 1831. Synonyms therein given are—*Pteris stenophylla*, Wallich MSS., 1829, and *P. angusta*, Wall. MSS. 1825 (non Bory). The habitat cited is "in Napalia, Wallich, 1818," and it is remarked—"Nearly allied to *Pt. lata* of Wallich's MSS. (from Nepál) and the European *Pt. cretica* ; but it may be known in both by its quite simple pinnæ and the entire margins." The entry in Wallich's catalogue is "*Pteris digitata*, Wall. in Herb. 1823, Napalia, 1820." Some specimens in the Kew Herbarium are named "*P. digitata*, Wall." in Wallich's own handwriting, and 2 sheets have tickets of Wallich's *P. angusta*, Wall. 1818, but none are marked *P. stenophylla*. The name adhered to in the catalogue, *P. digitata*, must be accepted. *P. lata*, Wall., is *P. cretica*.

Mussooree—unless some still unknown place in Nepal is—appears to be the headquarters of the species, and in several localities there and in the neighbourhood it is plentiful. It often grows at the foot of and under rocks and cliffs, in shady places, but in single plants, and never in dense clumps and beds as *P. cretica* often does. The longest and most upstanding plants I have seen

were in the forest behind (east of) Jharipani, the half-way halting place on the road up to Mussooree, alt. nearly 5000', growing in clayey soil away from rocks. I have kept only one of these plants, and find it has about 20 stipes springing in a tuft not so thick as a finger. The stipes of some of the sterile fronds are 15" long, and of the fertile ones 20". Some of the fronds are 1 ft. in length. I have a plant wholly a-pinnate, *i. e.*, all the 12 fronds (there are numerous broken stipes besides) are perfectly simple. The sterile fronds of this plant have stipes up to 5 in. long, and fronds up to 9 in. There are only two fertile fronds: one has stipes 9 in. and frond 9½ in. long. A specimen of *P. pellucida*, Presl., from the Nambur Forest, Mann, is subdimorphous, like *P. digitata*: the fertile frond much the longer, with one pair of side pinnæ.

4. **P. dactylina**, Hook., Syn. Fil. 155; C. R. 463; Bedd., H. B. 107.

N.-W. P.; *D. D. Dist.*—Jaunsar, near Deoban 8000', Herschell 1879, 9000', Mackinnons, "between Bodyar and Deoban, Mrs. J. Sladen, coll. for Hope, 1880, Lokandi 8-8500', Gamble 1892 and 1894; *Kumaun*—Pindar Gorge, near Dwáli 8000', Trotter 1891.

DISTRIB.—*Asia*: N. Ind. (Him.) Nepál-East; Sikkim up to 12,000'; Assam—Khasi Hills, 4200'. China—Szechwán Prov., *Faber* and *Henry*, Yünnan, *Delavay*.

Clarke doubts the East Nepal locality, which is that given for a specimen in the Kew Herbarium. If that is not an authentic record—though it is not an improbable one—there is a gap in the distribution between Kumaun and Sikkim. The shorter gap between Jaunsar and Kumaun ought to be filled up.

This fern need never be confused with *P. cretica* and *P. digitata*. It has a long though rather slowly creeping rhizome like that of *P. cretica*, though not so thick; but the stipes are like thin stalks of grass, whereas those of *P. cretica* are comparatively thick and very wiry. I have not seen *P. dactylina* growing, but I possess what Mr. Baker on seeing it pronounced to be a "champion" specimen: it was collected in Jaunsar by the Messrs. Mackinnon. This has a bit of rhizome 4½ inches long, with about 36 fronds springing from all along it, presumably of one and the same year's growth, very few of which are soriferous. This plant is 16—17 in. high: longest stipe 14', with a frond of only 4 in., fertile. Most of these fronds have a central terminal pinna, on a prolongation of the stipe, and a pinna springing from the stipe on each side, which side pinnæ immediately divide each into two, making apparently five pinnæ, which spread out. These fronds are really tripartite, the two side parts forking. A frond collected by Mrs. Sladen, has apparently 7 pinnæ, the lowest pair forked, making apparently 4, and 3 pinnæ taking off together from the main rhachis, which is prolonged for nearly half an inch beyond the springing of the lowest pair. I find the same, apparently 7 pinnæ, in some of Mr. Gamble's specimens, but also some fronds having apparently 9 pinnæ, as the lowest pair split each

into 3, and there are the triplets above. I had, long before seeing this, noted the number of pinnæ of this fern as being sometimes 9, but I cannot now find such specimens.

5. *P. quadriaurita*, Retz.; Syn. Fil. 158; C. R. 465; Bedd. H. B., 110.

KASHMIR: Trotter (in list of Punjab Ferns)—Rattan Pir 8000', Gammie: small and sterile: may be young *P. excelsa*, Gaud.

PUNJAB: *Chamba* (McDonell in List); Dalhousie 5000', Trotter; *Kangra Vy. Dist.*—Dharmasala 8000, Trotter; *Mandi State* 6500-7000', Trotter; *Kullu* 6-8000', Trotter, Coventry; *Simla Reg.* 4-8600', common.

N.-W. P.: *D. D. Dist.*—Jaunsar 7600', Gamble; Mussooree and Landour 6-7000', common; *T. Garh.* 3-8000'; Kumaun 4-10,000', in many places.

DISTRIB.—“All round the world within the Tropics, and a little beyond them,” (Syn. Fil.). *Amer.* from Cuba and Mexico, southward to Brazil. *Asia*: N. Ind. (Him.) Sikkim, Assam and Bengal (Chittagong) 0-7000' “very common, but not found far from the hills” (Clarke in “Rev.”). Kohima and N. Manipur, *Clarke*. Centr. Provs. Ind.—Pachmarhi, *Duthie*. S. Ind.—up to 8000' “very common.” S. China. Japan. Ceylon. Malay Penins. and Isles. Polynesia. Trop. Australia—Rockingham Bay. *Afr.*: Angola, Zambesi Land, Natal, Madagascar.

The *Synopsis Filicum* gives no varieties of this protean species, but mentions, as synonyms, a number of forms got in various parts of the world. Mr. Clarke has given an “expanded” diagnosis to include what he calls trifling varieties, namely *P. nemoralis*, Hk. and Bauer, *P. aspericaulis*, Wall., *P. pectinata*, Don, *P. pyrophylla*, Bl., *P. spinescens*, Presl., and *P. subquinata*, Wall., and has made interesting remarks about some of them. And besides these he makes three varieties—*major*; *khasiana* (completely bipinnate but graduating into the type); and *Blumeana* (sp.) Agardh, which are not recorded from N.-W. India, and are therefore here disregarded. I may mention, however, that Beddome says Clarke's var. *major* has arched (inarched?) veins and is, therefore, *Campteria biaurita*. According to Clarke, *P. subquinata*, Wall., with 7-5 pinnæ only, is not worthy a separate name; but Beddome in the Supplement to his Handbook gives it a prominent place as var. *subquinata*, Wall., with a full description. Specimens so named in Gamble's collection, from Sikkim, except that they are of much thinner texture, and have rather shorter and broader pinnules, are practically the same as the fern got in Kumaun, which I identify as Wallich's plant. Forms of *P. quadriaurita* with setæ on the upper side of the rachises and costæ are got in the N.-W. Himalaya; and another has an asperous stipes, with stipes and rachises red-coloured. But there is another form beautifully red, with quite smooth stipes. I do not think any separate species could be set up from the N.-W. Indian material; but more in that way might be done with North-Eastern plants, judging from some specimens in Mr. Gamble's collection: one has a stiff spine at the point of each segment.

A Mussooree specimen of the type plant, I got long ago, has 9 ears—3 on each side of the two lowest pinnæ, 1 on each of the two next above, and the 9th on one of the third pair. And I have another frond which has a remarkable development: it has deflexed ears on the three lower pairs of pinnæ, and abnormally developed inferior lower segments up to the seventh pair; but it has also ears pointing upwards on the superior side of the lowest pair of pinnæ, two on each of them. These are not so large as the ears on the inferior side, but yet are about two inches in length, deeply pinnatifid, and fertile like the rest. I have seen a frond collected by Mr. J. Marten, in Chamba, of which the fifth lowest pinna on the left side is prolonged, and as compound (bipinnate) as the frond itself,—the pinnules equalling in size the pinnæ of the main frond.

I have not seen on N.-W. Indian specimens of this fern the adventitious buds which are found on specimens from elsewhere, and are mentioned in books. Thinking these to be parasitical growths, I referred the question to Mr. G. Massee, F.L.S., of the Royal Herbarium, Kew, and he kindly looked up the subject, and showed me that Giesenhagen, in "Flora," 1892, says the abnormal growth is due to the presence of *Taphrina Laurencia*, Giesh. A similar growth on *Aspidium aristatum*, Sw., is caused by *Taphrina cornucervi*, Giesh.

6. **P. subquinata**, Wall. Cat. 104. *P. quadriaurita*, Retz., Syn. Fil. 158; C. R. 465. *P. quadriaurita*, Retz., var. *subquinata* (Wall.), Bedd. Suppl. H. B. 23. Plate XVII.

The following is Beddome's description:—

"A small form, 8-10 inches high; stipes stramineous; fronds short deltoide lateral pinnæ, often only 1-2, rarely 3-4 pair, with a large terminal central pinna, segments long, nearly equally broad throughout, spreading at right angles from the midrib, lower basal segments of the lower pinnæ only slightly enlarged and pinnatifid, or quite entire and uniform with the others.

"Nepal (Wallich), Kumaun 3000', at Bagasar (Strachey and Winterbottom). Lachen Valley, "Sikkim," (Levinge). Mr. Levinge's specimens are more slender than Wallich's type, more papyraceous in texture, and furnished with a broad, white band down the centre of each pinna; it would be a very pretty plant for cultivation."

N.-W. P.: *Brit. Garh.*; (Found among the Mackinnons' ferns, without ticket: they think it was got by Mr. P. W. Mackinnon in B. Garhwal in 1881—3 small fronds stipes incomplete); *Kumaun*—Sarju Vy., Bagesar 3000', S. and W. 1848, (named *P. subquinata* by them); Mandal 6000', Davidson; between Takala and Bagesar, Duthie 1884, No. 3704; Chipla, Ramsukh (Duthie's collector) 1888, No. 8024; Sarju Vy., near Kupkota, 12 miles north of Bagesar 3-4000', Col. E. Swetenham, comm. to Hope 1890; Gori Ganga and Sarju Valleys, 3-7000', MacLeod, 1893.

DISTRIB.—*Asia*: N. Ind. (Him.) Nepal, Sikkim.

In the British Museum in a wrapper—"22, *quadriaurita*—*quinata*, India"—are two old sheets (1829 watermark), without tickets, but enfaced—" *Pteris quinata*, Wall. in Herb.": also a sheet from Duthie, No. 3704 (see above) with 2 fronds which have only 1 pair and a terminal pinna each. And there is a sheet with a ticket—" *Pteris quinata*, Wall., E. Napalia, January, 1818, Goalmulia, Looh." A sheet from J. Smith's herbarium—" *Pteris subquinata*, Wall. Ag. mon. 25 Syn. *P. quadriaurita*, Hk., Nepál, Wallich, Sp. Fil. 2, p. 179," suggests Clarke's *P. subdivisa* from a low level in Sikkim.

The stipes and rhachises of this fern are pale straw-coloured to yellowish-brown. All the specimens I have seen have, I think, one large ear on each pinna of the lower pair. The pinnae are exactly opposite, and the lowest pair, with its ears, forms a flattened, unequally armed, St. Andrew's Cross. All the Kumaun specimens, from Strachey and Winterbottom's time, 1848, to MacLeod's, 1893, agree with Wallich's type, and are identical in every respect, and seem to me quite unlike *P. quadriaurita*.

7. *P. excelsa*, Gaud.; Syn. Fil. 159; C. R. 467; Bedd. H. B. 114.

KASHMIR.—? see under *P. quadriaurita*.

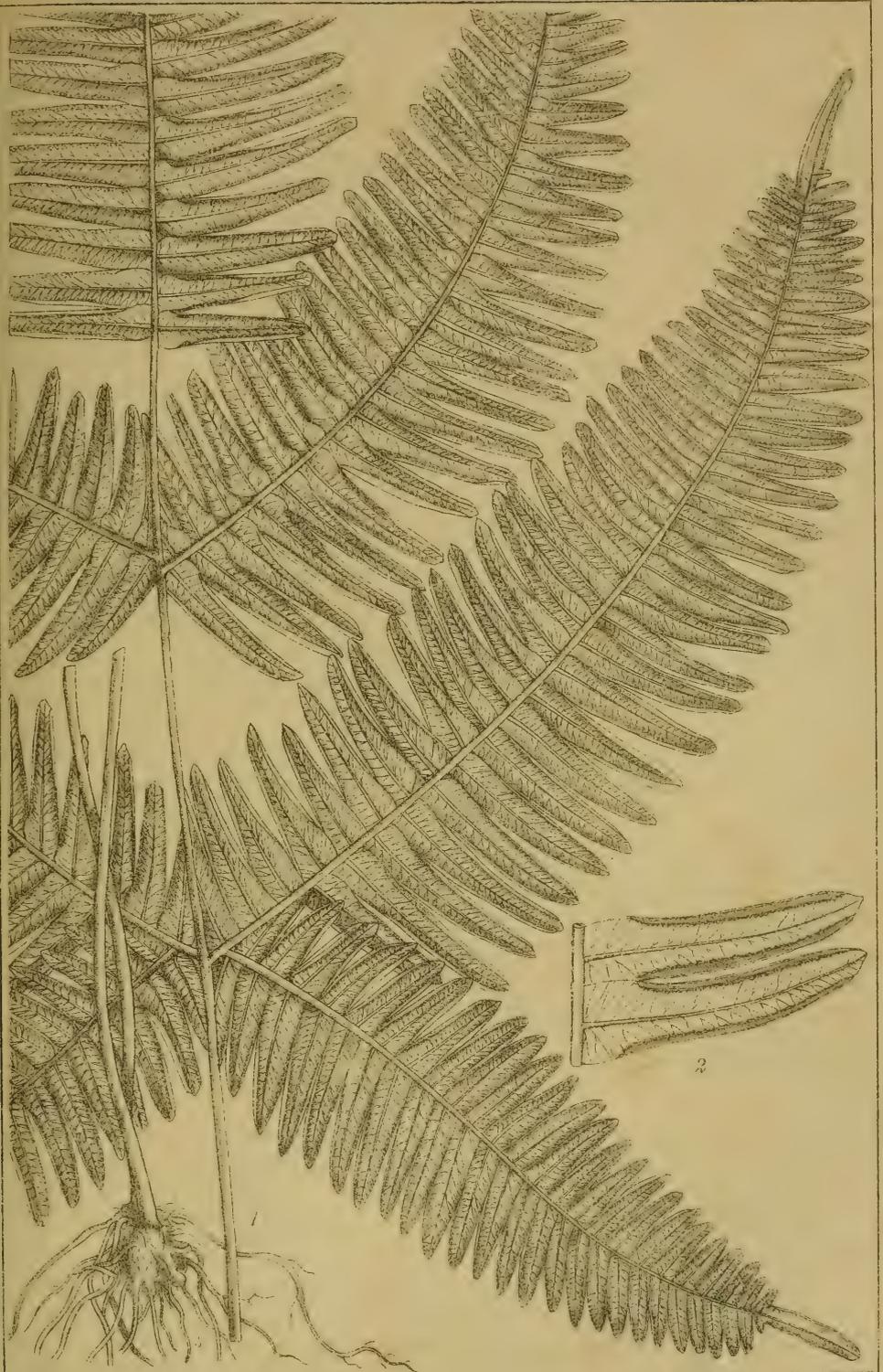
PUNJAB: *Chamba*—Dalhousie 6000', Clarke, Ravi Vy. 7000', McDonell, "common"; *Kullu* 6-8000', Coventry 1894; *Simla Reg.*—Simla 5-6000', Edgew., Bates, Gamble, Collett, Blanf. Trotter, Bliss; Mahásu 7-8000', T. T.

N.-W. P.: *D. D. Dist.*—Jaunsar—Harianta 8000', Gamble; Mussooree 5-6500', not common, Herschel, Mackinnons, Hope; *T. Garh.*—Dhakara 5000', T. T., Herschel; *Kumaun*—Wallich; near Naini Tal 6000', Hope 1861, Lev. 1874, Pindar Gorge 7500-8000' Trotter; Gori Ganga Vy. 7000', MacLeod 1893—"only one plant seen."

DISTRIB.—*Asia*: N. Ind. (Him.) Sikkim 8-9000', Sir J. D. Hooker; Assam—Khasi Hills, *Jerdon*, *Godwin Austen*; North Cachar Hills 2500', Mann; Burma, *Wallich*. China—Szechwán Prov., *Henry*, *Faber*. Philippines. Sandwich Isles. *Hildebrand*, Heller 1895.

Blanford says:—"Very rare" (in the Simla Region). "Apparently restricted to well-shaded spots by the margin of streams. I have collected it in two places at 5500' and 5800', but I have not met with it during the last few years, the original sites having been devastated by wood-cutters and cattle, or exhausted by collectors." But Mr. Bliss has found the plant since then in several localities.

Clarke thinks the Philippine station an error, and the Burma (Ava) one doubtful; but China must now be added as a habitat. I can confirm Clarke's observation that the veins are not rarely 3—4 branched, *i. e.*, a vein is like a tuning fork, each fork forking again, and occasionally these secondary forks unite with each other. In the decurrent bases of the pinnules or segments some veins spring from the rhachis and not from the costa, as occurs in many other ferns. On the upper side of a frond I see a short seta or gland at the



J.N. Fitch del.

A.C. Chowdhary lith.

## PTERIS SUBQUINATA Wall.

1. Portion of a frond, natural size.

2. Segments from a pinna  $\times 2$ .

3. Rhizome and stipes of another frond.



base of each costa. The involucre are olive-green or olive-brown. The pinnæ in large fronds are sometimes almost completely pinnate, but the pinnules are sessile with a broad base. In a frond from the Mackinnons I find the terminal pinna 13 in. l. by 5½ in. br., and a pair of side pinnæ 13 in. by 6 in. The fern loves water.

Sub-genus PÆSIA, *St. Hiltaire*.

8. *P. aquilina*, L.; Syn. Fil. 115; C. R. 468; Bedd., H. B. 115.

TRANS-IND. STATES: *Baraul* 7000', Harriss, Gatacre.

KASHMIR: *Gilgit*.—Shankargarh (?) Dr. Giles; Gulmarg, Nagmarg, Sonamarg.

PUNJAB: *Hazara*.—Black Mt., Duthie, near Thandiana 8000', Trotter. *Chamba*; *Kullu*; *Simla Reg.*: common.

N.-W. P.: *D. D. Dist.*; common in the Himalaya, and once seen in the Dún near foot of hills below 3000', Hope; *T. Garh.*; *Kumaun*.

DISTRIB.—“All round the world, both within the Tropics, and in the North and South Temperate Zones, unless it be absent from South Temperate America, from which there are no specimens in Kew Herbarium (Syn. Fil.), *S. Amer.* Brazil, var. *esculenta*. *Europe*: universal, except in the extreme north, and never an Alpine plant: range in the British Isles said to agree closely with that of corn cultivation, and in the Scottish Highlands never above 2000'” (*Britten*, in “*European Ferns*”). *Asia*: N. Ind. (Him.) very common; Assam—Khasi Hills 2-8000', common. S. Ind.—Deccan; Madras Presidency. Burma.—Tenasserim. Malay Penins., and Eastward to Australia and N. Zeal. *Afr.*: Cameroon Mts.; Abyssinia.

This fern is so common in the Himalaya that few specimens are to be found in herbariums in the North-West. But I have never seen such thickets and fields of it as are common in the United Kingdom.

Sub-genus CAMPTERIA, *Presl*.

9. *P. biaurita*, L.; Syn. Fil. 164; C. R. 469. *Campteria biaurita*, L. (under *Pteris*), Bedd., H. B. 116.

N.-W. P.: *D. D. Dist.*.—In the Dún 2000' and upwards, by streams or springs, Mackinnons, Hope; *Garhwal*—Clarke; *Kumaun*—Barmdeo, 900', S. and W.; Gola Valley 3-4000', Hope.

DISTRIB.—The following is the entry in Wallich's Catalogue, under 106, *Pteris nemoralis*, Willd., which is given as a synonym by Clarke, though not by Willdenow himself, who says they are different:—“*Pteris nemoralis*, Willd. species admodum varians.

- |                                                                      |                                                                       |
|----------------------------------------------------------------------|-----------------------------------------------------------------------|
| 1. Napalia, 1820, 'est <i>Pt. biaurita</i> '<br>(in Hook's writing). | 4. Montes Avæ, 1826.                                                  |
| 2. Penang, 1822, 'est <i>Pt. biaurita</i> '<br>(in Hook's writing).  | 5. Montes ad Sylhet, De Silva.                                        |
| 3. Hurdwar et Dehra Dún, 1825.                                       | 6. Kumaun, R. B.                                                      |
|                                                                      | 7. <i>Pt. biaurita</i> and <i>Pt. quadriaurita</i> :<br>Herb. Hegra,' |

The plant seems to be found in almost all the warm parts of the globe:—*Amer.*—*Trop.*: from the W. Ind. southward to Brazil. *Asia*: N. Ind. (Him. and Sub-Him. Valleys)—Sikkim and Bhotan, up to 6000'; Assam—Dharang, Khasia 0-6000'. Bengal—extending over the plains to Dháka, Pubna, &c., Parasnáth Mt. 4400'.

S. Ind.—The Deccan and Western parts of Madras Presy. up to 6000', not common. Ceylon. N. Burma and Andaman Islands, *Kurz.*, Malay. Penins. and Isles. Tonkin. S. China. Australia.

Baker, Clarke, and Beddome all say this species differs from *P. quadriaurita* only in the venation; but I must maintain that, apart from the difference in venation, the two species are abundantly unlike, and that no one knowing the two in growth, in N.-W. India at least, could ever mistake the one for the other. The form *P. nemoralis*, Willd., or a form which has both free and inarched venation on the same frond, is got in the Dehra Dún; and I have one small plant, less than 18 inches in height, altogether without inarched venation, but with forked veins, springing from the rhachis between the segments, which sometimes unite with the lowest costal veins. A large plant from the Dún has stipes 26 in., and frond 34 in. in length. These are 14½ pairs of pinnæ, of which the lowest pair is over 12 in. l. by almost 3 in. br.: these are bipartite, the secondary pinnæ being 10 in. l. The terminal pinna is nearly 9 in. by 1½ in. The lowest pinnæ of *P. biaurita* are, I should say, always bipartite; but I have never seen more than one descending pinnule or ear on each side: Clarke says there are sometimes two or three.

From Selim, below Darjiling, at altitudes of 1,200 and 1,500 feet, respectively, Gamble has two very different-looking plants, both of which he names *P. biaurita*, and both of which are *Campteria*: one has dark-coloured rhachises, 8-10 pairs of pinnæ, and broad, blunt, approximate segments: the other is much paler in colour, with straw-coloured rhachises, 8-15 pairs of pinnæ, with long narrow far-apart segments. This latter is what is supposed to be *P. nemoralis*, Willd., as the veins of contiguous segments often miss connection below the sinus; but it is quite different in cutting, colour, and appearance from my Dehra Dún specimens above described: the venation only is similar.

10. *P. Wallichiana*, Agardh; Syn. Fil. 65; C. R. 469. *Campteria Wallichiana*, Agardh, Bedd., H. B. 118.

PUNJAB: *Chamba*—Clarke, McDonell; *Kangra Vy. Dist.*—Dharmasála, Edgw., Clarke; *Kullu* 6-8000', Trotter, Coventry; *Mandí State* 5-6000', Trotter.

N.-W. P.: "*Garhwal*," T. T.; *T. Garh.*, 5-7000', Mackinnons, Ganges Vy. 5-6000', Duthie; *Kumaun*—Wallich, R. Blink. (*Pt. umbrosa*, Wall.), S. and W. (*Pt. umbrosa*) Davidson, Trotter.

DISTRIB.—*Asia*: N. Ind. (Him.) Sikkim, Bhotán 3-8000'; Assam—Khasi Hills 3-6000', common; Manipur, Clarke. Java. Japan. Philippines. Samoa.

Sub-genus DORYOPTERIS, *J. Smith.*

11. *P. ludens*, Wall.; Syn. Fil. 166; C. R. 470. *Doryopteris ludens*, Wall., Bedd., H. B. 120.

TRANS-IND. STATES: *Baraul*—Ziarat Valley 5000' and 8000', General W. Gatacre, June 1895.

DISTRIB.—*Asia* : N.-E. Ind.—Assam, Naga Hills, Nichugardh 750', *Clarke* ; E. Manipur, Chattick 5000', *Watt*, "very abundant." Bengal—Orissa, Balasore Hills, *Blanf.* ; Chitagong Hills up to 1000', *Roeburgh*, *Clarke*, *King*. Burma, on the Irrawady, *Wallich*, "Burma," *Kurz* ; Maulmein, *Lobb*, *Parish*. Malay Penins. Philippines.

Collected by Brig.-General (now Sir W.) Gatacre, when with the Chitral Fort Relief Expedition :—2 sterile fronds only, without rhizome (which should be creeping) ; one—from 8000' alt., about  $2\frac{1}{2}$  in. l. by barely 1 in. br., entire, cordate-lanceolate, and the other—from 5000', about 4 in. l. by  $4\frac{1}{2}$  br., with two pairs of lateral, oblong, rather bluntly-pointed lobes, the lowest of which has a pair of subsidiary lobes, deflexed. The stipes, main and secondary rachises are glabrous, and almost black : the veins are hidden in the coriaceous lamina. (See my paper on the "Ferns of the Chitral Relief Expedition," in "The *Journal of Botany*," March, 1896, p. 122). I compared these specimens with sterile fronds of *P. ludens* from the Chittagong Hill Tracts, in Mr. Gamble's collection, and found them identical, though the cutting varies ; and Mr. Gamble agreed. The most westerly extension of this species before known is in Orissa, in the Indian Peninsula, in about  $21\frac{1}{2}^{\circ}$  N. lat., and  $86^{\circ}$  E. long., up to 1000 ft. alt. Other known habitats are (in India) the Naga Hills in Assam, at about 750 ft. alt. ; the East of Manipur, in about  $23^{\circ}$  N. lat. and  $94^{\circ}$  E. long., at an altitude of 5000 ft. The Ziarat Valley, where General Gatacre got the plant, lies to the south of Chitral, north of the Lowari (or Lowarai) Pass, in about  $35^{\circ} 25'$  N. lat., and  $71^{\circ} 50'$  E. long. Snow must lie in the Valley for many months in the year at the altitude of 8000', and perhaps even down to 5000'.

In "the Botany of the Chitral Relief Expedition," No. 9, Vol. I. of "The Records of the Botanical Survey of India, Calcutta, 1898," I find the following note by Mr. Duthie regarding this fern :—

"In reply to a letter to General (now Sir William) Gatacre asking for further particulars regarding the localities of this very interesting fern, I received the following information :—'This fern was found growing in many places in the Ziárat Valley at 5000 feet, near the Kaffir Rock (about  $3\frac{1}{2}$  miles north of Lowári Pass, on the road), a well known spot by reason of the Kaffirs from Kafiristan selecting this wild spot to set upon and murder caravans passing through the country. The valley hereabouts is a very sheltered spot, a beautiful stream running down the centre, the hills clothed with flowering shrubs, and the valley filled with the white peony. Undoubtedly snow lies here during the winter, even down to 5000 feet, but the place is warm and sheltered from wind ; the soil is very rich, and streams from the summits of the hills are always

pouring through fissures into the valley below. This fern was also seen growing in several places on the hill above on the west side of the valley, where water runs out of rocks at 8000 feet. The ground here must be under snow for certainly four months, if not more. There is close by here a crater, apparently of volcanic origin, which may account for the fern being found here, but no difference was perceptible in the temperature of the water."

Another remarkable westerly and northerly extension of a tropical fern is the case of *Lygodium microphyllum*, A. Br., which also was found by General Gatacre in the Ziárat Valley, at 5000' alt.

Genus 17.—**CERATOPTERIS**, *Brong.*

1. **C. thalictroides**, *Brong.*; Syn. Fil. 174; C. R. 471; Bedd., H. B. 123.

PUNJAB: "in rice fields"—Edgew. in Herb., Saharanpur. *Chamba*—Raipur 3000', Clarke; *Kangra Vy. Dist.* "in rice fields" in Herb. Calcutta; "*Mundi*" (Mandi State?) Jacquem.; *Karnal District*, J. R. Drummond (*vide Trotter*); *Sirmur State*—Kíárda Dún (seen by J. R. Drummond, *vide Trotter*).

N.-W. P.: *D. D. Dist.*; Jaunsar—near Kalsi 1500', Gamble; D. Dún West, Mackinnons; D. Dún East—Nakraunda 1900', Hope 1886; Raspana R. below 2000', Angus Campbell 1889; *Kumaun*, Wallich (or R. Blink.) in Herb. Hort. Kew.

DISTRIB.—"Throughout the Tropics in quiet waters," (Syn. Fil.). *Amer.*: S. Florida, Mexico, and W. Indies southward to Brazil. *Asia*: "Arabia Felix" and S.-E. Arabia. N. India—Nepal, *Wallich*; Sikkim Bhotán; Assam—Goalpára, *Mann*; N. Manipur; 3000', *Clarke*; Bengal—Sháhabád *Dist. Lev.*; Chutia-Nagpur, *Rev. A. Campbell*. Centr. Provs. Ind.—6 stations, *Duthie*. Centr. Ind., *Clarke*. S. Ind. common (*vide Beddome*). Burma—Great Coco Island, *Dr. Prain*; Nicobar Islands, *Kurz*. Singapore, *Wallich*. Java. Philippines. Japan. China. Hongkong. *Afr.*:—W. Trop.; Angola; Madagascar.

Beddome's description amends that in the *Synopsis Filicum* as regards the veins, which anastomose distantly in the fertile fronds, and closely in the sterile ones. But I would add that in pressed and dried specimens the whole fertile frond—stipes, rhachises, and lamina—appears homogeneous, and the stipes even is veined. Living plants should be examined as to this.

I have seen this fern in its natural state only in the Dehra Dún. Mr. Angus Campbell and I were on an elephant, picking out a line for the proposed railway from Hardwar to Dehra (since constructed and lately opened for traffic), and on seeing water draining from a swamp I said—"this looks like a place where *Ceratopteris* would grow." I had hardly spoken when I saw bright green patches in the water, and told the "Mahaut" to get down and hand up a sample: it proved to be this fern. Both here and at Mr. Campbell's station, a few miles westward, the plant was of course rooted, as there was a considerable current.

Genus 18.—**BLECHNUM**, *Linn.*

1. **B. orientale**, L.; Syn. Fil. 186 ; C. R. 474 ; Bedd., H. B. 132.

N.-W. P.: *T. Garh.*—4000', Mackinnons 1879; *North Oudh*, in forests, R. Thompson 1870.

DISTRIB.—*Asia*: N. Ind. (Him.) Nepal, Sikkim; Assam—Khasi Hills up to 4000', Garo Hills. Bengal—North and East, near the Hills; Chutia-Nagpur—Palámow, *Dr. J. J. Wood*. Centr. Provs. Ind.—Pachmarhi 3,000', *Mrs. C. Morris*. Centr. Ind. ? *Clarke*. S. Ind. up to 6000', common. Burma—Maulmain, *Parish*. Ceylon. Malay Penins. and Isles. S. China—Hainan, *Hancock*. Polynesia. Australia: Queensland.

Genus 19.—**WOODWARDIA**, *Sm.*

## Sub-genus ENWOODWARDIA.

1. **W. radicans**, Smith; Syn. Fil. 188 ; C. R. 475 ; Bedd. H. B. 135.

KASHMIR: Basaoli 5500', *Clarke*.

PUNJAB: *Chamba*; McDonell (in List). *Mandi State* 7500', Trotter; *Kullu* 5-8000', Trotter, Coventry; *Simla Reg.* 5-6000' "common on steep, well-shaded banks, close to streams, below 5500'" (*Blanf.*); Bisahir, Lacey.

N.-W. P.: *D. D. Dist.*—Jaunsar—Thadyar 5000', Gamble; Mussooree 6-6500', not uncommon; *Kumaun*—4-8000', common.

DISTRIB.—*Amer.*: California, Arizona, Mexico, and Guatemala. *Europe*: Spain, Portugal, Italy, Sicily. *Asia*: N. Ind. (Him.) Nepal, *Wallich*; Sikkim, Bhotan, 3-8000'. Assam—Khasi Hills 4-5000', not plentiful; Garo Hills, *Day*. Sumatra and Java. Philippines. China: Szechwan Prov.—Mt. Omei, *Faber*; Ichang Prov., *Hancock*. *Afr.*: Azores, Madeira, and Canaries; Congo; Abyssinia.

The description of the genus in the *Synopsis Filicum* is incorrect as to the position of the sori, in *W. radicans* at least: they are not "placed in rows parallel with and contiguous to the midribs of the pinnae and pinnules." The fern is not bipinnate, and there are no rows of sori parallel with and contiguous to the midribs of the pinnae. The sori are placed in the segments of the pinnae, only one sorus on the lower side of a segment being below the sinus. The description in Beddome's Handbook of the species is correct in this respect. In the *Historia Filicum* Smith says of the genus—"Sori oblong, contiguous, forming a sub-costal, medial, row."

Clarke says the Indian form is erect, and not so fine as the pendent plant in Madeira and the Canaries. When it grows to a fair size *W. radicans* cannot stand upright, and if it did it could not root from the buds (one and sometimes two) which are found near the point on almost every frond. In India it often grows on steep banks, as *Blanford* says, and there is pendent. I have seen fronds up to 8 feet in height, and bending over running water.

Genus 20.—**ASPLENIUM**, *Linn.*Sub-genus THAMNOPTERIS, *Presl.*

1. **A. Nidus**, L.; Syn. Fil. 190 ; C. R. 475. *Thamnopteris Nidus*, L., Bedd., H. B. 137.

N.-W. P.: *Kumaun*.—Rámanga Vy., 2500', S. and W.; Gori Valley, near Askot 8-4000', Duthie's collector; Gori Valley 2-3000', on trees, Duthie.

DISTRIB.—*Asia*: N. Ind. (Him.)—Nepal, Sikkim; Assam, and through the plains of Bengal to the southward of Calcutta, and to Chittagong. Malabar. "Typical *Nidus* has not yet been found in the Madras Presidency" (Beddome in Handbook.) Burma—Rangoon. Ceylon, Penang, Tonkin, Borneo. China—Kow Loon, Chusan. Japan—Bonin Islands, Formosa. Polynesia—Samoa, Society Islands, New Caledonia. *Australia*:—Norfolk Island, Lord Howe's Island, Queensland. *Afr.*: Mascaren and Seychelle Isles.

A frond in the Kew Herbarium, got by Hooker fil. in Sikkim, is remarkable by having a lobe projecting  $2\frac{1}{2}$  inches beyond the margin of the frond, towards the apex, with a midrib of its own, 4 inches long from the main rachis, with veins and sori normal to it. There is a similar frond in the British Museum, marked "Khasya (?). H. and T."

Sub-genus EUASPLENIUM.

2. *A. ensiforme*, Wall.; Syn. Fil. 191; C. R. 476; Bedd., H. B. 141.

PUNJAB: *Simla Reg.*—Simla 6000', Edgew., Col. Cruikshank, Bliss; Hatu Mt. Dr. Cuttall 1875, Bági 9200', Bliss 1891; Bisáhir 5000', Lace 1891. *Karnal District* (in the plains) below 1000', Drummond (*vide Trotter*).

N.-W. P.: *D. D. Dist.*—Jaunsar 5500', C. G. Rogers; Mussooree, Mackinnons, Hope, *T. Garh.* Vicary 1832, No. 11, in Herb. Hort. Saharanpur; Kedar Kánta Mt. 7-8000, Herschel; *Brit. Garh.* 7-8000' Duthie; *Kumaun* 6-8000'; apparently not uncommon.

DISTRIB.—*Asia*: N. Ind. (Him.)—Nepal, *Wallich, J. Scully*; Sikkim and Bhotán, 4-9000', common. Assam—*Griffith, Mann*. Burma—Tenasserim. S. Ind.—W. Forests of Madras Presidency. Ceylon. *Afr.*: Madagascar, *Mrs. F. Gregory*, in Herb. Hort. Kew.

J. Smith noted on a sheet of Wallich's from Nepal—"Stains paper pink in drying," and Clarke and Beddome have noted this property of the plant; but it does not always do so. I imagine this depends on the age of the fronds, which remain on the plant, I think, for at least two years. The dye penetrates through several sheets of thick paper, and does so for years after the plant has been dried. *Gymnogramme elliptica*, Baker, from the Dehra Dún District at least, also has this property. Blanford says *A. ensiforme* is very rare in the Simla Region.

3. *A. alternans*, Wall.; Syn. Fil. 194; C. R. 476; Bedd., H. B. 142.

AFGHAN.:—"Alipore," Griffith in Herb. Kew.

TRANS-IND. STATES: *Chitral* 4500'; *Baraul* 5500', Harris; *Swát* 4000', Gatacre.

KASHMIR: Jacquem., Winterbottom; 7500-8000', Trotter, 7000' Gammie; "common below 4000'," MacLeod.

PUNJAB: *Salt Range*; Mt. Tilla, Aitchison, "profuse"; *Hasdra*—Black Mt., Duthie, Oertel 5000', near Kálapáni 7000', Trotter, Murree, Dr. Fleming. *Chamba*, T. Thomson, McDonell (in List); Dalhousie—Dyas (*vide Clarke*); *Jalandhar* (in the plains?) in a well with *Adiantum Cupillus-Veneris* and *Nephrodium molle*, Aitch. 1876; *Kangra Vy. Dist.* 3-3000', Trotter; *Mandi State* 5000', Trotter; *Kullu* 5-6000', Trotter, Coventry; *Simla Reg.*—"very common from 4-5000' up to about 8000'" (Blanf. in List), Sirmur State, Jacquem.

N.-W. P.: *D. D. Dist.*—In the Dún 2-3000', and probably lower, common; Mussooree 5-6500' common; Jaunsar—Gamble; "*Garhwal*," Jacquemont; *T. Garh.* 4-5000'; *Kumaun* 2-7000'.

DISTRIB.—Asia : Afghan.; N. Ind.(Him.)Sikkim, rare. Assam—Khasi Hills 3-4000', Mann; Manipur, Watt. Rajputana—Mt. Abu, King. Afr. : Abyssinia—Schimper.

In the north-east of India, where it is rare, this fern grows larger than in the north-west. Some specimens I have, or have seen, collected by Gamble and Levinge, are so different from others, and from the north-west plant that a variety-monger might make one here. One plant has fronds 11 inches long by  $2\frac{1}{4}$  inches broad, with hardly any stipe. A frond on another sheet is 1 foot long by 2 inches broad, and stipe 2 inches. The cutting of these is very coarse, the segments being broader and blunter than usual, and sometimes sub-crenulated or sub-lobed round the ends of the veins. There is a distinct hyaline (or cartilaginous) margin, which is rarely distinguished in my North-Western specimens. And on some small plants with similar cutting the sori are very short and broad. The large specimens seem to bear the same relation to the N.-W. India form that *A. aureum* of the Canary Islands bears to *A. ceterach* of North Europe; but intermediate forms might perhaps be picked out. Assam plants of *A. alternans*, in the Calcutta Herbarium, are like those from Sikkim, and the sori are more apical than those of N.-W. Indian plants.

Colonel Beddome says—of the venation and fructification—“veins sub-flabellate, all free; sori copious on all the lobes in two rows, linear-oblong, erect-patent, the superior basal one parallel with the costa”—parallel with the rhachis of the frond, I presume he means: but his enlarged drawing, while showing the venation fairly, does not show the basal sori he mentions; and it seems to show that the veins in the decurrent base of the segments spring from the rhachis of the frond and not from the costa of the segment or lobe. This they sometimes appear to do; but the substance of the frond is thick and opaque, and it is not always easy to trace the basal veins to their origin. The position of the sori depends of course upon the direction of the veins. The segments or lobes are more gradually decurrent on the rhachis on the superior side than on the inferior, and a main branch from the costa runs off, on the superior side, parallel to the rhachis from near the base of the costa, so near in some cases that the off-take is obscure; and it gives off veinlets towards the margin. This branch and its veinlets are not generally soriferous, and in the lower half of the frond perhaps never so, and then all the sori appear to lie in the segments, and at an angle with the costa of the segment. Higher up the frond basal sori appear, both on the parallel branch vein and on the veinlets which spring from it, and towards the apex of the frond the involucre of the long parallel basal sori open towards the rhachis of the frond, instead of towards the costa of the segment as the segmental sori do. At the apex of the frond, as the segments become confluent, the rhachis becomes the costa of the apex, and the involucre open inwards towards it.

LES FORMICIDES DE L'EMPIRE DES INDES  
ET DE CEYLAN.

PAR AUGUSTE FOREL.

PART VIII.

(Continued from page 332 of this Volume.)

4me Sous Famille DORYLINÆ.

TABEAU DES GENRES (chez l'ouvrière).

- Pédicule d'un seul article. Suture pro-mésnotale distincte ; suture méso-métanotale obsolète (*Dorylii*) ..... 1
- Pédicule de deux articles. Suture pro-mésnotale obsolète ; suture méso-métanotale distincte (*Ecitonii*) ..... 2
1. Un seul genre..... *G. Dorylus*—Fab.
- (a) Antennes de toutes les ♀ de 9 articles.....*S. G. Alaopone*—Emery.
- (b) Antennes des ♀ major de 11 articles, celles des ♀ minima de 10. Mandibules pointues, avec deux dents au bord interne..... *S. G. Typhlopone*—Westw.
- (c) Antennes des ♀ major de 12 ou de 11 articles, celles des ♀ minima de 10. Mandibules longues, étroites, en forme de sabre, sans bord terminal avec une dent au tiers apical (peu distincte chez la ♀ major)...*S. G. Dichthadia*—Gerst.
2. Un seul genre ..... *G. Enictus*—Shuckard.

TABEAU DES GENRES (chez le ♂).

- Grande taille, au moins 19 à 20 mill. Cuisses toujours comprimées. Pédicule convexe, d'un article. Le métanotum dépasse l'écusson en arrière ..... (*Dorylii*) 1
- Petite taille, au plus 10 mill. Cuisses cylindriques, exceptionnellement clavées ou comprimées. Pédicule d'un seul article, concave, plus ou moins bilobé en dessus. Thorax tronqué derrière, à partir du bord postérieur de l'écusson (*Ecitonii*) 2
1. Un seul genre ..... *G. Dorylus*—Fab.
- (a) Mandibules larges, obtuses, a bord interne sinueux  
*S. G. Alaopone*—Emery.
- (b) Mandibules très longues, au moins trois fois plus longues que larges, étroites, arquées... *S. G. Typhlopone*--Westw.
- (c) Mandibules très larges dans leur moitié basale, puis subitement et très fortement rétrécies, acuminées en pointe étroite et assez longue.....*S. G. Dichthadia*—Gerst.

1ere TRIBU DORYLII.

1er Genre DORYLUS, Fab.

1 S. G. ALAOPONE, Emery.

*Dorylus (Alaopone) orientalis*, Westw.

= *Dorylus (Typhlopone) curtisii*, Shuckard.

♀. Comme l'a déjà fait remarquer M. Emery lui-même, l'*Alaopone oberthüri*, Em., ne peut guère être que l'ouvrière du *Dorylus orientalis*. Je vais même plus loin et je dis que par exclusion il ne peut en être autrement. En effet, dans l'Indostan proprement dit on ne rencontre que deux espèces distinctes de *Dorylus*, toutes deux communes. Or, l'ouvrière lisse, de grande taille (L. 3.5 à 11 mill.), plus lisse et plus luisante encore que le *D. fulvus*, sans sillon frontal imprimé au milieu et en arrière sur la tête, avec 11 articles aux antennes, ne différant du reste du *D. fulvus* que par sa tête encore plus allongée, sa taille encore plus grande, ses arêtes frontales qui forment devant deux proéminences encore plus dentiformes, enfin par sa teinte plus terne, avec l'abdomen plus jaunâtre, le thorax et surtout la tête plus brunâtres; cette ouvrière, dis-je, ayant été prise avec le ♂ (*D. labiatus*, Shuckard) dans un seul et même nid par M. Bell ne peut appartenir qu'au *D. labiatus*, Shuckard dont M. Emery n'a fait qu'une variété du *D. fulvus*, mais que je dois, tout bien considéré, maintenir comme espèce. Donc, par exclusion, l'ouvrière fortement ponctuée, de 2 à 7.5 mill. de long, avec un sillon frontal fortement imprimé tout du long et 9 articles aux antennes ne peut être que celle de l'*orientalis*. Comme l'*A. oberthüri* = *A. curtisii*, il s'en suit que *curtisii*, *oberthüri* et *orientalis* ne sont qu'une seule et même espèce qui doit porter le nom d'*orientalis* comme le plus ancien.

♂. Mais le ♂ correspondant à cette ♀ forme trois races assez distinctes. Si l'on tient compte du fait que, chez les *Dorylus*, les ♂ sont bien plus différenciés que les ♀, on ne s'étonnera pas de ce que ces races n'aient pas pu être distinguées chez l'ouvrière. Ce sont les suivantes :—

r. *D. orientalis*, i. sp., Westw. L. 24 à 25 mill; tête rougeâtre ou roussâtre. Thorax tomenteux; corps en général non seulement pubescent, mais poilu; du reste assez variable. Couleur du corps jaune testacé plus ou moins roussâtre ou brunâtre.

r. *D. fuscus*, Emery. Corps entièrement d'un brun noirâtre. Un peu plus court, et surtout plus robuste.

r. *D. longicornis*, Shuckard. L. 17 à 20 mill. Tête noire. Corps d'un jaune testacé terne. Pubescent, mais presque sans poils dressés.

Ces trois races ne sont pas constantes; on trouve des formes intermédiaires.

La r. *D. fuscus* ♂ a été prise à Rangoon, Birmanie (Fea.), Dehra Dun, Himalaya (Smythies).

La r. *D. longicornis* ♂ a été prise au Bengale (Shuckard), à Tenasserim Kowkareet, Moulmein (Fea), Poona et Kanara (Wroughton), Ceylan (Yerbury).

La r. *D. orientalis*, i. sp., ♂ a été prise au Bengale (Saunders, d'après Shuckard), à Tenasserim, Kowkareet, Moulmein (Fea), à Orissa (Taylor), à Calcutta (Rothney, Wood-Mason), à Barrackpore (Rothney).

Un ♂ faisant passage d'*orientalis* à *fuscus* a été récolté au Bengale par M. Wood-Mason.

L'ouvrière a été récoltée dans toute l'Inde, à Calcutta (Rothney, ma collection); en Birmanie, Bhamó; Tenasserim, Kowkareet, Pegu, Palon, Carin Cheba; à Barrackpore (Rothney); à Coonoor (Wroughton); au Siwaliks (Rogers); dans la Prov. d'Assam et à Dehra Dun (Smythies); à Ceylan (d'après Shuckard); à Darjeeling (Christie); à Orissa (Taylor), etc.

## 2. *S. G. TYPHLOPONE*, Westw.

*Dorylus (Typhlopone) labiatus*, Shuck.

= *D. hindostanus*, Smith = *D. laeviceps*, Smith.

Le pédicule bien plus étroit, la base plus atténuée de l'abdomen, le corps plus grêle, moins pubescent, les côtés plus parallèles du thorax, chez le ♂, dont la longueur atteint de 30 à 32 mill., distinguent cette forme indienne spécifiquement du *fulvus*, Westw. (= *juvenculus*, Shuck.) d'Algérie. J'ai indiqué à propos de l'*orientalis* les différences entre l'ouvrière du *fulvus* et celle du *labiatus*. Ces ♀ sont faciles à distinguer de l'*orientalis* par leur grande taille, leur corps lisse et l'absence de sillon frontal sur le milieu et le derrière de la tête.

Poona (Sykes, Shuckard, Wroughton); Kanara (Bell), ♀ et ♂ ensemble; Ceara, Inde mérid. (♀ et ♂ ensemble); Calcutta (Wood-Mason), ♀; Dharm-sala (Sage); Kanara (Wroughton); South Konkan (Wroughton); Dehra Dun (Gleadow).

## 3. *S. G. DICHTHADIA*, Gerst.

*Dorylus (Dichthadia) laevigatus*, Smith.

= *D. breviceps*, Emery = *D. Klugi*, Emery (♂) ? = *Dichthadia glaberrima*, Gerst.

Le ♂, si c'est bien lui, est long de 20 à 21 mill. environ, et brunâtre.

L'ouvrière est facile à distinguer des autres par ses mandibules (voir tableau des *S. G.*) et par son pédicule bien plus large que long, ainsi que par sa tête assez courte. Elle est encore plus lisse que celle du *labiatus*, mais de la taille de l'*orientalis*.

Le type est de Borneo. A mon avis, la forme ♀ *breviceps*, d'Emery, qui se trouve à Tenassérin, diffère du type par ses mandibules plus courtes et moins courbées, et mérite d'être conservée comme variété.

Tenassérin, Kowkareet, Palong (Fea). Cette espèce n'a pas été trouvée dans le reste de l'Inde.

## 2me TRIBU ECITONII.

### 2me Genre ÆNICTUS, Shuckard.

#### Tableau des ouvrières.

Un tubercule longitudinal, ovale, allongé, jaunâtre, de chaque côté de l'occiput aux angles duquel son extrémité postérieure proémine. Noir; stature grêle..... *Æ. martini*, nov. spec.

- Pas de tubercule longitudinal de chaque côté de l'occiput ..... 1
1. Noirs ou brunâtres, avec une grande tache latérale, ovale, jaunâtre de chaque côté de la moitié postérieure de la tête.  
Tête lisse et luisante..... 2
- Bruns, sans tache latérale. Tête au moins en grande partie sculptée, mate ou subopaque ..... 4
- Jaunâtres ou d'un jaune roussâtre, sans taches. Tête lisse et luisante ..... 5
2. Tête ovale-rectangulaire, à côtés peu convexes et avec un bord postérieur distinct, aussi large que le bord antérieur.  
*Æ. fergusoni*, nov. spec.
- (a) Face basale du métanotum distinctement convexe, entièrement sculptée, Noeuds du pédicule aussi larges que longs, lisses et luisants ..... *Æ. fergusoni*, i. sp.
- (b) Face basale du métanotum en plan incliné d'arrière en avant, avec ses  $\frac{2}{3}$  antérieurs lisses et luisants, Noeuds comme le précédent ... .. var. *Æ. hoildgsoni*, n. var.
- (c) Plus petit. Noeuds du pédicule plus longs que larges, var. *Æ. piltzi*, n. var.
- (d) Un peu plus grand que le type. Premier noeud du pédicule densément réticulé, légèrement plus long que large ..... var. *Æ. montanus*, n. var.
- Tête ovale, à côtés très convexes, n'ayant comme bord postérieur que le bord articulaire, bien plus étroit que le bord antérieur..... 3
3. L. 4 à 4.6 mill. Second article du funicule aussi long que le premier. Pronotum sculpté ..... *Æ. binghami*—Forel.
- L. 3.5 à 3.8 mill. Second article du funicule plus court que le premier. Pronotum luisant et presque lisse...*Æ. lœviceps*—Smith.
- (a) Face basale du métanotum faiblement convexe, passant par un angle obtus à la face déclive qui est courte..... var. *Æ. lœviceps*, i. sp.
- (b) Face basale du métanotum rectiligne, passant par un angle aigu à la face déclive qui est fort concave, et plus longue ..... var. *Æ. smythiesti*, n. var.
4. L. 4.4 à 4.7 mill. Tous les articles du funicule beaucoup plus longs qu'épais. Thorax avec des rides longitudinales grossières ..... *Æ. ailkeni*, nov. sp.
- L. 3.2 à 3.9 mill. Articles 1 à 5 du funicule au moins aussi épais que longs. Thorax seulement avec une sculpture fine.  
*Æ. bengalensis*—Mayr.
- (a) Tête et pronotum en grande partie lisses et luisants, Devant de la tête rougeâtre..... v. *Æ. continuus*, nov. var.

5. Mandibules triangulaires, à bord terminal large et tranchant.. 6  
 Mandibules étroites, à bord terminal court, armé de trois  
 dents plus ou moins distinctes..... 7

6. Grêle. Thorax fortement échancré entre le mésonotum et  
 le métanotum. Entièrement lisse et luisant. L. 2·5 mill.

*Æ. wroughtoni*—For.

- (a) Plus grêle; d'un jaune pâle ou brunâtre; tête  
 1½ fois plus longue que large (étroite et allongée)

v. *Æ. wroughtoni*, i. sp.

- (b) Plus robuste; d'un rouge jaunâtre; tête plus large  
 et plus courte, 1¼ fois plus longue que large—

v. *Æ. sagei*, n. var.

Robuste. Thorax très faiblement et largement imprimé au mi-  
 lieu. Métanotum mat, sculpté. L. 3 à 3·5 mill. *Æ. punensis*, nov. sp.

7. Antennes très courtes, à forte massue. La face basale du  
 métanotum passe par une courbe arrondie et sans arête  
 à la face déclive. Mandibules distinctement tridentées.

*Æ. brevicornis*—Mayr.

Antennes plus longues, à massue plus grêle. La face basale du  
 métanotum est séparée de la face déclive par une petite  
 arête transversale distincte qui se recourbe de chaque côté  
 de la face déclive. Mandibules peu distinctement tri-  
 dentées..... *Æ. ceylonicus*\*—Mayr.

- (a) Métanotum sans stries, ni rides, seulement réticulé-  
 ponctué, à face déclive presque aussi longue que la  
 face basale, et séparée d'elle par un angle dis-  
 tinct. Noeuds du pédicule mats, réticulés-ponctués.  
 L. 2·6 mill..... v. *Æ. peguensis*—Em.

- (b) Métanotum strié-ridé irrégulièrement, à face déclive  
 à peine longue comme la moitié de la face basale et  
 séparée d'elle par un angle obtus, arrondi. Noeuds  
 lisses et luisants en dessus..... (c)

- (c) L. 2·4 à 2·6 mill. Articles 2 à 4 des funicules  
 plutôt plus épais que longs. Face postérieure du  
 2me noeud du pédicule obtuse, un peu inclinée.

v. *Æ. ceylonicus*, i. sp

L. 2·8 à 3·1 mill. Articles 2 à 4 des funicules un peu plus  
 longs qu'épais. Face postérieure du 2me noeud du  
 pédicule verticale, à sommet sub-acuminé...v. *Æ. latro*, n. var.

\* L'*Æ. türneri* d'Australie que j'ai décrit dernièrement a 2·7 mill de longueur (et pas  
 seulement 2·4 à 2·5, comme je l'ai écrit). Ses mandibules ont un bord terminal bien plus  
 large et sont bien plus triangulaires que celles du *ceylonicus*.

Tableau des mâles.

- Tibias énormément renflés sur leurs  $\frac{2}{3}$  apicaux, minces sur leur tiers basal. Cuisses et scapes énormément dilatés et comprimés (foliacés)... ..... *Æ. clavitibia*, nov. spec.
- Tibias médiocrement ou nullement renflés sur leur portion apicale..... 1
1. Scapes et cuisses énormément dilatés et comprimés (foliacés) de leur base à leur extrémité... ..... *Æ. latiscapus*, nov. spec.
- Scapes et cuisses autrement conformés..... 2
2. Cuisses fortement clavées (renflées) sur leur moitié ou leurs  $\frac{2}{3}$  apicaux, minces vers leur base. Hypopygium largement échancré à son bord postérieur. L. 5 à 5·5 mill ..... 3
- Cuisses médiocrement, mais fort nettement comprimées, fortement dilatées sur leur moitié apicale seulement. Pygidium convexe, entier. L. 9 à 10·5 mill. .... 4
- Cuisses et scapes médiocrement et peu à peu élargis de la base à l'extrémité. Pygidium avec une impression longitudinale médiane et une échancrure assez forte au milieu de son bord postérieur. L. 7 mill ..... *Æ. longi*, nov. spec.
- Cuisses médiocrement dilatées et comprimées sur toute leur longueur. L. 4·8 à 5·3 mill ..... 5
- Cuisses, tibias et scapes cylindriques (cuisses à peine comprimées). L. 8 mill. Une longue pubescence argentée, dont les extrémités s'unissent en raies..... *Æ. ambiguus*—Shuck.
- (a) Pubescence jaunâtre, plus courte, de forme ordinaire, moins dense ..... var. *Æ. westwoodi*, n. var.
3. L. 5·5 mill. Pédicule fortement concave transversalement. Ailes distinctement teintées de brunâtre ; corps d'un brun foncé ; tête noire, moitié apicale des cuisses renflée, ..... *Æ. shuckardi*, nov. spec.
- L. 5 mill. Pédicule non concave transversalement, fort convexe longitudinalement. Ailes subhyalines, à peine teintées de jaunâtre ; corps d'un jaune testacé un peu brunâtre, avec la tête noirâtre. Les  $\frac{2}{3}$  apicaux des cuisses renflés. (clavés)..... *Æ. clavatus*, nov. spec.
- (a) Corps assez luisant, médiocrement pubescent et ponctué..... v. *Æ. clavatus*, i. sp.
- (b) Corps subopaque ou mat, densément pubescent et ponctué..... v. *Æ. kanariensis*, n. var.
4. Robuste, large ; mésonotum et scutellum fortement convexes. Abdomen mat, assez grossièrement réticulé ponctué et en outre finement réticulé-ponctué. L. 9·5 à 10·5 mill. ... *Æ. feæ*.—Em,

Etroit, allongé; tête plus large que le thorax. Mésonotum et scutellum faiblement convexes. Abdomen luisant, seulement avec une ponctuation fine. L. 9 mill. .... *Æ. gleadowii*, n. sp.

265. Tête avec un bord postérieur distinct du bord latéral. Les yeux n'occupent que les  $\frac{2}{3}$  antérieurs de la tête. Ocelles petits. Pygidium sans concavité, ni tubercule, entier. Ailes dépassant l'abdomen. Couleur d'un noir brunâtre. L. 5.3 mill ..... *Æ. wroughtonii*—Forel, i, sp.

Tête n'ayant entre les yeux, derrière, qu'un bord faiblement convexe. Les yeux occupent tout le côté de la tête. Ocelles très gros. Pygidium avec une impression longitudinale médiane, formant de chaque côté de cette impression comme un large tubercule mousse, peu apparent, mais assez distinct et poilu. Les ailes n'atteignent pas l'extrémité de l'abdomen. Couleur d'un brun jaunâtre avec la tête brune. L. 4.8 mill ..... *Æ. arya*, nov. spec.

*N.B.*—Dans ce tableau je n'ai pas fait figurer les *Æ. certus*, Westw., et *pubescens*, Smith, qui me sont inconnus, parce que leur description incomplète ne permet pas de les y placer. L'*Æ. pubescens*, à en juger d'après Smith, doit être tout voisin de l'*ambiguus*, mais en différer par le pronotum échancré au milieu et le pédicule moins large. Or la forme du pédicule varie passablement chez l'*ambiguus*. Quant à la longue pubescence soyeuse qui est sensée le distinguer de l'*ambiguus*, elle est précisément caractéristique pour ce dernier, de sorte que je me demande qu'elle confusion se cache là dessous. L'*Æ. certus* est encore plus incertain peut-être. Westwood ne nous donnant guère que des détails sans importance, sa longueur (la même que celle de l'*ambiguus*) et sa couleur (*idem*), en ajoutant *pedunculo antice angustiori disco subplano—et mandibulis sub-brevibus*. Chez l'*Æ. gleadowii*, la seule de nos espèces à laquelle cette description pourrait à la rigueur s'appliquer, sans du reste prouver par là le moins du monde une identité réelle, le pédicule n'est pas plus étroit devant que derrière. En outre Westwood ne sait de quel pays provient son espèce qu'il trouve si "certaine!" La forme qu'il indique pour le pédicule se retrouve chez des variétés de l'*ambiguus*; seules les mandibules courtes en distinguent nettement le *certus*.

Les ♀ des *Ænctus* sont inconnues. Mais après la découverte que j'ai faite en juillet, 1899, de la ♀ de l'*Eciton carolinense* (Annales soc. ent. Belgique, tome XLIII, 1899) il ne peut être douteux qu'elle ne soit tout-à-fait voisine de celle de ce genre si rapproché, c'est à dire aptère, aveugle, avec un seul segment au pédicule, comme chez le ♂, et de forme analogue.

L'*Æ. wroughtonii* est la seule espèce dont le ♂ et l'ouvrière soient connus. Mais, par certaines analogies il est permis de soupçonner que l'*Æ. binghamii* soit l'ouvrière du *fecæ* (ou le *fergusoni*, ou le *laviceps* ?), tous deux étant de très grande taille, de couleur foncée et habitant la même région. On peut

aussi, et pour des raisons analogues, supposer que l'*Æ. punensis* soit l'ouvrière de l'*ambiguus*. Quant aux autres, on en est réduit à de pures conjectures. Il faut attendre des observations ultérieures, faites sur des fourmilières avec le soin et à l'époque nécessaires.

LISTE DES ESPECES DU GENRE *Ænictus*.

1. *Æ. wroughtonii*, Forel.

Thana près Bombay, ♀ et ♂ sortant ensemble du nid (M. Gleadow) ; Travancore, ♀ (Ingleby) ; Inde centrale ♀ (Betham) ; Poona, ♂ (Wroughton).

Var. *sagei*, nov. var. ♀. (Voir tableau.) Cette variété a en outre sur le vertex une tache brune distincte, grande, triangulaire, avec la base derrière et la pointe devant, mais à contours un peu nuageux.

Dharmasala (Sage).

2. *Æ. ambiguus*, Shuckard.

Poona (Sykes, d'après Shuckard, ♂ ; Wroughton, ♂) ; Guzerath, ♂ (Wroughton) ; Inde septentrionale (Wroughton), ♂.

Cette espèce, très fréquente dans la région de Poona où elle vole le soir à la lumière, varie à divers régards. Le pédicule, plus ou moins concave, est tantôt plus large et plus court, tantôt aussi long et étroit que le dessin que Smith donne de son *Æ. pubescens*. Parfois il est fortement rétréci devant et trapéziforme. Le scutellum est parfois presque entier et parfois fortement échancré derrière, même presque obtusément bidenté chez un ♂. Les mandibules varient un peu de longueur et sont tantôt plus, tantôt moins courbées. La pubescence est parfois plus courte, moins couchée en raies et moins argentée, passant (exemplaires de Poona) à la variété suivante.

Var. *westwoodi*, nov. var. ♂ (Voir tableau.) Inde septentrionale (Wroughton), mélangé à la forme typique, mais provenant probablement de fourmilières différentes, le tout volant le soir à la lampe. Pédicule un peu plus rétréci devant que derrière, à côtés fort convexes.

3. *Æ. pubescens*, Smith.

Inde septentrionale, d'après Smith ; ♂. Cette espèce m'a tout l'air d'être une variété de l'*ambiguus*.

4. *Æ. fece*, Emery.

Maggio, Teinzo, Birmanie (Fea), ♂.

5. *Æ. gleadowii*, nov. spec.

♂. (Voir tableau.) Mandibules lisses, luisantes, à pilosité dressée médiocre, un peu plus courtes et surtout plus larges que chez l'*ambiguus*, cultriformes, faiblement courbées. Tête fortement transverse, bien plus large que longue sans les yeux, rapidement rétrécie derrière les yeux, le bord articulaire faisant bord postérieur, comme chez l'*ambiguus*. Ocelles très gros, situés sur une éminence. Devant de la tête fortement concave ; son bord antérieur largement échancré d'un œil à l'autre. La tête est noire, lisse, luisante et entièrement glabre, sauf quelques poils sur le front. Scapes foliacés, très larges et

très comprimés vers l'extrémité, atténués vers leur base. Funicules médiocrement renflés vers leur premier tiers, avec tous les articles plus longs qu'épais. Thorax un peu plus convexe que chez l'*Ambiguus*; le mésonotum recouvre plus le pronotum. Scutellum entier. Face basale du métanotum courte, mais très distincte. Pédicule en rectangle transversal à côtés convexes à peine concave transversalement, très faiblement échancré devant et derrière, convexe longitudinalement. Hypopygium échancré au milieu. Pattes comme chez l'*A. fecæ*, mais la dilatation apicale est plus progressive et moins accentuée.

Thorax, pédicule et abdomen ponctués et couverts d'une pubescence d'un jaune grisâtre, longue, abondante, entièrement couchée (dense, courte et relevée sur le dernier segment). Le thorax, le pédicule et le pygidium sont subopaques, plus densément ponctués; l'abdomen est luisant. Pattes lisses, luisantes, avec de longs poils dressés jaunes.

Brun foncé; tête noire; bord des articulations du thorax, post-scutellum, côtés du métanotum, bord du pédicule et des segments abdominaux d'un roux brunâtre. Pygidium, valvules génitales, pattes, antennes et mandibules d'un jaune testacé. Ailes teintées d'un brun pâle, avec les nervures et la tache brunes.

Kanara (Wroughton). Je dédie cette espèce à M. Gleadow qui a découvert le premier les ♂ d'*Enictus* avec les ♀, et les a fournis à M. Wroughton.

#### 6. *A. longi*, nov. spec.

♂. (Voir tableau.) Mandibules longues, plus courbées que chez le précédent, plus larges vers l'extrémité, avec l'extrémité plus obtuse, lisses, luisantes, avec des points piligères et une pilosité abondante, plutôt courte. Les articles 2 à 9 du funicule sont plus épais que longs. Les yeux n'atteignent pas le bord postérieur de la tête qui est faiblement convexe et distinct du bord articulaire. Les ocelles, assez gros, ne sont pas situés sur une éminence. Tête, sans les yeux, aussi longue que large. Pédicule concave en dessus, avec les bords relevés, plus large que long, un peu plus large derrière que devant avec un gros tubercule en dessous. Ailes assez courtes, ne dépassant pas le corps. Face basale du métanotum indistincte, à peu près obsolète.

Front densément ponctué et subopaque. Le reste lisse, luisant, à ponctuation fine et espacée. Une pilosité dressée un peu oblique, jaunâtre, plutôt courte, abonde sur les pattes et les antennes, tandis qu'elle est très rare, presque nulle, sur le corps. En revanche ce dernier est recouvert d'un bout à l'autre d'une pubescence jaunâtre assez longue qui forme un duvet assez fort pour cacher presque entièrement la sculpture (il faut le gratter pour voir cette dernière). Pygidium relativement glabre.

D'un brun jaunâtre sale. Tête brune; mandibules et pattes jaunâtres. Ailes finement pubescentes, teintées de brun, avec la tache et les nervures d'un brun foncé.

Garó Hills (Long).

7. *Æ. shuckardi*, nov. spec.

♂. (Voir tableau.) Mandibules assez larges, assez courtes, fortement courbées, pointues au bout, lisses, luisantes médiocrement poilues. Tête conformée comme chez l'*Æ. longi*, ainsi que les yeux et les ocelles. Scapes assez courts, atténués à la base, fortement dilatés (foliacés) sur leurs  $\frac{2}{3}$  apicaux qui sont aussi larges que longs. Funicules atténués à leur base, renflés vers leur milieu, surtout à leur premier tiers ; leurs articles 4 à 6 plus de deux fois plus larges que longs. Mésonotum fort convexe devant. Face basale du métanotum courte, assez horizontale, fort distincte de la face déclive qui est verticale. Abdomen assez allongé, pas ou à peine courbé ; ailes de longueur moyenne.

Lisse, luisant, très finement et éparsément ponctué. Pilosité et pubescence comme chez l'*Æ. longi*, mais la pubescence est moins dense et ne cache pas la sculpture et la pilosité est plutôt un peu plus longue et moins abondante ; sur la tête la pubescence est faible.

Brun ; tête noire ; pattes, antennes et mandibules d'un brun jaunâtre. Ailes distinctement teintées de brun, avec la tache et les nervures brun foncé. Barrackpore (Rothney).

8. *Æ. clavatus*, nov. spec.

♂. (Voir tableau.) Mandibules fortement courbées, assez courtes, plus étroites que chez le précédent, lisses, luisantes, avec une pilosité très courte. Tête, sans les yeux, plus large derrière que longue. Les yeux divergent fortement en arrière et n'atteignent pas le bord postérieur de la tête, qui est fort convexe. Ocelles assez distants l'un de l'autre. Devant, la tête est subtronquée et concave ; les yeux proéminent devant de chaque côté. Moitié apicale des scapes fortement clavée, un peu comprimée, presque aussi large que longue. Antennes courtes et petites ; funicules atténués à leur base puis renflés ; leurs articles 4 à 6 moins de deux fois plus larges que longs. Mésonotum moins convexe que chez le *shuckardi* ; métanotum comme chez cette espèce ; scutellum proéminent en arrière. Abdomen plus courbé que chez le précédent. Pygidium entier. Ailes plutôt courtes, à tache marginale arrondie.

Sculpture du *shuckardi*. Pubescence un peu plus abondante, surtout sur la tête et le thorax, mais moins que chez le *longi*. Pilosité dressée courte et peu abondante sur les pattes et les antennes, presque nulle ailleurs.

Nervures et tache marginale brunes.

Poona (Wroughton) ; Inde septentrionale (Wroughton) ; Guzerath (Wroughton) ; var. *Æ. kanariensis*, nov. var. ♂ (voir tableau) ; Kanara (Wroughton).

9. *Æ. latiscapus*, nov. spec.

♂. (Voir tableau.) L. 5.4 à 5.6 mill. Mandibules bien plus longues et moins courbées que chez les deux précédents, très larges à leur base et relativement atténuées vers l'extrémité (un peu comme chez le *Dorylus helvolus*), lisses, luisantes, un peu ponctuées, avec une pilosité longue et courbée. Tête con-

formée comme chez l' *gleadowii*, transverse, beaucoup plus large que longue sans les yeux, largement et fortement concave devant, le bord articulaire formant le bord postérieur, les ocelles placés sur une éminence, la tête fort convexe derrière d'un œil à l'autre, tandis que les yeux proéminent devant. Les arêtes frontales, petites et très rapprochées, confluent en arrière, au fond de la concavité faciale. Les scapes dilatés et minces, comme deux feuilles, sont presque translucides et un peu contournés. Les funicules ne sont pas renflés; tous leurs articles sont plus longs que larges. Mésonotum très fortement convexe devant. Thorax du reste comme chez l'*Æ. clavatus*, avec le scutellum très convexe et proéminent, mais la face basale du métanotum est plus courte—extrêmement courte—convexe, passant par une courbe à la face déclive qui est un peu concave. Abdomen courbé, assez étroit; pygidium entier. Cuisses et anneaux fémoraux foliacés comme les scapes. Tibias à peine un peu renflés sur leurs  $\frac{2}{3}$  apicaux. Pédicule fortement échancré devant et derrière, deux fois plus large que long, assez concave en dessus. Il a en dessous une protubérance armée d'une forte dent dirigée en arrière. Ailes un peu plus courtes que chez l'*Æ. clavatus*.

Lisse, luisant, à ponctuation fort distincte, mais espacée. Pygidium très lisse, presque sans ponctuation. Pattes et antennes avec de longs poils jaunes, courbés; le reste du corps presque sans poils dressés. Pubescence jaune, médiocre, ne cachant pas la sculpture.

D'un jaune un peu brunâtre, y compris les mandibules. Tête brunâtre. Ailes hyalines, n'ayant qu'une pubescence presque microscopique; nervures pâles; tache marginale d'un jaune brunâtre.

Poona (Wroughton).

10. *Æ. clavitibia*, nov. spec.

♂. (Voir tableau.) L. 6.4 mill. Extrêmement voisin du précédent, dont il diffère par ses tibias très fortement renflés (clavés) sur leurs  $\frac{2}{3}$  apicaux. Les mandibules sont plus courtes et plus fortement atténuées (très pointues) à l'extrémité. La concavité de la face est bien plus faible et n'a pas l'apparence tronquée d'*Æ. latiscapus*. Les ocelles sont bien moins éminents. La face basale du métanotum est à peu près obsolète; le métanotum est vertical, continuant le plan du postscutellum. Sculpture, pilosité, pubescence et ailes, comme chez l'*Æ. latiscapus*, mais la pubescence est plus faible et les ailes sont plus courtes. La protubérance inférieure du pédicule ne se prolonge pas en dent en arrière.

Dessus du corps brunâtre, dessous d'un jaune brunâtre. Pattes, antennes et mandibules jaunâtres. Tête d'un noir brunâtre. Les nervures et la tache marginale d'un brun clair.

Barrackpore (Rothney).

11. *Æ. arya*, nov. spec.

♂. (Voir tableau.) Mandibules courtes, de largeur médiocre, presque aussi larges vers l'extrémité qu'à la base, ayant à leur bord interne, près de la base,

une dent triangulaire, large et courte; leur extrémité est fort obtuse; elles sont lisses, luisantes et poilues. Tête, sans les yeux, aussi longue que large. Les yeux proéminent devant, de chaque côté, et la face est concave, mais moins que chez le *latiscapus*, à peu près comme chez le *clavitibia*. Scapes sensiblement dilatés sur leurs  $\frac{3}{4}$  apicaux, mais peu à peu, et beaucoup moins que chez le *latiscapus* et le *clavitibia*; ils sont un peu comprimés, mais nullement foliacés. Funicules longs, tous leurs articles beaucoup plus longs qu'épais. Thorax, en particulier le métanotum, comme chez le *latiscapus*, mais le mésonotum est moins convexe et le scutellum bien plus petit et moins proéminent. Pédicule plus étroit que chez le *latiscapus*, avec la protubérance inférieure limitée à ses  $\frac{2}{3}$  antérieurs et dirigée droit en bas. Ailes courtes, pubescentes.

Ponctuation faible sur la tête et le thorax. Du reste (sauf le pygidium, voir tableau) sculpture, pubescence et pilosité comme chez le *latiscapus*, mais la pilosité des membres est plus courte et la pubescence est plus soulevée (passant à une pilosité oblique).

D'un brun jaunâtre avec le dessous plus clair, les pattes, les antennes et les mandibules d'un jaune sale et la tête brune. Ailes teintées de brunâtre, avec les nervures et la tache d'un brun foncé.

Kanara (Wroughton).

Cette petite espèce est fort distincte par la forme de ses mandibules, par ses pattes non dilatées et son pygidium à tubercules poilus.

12. *Æ. martini*, nov. spec.

♀. (Voir tableau.) L. 3 à 3·2 mill. Extrêmement voisin de l'*Æ. gracilis*, Emery, mais plus robuste. Les scapes ne dépassent pas le bord occipital (le dépassent très sensiblement chez l'*Æ. gracilis*). Les articles 5 à 7 du funicule sont au moins aussi épais que longs, souvent plus épais que longs, et les funicules sont bien moins grêles. Chez l'*Æ. gracilis* tous les articles du funicule sont plus longs qu'épais. Le thorax, les noeuds du pédicule, les pattes sont moins allongés. Les tubercules latéraux de l'occiput sont rousâtres (d'un blanc jaunâtre chez le *gracilis*). La sculpture du métathorax et du pédicule est aussi un peu plus forte.

Pahang et Perak, Malacca (Dr. R. Martin); Moulmain, Birmanie (Hodgson). Ce n'est peut-être qu'une race de l'*Æ. gracilis* (Em.) de Bornéo.

13. *Æ. fergusonii*, nov. spec.

♀. (Voir tableau.) L. 3·4 à 3·6 mill. Le bord terminal des mandibules a derrière la dent terminale 4 ou 5 denticules très petits, mais assez distincts. De même que chez le précédent et les deux suivants, les arêtes latérales des joues sont très courtes et se confondent avec le bord latéral de la fossette articulaire de l'antenne. Le scape n'atteint pas le bord occipital. Les articles du funicule sont tous bien plus longs que larges. Le bord postérieur de la tête est très distinct, même presque un peu concave. Thorax plus court que chez

les deux suivants, avec la convexité pro-mésotale plus forte. La face basale du métanotum est aussi un peu plus convexe et la face décline, plus haute, est bordée d'une arête plus distincte. L'échancre thoracique est un peu moins évasée. Les noeuds du pédicule sont plus arrondis en dessus et ne sont pas subverticalement tronqués derrière comme chez le *laviceps*. Sculpture et pilosité identiques à celles du *laviceps*, sauf le premier article du pédicule qui est à peu près entièrement lisse et luisant (réticulé chez le *laviceps*).

D'un brun de poix, plus clair que le *laviceps*. Antennes, mandibules, tarsi, et articulations des pattes d'un jaune plus ou moins roussâtre. La tache latérale de la tête est d'un jaune roussâtre et atteint derrière l'angle occipital ; devant elle n'atteint pas le milieu du côté de la tête.

Travancore (Ferguson, Rothney).

Cette espèce est très distincte par la forme de sa tête qui la place entre le *martini* et le *laviceps*.

Var. *piltzi*, nov. var. (voir tableau). Diffère encore du type par son échancre thoracique bien plus profonde.

Kanara et Surat Distr. (Wroughton).

Var. *hodgsoni*, nov. var. (voir tableau). Diffère encore du type par la tache latérale de la tête qui est bien plus petite et n'atteint pas l'angle occipital. La couleur est aussi bien plus foncée, presque noire, avec les pattes, les antennes et les mandibules brunes.

Moulmain, Birmanie (Hodgson).

Var. *montanus*, nov. var. Légèrement plus grand que le type. Le premier noeud du pédicule est densément réticulé, comme chez le *laviceps*. La tache latérale de la tête, un peu plus petite que chez le type, est roussâtre et n'atteint pas l'angle occipital. Couleur du type, mais un peu plus foncée.

Darjeeling, 3,000' à 8,000' (Wroughton).

Malgré ses variétés, l'*Æ. fergusoni* constitue une espèce fort distincte. Du reste ses variétés habitent des parties fort éloignées de l'Inde.

#### 14. *Æ. binghamii*, Forel.

♀. (Voir tableau.) Très voisin du *laviceps*, mais plus grand, avec les côtés de la tête un peu plus convexes et les caractères indiqués au tableau. Métanotum à peine convexe. Epine du premier noeud du pédicule plus longue. Premier segment de l'abdomen plus atténué à sa base qui est colliforme. Thorax, premier noeud du pédicule, et cou de l'abdomen entièrement réticulés ; le pronotum subopaque ; le reste du thorax et le premier noeud mats. Thorax avec quelques rides sur les côtés. Poils des tibias plus obliques. Le bord terminal des mandibules est très distinctement denticulé, ce qui n'est pas le cas du *laviceps*.

Birmanie (Bingham, Fea.) ; Moulmain, Birmanie (Hodgson) ; Assam (Long).

15. *Æ. læviceps*, Sm.

♀. (Voir tableau.) Tenasserim, Thagata (Fea).

Var. *Æ. smythiesii*, nov. var. ♀ (voir tableau) ; Assam (Smythies) ; Mount Tapah, Perak (Dr. R. Martin).

16. *Æ. aitkeni*, nov. spec.

♀. (Voir tableau.) Mandibules armées d'une dent distincte derrière la grande dent apicale ; le reste du bord terminal, qui est fort long, est extrêmement finement et assez indistinctement denticulé. Les mandibules sont mates, densément réticulées-punctuées, avec des points épars. Les arêtes latérales des joues sont très élevées, perpendiculaires à l'extrémité antérieure recourbée des arêtes frontales qui borne devant l'articulation de l'antenne. Les arêtes latérales s'étendent presque du bord antérieur de l'épistome aux  $\frac{2}{3}$  de la longueur de la tête, en convergeant médiocrement en arrière ; elles forment une dent élevée à leur tiers antérieur. Sillon frontal très distinct, dépassant les arêtes, latérales et allant jusqu'au vertex (place de l'ocelle antérieur). Tête ovale, à côtés fort convexes, sans bord postérieur distinct outre que le bord articulaire. Les scapes dépassent sensiblement le bord occipital (articulaire). Thorax allongé, très distinctement, quoique très largement et faiblement échancré ou plutôt évasé entre le mésonotum et le métanotum. Face basale du métanotum étroite, presque subbordée, terminée par une arête étroite très élevée, un peu inclinée en arrière, et dont le pan postérieur se continue dans la face déclive, tout en la surplombant (elle rappelle en plus court et plus vertical celle de l'*Eciton rogeri*, D. T.) Les noeuds du pédicule sont plus longs que larges ; le premier a en dessous une protubérance obtuse ou un gros tubercule, le second a deux stigmates latéraux proéminents. Abdomen atténué devant, mais nullement colliforme. Pattes longues.

Abdomen lisse et luisant. Tout le reste, y compris les pattes et les antennes (même les funicules), entièrement réticulé-punctué et mat, sauf les joues qui sont subopaques. Le thorax et le premier noeud du pédicule ont en outre des rides longitudinales grossières, irrégulières, espacées, parfois interrompues.

Pilosité dressée roussâtre, assez longue et assez abondante partout, y compris les pattes et les antennes. Pubescence quasi nulle.

Milieu du front, vertex, occiput, thorax, abdomen, milieu des cuisses et des tibias d'un brun plus ou moins foncé selon les individus. Le reste d'un roux ferrugineux plus ou moins brunâtre selon les individus. Bord des segments abdominaux jaunâtre.

Kanara (Aitken, Wroughton) ; Thana (Gleadov) ; Travancore (Ferguson, Ingleby). Le manque de bord postérieur à la tête, les antennes et les noeuds du pédicule bien plus grêles distinguent nettement cette espèce de ses voisines les *Æ. aratus* et *Æ. bengalensis*.

17. *Æ. bengalensis*, Mayr.

♀. (Voir tableau.) Les arêtes latérales des joues forment deux petites dents, une devant, l'autre derrière. L'*Æ. aratus*, Forel, d'Australie, n'a que la dent de devant et l'a très faible. L'*Æ. bengalensis* a le thorax à peine échancré et à peine pourvu de quelques rides ou sillons derrière ; chez l'*aratus* il est très distinctement échancré et fortement sillonné. Ces deux espèces sont du reste très voisines l'une de l'autre et bien distinctes de l'*aikeni*.

Kanara (Wroughton) ; Madras, Travancore, Calcutta (Rothney) ; Dehra Dun (Smythies).

Var. *Æ. continuus*, n. var. ♀. Dos du thorax absolument continu, sans échancrure. Sculpture plus faible ; thorax en partie luisant.

Ceylan, Calcutta (Rothney).

18. *Æ. punensis*, nov. spec.

♀. (Voir tableau.) Mandibules densément et finement striées, dentées comme chez l'*aikeni*. Arêtes latérales comme chez les précédents, mais n'ayant qu'un faible denticule devant, comme chez l'*aratus*. Le sillon frontal n'est qu'une continuation élevée des arêtes frontales soudées derrière ; il se termine avant les arêtes latérales (chez l'*aikeni* il se continue distinctement en sillon en arrière, chez le *bengalensis* moins distinctement). La tête, bien plus longue que large, à côtés peu convexes, a un bord postérieur distinct du bord articulaire, comme chez le *bengalensis*, mais plus droit ; la tête est moins convexe que chez cette espèce. Les scapes sont loin d'atteindre le bord occipital. Les articles du funicule sont tous plus longs qu'épais. Le pronotum avec le mésonotum forme une convexité distincte de celle de la face basale du métanotum. L'échancrure qui sépare ces deux convexités ressemble à celle de l'*aikeni*, du *laviceps*, etc., mais elle est plus faible que chez le *laviceps*. La face déclive du métanotum est fort petite et entourée d'une petite arête circulaire, comme chez le *ceylonicus*. Les noeuds du pédicule sont arrondis, environ aussi larges que longs. Le premier n'a en dessous qu'une faible arête longitudinale (ni épine, ni tubercule) ; le second a de chaque côté un stigmatte proéminent. Abdomen ovale. Cuisses assez renflées vers leur tiers périphérique.

Mésonotum, métanotum et premier noeud du pédicule densément réticulés ponctués et mats. Tête et abdomen lisses et luisants. Bord occipital de la tête, pronotum, pattes, antennes et second noeud du pédicule assez luisants et plus ou moins distinctement réticulés.

Pilosité dressée fine, jaunâtre, assez longue, médiocrement repandue partout, aussi sur les pattes et les antennes. Pubescence presque nulle.

Tête et thorax roussâtres ou d'un rouge jaunâtre. Abdomen et mandibules d'un brun jaunâtre. Le reste d'un jaune roussâtre.

Poona (Wroughton).

Au premier abord, cette espèce ressemble a un grand *ceylonicus*. Mais un examen plus sérieux montre qu'elle est bien plus parente du *bengalensis*.

19. *Æ. brevicornis*, Mayr.

♀. (Voir tableau.) Calicut, Calcutta, Bangalore (Rothney); N.-W. Prov. (Smythies); Assam (Smythies).

20. *Æ. ceylonicus*, Mayr.

v. *Æ. ceylonicus*, i. sp. (voir tableau). Ceylon (d'après Mayr); Kanara (Bell); N.-W. Prov. (Smythies); Calcutta (Rothney); Raipur (Betham); Barrackpore (Minchin).

v. *Æ. latro*, nov. var. (voir tableau). Poona (Wroughton). Certains individus de Poona font passage au *ceylonicus*, i. sp. Cependant les articles plus allongés du funicule et la face déclive plus haute du métanotum distinguent encore cette variété du type de l'espèce.

r. *Æ. peguensis*, Emery (voir tableau). Palon, Pegu (Fea.).

Le nombre total des espèces connues du genre *Ænictus* se monte aujourd'hui à 40, dont 20 habitent l'Inde. Les autres se trouvent en Afrique, aux îles de la Sonde, en Australie et en Amérique. C'est le seul genre de *Dorylinae* qui se trouve à la fois dans l'ancien et le nouveau monde. L'*Æ. wroughtonii* est, nous l'avons vu, la seule espèce dont le ♂ et l'ouvrière soient connus. Mais il est probable que la connaissance de ces deux sexes trouvés dans la même fourmière amènera à la synthèse de plusieurs autres espèces.

Dans le présent travail nous avons décrit 11 espèces nouvelles de *Ænictus* de l'Inde. Précédemment nous en avions déjà décrit deux autres découverte par M.M. Wroughton et Bingham.

DESCRIPTIONS OF SOME NEW SPECIES OF SPIDERS  
FROM BRITISH INDIA.

By R. I. POCKOCK, OF THE BRITISH MUSEUM OF NATURAL HISTORY.  
(Read before the Bombay Natural History Society on 9th October, 1900.)

THE descriptions contained in the following pages are based to a large extent upon materials kindly forwarded to me through Messrs. H. M. Phipson and R. C. Wroughton, by various members of the Indian Forest Service and of the Bombay Natural History Society. The descriptions were drawn up for publication in a volume upon the *Arachnida* of India, forming part of the Fauna of India Series. But, unfortunately, exigencies of space compelled me to omit them from the volume, together with the diagnoses of many previously established species.

I hope at some future time to be allowed to publish in this Journal illustrations of the essential characters of the species here described.

Family ARGIOPIDÆ.

*Tetragnatha cælestis*, sp. n.

*Colour* of carapace and limbs yellowish-brown, sternum infuscate; abdomen with the dorsal area ashy yellow above, bordered with black; a broad sinuous superior lateral white band on each side; median ventral line black with a pale band at the sides.

*Head* much shorter than in *T. mandibulata*; *eyes* of posterior line slightly recurved, subequal, subequally spaced; of anterior line strongly recurved, the laterals separated from the posterior lateral by about the diameter of the latter; median quadrangle about as wide as long, a little narrowed in front. Basal segment of *mandible* about as long as carapace, lower border of fang-groove armed with 9 teeth, one close to the fang-socket, one some little distance behind it, and a row of 6 close set; there is in addition 1 largish tooth projecting downwards and inwards beneath the base of the fang; upper edge of groove armed with a row of 7 close set teeth and 1 larger tooth close to the fang-socket, also 1 small tooth above close to the joint of the fang; fang bent at right angles in its basal portion, armed externally on the angle with a single forwardly directed tooth, the rest of the fang unarmed but slightly sinuous. *Abdomen* abruptly narrowed behind the middle, the posterior half cylindrical, genital aperture only a short distance behind the pulmonary opercula.

*Measurements in millimetres.*—Total length 11 ; length of carapace 3·3, width 2 ; length of abdomen 8, width 3 ; length of basal segment of mandible 3.

*Loc.* Shillong in Assam (*Heaven*).

*Tetragnatha paradisea*, sp. n.

♀. *Carapace* with a broad median fuscous band covering the cephalic area and the median dorsal area of the thoracic portion ; yellow at the sides but with a narrow black rim, legs obscurely banded ; abdomen covered above with a wide dark and black-bordered but mesially paler band, sides with broad white upper stripe and a corresponding black stripe below, lower surface black along the middle line, pale at the sides.

*Carapace* with cephalic region shorter than in *T. mandibulata* ; eyes almost as in that species. *Mandibles* about as long as carapace, their armature almost as in *T. gracilis*, except that there is a small tooth projecting beneath the base of the fang ; fang strongly sinuous as in *T. mandibulata*, when viewed from the outer side, armed basally beneath with a strong tooth.

*Abdomen* not so long, a little more than twice as long as broad, broadest in the middle and narrowing forwards and behind, genital aperture about one-third of the distance from the anterior end.

*Measurements in millimetres.*—Total length 9 ; carapace 4 ; length of abdomen 7, width 2·5 ; basal segment of mandible about 3.

*Loc.* Shillong in Assam (*Heaven*).

Genus ORSINOME, Thorell.

*Orsinome marmorea*, sp. n.

♀. *Colour* of sides of thoracic and cephalic portion of carapace yellow, middle line and margin as well as the entire upper surface of the head black or deep brown ; mandibles yellowish-brown ; sternum and mouth parts black, palpi yellow, apically black ; coxæ of legs yellow ; femora pale at base, infusate distally with subapical yellow ring ; basal half of patella yellow ; tibiæ coloured like femora ; upper surface of abdomen grey with small white spots, the grey area divided by a median lanceolate dark line and bordered with a broad black band which extends on to the sides and is broken up by pale stripes and spots ; ventral surface black with a pair of narrow white bands extending from the pulmonary opercula to the spinning mammillæ.

*Carapace* about half the length of the anterior tibia and about equal to that of the fourth leg; *eyes* of posterior line nearly straight, medians about a diameter apart and at least a diameter and a half from the laterals; ocular quadrangle square; eyes of anterior line straight when viewed from the front, the medians about a diameter from the laterals, less than that from each other. *Legs* strongly spiny; the first about eight times as long as the carapace. *Abdomen* about twice as long as wide, convex above, rounded in front; obtusely angular above the spinners. *Vulva* consisting of a smooth shining heart-shaped sclerite, the apex of which is directed posteriorly.

♂. About as large as the ♀ which it resembles in colour. *Mandibles* longer, divergent, upper margin of fang-groove armed with a distal and a basal tooth with some smaller granuliform teeth between them; lower margin armed with 5 subequally spaced teeth, of which the basal is large and quadrate: fang strong, sinuous but not toothed. *Palpi* with short patella, this segment only about twice as long as broad and about one-third shorter than the tibia; the two together scarcely as long as the tarsus and palpal organ, the spiniform process of the tarsus short, curved; tip of organ ending in a short slender black spine.

*Measurements in millimetres.*—♀. Total length 10·5; length of carapace 4; of first leg 31. ♂. Total length 10; length of carapace 4·5, of first leg 39.

*Loc.* S. India: Ootacamund (*G. F. Hampson*), and Ponnudi in Travancore (*H. Ferguson*).

The genus *Orsinome* is allied to *Argyroëpeira*, but has no serially arranged bristles on the femora of the posterior legs. It ranges as far to the east as Celebes, but has not been previously recorded from India.

*Orsinome armata*, sp. n.

♂. *Colour* like that of *O. marmorea*, but legs yellower with black spots at the bases of the spines, upper side of abdomen blackish with a median posteriorly lanceolate white mark which gives off a pair of short branches on each side, sides of upper surface and upper portion of lateral surface with a chalky yellow stripe ornamental with red spots. *Eyes* very much as in *O. marmorea*, but the anterior medians not larger than posterior medians and about two diameters from the laterals. *Mandibles* with external prominence above the base of the fang; fang-groove armed above in front with 3 teeth and below (behind) with 4, fang shorter than in *O. marmorea*, bent nearly at right-angles

in its basal half, sinuous, with its lower edge finely serrulate. *Palpi* with trochanter shorter than in *O. marmorea* and armed inferiorly at the apex with a strong spike, femur long, nearly straight, patella very short, scarcely longer than wide; tibia long, slender, straight, about two-thirds the length of the femur, lightly incrassate, nearly or quite four times as long as patella, palpus a little shorter than tibia, much less inflated than in *O. marmorea*, and with its upper spiniform process reduced to a more pointed tubercle.

*Measurements in millimetres.*—Total length 7; length of carapace 3, of first leg 24.

*Loc.* Shillong in Assam (*Heaven*).

The males of the two Indian species of this genus may be recognised as follows:—

a. Tip of trochanter of palp unarmed beneath; tibia a little longer than patella, shorter than tarsus and only about one quarter the length of the femur, etc. . . . . *marmorea*.

b. Tip of trochanter of palp armed beneath with a spike; tibia at least four times as long as the patella, longer than tarsus and more than half the length of the femur, etc. . . . . *armata*.

Genus ARGYROËPEIRA, Emerton.

*Argyroëpeira beata*, sp. n.

With a close general resemblance to *A. celebesiana*, but easily distinguishable by the following features:—The sternum and labium are black; the dorsal side of the abdomen is adorned with a pair of silvery bands converging in front and behind and separated by a narrow olive-green stripe narrowed anteriorly and posteriorly; externally the silvery bands are limited by a black line which expands posteriorly and unites upon the extremity of the abdomen; lateral surface reddish-yellow above, sometimes showing a yellow band on a darker field, black below; ventral surface black, with a pair of parallel yellow bands passing from the external ends of the epigastric fold to a point on each side of the spinners.

The abdomen further differs from that of *A. celebesiana* in being more rounded and without shoulder prominences in front, and widely rounded, without caudal process posteriorly.

*Measurements in millimetres.*—Total length 9; length of carapace 3, of abdomen 6.5, of first leg 21.

*Loc.* Shillong in Assam (*Heaven*).

## Family OXYOPIDÆ.

## Genus OXYOPES, Latr.

*Oxyopes hindostanicus*, sp. n.

Closely allied to *O. birmanicus* in colour and structural features; but quite different in the form of the generative organs. In the ♀ the *vulva* somewhat approaches that of *O. javanus*, the excavation being divided into two by a distinct partition, but the partition is shorter, and the posterior border of the excavation is not mesially produced into a smooth black rounded tubercle but in transversely truncate; behind this black border there is a subpellucid transversely arched horny plate, which is more conspicuous than in the majority of species. In the ♂ the patella of the palp is armed externally with two horny teeth, the distal longer, sharp, and directed forwards, the basal blunt, cylindrical and directed outwards; tibia furnished below with a great downwardly directed subquadrate process, the posterior angle of which projects below the anterior; marked with two black crests.

*Measurements in millimetres.*—♀. Total length 9; carapace 3, first leg 14.5, second 13, third 11, fourth 13; patella and tibia of fourth 4. ♂. Total length 8; carapace 3; first leg 13.5, fourth 12.5, patella and tibia of fourth 4.

*Loc.* Widely distributed throughout India and Ceylon, and possibly identical with *O. similaris* of Stoliczka.

*Oxyopes ryvesii*, sp. n.

♀. Closely allied to all the species of the genus; colour of abdomen slightly different, this region of the body being mostly of a yellowish-white hue clothed with silvery white hairs, but ornamented with a median dorsal brownish band clothed with red hairs, a median ventral black band, and the lateral surface ornamented in front with two short longitudinal reddish lines, in the middle with a pair of short black lines, united in front and just before the apex with a similar pair of narrowly separated black lines—these dark lines might perhaps be described as corresponding to the two lateral black stripes seen in *O. lagarus*, broken up into three pairs.

*Legs* very long, first nearly  $5\frac{1}{2}$  times as long as carapace, patella of fourth a little longer than carapace.

The *abdomen* differs also in shape from that of the other species, its anterior half being broader and parallel-sided, its posterior half from a point just behind the fused median lateral black lines abruptly narrowed and cylindrical. The *vulva* impressed with a nearly circular excavation, the border of which is evenly thick and high throughout, except in the middle of the sides where there is an apparent infolding emphasised by a double thickening.

*Measurements in millimetres.*—Total length 11 ; carapace 3·5, first leg 19, second 18, third 15, fourth 18 ; patella and tibia of fourth 5·8.

*Loc.* Allahabad (*A. E. Ryves*).

*Oxyopes rufisternis*, sp. n.

*Colour* : carapace deep mahogany brown, clothed with white hairs at least at the sides and in part above; sternum and coxæ yellowish-red, clothed with rusty-red hairs, legs nearly black, varied with white hairs ; abdomen olive-yellow above varied with white and reddish hairs, a broad ventral black band bordered with white ; sides blackish varied with white streaks, or blotches and patches of red.

*Carapace* about as long as patella and tibia of fourth leg ; clypeus about twice the height of the anterior portion of ocular quadrangle ; clypeus more than half the length of the mandibles ; anterior median eyes about a diameter apart. *Legs* 1, 2, 4, 3, in length, the fourth and third subequal and much shorter than the first, the first a little more than four times as long as the carapace. *Tibia of palp* armed below at its distal end with a pair of subequal parallel processes projecting downwards and forwards, the posterior of these hairy, pale coloured, the anterior black, smooth and clavate at the apex.

*Measurements in millimetres.*—Total length 9 ; carapace 3·5, first leg 15, second 14, third 11, fourth 11·5.

*Loc.* Ceylon : Trincomali (*Col. Yerbury*.)

*Oxyopes wroughtoni*, sp. n.

*Colour* and other characters as in *O. birmanicus*, etc., but distinguishable by the form of the generative organs. The plate of the *vulva* is transverse, its posterior border truncate, the depression divided into two by a median partition which is much broader than in *O. javanus*, the two resulting pits being oval. In the ♂ the tibia of the *palpus* is furnished below with a large subconical process somewhat resembling that of *O. birmanicus* but much blacker and more

corneous, its posterior border lightly convex, directed downwards, not obliquely downwards and forwards as in *O. birmanicus*; the process is deeply excavated, the posterior borders of the excavation being strongly raised and bidentate, the anterior border being armed with one tooth, and the superior with two teeth close to the base of the tarsus.

*Measurements in millimetres.*—♀. Total length 11; carapace 3·7, first leg 15, second 14, third 12, fourth 14; patella and tibia of fourth 4·5. ♂. Total length 10; carapace 3·7, first leg 17, second 15, third 13, fourth 15; patella and tibia of fourth 4·5.

*Loc.* Bulsar in S. Guzerat (*R. C. Wroughton*).

Family LYCOSIDÆ.

Genus LYCOSA, Latr.

*Lycosa goliathus*, sp. n.

♀. Allied to *L. phipsoni*, Poc., but much larger, the median band of the carapace covered with golden yellow hairs; mandibles with a patch of fiery red hairs in the upper half; sternum, coxæ and lower side of abdomen jet black; legs black, clothed with golden-grey hairs above, grey hairs below, with some white hairs on the underside of the patellæ and of the middle of the tibia of the fourth leg. *Eyes* of the anterior line slightly procurved, their lower edges in a straight line, the medians a little larger than the laterals. *Vulva* with pit much longer than broad, narrowed in front, the median crest thick, expanded in the middle, with short posterior transverse bar.

*Measurements in millimetres.*—Total length 30; carapace 15, first leg 39, fourth leg 44.

*Loc.* Helvak in Satara (*R. C. Wroughton*).

*Lycosa masteri*, sp. n.

♀. About the same size as *L. phipsoni*, but with the carapace and abdomen more conspicuously banded with greyish-white; coxæ and sternum not black, clear yellowish-brown, clouded with fuscous, the sternum with a broad median fuscous band, anterior legs infuscate below, the femora darker than the coxæ, the tibiæ scarcely distinctly banded, posterior legs redder below, tibia of fourth distinctly, of third less distinctly, banded; lower side of abdomen yellowish-brown, paler than the lateral surface: mandibles clothed externally and above with yellow hairs. *Eyes* of anterior line slightly procurved, less so than in *L. phipsoni* and subequal in size. Pit of *vulva* larger

than in that species, with thinner, more elevated edges, inversely cordate, the median crest angularly expanded in the middle.

*Measurements in millimetres.*—Total length 22 ; carapace 11, first leg 31, fourth leg 35.

*Loc.* Jaoli in Satara (*Master*).

*Lycosa iranii*, sp. n.

♀. Coloured much as in *L. phipsoni*, but the posterior tibiæ not banded, and the hairy clothing on the front of the mandible scanty and grey in tint, not yellow. Posterior median eyes very large, about half a diameter apart and about their own diameter above the edge of the clypeus ; eyes of anterior line slightly procurved, the medians much larger than the laterals. Pit of vulva transversely elliptical, wider than long, the median crest distinct in front, expanding into a broad irregularly quadrate plate, which posteriorly intervenes between the extremities of the right and left edges of the pit.

*Measurements in millimetres.*—Total length 15 ; carapace 8·5, first leg 20, fourth leg 24.

*Loc.* Eastern District of Poona (*Irani*).

*Lycosa prolifica*, sp. n.

♀. Smaller than *L. phipsoni*, but much resembling that species in colour, except that the sternum is noticeably redder than the coxæ. Posterior median eyes very large, less than their diameter above the edge of the clypeus ; eyes of anterior line strongly procurved, the medians larger, their inferior edges above the level of the centres of the laterals. Vulva with its pit wider than that of *L. phipsoni*, with its edges thinner, the cross-bar of the median crest longer.

*Measurements in millimetres.*—Total length 15 ; carapace 7·5, first leg 18·5, fourth leg 22.

*Loc.* Eastern District of Poona, very abundant (*Irani*).

*Lycosa fuscana*, sp. n.

♀. Allied to *L. prolifica*, but less distinctly banded above ; the integument of the legs dark, the femora scarcely paler beneath than the coxæ, sides of abdomen not whitish inferiorly, the tint blending with that of the inferior surface. Vulva with pit narrowly oval, much narrower than in *L. prolifica*.

*Measurements in millimetres.*—Total length 14 ; carapace 8, first leg 20, fourth leg 25.

*Loc.* Eastern District of Poona (*Irani*).

*Lycosa pictula*, sp. n.

♀. Much smaller than the preceding species, ventral surface pale, legs yellowish, banded with black, upper side of abdomen blackish with pale spots. Posterior median *eyes* very large, less than a diameter above the clypeus; eyes of anterior line strongly procurved, medians much larger, their inferior edges about as high as the centres of the laterals. Pit of *vulva* longer than wide, rounded in front, the median crest longer than the cross-bar, lightly incrassate in front.

*Measurements in millimetres.*—Total length 11; carapace 5, first leg 13, fourth leg 18.

*Loc.* Chopda in Eastern Khandesh (*Madan*).

*Lycosa madani*, sp. n.

♀. A little larger than *L. pictula* and more robust, ventral surface pale, legs pale, not banded, dorsal surface normally coloured, mandibles without yellow or red hairs in front. Posterior median *eyes* of medium size, more than their diameter above the edge of the clypeus; eyes of anterior line straight, medians larger, the four as wide as the posterior medians. Pit of *vulva* nearly parallel-sided, concavely truncate in front, the median keel longer than the cross-bar.

*Measurements in millimetres.*—Total length 13; carapace 5·5, first leg 12·5, fourth leg 16.

*Loc.* Chopda in Eastern Khandesh (*Madan*).

*Lycosa yerburyi*, sp. n.

♀. *Colour* very like that of *L. phipsoni*; tibiae of third and fourth legs distinctly banded below, patella and tibia of palpus clothed in front with yellow hairs like the upper half of the mandible. *Eyes* of anterior line slightly procurved, medians larger than laterals, posterior medians about their diameter above the edge of the clypeus. *Vulva* very different from that of the previously-described species, the cross-bar of the median crest curving forwards on each side to form a distinct horseshoe-shaped sclerite.

*Measurements in millimetres.*—Total length 15; carapace 9, first leg 2, fourth leg 22·5.

*Loc.* Ceylon: Trincomali (*Col. Yerbury*).

The females of the foregoing species of *Lycosa* from Western India may be tabulated as follows:—

- A. Ventral surface of abdomen yellowish-brown, paler than the sides.

- $\alpha^1$ . Small, carapace 5.6 mm., integument of legs yellowish.
- $\alpha^2$ . Eyes of anterior line strongly procurved, much narrower than the posterior medians *pictula*.
- $\beta^2$ . Eyes of anterior line straight, as wide as the posterior medians..... *madani*.
- $\beta^1$ . Large, carapace 1.11 mm., integument deep reddish-brown ..... *mastri*.
- B. Ventral surface of abdomen black, darker than the sides.
  - $\alpha^1$ . Eyes of anterior line strongly procurved, the lower edge of the medians standing as high as the centres of the laterals or higher.
  - $\alpha^2$ . Black of ventral surface sharply defined from the pale of the femora and of the sides of the abdomen ..... *prolifera*.
  - $\beta^2$ . Black of ventral surface not sharply defined, femora and sides of abdomen dark ..... *fuscana*.
  - $\beta^1$ . Eyes of anterior line very slightly procurved.
    - $\alpha^2$ . Integument of legs black above and below... *goliathus*.
    - $\beta^2$ . Integument of legs yellowish-brown.
      - $\alpha^3$ . Mandibles clothed with yellow hair in front..... *phipsoni*.
      - $\beta^3$ . Mandibles clothed with grey hair in front..... *irani*.

Family HETEROPODIDÆ.

Genus THELCTICOPIS.

*Thelcticopis hercules*, sp. n.

Colour black; carapace, legs and abdomen clothed with bright yellowish-green hairs, lower side of abdomen black. *Eyes* widely separated, distance between anterior median and anterior lateral about three times as great as that between the two anterior medians, distance between posterior median and posterior lateral only a little less than twice as great as distance between the posterior medians. Tibiæ of anterior two pairs of *legs* armed with 5 anterior and 4 posterior short and overlapping spines. Fang-groove of *mandible* armed below with 5 teeth. Cleft between lobes of *vulva* about half as wide behind as in the middle and in front, tips of the lobes compressed and pointed behind, the posterior end of the median skeletal piece bilobed.

*Measurements in millimetres.*—Total length 24 ; carapace 10.

*Loc.* Ceylon : Peradenia in the botanical garden (*Freeman*).

*Thelcticopis ajax*, sp. n.

*Colour* of carapace and legs deep blackish-brown ; clothed like the abdomen with greyish-brown hairs. Anterior median *eyes* about half as far from each other as from the laterals ; posterior eyes unequally spaced, the medians nearer each other than to the laterals. Fang-groove of *mandible* armed with 7 or 8 teeth behind. Tibiæ of anterior *legs* furnished with 5 pairs of long spines, with sometimes an additional spine at the apex in front. *Vulva* consisting of a convex black horny plate of which only the posterior third is cleft ; the space is broader in front than behind, is bounded laterally by a pair of smooth posteriorly converging lobes, is divided throughout its length by a median longitudinal crest at the base of which on each side there is a rounded prominence.

*Measurements in millimetres.*—Total length 23 ; carapace 10.

*Loc.* Ootacamund, S. India (*Hampson*).

*Thelcticopis virescens*, sp. n.

♂. *Colour* of integument deep brownish-red, clothed with yellowish-green pubescence, abdomen covered above with greenish-grey pubescence, median area of lower surface black, pulmonary opercula yellow. *Carapace* as long as patella and tibia of third leg ; *eyes* of posterior line slightly procurved, medians four diameters apart and six diameters from the laterals ; anterior medians less than a diameter apart and more than twice as far from the laterals. Fang-groove armed behind with 5 teeth. Tibiæ of first and second *legs* with 5 pairs of short inferior spines. Apophysis of tibia of *palp* short, divided distally into three short subequal processes.

*Measurements in millimetres.*—Total length 17 ; carapace 8, first leg 29, second 28, third 22, fourth 27.

*Loc.* Trivandrum in Travancore, S. India (*Ferguson*).

*Thelcticopis rufulus*, sp. n.

♂. *Colour* of carapace and mandibles castaneous ; legs, sternum and coxæ ochre-yellow, the hairs covering these parts apparently yellowish or greyish-white ; abdomen dirty yellowish-grey, variegated at the sides with black spots, and with a median dorsal band consisting of a series of black spots.

*Carapace* about as long as patella and tibia of third leg ; posterior median *eyes* nearer to each other than either is to the lateral ; eyes of anterior line subequally spaced. Fang-groove of *mandible* armed behind with 5 teeth. Tibia of first and second *legs* with 6 pairs of inferior spines ; of third and fourth with 3 pairs. Tibia of *palp* armed externally with a double process, the upper branch short, thinner and pointed, the lower much larger, stouter and bent downwards ; tarsus of palp large, oval, with a conspicuous external basal angular prominence which fits into the space between the two branches of the tibial process.

*Measurements in millimetres*.—Total length 12 ; length of carapace 6, width 5 ; of second leg 19, of third leg 15, of fourth leg 19.

*Loc.* Nilgiri Hills (*E. W. Oates*).

*Thelcticopis bicornutus*, sp. n.

♂. *Colour* nearly black, clothed with yellowish-grey hairs ; abdomen ornamented above—especially behind—with narrow transverse darker stripes ; its ventral surface not noticeably darker in the middle.

Structurally nearly allied to *T. virescens*, but with the anterior line of eyes straighter, the superior edge of the laterals on a level with the centres of the medians, the medians less than a diameter apart, and a little more than a diameter from the laterals. *Mandibles* armed below with 4 irregularly-spaced teeth ; spine-armature of *tibiæ* as in *T. virescens*. Tibial apophysis of *palp* very large, rising from the whole of the external side of the segment and ending distally in two branches, the upper broad at the base, striate and running out into a tolerably straight almost thread-like termination, the lower short, blunt, and forming a nearly semi-circularly incurved hook.

*Measurements in millimetres*.—Total length 17 ; length of carapace 9 ; length of first leg 27, of second 28, of third 23, of fourth 28.

*Loc.* Assam : Naga Hills.

Genus SPARASSUS, Latr.

*Sparassus xerxes*, sp. n.

♀. Allied to *S. walckenaerii*. *Colour* of carapace and legs mahogany brown above and below, clothed with whitish-yellow hairs, mandibles black, clothed with white hair at base ; under side of *tibiæ* with a subapical fuscous band in the distal half ; abdomen olive-yellow above, whitish at the sides, black in the middle line below, or at all events with

a transverse black stripe behind the epigastric fold, a large clear yellow spot on each side of the epigastric area. *Carapace* longer than wide, head region narrow, its width about one-half the length of the carapace; the eyes compact, those of anterior line sub-equal, the anterior medians almost touching the anterior laterals, about a radius from each other and a diameter above the edge of the clypeus. *Legs* not very unequal, 2, 4, 1, 3 in length. Lateral lobes of *vulva* in contact throughout their length, a pellucid heart-shaped area in front of them.

♂. Like ♀ in colouring. *Palpus* with its tibia and patella armed externally with spines; tibial spur long and broad at base, apically sub-filiform; directed downwards so that its axis forms an obtuse angle of about  $100^{\circ}$  with the axis of the tibia; tarsus evenly oval, about twice as long as wide.

*Measurements in millimetres.*—♀. Total length 30, carapace 11.5, of first leg 45, of second 47, of third 41, of fourth 46. ♂. Total length 24, carapace 11, of first leg 53, of second leg 56, of third leg 44, of fourth 48.

*Loc.* Omara on the Mekran coast, 130 miles west of Karachi (*F. W. Townsend*); also Bushire on the Persian Gulf.

*Sparassus maynardi*, sp. n.

♀. Nearly allied to the ♀ of *S. xerxes* but smaller and of a tolerably uniform flavous or ochreous colour above and below, tibiæ of legs not banded. *Eyes* of anterior line slightly recurved, the medians a little larger than the laterals. *Vulva* with its two plates longer and meeting in a longer suture than in *S. xerxes*.

♂. Resembling the ♀ in colour. Tibial spine of *palpus* and palpal organ much like those of *S. xerxes*.

*Measurements in millimetres.*—♀. Total length 21; length of carapace 9, of first leg 37, of second 40, of third 35, of fourth 38. ♂. Length of carapace 7; second leg 39, of fourth 38.

*Loc.* Jacobabad (*H. M. Phipson*), Northern Baluchistan (*Maynard* and *Macmahon*).

*Sparassus pyrozonis*, sp. n.

♀. *Colour* of carapace, sternum, coxæ, and upper and under sides of abdomen as in *S. senilis*, *S. punctipes*, var. *sordidatus*, and apparently *S. hirtus*; but differing in the colouring of the legs. The basal black band on the femora extends over nearly one-third of the segment, there is also a black band at the tip, but the hairs on the rest of the

segment below and in front are not white but a beautiful orange-red, becoming greyer above and spotted with black; the tibiæ are white with a basal black band extending on to the patella, a distal narrow black band and a black spot at the base of each spine, the dorsal side being irregularly spotted.

*Carapace* longer than wide; a little shorter than tibia of second leg and patella and tibia of third; its width about equal to first tibia; *eyes* of posterior line slightly procurved; of anterior line sub-equal and sub-equally spaced, about a diameter apart.

*Legs* much the same on as in *S. lamarekii*.

Cleft of *vulva* sub-elyptical, narrower in front, not so triangular as in *S. lamarekii*.

*Measurements in millimetres*.—Total length 25; length of carapace 11, width 10; length of first leg 44, of second 48·5, of third 35, of fourth 39.

*Loc.* Sylhet in Assam.

*Sparassus hampsoni*, sp. n.

♀. *Colour* mostly resembling that of *S. lamarekii*, but with the femora of the legs uniformly yellowish-white below, not spotted; a narrow mesial black band on the tibiæ, the coxæ black like the sternum, the black of the lower side of the abdomen extending all over the epigastric area, and the whole of the upper side of the abdomen beautifully variegated with symmetrically arranged yellow spots and black stripes. *Carapace* about equal to tibia of second leg and to patella and tibia of third. *Legs* of first and second pair nearly equal in length.

*Vulva* larger than in *S. lamarekii*; its lateral lobes widely separated, diverging, not converging anteriorly, the intervening space occupied by a smooth amber-coloured median sclerite.

*Measurements in millimetres*.—Total length 16; length of carapace 7·5, width 7; length of first leg 28, of second 29, of third 22, of fourth 24.

*Loc.* Nilgiri Hills (*G. F. Hampson*).

*Sparassus fuligineus*, sp. n.

♀. Nearly allied to *S. lamarekii* and *S. hampsoni*, and especially to the latter in the form of the *vulva*, but at once recognisable from both by having the legs a uniform olive-black above and below and no distinct pattern on the abdomen, which like the carapace and limbs is covered with olive-black hairs. The median ventral surface of the abdomen is black as in *S. lamarekii* and *S. hampsoni*, the black area

defined by a narrow pale line. *Vulva* practically identical with being that of *S. hampsoni*. Total length 20 millimetres.

*Loc.* Jaoli in Satara (*Master*).

*Sparassus admiratus*, sp. n.

♀. *Colour* of carapace yellowish-red, darker on the head, covered with greyish-yellow hairs, the facial area, mandibles, palpi, mouth parts, sternum and coxæ jet black, legs bright yellowish-red, covered with golden yellow hairs, a black band at the extremity of the femora and the base of the tibiæ; protarsi and tarsus black; abdomen olive-yellow, covered with golden hair, the middle ventral line marked with a narrow lanceolate longitudinal black band; dorsal surface with a pair of black patches in front and a Y-shaped median black stripe behind; the elliptical area between the forks of the Y and the two black patches pale yellow. *Carapace* as wide as long; *eyes* like those of *S. lamarckii* but smaller, and hence appearing to be further apart. Lateral lobes of *vulva* diverging behind, the area between them occupied by a pellucid anteriorly-bilobed sclerite. Total length 20 millimetres; carapace 10.

*Loc.* Bombay (*H. M. Phipson*).

*Sparassus iranii*, sp. n.

♀. *Colour* of carapace reddish, blackish on the head, thickly clothed like the legs, abdomen, mouth parts and sternum with a coating of tolerably uniformly greyish hairs, face and mandibles black, labium and maxilla deep brown; legs uniformly pale, with base of tibia and adjacent area of patella black; abdomen without distinct pattern, no black on its median ventral area. *Carapace* longer than wide, head broad, its width much greater than half the length of carapace; *eyes* as in *S. lamarckii*, but further apart and smaller. *Vulva* very large, its lateral lobes united in front, separated throughout their length behind, the two together forming a somewhat horseshoe-shaped curve, the area between them occupied by an anteriorly clavate sclerite. Total length 22; carapace 12, its width 10.5.

*Loc.* Khost in Baluchistan (*Smith*); Poona District (*Irani* type); Nagpur.

*Sparassus pearsoni*, sp. n.

♀. *Colour* of head reddish-brown, legs, coxæ and sternum yellowish-brown, abdomen greyish-olive, mandible black, the whole (except the lower end of the mandibles) covered with a coating of tolerably uniform

greyish-white or greyish-yellow hairs; no black markings on body or limbs. *Carapace* longer than wide; anterior median *eyes* longer than anterior laterals, about a radius from each other and rather less than a radius from the laterals, clypeus equal to the diameter of the anterior median eyes. *Legs* short and not very unequal in length, 2, 4, 1, 3, the third reaching almost to the tip of the protarsus of the second when extended. Lobes of *vulva* in contact posteriorly and forming a long median suture, anteriorly their edges diverge and circumscribe a space which is occupied by a heart-shaped skeletal jet black piece. Total length 21; carapace 9·5, first leg 31, second 34, third 30, fourth 33.

*Loc.* Poona Ghats; Eastern Khandesh (*Madan*); Pimpalner in W. Khandesh (*Pearson*).

*Sparassus obesulus*, sp. n.

♀. *Colour* of carapace yellowish-red marked with radiating patches and clothed with silky golden hairs; face and mandibles black, legs and palpi deep reddish-brown, femora paler, sternum yellow, labium and maxillæ infuscate; abdomen clothed with silky yellow hairs, mottled with dark spots above, and marked with a median fuscous laterally dentate stripe. *Carapace* short, as wide as long; eyes of anterior line straight by their centres, medians much larger, nearly a diameter apart, and about a radius from the laterals and from the edge of the clypeus, laterals about a diameter above the edge of the clypeus. *Legs* 2, 1, 4, 3, first longer than fourth by its tarsus; third not reaching middle of protarsus of second. *Vulva* with its lateral lobes smooth, shining, in contact throughout, broader behind than in front, piriform, passing anteriorly into a black horny rugose area.

*Measurements in millimetres.*—Total length 13·5; length of carapace 5·5, first leg 21, second leg 24, third leg 18, fourth leg 20.

*Loc.* E. Poona (*Wroughton and Irani*).

*Sparassus rotundiceps*, sp. n.

♀. *Colour* of integument pale castaneous, covered with yellow hairs; clypeus, sternum and mandibles dark brown; protarsus and tarsi infuscate. *Carapace* about as broad as long, as long as tibia of first leg; eyes of anterior line straight by their centres, medians larger, about a diameter apart, and less than that from the laterals, which are about their own diameter above the clypeus. *Legs* 2, 1, 4, 3, third only a little surpassing tibia of second. *Vulva* with its right and left halves divided by

a median transverse slit into an anterior semi-circular striate portion which along its convex edge is nearly in contact with its fellow of the opposite side and of a posterior piece which meets its fellow behind, but is in front separated by a wide heart-shaped space.

♂. Like the ♀ in colour; *legs* longer. Tibia of *palpus* armed with two apophysis, a basal and an apical, the latter is pointed, lightly sinuous, directed downwards and outwards from the base, with its upper edge serrate in its basal half; the basal is directed forwards and slightly upwards, and gradually tapers to a simple bluntly-rounded tip.

*Measurements in millimetres.*—♀. Total length 11, carapace 4·5, of first leg 18·5, of second 21, of third 15, of fourth 16. ♂. Total length 10, carapace 4·5, of first leg 24, of second 27, of third 19, of fourth 20.

*Loc.* Ootacamund, S. India (*Hampson*).

*Sparassus milleti*, sp. n.

♂. *Colour* uniformly pale, above, below, and on the appendages; clothed with yellowish hair. *Carapace* longer than broad, its cephalic region narrowed, less than half the length of the whole carapace, ocular quadrangle square; eyes of posterior line straight, subequal, the medians about three diameters apart and two diameters from the laterals; eyes of anterior line almost straight by their centres, medians much larger than laterals, a diameter apart and barely half a diameter from the laterals. *Palpus* with patella and tibia not spined; tibial apophysis small, hooked, its basal portion directed outwards almost at right-angles to the axis of the tibia, its apical third pointed, curving straight forwards. *Legs* very long and slender (see measurements).

*Measurements in millimetres.*—Total length 8; carapace 4·5, first leg 29, second 36, third 21, fourth 24.

*Loc.* Nasik (*Millet*).

*Sparassus greeni*, sp. n.

Allied to *S. impudicus*. *Colour* of carapace, mandibles, sternum, coxæ and legs uniformly yellowish-brown, carapace covered with silky yellow hairs, protarsi and tarsi infuscate; abdomen pale above and below and covered with yellow hairs, its sides and posterior extremity above spinners ornamented with a broad blackish-green band. *Carapace* as wide as long, shorter than tibia of second leg. *Legs* of third pair very short, not overlapping apex of tibia of second. *Vulva* with median skeletal

piece horny, blackish, and completely filling up the space between the lobes; near the middle of its area there is a large wide depression, which is furnished anteriorly with a pair of horny ridges.

*Measurements in millimetres.*—Total length 15; carapace 8, first leg 28, second 32, third 21, fourth 24.

*Loc.* Ceylon; Punduloya (*Green*).

Genus HETEROPODA, Latr.

*Heteropoda hampsoni*, sp. n.

♀. *Colour*: Darker and more variegated than in *H. venatoria*; the yellow band on clypeus extending on to the sides of the head, and with fine radiating pale lines on the upper side of the carapace; upper side of legs banded, especially on the femora, tibiæ with two bands below, abdomen mottled with black above and at the sides, the upper side with a pair of pale median sigilla spots, and three indistinct pale patches forming a transverse band in the posterior half, lower side of abdomen uniformly blackish-brown, the pulmonary opercula yellow, and two fine pale lines running backwards from the genital fold and defining the dark median area. *Carapace* longer in proportion to its width than in *H. venatoria*, considerably longer than wide; the length exceeding that of tibia of third leg; equal to that of first and to protarsus of second leg; width almost equal to length of tibia of third leg; *eyes* practically the same as in *H. venatoria*.

*Mandibles* and *palpi* armed as in *H. venatoria*. *Legs* shorter and relatively stouter than in *H. venatoria*, with the same spine armature; third leg as long as the fourth, and surpassing the middle of the protarsus of the second.

*Vulva* larger than in *H. venatoria*, the lateral lobes separated by a narrow median sclerite.

*Measurements in millimetres.*—Total length 29; length of carapace 13, width 10.5; width of head 6.5; length of first leg 49, of second 53, of third 44, of fourth 44, tibia of third 11.

*Loc.* Ootacamund (*G. F. Hampson*).

*Heteropoda nilgirina*, sp. n.

*Colour*: Much resembling that of *H. venatoria*, but the sternum darker; the white clypeal band much less distinct, the mandibles deep-shining black; abdomen mottled above and at the sides with rusty-brown spots.

*Carapace* of about the same form as in *H. venatoria*, but with the head a little narrower, the width a little less than the total length of the carapace; *eyes* of anterior line closer together, more procurved, the quadrangle narrower in front; the anterior medians only about half the diameter of the anterior laterals, the lower edges about on a level with the centre of the laterals.

*Legs* with spine armature as in *H. venatoria*, but with a spine on the distal half of the upper side of the third tibia; third leg relatively longer than in *H. venatoria*, surpassing the middle of the protarsus of the second, the fourth not surpassing it by the length of its tarsus.

*Vulva* larger than in *H. venatoria*; the lobes widely separated by a broad median sclerite, which is posteriorly marked by a median elliptical excavation.

*Measurements in millimetres.*—♀. Total length 27; length of carapace 11.5, width 10.5; width of head 5.5; length of first leg 49, of second 54, of third 44.5, of fourth 46.5, tibia of third leg 12.

♂. Much resembling the ♂ of *H. venatoria* in colour and structural characters, but with the anterior median eyes only about half the diameter of the laterals, a much less noticeable white band upon the clypeus, and the legs considerably longer, the first being about  $5\frac{1}{2}$  times the length of the carapace; carapace about three-quarters the length of the tibia of third leg. Tibia of first, second and third with two superior spines, of fourth with one distal superior spine; patella of fourth unspined. Tibial apophysis of *palpus* longer, clavate and truncate apically, with the lower border concave, and the inferior distal angle subacute; tarsus of *palpus* more voluminous, externally angular at base.

*Measurements in millimetres.*—♂. Total length 16; length of carapace 8, width 7; length of first leg 45, of second 51, of third 39, of fourth 40.5; tibia of third 10.5.

*Loc.* Nilgiri Hills (*E. W. Oates*); Coonoor (*W. Davison*); Ootacamund (*G. F. Hampson*); Kotagiri (*J. R. Henderson*).

*Heteropoda lentula*, sp. n.

♀. Much resembling *H. nilgirina* in the form of the vulva, but smaller, with the carapace higher, the mandibles not black but pale, with two fuscous bands, and the legs considerably shorter; the carapace being longer than the tibia of the second leg, while the latter is only about three and-a-half times the length of the carapace.

♂. Differing from that of *H. nilgirina* in being smaller, in having pale and striped mandibles, and in the form of the tibial apophysis, the lower edge of which is more abruptly emarginate, with the inferior distal angle produced into a distinct tooth-like prominence.

*Measurements in millimetres.*—Total length 15; carapace 6·5; first leg 21, second 24, third 19, fourth 21. ♂. Total length 11; carapace 5·5; first leg 27, second 31, third 25, fourth 26·5.

*Loc.* S. India: Ponmudi in Travancore ( *Ferguson* ), Tinnevely ( *Barber* ).

Family THOMISIDÆ.

Genus ANGÆUS, Thorell.

*Angæus pentagonalis*, sp. n.

*Colour* of carapace reddish-brown with two darker bands, clothed with a thick coating of yellowish-grey hairs, clypeus and mandibles nearly black, much more scantily clothed with pale hairs, anterior legs deep reddish-brown, posterior paler, banded with brown, clothed with pale hairs, dark at the base of the spines; abdomen testaceous, marbled with black, clothed with silky-yellow hairs above and below. *Carapace* a little longer than broad, moderately high, flat above longitudinally behind the posterior eyes; *eyes* of posterior line subequally spaced, medians smaller than laterals and about four diameters apart; crest above anterior eyes prominent and furnished with a tuft of hair at the angles; eyes of anterior line subequally spaced, laterals standing much higher, so that a line touching their inferior edges would just cut the upper half of the laterals; height of clypeus in middle about equal to distance between anterior median eyes, height at sides about equal to twice the diameter of the lateral eye. *Fang-groove* of *mandible* armed with 3 strong teeth behind and 3 in front. *Legs* 1, 2, 4, 3, first and second sub-equal, first leg nearly four times as long as carapace; *tibia* of first and second armed beneath with 4 pairs, *protarsi* with 2 pairs of long spines, *tibiæ* and *protarsi* with 2 anterior and 2 posterior spines as well, *tibiæ* and *protarsi* of third and fourth armed with a few spines in front and behind: legs, especially the femora, more or less tubercular and tufted above. *Abdomen* pentagonal, widest behind the middle, as wide as long, furnished above with two rows of tufts in its posterior half and others at the sides. *Vulva* consisting of a pair

of lobes or ridges, inclined posteriorly at an angle and enclosing a small sclerite shaped like an arrow-head.

*Measurements in millimetres.*—Total length 9 ; length of carapace 3·5 ; length and width of abdomen 5 ; length of first leg 13.

*Loc.* S. India, Nilgiri Hills (*G. F. Hampson*).

Family CRYPTOHELIDÆ.

*Cryptothele collina*, sp. n.

*Colour* of a uniform yellowish or muddy-brown above and below. *Carapace* high, much higher behind than in front, abruptly sloped away behind and at the sides, ocular region distinctly elevated, a deep depression behind the posterior eyes ; *eyes* of anterior pair the largest, considerably more than a diameter apart, the median quadrangle more than twice as long as wide, parallel-sided. *Abdomen* as wide as long. *Vulva* wider than long, consisting posteriorly of a pair of horny lobes meeting in the middle line and enclosing a space occupied by a small median heart-shaped sclerite. *Legs* short. subequal.

*Measurements in millimetres.*—Total length 10 ; length of carapace 4·5.

*Loc.* S. India : Ootacamund (*G. F. Hampson*).

According to the description *Cryptothele ceylonica*, O. P. Cambridge (Proc. Zool. Soc. Lond., 1877, p. 563, pl. LVI, fig. 4) differs from the preceding in the following particulars :—Size very much smaller, carapace not noticeably elevated behind ; ocular tubercle low, no depression behind it : eyes of anterior pair a diameter apart, median ocular quadrangle not twice as wide as long. Total length 4 mm.

## THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN  
"THE FAUNA OF BRITISH INDIA."

## SERIES II. PART III.

BY SIR G. F. HAMPSON, BART., F.Z.S., F.E.S.

(Continued from page 235 of this Volume).

## ARCTIADÆ.

## ARCTIANÆ.

1175a. *SPILOSOMA ALBICORNIS*, n. sp.

♂. Head and thorax bright red-brown, tinged with crimson, especially on frons; antennæ with the shaft and branches white above; palpi black at tips, crimson at base; pectus and legs crimson, the tibiæ and tarsi black; abdomen crimson, with dorsal, subdorsal, sublateral and ventral series of black spots. Forewing bright red-brown; a black spot at upper angle of cell; the postmedial line excurved from costa to vein 4, then strongly incurved, below vein 2 reduced to a spot above vein 1; small double spots on veins 2 and 5. Hindwing crimson, slightly tinged with fuscous towards costa; a discoidal black spot; a subterminal series of spots, the two towards tornus larger.

*Habitat.*—Ceylon (Mackwood). *Exp.* 54 mill. *Type*—In B. M.

1197. *THYRGORINA SIKKIMENSIS*.

♂. Head and thorax greyish-fuscous; antennæ and greater part of legs black; neck with some crimson; abdomen crimson above, the base brownish; dorsal and lateral series of black spots, the ventral surface whitish. Forewing greyish-fuscous, the veins pale; an obscure, curved, dark, antemedial line; a similar postmedial line bent inwards below vein 3; three obscure subterminal spots. Hindwing blackish-fuscous, with traces of a sinuous postmedial line and of some subterminal spots.

*Habitat.*—Sikkim; Khâsis. *Exp.* ♂ 32; ♀ 44 mill.

## LITHOSIANÆ.

## KEY TO THE GENERA.

A. Forewing with vein 5 absent.

a. Hindwing with vein 5 absent.

$a^{\frac{1}{2}}$ . Forewing with vein 4 absent ..... *Neoblavia*.

$b^1$ . Forewing with vein 4 present.

$a^2$ . Hindwing with vein 2 stalked with 3 ..... *Rhanghana*.

$b^2$ . Hindwing with vein 2 from the cell.

$a^3$ . Forewing with vein 7 stalked with 8.

$a^4$ . Forewing with vein 7 from 8 beyond 9.

$a^5$ . Forewing with vein 2 curved at base.

$a^6$ . Forewing with vein 10 stalked with

7·8·9, ..... *Siculifer*.

$b^6$ . Forewing with vein 10 from the cell *Lexis*.

- b*<sup>5</sup>. Forewing with vein 2 oblique.
- a*<sup>6</sup>. Hindwing with vein 4 absent in ♂, present in ♀ ..... *Nishada*.
- b*<sup>6</sup>. Hindwing with vein 4 present in ♂ ..... *Gampola*.
- b*<sup>4</sup>. Forewing with vein 7 from 8 before 9, or 9 absent.
- a*<sup>5</sup>. Hindwing with vein 4 absent.
- a*<sup>5</sup>. Forewing with vein 11 anastomosing with 12 ..... *Poliosia*.
- b*<sup>6</sup>. Forewing with vein 11 free ..... *Lobobasis*.
- b*<sup>5</sup>. Hindwing with vein 4 present.
- a*<sup>6</sup>. Forewing with vein 2 from towards end of cell oblique ..... *Phryganopsis*.
- b*<sup>6</sup>. Forewing with vein 2 from middle of cell, curved at base.
- a*<sup>7</sup>. Hindwing with the cell open, a recurrent vein in cell ..... *Chrysorhabdia*.
- b*<sup>7</sup>. Hindwing with the cell closed, no recurrent vein in cell.
- a*<sup>8</sup>. Forewing with vein 10 stalked with 7·8·9 ..... *Mithuna*.
- b*<sup>8</sup>. Forewing with vein 10 from the cell ..... *Ilema*.
- b*<sup>8</sup>. Forewing with vein 7 stalked with 6 ..... *Conosia*.
- b*. Hindwing with vein 5 present.
- a*<sup>1</sup>. Forewing with vein 11 anastomosing with 12. *Neasura*.
- b*<sup>1</sup>. Forewing with vein 11 free.
- a*<sup>2</sup>. Forewing with vein 10 stalked with 7·8, 9 absent. .... *Pseudoblabe*.
- b*<sup>2</sup>. Forewing with vein 10 from the cell.
- a*<sup>3</sup>. Forewing with vein 6 stalked with 7·8 ... *Padenia* (♂).
- b*<sup>3</sup>. Forewing with vein 6 from the cell..... .. *Garudinia*.
- B.** Forewing with vein 5 present.
- a*. Hindwing with vein 5 absent, coincident with 4.
- a*<sup>1</sup>. Forewing with vein 7 stalked with 8, or 8·9 absent.
- a*<sup>2</sup>. Forewing with vein 9 stalked with 7·8, or absent.
- a*<sup>3</sup>. Forewing with vein 5 stalked with 4 ..... *Tortricosia*.
- b*<sup>3</sup>. Forewing with vein 5 from the cell.
- a*<sup>4</sup>. Forewing with vein 7 from 8 beyond 9. *Pachycerosia*.
- b*<sup>4</sup>. Forewing with vein 7 from 8 before 9.
- a*<sup>5</sup>. Hindwing with veins 3·4 stalked.

- a*<sup>6</sup>. Proboscis aborted; frons with rounded prominence..... *Dohertya*.  
*b*<sup>6</sup>. Proboscis fully developed; frons not prominent ..... *Adrepsa*.  
*b*<sup>5</sup>. Hindwing with vein 3 from the cell, *Chryscæglia*.  
*b*<sup>3</sup>. Forewing with vein 9 from 10 anastomosing with 8 to form the areole ..... *Lithosia*.  
*b*<sup>1</sup>. Forewing with veins 6·7 and 8·9 stalked.  
*a*<sup>2</sup>. Forewing with vein 11 anastomosing with 12 *Eugoa*.  
*b*<sup>2</sup>. Forewing with vein 11 free ..... *Cyclosiella*.  
*c*<sup>1</sup>. Forewing with veins 6·7 stalked, 8·9 from cell. *Hemonia*.  
*b*. Hindwing with vein 5 present.  
*a*<sup>1</sup>. Forewing without an areole.  
*a*<sup>3</sup>. Forewing with vein 9 stalked with 7·8 or 8·9 absent.  
*a*<sup>5</sup>. Forewing with vein 7 from 8 beyond 9 ...  
*a*<sup>4</sup>. Forewing with vein 10 stalked with 7·8·9 ..... *Cyclomilla*.  
*b*<sup>4</sup>. Forewing with vein 10 from the cell.  
*a*<sup>6</sup>. Proboscis aborted ..... *Nephelomilla*.  
*b*<sup>5</sup>. Proboscis present.  
*a*<sup>6</sup>. Hindwing with vein 5 obsolescent from just below angle of disco-cellulars ..... *Chioncema*.  
*b*<sup>6</sup>. Hindwing with vein 5 fully developed from well below angle of disco-cellulars.  
*a*<sup>7</sup>. Hindwing with veins 3·4 stalked or coincident.  
*a*<sup>8</sup>. Forewing with veins 4·5 stalked *Scaptelyle*.  
*b*<sup>8</sup>. Forewing with vein 5 from the cell.  
*a*<sup>9</sup>. Palpi upturned.  
*a*<sup>10</sup>. Hindwing with veins 3·4 coincident.  
*a*<sup>11</sup>. Hindwing with vein 5 from angle of cell.  
*a*<sup>12</sup>. Forewing thinly the costa scaled, strongly arched at base ..... *Costarcha*.  
*b*<sup>12</sup>. Forewing thickly scaled ..... *Sivcia*.

- $\delta^{11}$ . Hindwing with vein 5  
 from well above  
 angle of cell ..... *Halone*.  
 $b^{10}$ . Hindwing with veins 3'4  
 stalked..... *Macaduma*.  
 $\delta^9$ . Palpi porrect,  
 $a^{10}$ . Forewing with the costa  
 excised towards apex,  
 the termen above and  
 below middle ..... *Oxacme*.  
 $b^{10}$ . Forewing with the shape  
 normal.  
 $a^{11}$ . Hindwing with vein 2  
 near angle of cell ..... *Utriculifera*.  
 $b^{11}$ . Hindwing with vein 2  
 from long before angle  
 of cell ..... *Eurosia*.  
 $b^7$ . Hindwing with vein 3 from the cell.  
 $a^8$ . Forewing with vein 10 from close  
 to 11..... *Ovipennis*.  
 $b^8$ . Forewing with vein 10 from towards  
 end of cell ..... *Stictane*.  
 $\delta^8$ . Forewing with vein 7 from 8 before 9, or 9  
 absent.  
 $a^4$ . Hindwing with vein 3'4 stalked or coincident.  
 $a^5$ . Forewing with vein 9 absent.  
 $a^6$ . Forewing with vein 11 anastomosing with 12 *Pareugoa*.  
 $b^6$ . Forewing with vein 11 free.  
 $a^7$ . Forewing with veins 3'4'5 stalked..... *Eucyclopera*.  
 $b^7$ . Forewing with veins 4'5 stalked, 3 from  
 cell..... *Padenia* (♀).  
 $c^7$ . Forewing with veins 3'4'5 from the  
 cell ..... *Narasodes*.  
 $\delta^6$ . Forewing with vein 9 present,  
 $a^6$ . Forewing with vein 11 anastomosing  
 with 12.  
 $a^7$ . Forewing with veins 10'11 stalked ..... *Machairophora*.  
 $b^7$ . Forewing with veins 10'11 from cell..... *Thumatha*.  
 $b^6$ . Forewing with vein 11 free..... *Æolosia*.  
 $b^4$ . Hindwing with vein 3 from, or from close to,  
 angle of cell.  
 $a^5$ . Forewing with vein 11 anastomosing with 12.  
 $a^6$ . Forewing with veins 10'11 stalked ..... *Asuridia*.  
 $b^6$ . Forewing with veins 10'11 from cell.

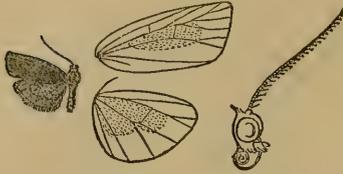
- a*<sup>7</sup>. Palpi upturned ..... *Hypostoccia*.  
*b*<sup>7</sup>. Palpi porrect ..... *Asura*.  
*b*<sup>5</sup>. Forewing with vein 11 free.  
*a*<sup>5</sup>. Forewing with veins 10·11 from a point  
or shortly stalked ..... *Idopterum*.  
*b*<sup>5</sup>. Forewing with veins 10·11 well separated.  
*a*<sup>7</sup>. Forewing with vein 2 strongly curved  
at base ..... *Ceonistis*.  
*b*<sup>7</sup>. Forewing with vein 2 oblique.  
*a*<sup>8</sup>. Palpi upturned..... *Parasiccia*.  
*b*<sup>8</sup>. Palpi porrect..... *Mitochrista*.  
*c*<sup>4</sup>. Hindwing with vein 3 from well before angle  
of cell.  
*a*<sup>5</sup>. Forewing with vein 11 anastomosing with 12. *Xanthocraspeda*.  
*b*<sup>5</sup>. Forewing with vein 11 becoming coinci-  
dent with 10..... *Hemipsilia*.  
*c*<sup>5</sup>. Forewing with vein 11 free.  
*a*<sup>6</sup>. Antennæ with the basal joint very long ... *Chamaita*.  
*b*<sup>6</sup>. Antennæ with the basal joint moderate.  
*a*<sup>7</sup>. Forewing with vein 6 stalked with 7·8... *Nudaria*.  
*b*<sup>7</sup>. Forewing with vein 6 from the cell..... *Palæopsis*.  
*b*<sup>2</sup>. Forewing with veins 9·10 stalked.  
*a*<sup>3</sup>. Hindwing with veins 6·7 coincident..... *Meteugoa*.  
*b*<sup>3</sup>. Hindwing with veins 6·7 stalked.  
*a*<sup>4</sup>. Forewing with veinlets between vein 12 and  
the costa ..... *Schistophleps*.  
*b*<sup>4</sup>. Forewing without veinlets between vein 12  
and the costa.  
*a*<sup>5</sup>. Palpi oblique ; frons with large tuft..... *Holocruspedum*.  
*b*<sup>5</sup>. Palpi porrect ; frons without tuft..... *Scæodora*.  
*c*<sup>2</sup>. Forewing with veins 6·7 and 8·9 stalked.  
*a*<sup>3</sup>. Forewing with veins 4·5 stalked ..... *Trischalis*.  
*b*<sup>3</sup>. Forewing with veins 4·5 from the cell..... *Philenora*.  
*d*<sup>2</sup>. Forewing with veins 6·7 from the cell ..... *Tropacme*.  
*e*<sup>2</sup>. Forewing with vein 9 from the cell.  
*a*<sup>3</sup>. Forewing with veins 6·7 stalked, 8 absent ..... *Gymnochroma*.  
*b*<sup>3</sup>. Forewing with vein 6 from the cell, 7·8 stalked... *Diduga*.  
*b*<sup>1</sup>. Forewing with an areole.  
*a*<sup>2</sup>. Palpi upturned.  
*a*<sup>3</sup>. Forewing with veins 9·10 anastomosing with  
8 from the areole ..... *Agrisius*.  
*b*<sup>3</sup>. Forewing with vein 9 from 10 anastomosing  
with 8 from the areole..... *Agylla*.  
*b*<sup>2</sup>. Palpi porrect ..... *Paraona*.

Genus NEOBLAVIA.

Type.

*Neoblavia*, Hmps. Cat. Lep. Phal. B. M. II., p. 105 (1900)..... *scoteola*.

Proboscis fully developed; palpi porrect, hardly reaching beyond the frons; antennæ of male with bristles and cilia; tibiæ with the spurs moderate. Forewing narrow; veins 2·3 stalked; 4·5 absent; 6 shortly stalked with 7·8·9; 10 free; 11 given off at right angles to cell and becoming coincident with 12; male with a large elliptical patch of androconia



*Neoblavia scoteola* ♂  $\frac{1}{2}$ . Hindwing with vein 2 from near angle of cell; 3·4 coincident; 5 absent; 6·7 stalked; 8 from middle of cell; a large patch of androconia in, beyond, and below the cell.

1379a. NEOBLAVIA SCOTEOLA, Hmps., Cat. Lep. Phal. B. M. II., p. 105.

♂. Black-brown. Forewing with a few grey scales in the patch of androconia in cell. Hindwing with the patch of androconia rather redder-brown; the terminal area somewhat greyish, the cilia yellowish.

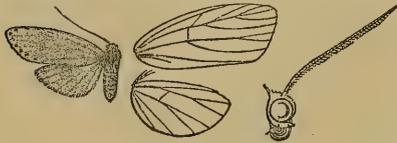
*Habitat*.—Sikhim 2,600' (Pilcher). *Exp.* 18 mill.

Genus RHANGHANA.

Type.

*Rhanghana*, Moore, P. Z. S. 1878, p. 22 ..... *punctata*.

Proboscis fully developed; palpi porrect, not reaching beyond the frons; antennæ of female ciliated; tibiæ with the spurs short. Forewing long and narrow; the cell less than half the length of wing; vein 2 from angle, curved at base; 3·4 on a long stalk; 5 absent; 6·7·8·9·10·11 stalked,



*Rhanghana punctata* ♀  $\frac{1}{2}$ . 11 anastomosing with 12. Hindwing with the cell short; veins 2·3 stalked; 4·5 absent; 6·7 stalked; 8 from towards angle of cell.

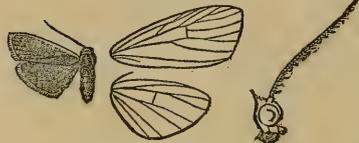
1490. RHANGHANA PUNCTATA.

Genus POLIOSIA.

Type.

*Poliosia*, Hmps., Cat. Lep. Phal. B. M. II., p. 106 (1900)..... *muricolor*.

Proboscis fully developed; palpi porrect, hardly reaching as far as frons; antennæ of male with bristles and cilia; tibiæ with the spurs moderate; abdomen clothed with rough hair. Forewing long and narrow; vein 2 from well before angle of cell, curved at base; 3·4 stalked; 5 absent; 6 from well below upper angle;



*Poliosia muricolor* ♂  $\frac{3}{4}$ . 7·8·9 stalked; 10 free; 11 anastomosing with 12. Hindwing with vein 2 from well before angle of cell; 3·4 coincident; 5 absent; 6·7 stalked, 8 from middle of cell.

A. Forewing dark-grey; with yellow costal fascia ... 1381c. *muricolor*.

B. Forewing grey-brown, without costal fascia.

a. Head and tegulæ yellow; forewing with black point below end of cell ..... 1381b. *punctivena*.

b. Head and tegulæ dark.

a<sup>1</sup>. Forewing with black points in and below end of cell ..... 1381. *binotata*.

b<sup>1</sup>. Forewing without black points..... 1347. *brunnea*.

C. Forewing yellow-brown, with dark postmedial

line ..... 1356. *cubitifero*.

1381c. POLIOSIA MURICOLOR, insert (syn.) *Collita parva*, Moore, P. Z. S., 1878, p. 16, pl. 1, f. 13.

1347. POLIOSIA BRUNNEA, insert (syn.) 1381a. *Gampola normalis*.

Genus NISHADA.

1378. NISHADA FLABRIFERA.

1379. *Nishada rotundipennis* does not occur within Indian limits, and the figure represents *N. flabrifera*.

Genus GAMPOLA.

1380. GAMPOLA FASCIATA.

Genus LEXIS.

*Lexis*, Wllgrn., Vet. Akad. Handl. (2) 5 (4) p. 41 Type.

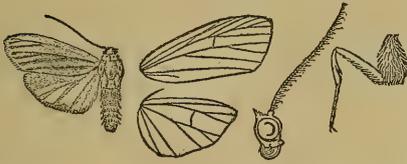
(1865) ..... *bipunctigera*.

*Tigrioides*, Butl., Trans. Ent. Soc., 1877, p. 339 ..... *alterna*.

Proboscis fully developed; palpi porrect; tibiæ with the spurs short; abdomen clothed with rough hair.

Forewing with vein 2 from middle of cell, curved at base; 3·4 stalked; 5 absent; 6 stalked with 7·8·9, or from below angle of cell; 7 from beyond 9; 11 anastomosing with 12.

Hindwing with vein 2 from long before angle of cell; 3·4 on a long stalk; 5 absent; 6·7 stalked; 8 from middle of cell.



*Lexis leucanioides* ♂ 1.

of cell.

Sect. I. Antennæ of male bipectinate.

1367b. LEXIS SABULOSALIS, Wlk., xxxiv, 1219 (1865).

*Lithosia brevipennis*, Snell., Veth's Midden Sumatra, Lep. p. 36 (1886).

Dull brownish-ochreous; forewing sometimes mottled with slightly darker scales and with discoidal point, hindwing paler.

Forewing rather short and broad; veins 6·7·8·9 stalked.

*Habitat*.—Burma, Rangoon; Sumatra; Sarawak. *Exp.* 22 mill.

Sect. II. Antennæ of male with bristles and cilia.

A. Palpi reaching just beyond the frons.

a. Fore coxæ of male with thick tufts of black hair.

1367a. LEXIS LEUCANOIDES, Wlk., Journ., Linn. Soc. Zool., vi, p. 103 (1862). Swinhoe, Cat. Het. Mus. Oxon., p. 124, pl. 3, f. 7.

Head and tegulae dull orange-yellow; palpi, frons, and antennae blackish; thorax yellowish, with black spots on patagia, meso- and meta-thorax; abdomen orange, greyish towards base. Forewing yellowish, with diffused black streaks on all the veins except the costal and subcostal nervures. Hindwing pale-yellow.

*Habitat.*—Tenasserim, Daunat Hills; Penang; Singapore; Borneo. *Exp.* ♂ 32, ♀ 40 mill.

b. Fore coxae of male without tufts of hair.

1367. LEXIS EUCHANA.

B. Palpi not reaching as far as the frons.

a. Forewing uniform fulvous-yellow below..... *fulveola*.

b. Forewing uniform fuscous-brown..... *phœola*.

1367c. LEXIS FULVEOLA, Hmps., Cat. Lep. Phal. B.M., II., p. 119, pl. xxi, f. 10. Fulvous-orange. Hindwing pale-yellow. Forewing with vein 6 very shortly stalked with 7·8·9.

*Habitat.*—Calcutta, Barrackpore. *Exp.* 22 mill.

1367d. LEXIS PHÆOLA, Hmps., Cat. Lep. Phal. B. M., II., p. 119, pl. xxi, f. 7. ♀. Uniform fuscous-brown, hindwing paler.

*Habitat.*—Bombay; Ceylon. *Exp.* 26 mill.

Genus PHRYGANOPSIS.

*Phryganopsis*, Felder, Reise Nov., p. 8 (1874); non descr., Hmps., *Type*.

Cat. Lep. Phal. B. M., II., p. 120 (1900)..... *asperatella*.

Proboscis aborted, minute, or well developed; palpi short, correct, not reaching beyond the frons; antennae of male serrate and ciliated, or with cilia and bristles; tibiae with the spurs moderate; abdomen clothed with rough hair. Forewing short and rather broad; vein 2 from towards angle of cell, oblique; 3·4 strongly



*Phryganopsis chota* ♀  $\frac{3}{2}$ . angle of cell, oblique; 3·4 strongly stalked, 5 absent; 6 from before angle of cell or stalked with 7·8·9; 10 free; 11 anastomosing with 12. Hindwing with vein 2 from before angle of cell; 3·4 stalked; 5 absent; 6·7 stalked with 8 from middle of cell.

1346. PHRYGANOPSIS CHOTA.

Genus MITHUNA.

Sect. I. Forewing with vein 6 stalked with 7·8·9·10, 10 from before 7; antennae of male bipectinate.

1372a. MITHUNA FUSCIVENA, Ceylon; Borneo.

Sect. II. Forewing with vein 6 from long below angle of cell; antennae of male with bristles and cilia.

A. Forewing with vein 7 from before 10.

1372. MITHUNA QUADRIPLAGA.

B. Forewing with vein 7 from after 10.

1372b. MITHUNA STRIGIFERA, Hmps., Cat. Lep. Phal. B. M., II., p. 123(1900).

♀. Grey-brown. Forewing pale-grey suffused with red-brown except on costal and terminal areas; a postmedial black spot on costa with obscure line from it, acutely angled at vein 6, then retracted to middle of vein 1; a dark streak in cell; three black points on costa towards apex, with an oblique streak from the last almost to the angle of the postmedial line; a terminal series of black points. Hindwing fuscous.

Habitat.—Sikhim. Exp. 28 mill.

Genus ILEMA.

*Lithosia*, Hmps., Moths. Ind. II., p. 79, nec Fabr.

I also include now the genera *Teulisna*, *Tegulata*, *Corcura*, *Simaræa*, *Zadadra*, *Prabhasa*, *Thysanoptyx* and *Lophoneura* as sections of it.

Sect. I. Forewing of male with a fold in cell and the subcostal and median nervures closely approximated.

A. Forewing of male with a fringe of long scales in cell.

a. (*Macotasa*). Forewing of male with vein 3 bent downwards and becoming coincident with 2;  
a bar across end of cell .....1363. *tortricoides*.

B. Forewing of male with vein 3 not becoming coincident with 2.

a<sup>1</sup>. Hindwing of male with fringes of scales on basal part of inner area on upperside; the anal tufts very large.

a<sup>2</sup>. Forewing with the tornus hooked; hindwing of male with a small pouch below the base of cell.

a<sup>3</sup>. (*Tegulata*). Forewing with the costa strongly lobed at middle.

a<sup>4</sup>. Forewing of male with unulate spot at end of cell; female with elongate costal spot; hindwing fuscous.....1373. *umida*.

b<sup>4</sup>. Forewing of male with round spot at end of cell; female with rounded spot on costa; hindwing yellow...1374. *protuberans*

c<sup>4</sup>. Forewing of male with black point at lower angle of cell nearly joined by an oblique striga from costa.....1375. *obliquistria*.

b<sup>2</sup>. (*Teulisna*). Forewing without costal swelling; hindwing of male with tuft of hair on middle of costa on upper-side .....1377. *uniplaga*.

- b<sup>2</sup>. Forewing with the tornus not hooked; hindwing of male without pouch below the cell..... 1376. *inducta*;
1373. ILEMA TUMIDA, del. *Ityca humeralis*,
- b<sup>1</sup>. (*Zadadra*). Hindwing of male with large patch of androconia below medial part of costa; forewing with the inner margin highly arched and fringed with hair towards base ..... 1366. *distorta*,
- c<sup>1</sup>. (*Prabhasa*). Hindwing of male without secondary sexual characters,
- a<sup>2</sup>. Forewing with large quadrate post-medial black patch from cell to inner margin ..... 1329. *tetragona*,
- b<sup>2</sup>. Forewing without postmedial black mark below the cell,
- a<sup>3</sup>. Forewing with postmedial black spot on costa,
- a<sup>4</sup>. Hindwing fuscous-brown,
- a<sup>5</sup>. Forewing dark-brown, with prominent pale costal fascia.. 1333. *flavicosta*,
- b<sup>5</sup>. Forewing paler-brown, with indistinct costal fascia..... 1331. *venosa*,
- b<sup>4</sup>. Hindwing pale-yellowish,
- a<sup>5</sup>. Forewing dark-fuscous, with prominent pale fasciæ on costa and inner margin ..... 1334. *plumbeomicans*,
- b<sup>5</sup>. Forewing whitish, streaked and suffused with fuscous ..... 1332. *costalis*,
- b<sup>3</sup>. Forewing without postmedial black spot on costa,
- a<sup>4</sup>. Forewing grey-brown,
- a<sup>5</sup>. Forewing of male with leaden-fuscous streak below terminal part of fold in cell ..... 1335. *fuscistriga*,
- b<sup>5</sup>. Forewing of male without fuscous streak in cell..... 1334a. *cana*,
- b<sup>4</sup>. Forewing purplish-black-brown... 1334b. *brunnea*,
1332. ILEMA *finbriata*, insert *Prabhasa* COSTALIS, Moore, P. Z. S., 1878, p. 22, which has priority, and 1361. *Lithosia nebecula*, N. China; Borneo,
- 1334b. ILEMA BRUNNEA, Moore, P.Z.S., 1878, p. 22, pl. 2, f. 11.
- ♀. Head, thorax and abdomen dark-brown, Forewing brown suffused with purplish-black and irrorated with black scales. Hindwing fuscous-brown,

*Habitat*.—Sikhim, 7000'. *Exp*, 32 mill.

B. (*Lophoneura*). Forewing of male with a radiating tuft of scales in cell just beyond middle, and a fringe of scales on costa beyond middle; hindwing with the inner area clothed with rough scales .....1337. *uniformis*.

C. Forewing of male with slight fringe of scales above terminal part of fold in cell.

1349. ILEMA SIMPLEX, Wlk., Journ. Linn. Soc., Zool. VI, p. 105 (1862).  
*Lithosia microzantha*, Hmps., Moths Ind. II, p. 81 (1900).

D. Forewing of male without fringe of scales in cell.

1348. ILEMA AURIFLUA, insert (syn.) 1370a. *Lithosia sthenoptera*, and *Systropha dorsalis*, Moore, P.Z.S., 1878, p. 18 (nec Wlk.).

Sect. II. (*Capissa*). Forewing of male with a furrow just below median nervure from near base end of cell, with two streaks of androconia above and below it; hindwing with very large patch of androconia on disc .....1371. *vagesa*.

Sect. III. (*Katha*). Forewing of male with a slight ridge of rough scales in basal part of cell and a furrow below the cell.

A. Forewing with fuscous postmedial line angled outwards at middle.....1354. *angulifera*.

B. Forewing without postmedial line .....1358. *conformis*.

1358. ILEMA CONFORMIS, insert (syn.) 1365. *Lithosia nigrifrons*.

Sect. IV. (*Ilema*). Wings of male without secondary sexual characters.

A. Forewing with dark postmedial line .....1352. *reticulata*.

B. Forewing without postmedial line.

a. Forewing with postmedial black spot on costa.....1360. *pallida*.

b. Forewing with ante- and post- medial black spots on a whitish costal fascia.....1362. *quadrisignata*.

c. Forewing with black basal patch on whitish costal fascia .....1359. *basigera*.

d. Forewing without black spots on costa in male.

a<sup>1</sup>. Forewing of male with black band on terminal area.....1368. *terminalis*.

- b*<sup>1</sup>. Forewing with diffused fuscous on terminal area .....1366. *cuculata*.
- c*<sup>1</sup>. Forewing of male with broad oblique fuscous shade from below apex to middle of inner margin ; female uniform orange.....1369. *fasciata*.
- d*<sup>1</sup>. Forewing of male without fuscous terminal band or patch.
  - a*<sup>2</sup>. Forewing with well defined yellow or orange fascia on costal area.
  - a*<sup>3</sup>. Forewing with the veins streaked with orange.....1348a. *chrysochleps*.
  - b*<sup>3</sup>. Forewing with the veins not streaked with orange.
  - a*<sup>4</sup>. Forewing with more or less broad costal fascia.
    - a*<sup>5</sup>. Forewing dark-brown .....1342. *fumidisca*.
    - b*<sup>5</sup>. Forewing grey .....1341. *vicaria*.
  - b*<sup>4</sup>. Forewing with the costal edge only yellow.
    - a*<sup>5</sup>. Hindwing yellow.....1343. *griseola*.
    - b*<sup>5</sup>. Hindwing white.....1350. *xanthocraspis*.
- b*<sup>2</sup>. Forewing without costal fascia.
  - a*<sup>3</sup>. Forewing dark fuscous-brown irrorated with grey scales...1382. *basinota*.
  - b*<sup>3</sup>. Forewing orange or yellow.
    - a*<sup>4</sup>. Forewing suffused with grey-brown.
      - a*<sup>5</sup>. Forewing with discoidal dark point.....1357. *punctifera*.
      - b*<sup>5</sup>. Forewing without discoidal dark point .....1356. *brevipennis*.
    - b*<sup>4</sup>. Forewing without grey-brown suffusion.
      - a*<sup>5</sup>. Forewing deep orange ...1356a. *nigripes*.
      - b*<sup>5</sup>. Forewing pale orange-yellow .....1340. *calamaria*.
  - c*<sup>3</sup>. Forewing white.
    - a*<sup>4</sup>. Hindwing pale-yellow ; forewing with the termen tinged with yellow .....1370. *nigripars*.
    - b*<sup>4</sup>. Hindwing white .....1338. *varana*.

1341. *IEMA antica*, insert *Lithosia VICARIA*, Wlk., II, 500 (1854) which has priority, also *Lithosia imitans*, Mab., Bull. Soc. Zool. Fr., III, p. 87 (1878).

1343. ILEMA GRISEOLA, insert (syn.) 1344. *Lithosia fuscicollis*.

1350. ILEMA XANTHOCRASPIS, Hmps., Cat. Lep. Phal. B. M., II., p. 169, pl. xxii, f. 30 (1900).

*Lithosia nigripars*, Hmps., Moths, Ind. II., p. 81 (nec Wlk.).

1356. ILEMA BREVIPENNIS, insert (syn.) 1364. *Lithosia intermixta* and *Systropha fuscipes*, Hmps., Ill. Het., ix, p. 80, pl. 158, f. 23.

1356a. ILEMA NIGRIPES, Hmps., Cat. Lep. Phal. B. M., II. p. 175, pl. xxiii, f. 6 (1900).

♂. Fulvous-orange; palpi with the 3rd joint black; antennæ and greater part of legs black; ventral surface of abdomen with black bands. Forewing with the basal part of costa black; underside with black suffusion in cell extending as streaks beyond its angles. ♀. Forewing without the black on costa or underside.

*Habitat*.—Sikhim; Khâsis. *Exp.* ♂ 42, ♀ 46 mill.

1340. ILEMA CALAMARIA, insert (syn.) *Katha aprica*, Butl., Cist. Ent. III., p. 115 (1885). Japan. China.

1370. ILEMA *pallens* insert *Lithosia nigripars*, Wlk., vii, 1779 (1856), which has priority.

1338. ILEMA VARANA, insert (syn.) 1339. *Lithosia nivea*, which is its female.

#### Genus CHRYSORABDIA.

Sect. I. Forewing of male with an oblique patch of androconia on vein 1, almost met by an oblique streak from end of cell; hindwing with veins 3·4 stalked.

A. Thorax black ..... 1327. *viridata*.

B. Thorax yellow ..... 1328. *bivitta*.

Sect. II. Forewing of male without streak of androconia; hindwing with veins 3·4 from cell.

A. Patagia black ..... 1328a. *aurantiaca*.

B. Patagia yellowish ..... 1328b. *alpina*.

1328b. CHRYSORABDIA ALPINA, Hmps., Cat. Lep. Phal. B. M., II., p. 184, pl. xxiii, f. 17 (1900).

Brownish-ochreous; palpi, frons and thorax black; legs black and ochreous; abdomen tinged with greyish. Forewing with the basal half of costal edge black; a diffused greenish-black subcostal fascia from base to beyond middle or to termen; a similar broader fascia from inner margin near base to middle of termen. Hindwing somewhat yellower in male, and with the costal area tinged with fuscous.

*Habitat*.—Tibet, Yatong, 10,500' (Hobson). *Exp.* 46 mill.

#### Genus CHRYSÆGLIA.

1325. CHRYSÆGLIA MAGNIFICA.

#### Genus CÆONISTIS.

1324. CÆONISTIS ENTELLA.

## Genus AGYLLA.

|                                                                                                                   | <i>Type.</i>               |
|-------------------------------------------------------------------------------------------------------------------|----------------------------|
| <i>Agylla</i> , Wlk., II., 552 (1854) .....                                                                       | <i>fasciculata</i> .       |
| <i>Sidyma</i> , Wlk., VII., 1686 (1856) .....                                                                     | <i>albifinis</i> .         |
| <i>Tripura</i> , Moore, Lep. E. I. C., p. 298 (1858) .....                                                        | <i>prasena</i> .           |
| <i>Salapola</i> , Wlk., XXVIII, 525 (1863) .....                                                                  | <i>monoleuca</i> .         |
| <i>Crambomorpha</i> , Feld., Reis. Nov., pl. 106, f. 9 (1874),<br>non desc., nec Mac. L. Neur., 1867 .....        | <i>umbrifera</i> .         |
| <i>Churinga</i> , Moore, P. Z. S., 1878, p. 9 .....                                                               | <i>rufifrons</i> .         |
| <i>Vumuna</i> , Moore, P. Z. S., 1878, p. 10 .....                                                                | <i>rameluna</i> .          |
| <i>Ghoria</i> , Moore, P. Z. S., 1878, p. 12 .....                                                                | <i>albocinerea</i> .       |
| <i>Hesudra</i> , Moore, P. Z. S., 1878, p. 12 .....                                                               | <i>divisa</i> .            |
| Sect. I. Antennæ of male bipectinate.                                                                             |                            |
| A. ( <i>Sidyma</i> ). Antennæ of male bipectinate, with moderate branches to apex.                                |                            |
| a. Colour black-brown; hindwing without white at apex .....                                                       | 1312. <i>apicalis</i> .    |
| b. Colour grey-brown; hindwing with white at apex .....                                                           | 1311. <i>albifinis</i> .   |
| B. ( <i>Hesudra</i> ). Antennæ of male bipectinate, with short branches, the apical part serrate and fasciculate. |                            |
| a. Forewing with the costal half yellowish, the inner half fuscous.....                                           | 1320. <i>divisa</i> .      |
| b. Forewing brown.                                                                                                |                            |
| a <sup>1</sup> . Hindwing brown with the costal and terminal areas yellow .....                                   | 1313. <i>beema</i> .       |
| b <sup>1</sup> . Hindwing orange with terminal fuscous band narrowing to tornus.....                              | 1308b. <i>metaxantha</i>   |
| <i>tha</i>                                                                                                        |                            |
| c <sup>1</sup> . Hindwing wholly orange.                                                                          |                            |
| a <sup>2</sup> . Head and tegulæ orange.....                                                                      | 1321. <i>rufifrons</i> .   |
| b <sup>2</sup> . Head and tegulæ dark.....                                                                        | 1308. <i>semirufa</i> .    |
| Sect. II. ( <i>Tripura</i> ). Antennæ of male ciliated.                                                           |                            |
| A. Forewing white, with the inner area fuscous .....                                                              |                            |
|                                                                                                                   | 1319. <i>albocinerea</i> . |
| B. Forewing white or yellowish, the inner area not fuscous.                                                       |                            |
| a. Forewing with the ground-colour white.                                                                         |                            |
| a <sup>1</sup> . Tegulæ orange.                                                                                   |                            |
| a <sup>2</sup> . Thorax dark; forewing with prominent dark purple-black streaks on the veins .....                | 1309. <i>prasena</i> .     |

*b*<sup>2</sup>. Thorax white ; forewing with the veins hardly darker.....1310. *pallens*.

*b*<sup>1</sup>. Tegulæ not orange.

*a*<sup>2</sup>. Forewing with postmedial black band in male ; in female reduced to a spot.....1315. *rumelana*.

*b*<sup>3</sup>. Forewing with the terminal half black .....1316. *bipars*.

*b*. Forewing pale-yellow .....1314. *maculata*.

C. Forewing fuscous with yellow costal fascia.....1322. *postfusca*.

1319. AGYLLA ALBOCINEREA, insert (syn.), 1318. *Gnophria sericetpennis*.

1322. AGYLLA POSTFUSCA, insert (syn.), 1317*a*. *Gnophria collitoides*, Hmps. (nec Butl.).

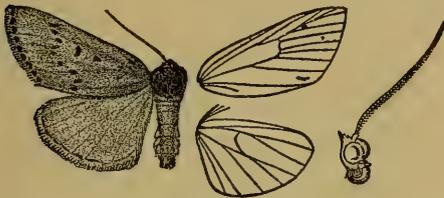
Genus LITHOSIA.

1326. LITHOSIA GUADRA.—The single female from Sikhim with abnormal venation still remains unique.

Genus DOHERTYA.

1304. DOHERTYA CYMATOPHOROIDES.

Genus ADREPSA.



*Adrepsa stilboides* ♀  $\frac{1}{2}$ .

1305. ADREPSA STILBOIDES.

Genus PARAONA.

1323. PARAONA SPLENDENS.

Genus AGRISIUS.

1306. AGRISIUS GUTTIVITTA.

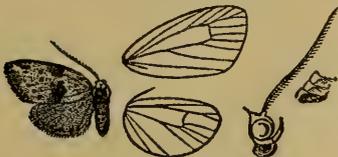
1307. AGRISIUS FULIGINOSUS is probably not found in India.

Genus STICTANE.

Type.

*Stictane*, Hmps., Cat. Lep. Phal. B. M., II., p. 258 (1900). *fractilinea*.

Proboscis well developed ; palpi upturned, slender and reaching vertex of



*Stictane fractilinea* ♂  $\frac{3}{2}$ .

head ; antennæ of male serrate and fasciculate ; tibiæ with the spurs moderate. Forewing rather short and broad, the costa arched ; vein 2 from middle of cell, curved at base ; 3 from long before angle ; 5 from well above angle ; 6 from below

upper angle ; 7·8·9 stalked, 7 from beyond 9 ; 10 and 11 free. Hindwing with vein 2 from middle of cell ; 3 from well before angle ; 5 from well above angle ; 6 and 7 stalked ; 8 from middle of cell.

A. Forewing with the medial line very oblique .....*obliquilinea*.

B. Forewing with the medial line excurved from below  
costa to submedian fold .....*fractilinea*.

1390a. STICTANE OBLIQUILINEA, Hmps., Cat. Lep. Phal. B. M., II., p. 258,  
pl. xxv, f. 5 (1900).

♀. White; palpi, lower part of frons and antennæ brownish; tarsi tinged with ochreous. Forewing with subbasal black point on median nervure and antemedial points on subcostal nervure and vein 1; a nearly straight, very oblique medial band from below the cell to inner margin; two discoidal points; diffused fuscous patches on costa before apex and on middle of termen; a terminal dark line. Hindwing pale-fuscous.

*Habitat*.—Ceylon, Hambantota. *Exp.* 14 mill.

1390. STICTANE FRACTILINEA, Snell., Veth's Midden Sumatra, Lep., p. 38 (1880).

*Eugoa multipuncta*, Hmps., Ill. Het., IX, p. 81, pl. 158, f. 3 (1893).  
Moths Ind., II., p. 93.

Genus LOBOBASIS.

1398a. LOBOBASIS NIVEIMACULATA.

Genus PSEUDOBLABES.

1399. PSEUDOBLABES OOPHORA.

Genus GARUDINIA.

Sect. I. Forewing of male with the cell very long; a fringe of long hair on subcostal nervure; vein 1 bent upwards beyond middle and vein 2 bent downwards so as almost to meet; 3·4 from cell; 8 absent. Hindwing with patches of androconia on upperside near lower angle of cell and below costa towards apex; the subcostal nervure fringed with scales below; the cell long, and veins 3·4 from angle of cell.

1400a. GARUDINIA BIPLAGIATA.

Sect. II. Forewing of male with the cell of moderate length; a patch of short hair in end of cell; veins 1 and 2 not bent; 3·4 stalked; 7·8 stalked. Hindwing without patches of androconia; the cell of moderate length, and veins 3·4 stalked.

1400. GARUDINIA LATANA.

Genus EUCYCLOPERA.

1394a. EUCYCLOPERA PLAGIDISCA.

Genus PADFNIA.

A. Forewing with the bands purplish-black, the ante-  
medial band slightly angled in cell .....1401. *transversa*.

B. Forewing with the bands cupreous-fuscous, the ante-  
medial band straight, oblique .....1401a. *duplicana*.

1401a. PADFNIA DUPLICANA, Wlk., xxviii, p. 429 (1863).

Pure white; patagia and thorax with cupreous-fuscous patches; palpi and legs tinged with orange-yellow. Forewing with oblique cupreous-fuscous antemedial band expanding at inner margin; a similar band from costa

beyond middle, oblique and slightly sinuous to vein 3, where it is angled and becomes subterminal. Underside of forewing with the costal fold tinged with orange; the fringe of hair on hindwing brown.

*Habitat*.—Burma, Rangoon; Borneo, Sandakan, Sarawak; Sumatra; Java, Arjuno. *Exp.* 24 mill.

Genus NARASODES.

1395. NARASODES PUNCTANA.

Genus MACADUMA.

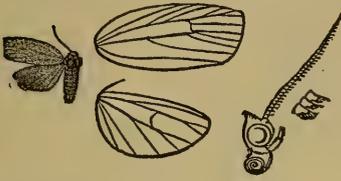
1383a. MACADUMA TORTRICELLA.

Genus PACHYCEROSIA.

*Type.*

*Pachycerosia*, Hmps., *Cat. Lep. Fal.* B. M., II., p. 270 (1900). *bipuncta*.

Proboscis fully developed; palpi upturned, reaching vertex of head; frons somewhat prominent; antennæ of male laminate and serrate; tibiæ with the spurs long. Forewing narrow, the costa strongly arched at base, then nearly straight; vein 2 from middle of cell, curved at base; 3 from near angle; 4, 5 from angle; 6 from below upper angle;



*Pachycerosia bipuncta* ♂  $\frac{1}{2}$ .

7·8·9 stalked, 7 from beyond 9; 10·11 free. Hindwing with vein 2 from beyond middle of cell; 3·4 stalked; 5 absent; 6·7 stalked; 8 from middle of cell.

PACHYCEROSIA RIPUNCTA, Hmps., *Cat. Lep. Fal.* B. M., II., p. 270 (1900).

♂. Grey-brown. Forewing with slight subbasal dark mark below the cell, and black points in middle of cell and on disco-cellulars.

*Habitat*.—Andamans. *Exp.* 18 mill.

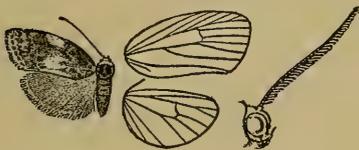
Genus HALONE.

*Type.*

*Halone*, Wlk., 540 (1854) ..... *sobria*.

*Mosoda*, Wlk., xxxv, 1899 (1866) ..... *sinuata*.

Proboscis fully developed; palpi upturned, not reaching vertex of head;



*Halone flavescens* ♂  $\frac{3}{2}$ .

tibiæ with the spurs long; forewing with vein 2 from beyond middle of cell; 3 well before angle; 5 from well above angle; 6 from below upper angle; 7·8·9 stalked; 7 from beyond 9; 10 and 11 free. Hindwing with vein 2 from towards angle of cell; 3·4 coincident; 5 from well above angle; 6·7 stalked; 8 from middle of cell.

Sect. I. Antennæ of male bipectinate.

1388b. HALONE FLAVESCENS.

Sect. II. Antennæ of male ciliated.

1386b. HALONE DIFFUSIFASCIA.

Genus SCAPTESYLE.

A. Forewing with cupreous-red patch on the terminal band... 1418. *tricolor*.

B. Forewing without red patch on the terminal band..... 1419. *bicolor*.

Genus UTRICULIFERA.

1394. UTRICULIFERA FUSCAPEX.

Genus SICULIFER.

1393b. SICULIFER BILINEATUS.

Genus TORTRICOSIA.

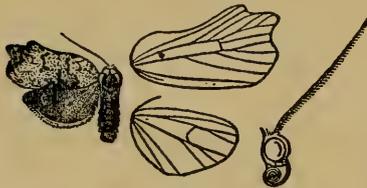
*Type.*

*Tortricosia*, Hmspn., Cat. Lep. Phal., B. M., II., p. 291 (1900). *excisa*.

Proboscis fully developed; palpi porrect, not reaching beyond the frons; antennæ of male ciliated; tibiæ with the spurs long. Forewing with the costa strongly lobed near base, excised at middle, lobed beyond middle and excised at apex; the termen excised towards apex and strongly excurved at middle; vein 2 from middle of cell, somewhat curved at base; 3 from near angle; 4·5 stalked; 6 from below upper angle; 7·8·9 stalked; 7 from beyond 9; 10·11 free. Hindwing with vein 2 from towards angle of cell; 3·4 stalked; 5 absent; 6·7 stalked; 8 from middle of cell.

1393c. TORTRICOSIA EXCISA, Hmspn., Cat. Lep. Phal. B. M., II., p. 291 (1900).

♂. Head and thorax grey-white irrorated with black; abdomen fuscous-



*Tortricosia excisa* ♂  $\frac{3}{1}$ .

black, the anal tuft ochreous. Forewing grey-white irrorated with dark red-brown; subbasal, antemedial, medial, postmedial and subterminal small black spots on costa; indistinct ante- and post-medial punctiform lines, the former excurved from below costa to submedian fold, the latter waved, and with stronger irroration on its inner side on inner area; an apical patch of dark red-brown suffusion; cilia black at middle, red-brown and ochreous towards apex, white towards tornus. Hindwing fuscous-brown; cilia whitish from middle to tornus.

*Habitat.*—Mergui, Perak. *Exp.* 20 mill.

Genus OXACME.

*Type.*

A. Wings white ..... 1393a. *marginata*.

B. Wings fuscous ..... 1393. *dissimilis*.

Genus COSTARCHA.

1392. COSTARCHA INDISTINCTA.

Genus CHIONEMA.

*Chionema*, Herr.-Schaff., austereur Schmett; p. 20

(1850) .....

*Cyana*, Wlk., II., 528 (1854) .....

*puella*.

*detrita*.

Sect. I. Forewing of female with veins 4·5 stalked

A. Hindwing of male with a large elliptical patch of brown androconia on upperside below middle of costa, which is highly arched;

forewing with elongate patch of androconia in end of cell on underside; the fringe on costa well developed; the lobe large and single; female with vein 6 stalked with 7-8.

*a.* Forewing with black edges to the ante- and postmedial lines .....1281. *peregrina.*

*b.* Forewing without black edges to the ante- and post-medial lines .....1281*b.* *catorhoda.*

**B.** Hindwing of male without patch of androconia; forewing with the fringe on costa well developed, the lobe large and single.

*a.* Forewing of female with vein 6 stalked with 7-8; 9 absent.

*a*<sup>1</sup>. Forewing with the spots in end of cell black.

*a*<sup>2</sup>. Forewing with black edges to the ante- and post-medial lines.1282. *puella.*

*b*<sup>2</sup>. Forewing without black edges to the ante- and post-medial lines.

*a*<sup>3</sup>. Forewing with the post-medial line nearly erect...1281*a.* *alborosea.*

*b*<sup>3</sup>. Forewing with the post-medial line extremely oblique .....1282*a.* *obliquilineata.*

*b*<sup>1</sup>. Forewing with the spots in end of cell red .....1283. *amabilis.*

*b.* Forewing of female with vein 6 from the cell; 9 from 7 .....1284. *effracta.*

**Sect. II.** Forewing of female with veins 4-5 from cell.

**A.** Forewing of male with the lobe trifold, the costal fringe moderately developed.

*a.* Forewing with the lines scarlet.

*a*<sup>1</sup>. Forewing of male with the two discoidal spots conjoined into a bar; female with the postmedial line not bent outwards to costa.....1289. *signa.*

*b*<sup>1</sup>. Forewing of male with the two discoidal spots separate; female with the postmedial line bent outwards to costa.1289*a.* *adita.*

*b.* Forewing with the lines yellow.

- a*<sup>1</sup>. Hindwing yellow ..... 1291. *guttifera*.  
*b*<sup>1</sup>. Hindwing white.  
*a*<sup>2</sup>. Forewing with subterminal yellow line..... 1294. *molleri*.  
*b*<sup>2</sup>. Forewing without subterminal line ..... 1289*b*. *hasiana*.
- B.** Forewing of male with the lobe bifid.
- a*. Forewing of male with the inner part of lobe large and elongate, the fringe long and strongly developed.  
*a*<sup>1</sup>. Forewing with the postmedial band angled inwards in submedian fold ..... 1285*a*. *javanica*.  
*b*<sup>1</sup>. Forewing with the postmedial band not angled in submedian fold ..... 1285. *perorata*.
- b*. Forewing of male with the lobes small and closely attached, the fringe much slighter.  
*a*<sup>1</sup>. Forewing in both sexes with three black spots at end of cell.  
*a*<sup>2</sup>. Forewing with orange bands.  
*a*<sup>3</sup>. Forewing with subterminal orange band.  
*a*<sup>4</sup>. Abdomen with the terminal half of dorsum crimson ..... 1301. *arama*.  
*b*<sup>4</sup>. Abdomen wholly white.  
*a*<sup>5</sup>. Forewing with the ante- and post-medial bands conjoined below the cell ..... 1293. *divakara*.  
*b*<sup>5</sup>. Forewing with the bands separate... 1302. *dohertyi*.  
*b*<sup>3</sup>. Forewing without subterminal band ..... 1292. *sikkimensis*.  
*b*<sup>2</sup>. Forewing without bands ... 1288. *candida*.  
*b*<sup>1</sup>. Forewing of male with three black spots at end of cell; female with two ..... 1290. *puer*.  
*c*<sup>1</sup>. Forewing with three fuscous annuli at end of cell..... 1295. *detrita*.
- C.** Forewing with the lobe single.
- a*. Forewing in both sexes with three black spots at end of cell.  
*a*<sup>1</sup>. Forewing with orange subterminal band ..... 1297. *bellissima*.  
*b*<sup>1</sup>. Forewing with scarlet subterminal band.  
*a*<sup>2</sup>. Forewing with the postmedial line not angled below costa..... 1284*a*. *dudgeoni*.  
*b*<sup>2</sup>. Forewing with the postmedial line angled inwards below costa ..... 1287. *subornata*.  
*b*. Forewing of male with three black spots in end of cell, of female with two.

THE MOTHS OF INDIA.

- a<sup>1</sup>. Forewing of female with the black edge of postmedial band straight; ♂ yellow and scarlet ..... 1298. *coccinea*.
- ♂<sup>1</sup>. Forewing with the black edge of post-medial band sinuous; ♂ white with scarlet bands ... 1286. *bianca*.
- c. Forewing with two black spots in cell in both sexes..... 1299. *harterti*.
- d. Forewing with three obscure fuscous annuli in end of cell..... 1296. *gelida*.
- e. Forewing without spots in end of cell. 1300. *gazella*.
- 1282a. CHIONÆMA OBLIQUILINEATA, Hmps., Cat. Lep., Phal. B. M. II, p. 299, pl. xxvi, f. 24 (1900).

♂. Forewing with the costal tuft forming a large flap; the veins very much curved. White; antennæ crimson, tegulæ and patagia edged with crimson, meso- and metathorax with crimson spots; abdomen with the terminal half crimson above. Forewing with sinuous sub-basal crimson line not reaching inner margin; very oblique crimson ante- and postmedial lines; a black spot in lower end of cell and two on disco-cellulars; a diffused obliquely-placed fuscous patch beyond the postmedial line below costa; a sub-terminal crimson line bent round below apex to above fuscous patch. Hindwing crimson, with the costal area white.

*Habitat*.—Sikhim, 1,800' (Dudgeon). *Exp.* 32 mill.

1289a. CHIONÆMA ADITA, Moore, Lep. E. I. C., p. 306, pl. 7a, f. 11 (1859).

*Bizone bifasciata*, Pobj., Bull. Soc. Ent. Fr. (6), VI, p. CXXIV (1886).

♂. Pure white; palpi black above; antennæ blackish; tegulæ edged with scarlet, the front part of patagia scarlet; fore and mid legs banded with black. Forewing with scarlet spot on costa near base; the costal edge scarlet to the antemedial line, which is obliquely curved; a black spot in end of cell, and two on disco-cellulars; the postmedial scarlet line oblique from costa to vein 3, and with black spot on its outer edge below costa.

♀. Sometimes without red on tegulæ, patagia, and costal edge of forewing; the spot at upper angle of cell placed further from the base than the lower spot; the postmedial line bent outwards to costa.

*Habitat*.—Tibet, Moupin; N.-W. Himalayas, Simla, Dalhousie, Kangra; Sikhim. *Exp.* ♂ 36, ♀ 42 mill.

1294. CHIONÆMA MOLLERI, insert (syn.), 1289a. *Cyana watsoni*.

Genus EUROSIA.

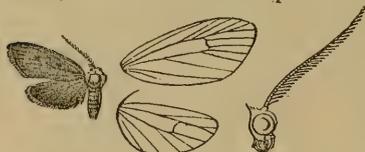
*Type.*

*Eurosia*, Hmps., Cat. Lep. Phal. B. M., II, p. 330 (1900). *trimaculata*.

Proboscis well developed; palpi porrect, not reaching beyond the frons, which is rounded, forewing narrow, the costa slightly arched, the termen obliquely rounded; vein 3 from close to angle of cell; 5 from or from well above angle; 6 from or from below upper angle; 7 from 8 beyond 9; 10·11 free. Hindwing with vein 2 from long before angle of cell; 3·4 coincident, rarely

strongly stalked; 5 from well above angle; 6·7 strongly stalked; 8 from beyond middle of cell.

Sect. I. Antennæ of male pectinate.



1479. EUROSIA TRIMACULATA.

*Eurosia trimaculata* ♂  $\frac{3}{2}$ .

Sect. II. Antennæ of male ciliated.

A. Forewing with black discoidal spot..... 1384. *grisea*.

B. Forewing with fuscous discoidal annulus ..... 1384a. *annulata*.

1384a. EUROSIA ANNULATA, Hmps., Cat. Lep. Phal. B. M. II., p. 332, pl. xxviii, f. 11 (1900).

♀. Grey tinged with fuscous and brown; abdomen fuscous. Forewing with dark antemedial line oblique towards costa, then erect and sinuous; a minute annulus in middle of cell and a larger one on disco-cellulars; a dentate subterminal line strongly bent inwards to costa and angled outwards nearly to termen on veins 6 and 4. Hindwing fuscous.

*Habitat*.—Calcutta. *Exp.* 14 mill.

(To be continued.)

NOTES ON SOME KALIJ PHEASANTS FROM THE  
KACHIN HILLS IN THE POSSESSION OF THE  
BOMBAY NATURAL HISTORY SOCIETY.

BY CAPTAIN W. G. NISBETT, AND F. FINN, B.A., DEPUTY  
SUPERINTENDENT OF THE INDIAN MUSEUM.

*Locality in which obtained.*—Kachin Hills, north of Bhamo and east of Myitkyina. Western limit, Irrawaddy river; eastern limit, the hill ranges on the Chinese frontier; northern and southern limits, not known.

*Local Names.*—Yit (Burmese); Wuri (Kachin).—(W. G. N.)

*Description of Specimens.*—No. I. \*(Skin).—*Colouration* as in the Black-breasted Kalij (*Gennæus horsfieldi*)—purple-black, with white bars terminating the feathers of the lower back, rump and upper tail-coverts; but these bars are narrower than in that species, and the two central tail-feathers show some clear, but fine and broken, white pencilling, occurring on both webs, but dying out before the tip of the feather. The legs are still red even in the dry skin.

*Length*, about 2ft. 6in.; *Wing*, about 10in.; *Tail*, about 14½in. to end of longest feather (on left side); *Bill* (from gape), about 1½in.; *Shank* (from top of hock to underside of hind toe), about 3·8 in.

No. II. (Skin, in poor condition).—*Colouration* as in preceding, but with much more white pencilling, this occurring generally over the upper surface and tail, with the exception of most of the head, neck, upper mantle, some of the wing-coverts and two outer pairs of tail-feathers. The cheeks and mantle show a little white pencilling, in the latter along the shafts. Legs also red.

*Length*, about 2ft. 4in.; *Wing*, about 9½in.; *Tail*, about 14½in. to end of longest feather (on left side); *Bill*, broken; *Shank*, about 3·5 in, measured as above.

No. III. (Skin).—*Colouration*, very like No. II., but mantle and neck with a good deal of broken white pencilling; more white pencilling also on rump. The wing-coverts, however, are nearly all black, and only the right centre tail-feather, which is the longest, is pencilled throughout; some of the other feathers show more or less pencilling,

but not alike on both sides of tail. Legs dull whitish-yellow in skin.

*Length*, about 2ft. 3in. ; *Wing*, about 10in. ; *Tail*, to end of longest feather, about 14in. ; *Bill*, 1.4in. ; *Shank*, about 3.5in.

No. IV. (Skin).—Agrees generally with the description given by Mr. Oates in the "Game Birds of India" (Pt. I., p. 341), of what he calls in that work *Gennæus andersoni*, which is the *Gennæus davisoni* of the "British Museum Catalogue of Birds" (Vol. XXII., p. 304). That is to say, the present bird is black below and on the flanks, and has a black crest, while the upper plumage, wings, and tail are marked with bold zig-zag pencillings of white, fading out on the three outer pairs of tail-feathers. The lower back and rump have the feathers broadly tipped with white, with a broad black zone sometimes preceding the white. The specimen shows, however, some few points of difference. Some of the wing-coverts are almost all black, showing merely a little white along the shafts, and this is much more the case on the right wing than the left.

Moreover, the dimensions differ slightly. The length is about 27 inches as against 24 ; the wing is only 9 inches long as against nearly 9½ ; while the tail is about 14 inches instead of 11. The legs in the skin are horny-brown.

No. V. (Wing, three long tail-feathers, and skin of rump, with note from Captain Nisbett to the following effect) :—"One wing, patch of feathers of back, and tail of *Gennæus* Pheasant. Shot at Sanguame, east of N'Maikha river. This is the first of this species shot by me and was reported in my letter dated 6th January, 1900 ; it is the nearest to the Silver Pheasant of any I shot. Soft parts of cheek bright crimson, legs of a yellowish-white." In this bird the wing is like that of the last specimen, *i.e.*, black with white zig-zag pencilling nearly obsolete on a few coverts ; the rump feathering is also similar, but the white terminal fringe is reduced and faint—indeed, nearly obsolete, and only a few of the feathers, low down, show a tendency to exhibit the black subterminal zone.

The tail-feathers, which are the two central ones and one of the next pair, agree generally with those of the last specimen, in the case of the latter absolutely ; but in the former there is so much white on the inner webs that the marking becomes there black on white

instead of *vice-versâ* as in No. IV., where the white pencilling is evenly distributed all over the feather. The wing is a little over  $9\frac{1}{2}$  inches, and the longest of the tail-feathers about 14 inches.

No. VI. (Pair of Legs [male] with note from Captain Nisbett as follows):—"Specimen of legs of *Gennæus* Pheasant (one variety). The colour has altered; in life the legs should be a dark greenish-blue, like the legs of a Jungle-fowl." From top of hock to under hind-toe they measure 3.6 inches. The colour is now horny-grey.—(F. F.)

*Colouration of Soft Parts.*—The colour of soft skin of heads and the colour of legs of specimens sent has altered a good deal. The naked skin of head should be bright crimson. In the specimens with red legs (I. and II.) the red should be a bright vivid colour. In those with white legs the colour should be a yellowish-white. In those with dark legs (specimen VI.) the colour should be a dark greenish-blue (a slate), like the legs of a Jungle-fowl.

*Weight.*—The average weight of the male is 3lbs., and that of the female  $2\frac{1}{2}$ lbs. The above averages have been obtained by weighing some twenty specimens.

*Habits.*—These birds are found at an altitude of between 3,000 and 5,000ft. They are generally found in parties of three to seven, though the males often wander about by themselves. They generally keep in the *nullahs* near the water during the heat of the day, and in the early morning and towards evening feed along the hill sides and on high ground, being especially fond of long, flattish spurs or knolls covered with open evergreen forest. They are intensely shy, and one rarely has an opportunity of seeing them, as they make off very quickly on hearing any one coming, and then rarely take to flight, unless run down by dogs, when they fly up into the trees. They are confirmed runners, and it is often hard to make them take flight even with dogs. Their food consists entirely of jungle seeds, insects and acorns. My usual way of obtaining them was to walk very quickly along a jungle path until I heard the sound of their scratching up the dry leaves in search of food. I would then send a coolie, who always accompanied me, to take a circuit in the jungle and get round them; and on his advancing toward them, they nearly always came within shot. This sounds like poaching, but it is the only way of getting them: shooting them in a fair way is impossible. On my first acquaintance with them

it took me over a fortnight to get a single specimen, though I met them every day.

The breeding season begins about April, when the cocks can be heard challenging one another in the early morning. When breeding, they appear to leave their usual haunts in the open jungle and disappear altogether, probably in the thick undergrowth. Since the end of April I have hardly come across a bird, though I constantly met them before.

I have not been successful in obtaining any eggs, though I have asked Kachins to try and get me some.

*General Remarks.*—The lower in altitude, and the nearer the Irrawady one finds them, they partake more of the Black-breasted Kalij in character; and the higher one gets towards the Chinese frontier, the more they partake of the appearance of the Silver Pheasant. Near the Mongwan Valley, on the Chinese frontier east of Bhamo (some 45 miles), I have shot a large number of Silver Pheasant (Crawford's) at an altitude of between 4,500 and 7,000ft. The Black-breasted Kalij I have obtained in the Irrawady at Sigaing, which is only a little south of Bhamo. The Black-breasted Kalij is also common in the Wuntho District. Unfortunately, I have not been able to secure any pure Silver Pheasant (Crawford's) up here, but from information received they are apparently found at altitudes of about 5,000ft. and over on the Chinese frontier. What has puzzled me is the three varieties with different coloured legs. Up to date, all specimens obtained by me have each so differed from the other that it is not possible to lay down which are the distinct species. The dark-legged birds seem to favour the Kalij in character, and the light-legged birds the Silver Pheasant; those having red legs may favour either type equally.—(W. G. N.)

*General Notes on the Series and Conclusions.*—There can be no doubt that the very interesting series of forms of *Gennæus* forwarded by Captain Nisbett, and described above, are hybrids of various grades between the common Black, or Black-breasted, Kalij (*Gennæus horsfieldi*) and Crawford's or Anderson's Silver Pheasant (*Gennæus andersoni*). With the latter species I unite Mr. Oates's *G. rufipes* from the Ruby Mines, a fine male specimen of which is in the Society's collection (marked, however, simply "Burma") and M. Oustalet's *G. beli* from Annam.

I had the privilege, when at home on leave this year, of inspecting a stuffed male of *G. beli* in the Paris Museum, and four adult living speci-

mens, three males and a female, in the Jardin des Plantes, and I consider that the species cannot possibly be separated from *G. andersoni*, with the type of which, as it is exhibited in the Indian Museum, I am very familiar. This type, however, is itself, I think, rather tainted with alien blood, as shown by its rather too short tail, some plain black on the wing-coverts, and light-coloured legs. With regard to Dr. Blanford's suggestion in the *Fauna of British India* series, that *G. andersoni* may be merely a hybrid between *G. nycthemerus* (the well-known Chinese Silver Pheasant of aviaries) and the common Lineated Kalij of Burmah (*G. lineatus*), I may mention that in the Paris Museum there is exhibited such a hybrid, and it comes so close to *G. andersoni* in appearance that, had not its origin been indicated on the stand of the specimen, I should have referred it to that species, as the only perceptible difference was that the pencilling on the back was finer and less regular.

The pencilling of these parts is also undoubtedly finer and shows no perceptible white terminal band in the Burmese and Annam birds, which also have red legs; but in view of the great amount of interbreeding that undoubtedly goes on in this group, one would not be justified in separating them from *G. andersoni* on this account. I do not think *G. andersoni* is a hybrid, because of the close resemblance of the male specimens I have seen, and because the female differs strikingly from those of the possible parents, *G. nycthemerus* and *G. lineatus*, in having a plain brown tail with no pencilling on any of the feathers.

The hybrid nature of Captain Nisbett's specimens, above discussed, is, however, quite obvious: no two of them are alike, and in some cases the two sides of the same bird differ in amount of pencilling and length of tail-feathers (about an inch)—a thing I have never seen or heard of in a natural or true-bred species. As to the variable colour of the legs, this is not astonishing in a set of mongrels, the parents of which had legs of different colours. The normal Jungle-fowl (*Gallus ferrugineus*) has, as Captain Nisbett says, slate-coloured legs; but domestic fowls show legs of various colours in addition to pale- and dark-slate—white, yellow and olive-green, so that variation in this point might be expected under the circumstances.

The most pure-bred-looking bird of the lot is No. IV, which is practically *G. davisoni*, but I should not like to put this form down as

a pure species without seeing more specimens. In a recent paper in *J. A. S. B.*, (LXIX, Pt. II, p. 144), I identified, with some hesitation, a pair of birds from the Chin Hills with this sub-species; and on inspecting a dead male specimen and a living pair in the Bombay Natural Society's collection from the same place I find they agree closely with the specimen I described. Moreover, a photograph of three males from the Chin Hills, submitted to me by the Society, shows all of them with the same character. A pair in the Indian Museum, lately received from Colonel C. T. Bingham, also agree, and thus the type seems a quite definite one. I find it differs from the true *G. davisoni* in its much finer pencilling and shorter tail, as I can now perceive from specimen IV above mentioned. Mr. Oates calls this form *G. williamsi*, and describes it as having buff pencilling; but I do not attach much importance to the colour of this marking, as a young male Silver Pheasant (very near *G. andersoni*) in the Indian Museum collection, changing from female to male plumage, actually sometimes shows fine irregular buff and bold white pencilling on the same feather. It is possible, therefore, that this buff pencilling might get white as the bird got older, or some birds may tan or get rusty, as some white domestic fowls do. It seems most unlikely that there should be two forms of finely pencilled Kalij in the Chin Hills, differing only in colour of pencilling; if, however, this should prove to be the case, the white-pencilled one will not bear my suggested name, *G. turneri*, but should be identified with Temminck's *Lophophorus ewieri*, described from an unknown locality; I have looked at the coloured figure of this, and it agrees so closely with the Chin Hills *Gennæus* Pheasant that I think it must be the same bird.

Four of Blyth's old specimens from Arrakan, which he referred to *G. ewieri*, are still existing in the Asiatic Society's collection; two of them (a pair) agree so closely with *Gennæus oatesi* that they must be referred to that species if it be such.\* But the other two are obviously hybrids between *G. horsfieldi* and *G. lineatus*, which was the

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\* A living male which has been for years in the Calcutta Zoological Garden is also referable to this form, having the general structure and colour of *G. horsfieldi*, but the upper surface, wings, and tail finely, irregularly, and brokenly pencilled with white, the last white line on each feather best defined. The white of the inner web of central tail-feathers is pencilled with black. The legs of this specimen are lead-coloured. Its exact place of origin is unknown.

origin he ascribed to the series as a whole. As a matter of fact, all the short-tailed forms with narrow sub-erect crests and non-lanceolate lower plumage, agreeing in structure with *G. horsfieldi*, might very well be treated as sub-species of that form, even including *G. lineatus*, and all probably interbreed freely.

But when we come to *G. andersoni*, we get a structural distinction in the long arched tail, which is seen in a much fuller development in the Chinese *G. nycthemerus*; and both of these have full pendent crests and red legs; the legs of the others vary from lead-colour to fleshy. The pencilled forms of *Gemmæus*, then, fall into these types:—

- A. With structure of *G. horsfieldi*, tail not much longer than wing and narrow suberect crest.
  - a. With fine clear white or buff pencilling on black, and white rump-bars; all tail-feathers equally pencilled ... .. *G. cuvieri*.
  - b. With very scanty, broken white pencilling on black, white rump-bars; inner webs of middle tail-feathers white or nearly so ... .. *G. oatesi*.
  - c. With a pepper-and-salt mixture of black-and-white above, formed by close irregular pencilling; no white rump-bars; inner webs of centre tail-feathers white *G. lineatus*.
- B. With tail much longer than wing and full drooping crest.
  - a. With bold, regular, subequal black and white pencilling ... .. *G. andersoni*.
  - b. With very fine black pencilling on a white ground, invisible at a short distance on most parts of the upper surface; tail very long ... .. *G. nycthemerus*.

These two species evidently interbreed also, for in the Indian Museum are two tails of males intermediate in type.

The hens of these species will be easily distinguished, thus:—

A.

- a. Very like female of *G. horsfieldi*, but with most of tail-feathers outside central pair finely pencilled with white ... .. *G. cuvieri*.

- b. Very like *G. horsfieldi*, but with outer tail-feathers more or less mottled black and chestnut; centre tail-feathers very pale, or even whitish, on inner web ... *G. oatesi*.
- c. Upper plumage marked with white; outer tail-feathers mottled black and white and chestnut ... .. *G. lineatus*.

## B.

- a. Lower plumage with white "V"-shaped marks; tail plain-brown throughout ... *G. andersoni*.
- b. Nearly uniform brown, with no light markings or edgings to the feathers; outer tail-feathers black, strongly pencilled with white ... .. *G. nycthemerus*.

The fact that all the hens of these species can be so readily distinguished would seem to militate against the hybrid origin of any of them; but some of them may be the offspring of hybrids in the first place, which have ultimately by inter-breeding "shaken down," as it were into definite types. That such a possibility exists is, I think, indicated by some remarks made by Messrs. Stevenson in "The Birds of Norfolk" and Ogilvie-Grant in the British Museum Catalogue, in speaking of the English hybrids between *Phasianus colchicus* and *P. torquatus*. The former says: "The most marked feature of all, the white ring on the neck, descends from one generation to another, and the hybrid origin of the bird is thus apparent long after every other trace of its mixed parentage has passed away." The latter (B. M. C., XXII., p. 321) notes: "It is very rarely now that anything approaching a pure bred male of *P. colchicus* can be found in England; even in specimens which appear to be pure bred at the first glance (that is, in those which have no trace of a white ring), the subterminal green bar of *P. torquatus* is usually more or less developed on the feathers of the lower back, and the basal part of the central tail-feathers is rather widely barred with black." We see, therefore, that these undoubted hybrids are tending by inter-breeding to fall into two distinct types or sub-species, and it is quite possible that, given *G. horsfieldi* and *G. lineatus* to start with, the forms *G. oatesi* and *G. cuvieri* have been thus produced. (F. F.)

## MISCELLANEOUS NOTES.

## No. I.—A WILD DOG'S EARTH.

(With a Plate.)

At the end of December, 1898, I found myself in the Gagamul Forest in the Berars, and on the 27th of that month I was stalking along the slopes of the lower hills, looking for Samber. I had just ascended the steep side of a ravine, and, as we topped the ridge, my shikari said he saw a tiger on the opposite side of the next nullah. About 80 yards off, just below the sky line of the next ridge, there was certainly a yellow animal sitting in the grass. The rising sun was in my eyes, and the long grass prevented me from being sure what it was, though I could see it was not a deer; I fired, the smoke hung in the morning air, and when it cleared away, nothing was visible. I crossed the nullah higher up and came down the ridge so as to have the advantage of being on higher ground. When I had got within 15 yards of the place, a wild dog bolted out of the ground at my feet and was out of sight, down the ravine, in a moment. I found a patch of blood where the animal I had fired at had been sitting, and as the grass there was laid flat in a large circle, there seemed to be every chance of it being a tiger. The ground was too hard to show any footprints. Following the blood, of which there was plenty, for about 100 yards, I walked on to a wild dog lying dead shot through the middle of the body. I found that he had not eaten anything for several days, as his stomach was empty. A handful of Samber hair in the intestine showed that his last meal was Samber. The dog was a male. He measured in length  $51\frac{1}{2}$  inches, of which the tail was 17 inches, height  $21\frac{1}{2}$  inches. The teeth were worn with age. I then returned to the spot where the other dog had come out of the ground, and found a large hole. I suspected that there might be young ones, but could not hear them or see any signs of such being the case. Three days afterwards, on the 30th, I returned with pickaxes and spades, and walked very quietly up to the hole. As I got in front of it, the dog appeared at the bottom of the hole and at once went back out of sight. I called to one of my men to throw his blanket over the hole, but immediately the dog shot out and got a bullet in the chest, falling dead just clear of the mouth of the hole. She was in milk, but did not appear to have had puppies recently. We then turned our attention to the hole, and found it descended at an angle of  $45^\circ$  into the hill for about 4 feet and then turned at right-angles sharp to the right. We dug down about 6 feet from the turn, and reached the bottom of the tunnel, 3 feet 6 inches from the surface, without hearing or seeing anything of the puppies. In the meanwhile, I discovered a small hole, of 4 inches only in diameter, about 16 feet from the big hole. On opening this up it descended at an angle of  $60^\circ$ , and communicated with the tunnel; in fact, at the bottom of it there was an enlarged space at the end of the tunnel, in which were lying 5 puppies. The small hole was evidently for

ventilation. There was then a large entrance hole, a tunnel, about 16 feet long, running quite straight at right-angles to the entrance at a depth of 3 feet 6 inches, and an enlarged space at the end from which the tunnel extended upwards again, narrowing at the surface to a small orifice. The earth was an old one, and the mound at the entrance, made by the excavated earth, was grown over with old grass. The tunnel was only 14 inches high, and must have been made, I think, by wild dogs. It was too low for a hyæna and not at all like a porcupine's hole. The puppies (3 males and 2 females) were at least a week old. Three had ticks on them. They were of a uniform dark brown colour, slightly yellow about the neck, and were exactly like pointer puppies, as will be seen from the photograph. When handled, they whined like a domestic pup, and when put down on the ground, went to sleep. I tried to keep them alive, but could not get a foster-mother. They did not thrive on tinned milk, which was all I had to give them. After five days I destroyed them, as they were slowly starving. They had not opened their eyes. The bitch measured  $54\frac{1}{4}$  inches, of which the tail was 17 inches, height  $18\frac{1}{2}$  inches. She was younger than the dog, and there were a few white hairs at the end of her tail. A small quantity of Samber hair in her intestines was the only trace of food. I have long been of opinion that carnivorous animals can go many days without eating, and this seems to prove it, for these two dogs had no doubt killed a Samber together. Between the 27th and 30th it is certain the female had eaten nothing, and it must have been several days before the 27th that the Samber was killed. I had left the carcase of the male, with the skin on, lying 100 yards from the earth on the 27th. It was still there on the 30th untouched, and quite fresh as the weather was cold. A small hawk or two had been picking the flesh off the ribs, but the vultures had not found it, nor had the female wild dog touched it. My men said wild dogs would not eat one of their own kind. Another matter of interest is that the male was with the female when she was lying up with the puppies. I had been walking over these hills for some days without seeing Samber, but no sooner had I left the earth and walked a quarter of a mile than a good stag jumped up within 30 yards of me and cantered up some open ground in front, an easy shot. My rifle was unloaded, as I never thought of seeing deer in such close proximity to wild dogs.

J. D. INVERARITY.

BOMBAY, January, 1900.

No. II.—THE LARGE-BARRED OWLET (*GLAUCIDIUM CUCULOIDES*, VIGORS) CAPTURING QUAIL ON THE WING.

In January last, during the two or three days when the whole of the Kangra Valley as far south as the Beas River at Dehra was covered with snow, standing in the verandah of my house with two or three friends, we



From a photograph by J.D. Inverarity.

WILD DOG PUPPIES.



were surprised to see a common quail (*Coturnix communis*, Linn.) fly past. Almost immediately after we first caught sight of it, an owlet swooped down upon it, and tried to carry it off. We ran to the place where the pair had fallen upon the snow, the quail having proved too heavy for the owlet, when the latter flew off, leaving its quarry with but slight remains of life in its body. I found upon examination that the neck had been torn open at the back, and one eye was damaged. The owlet must have caught the quail by the head in one of its feet and driven its claws home. The day was a bright, clear one, and the incident occurred at about 12 o'clock. I have seen *G. cuculoides* catch large crickets, and since late in the afternoon, but have never before known it act the part of a hawk, or observed it capture a creature on the wing at midday.

G. C. DUDGEON, F.E.S.

PALAMPUR, PUNJAB, May, 1900.

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No. III.—*PTEROMYS INORNATUS*.

It is worth recording that I came across the large red Flying-Squirrel (*Pteromys inornatus*) on January 2nd, 1900, at 3,000 feet elevation in the Tons Valley. These squirrels are said by Blanford to be found at 6—10,000 feet, and are supposed to hibernate in winter. I was making a valuation survey on the day mentioned in a *chir* (*Pinus longifolia*) forest, and just as one of the men proceeded to measure a tree in which there was a hole about 12 feet from the ground, out jumped a squirrel. In the hole were some fresh *chir* needles, but whether it had taken them to eat or to sleep on, I was unable to determine.

This occurrence at 3,000 feet shows that, at any rate, some of this species retire to a lower elevation in winter, and do *not* hibernate.

P. H. CLUTTERBUCK, F.Z.S.

DEOBAN, May, 1900.

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No. IV.—NIDIFICATION OF *RIMATOR MALACOPTILUS*, BLYTH.

Mr. W. P. Masson, of Darjeeling, has been so fortunate as to discover the nest and eggs of *Rimator malacoptilus*, Blyth, the Long-billed Babbler, No. 185 of Blanford's Birds, Fauna of British India. It is recorded only from Sikkim and Manipur, and is a very rare species; its nidification has not been described. The nest contained three eggs, is the same shape and size as that of *Rhipidura albicollis*, Vieill., the White-throated Fantail Fly-catcher, Blanford's No. 605, and was made entirely of fine grass, without any lining; it was fixed in the fork of the branch of a shrub. The eggs are small, light blue, and without spots.

LIONEL DE NICEVILLE, F.E.S., C.M.Z.S.

CALCUTTA, June 5th, 1900.

No. V.—ON THE OCCURRENCE OF THE WHITE-WINGED WOOD DUCK (*ASARCORNIS SCUTULATUS*) IN UPPER BURMA.

On a recent visit to Bhamo I was, through the kindness of Capt. Barnard, fortunate in obtaining a specimen of this rare duck which was shot by a sepoy of the Military Police.

On reference to the description given by Oates in the "Game Birds of India," Part II, I find that Mr. Oates has never met with, or even heard of, this duck in Upper Burma, or Pegu, though he conjectures it occurs throughout the whole eastern part of the Empire, from Assam to Tennasserim.

The duck was brought to me on the morning of the 10th February, having been shot the evening previous on a swamp or jheel, about one and-a-half miles distant from the town of Bhamo. Capt. Barnard informed me that the sepoy had two days previously shot another specimen of this duck.

The jheel is an ordinary one, with some wet cultivation near by and jungle not far distant. The sepoy stated that during the day no ducks were to be found, but that towards evening a variety of duck flighted in, evidently from the Irrawaddy, to feed. On one of his evening visits, he observed two strange ducks; owing, however, to their extreme shyness he failed to get near them.

The ducks visited the swamp every evening, and he at last succeeded in getting an easy flying shot, and dropped one bird, the other flew away; two days later he was lucky enough to bag the other one. This was the specimen brought to me.

DESCRIPTION:—The head sparsely mottled with black, except on crown, where black predominates. The sides of the body are chestnut-brown, but on the abdomen the colour is dusky-rufous. In other respects the plumage accords with the description given in the work referred to. This is the first specimen of this duck I have met with—a fine bird, as large as a goose. I showed the bird to several Burmans, but not one of them had ever seen one before, and could not give me a specific name for it.

Though the bird was somewhat damaged, I skinned it as well as I could and forwarded the skin to Mr. Oates. I thought I should like to try the flesh, so, after I skinned the bird, I had him hung for twelve hours or so, and then roasted. The flesh, though not as good as that of some of the smaller ducks, was very palatable.

|                |     |     |     |        |
|----------------|-----|-----|-----|--------|
| Total length   | ... | ... | ... | 31½"   |
| Length of wing | ... | ... | ... | 14½"   |
| Do. tail       | ... | ... | ... | 6"     |
| Do. mandible   | ... | ... | ... | 2⅝"    |
| Weight         | ... | ... | ... | 8½lbs. |

MANDIBLE:—Orange-yellow, black at the base; the nail and anterior portion including tomium, blackish.

MAXILLA :—Orange-yellow, blackish anteriorly.

LEGS :—Orange-yellow.

IRIDES :—Golden-yellow, not crimson.

G. H. EVANS, VET.-CAPT., A.V.D.

RANGOON, 21st May, 1900.

No. VI.—THE GOLDEN-EYE (*CLANGULA GLAUCION*).

Mr. Blanford (in *Birds*, Vol. IV, p. 465, "Fauna of British India") mentions my name as one of the few who have met with the Golden-eye within Indian limits; having regard, therefore, to Mr. Baker's remarks on pages 15 and 17 of this Volume of the Society's Journal, it seems incumbent on me to send to the Journal a note regarding my acquaintance with this duck. In the Chach Plain, on the banks of the Indus above Attock, the Golden-eye is a regular and by no means rare cold-weather visitant.

On referring to my old shikar diary I find the following records regarding it.

- I. Azgar, 26th December, 1885—2 specimens ♀ ♀.
- II. Azgar, 27th December, 1885—1 specimen ♂, immature. The skin of this specimen is now in the British Museum collection, *vide* Cat. Birds, Vol. XXVII, p. 382, and this record has apparently been overlooked by Mr. Baker.
- III. Azgar, 8th February, 1886—2 specimens, unsexed.
- IV. River Indus, between Attock and Azgar, 24th February, 1886—1 specimen, unsexed.

On the latter date I was in company with Dr. Stoker, and we shot up stream from Attock along the banks of the river to Gaziabad, returning the next day to Attock by boat.

I can find no record of shooting any specimens during the cold weather of 1886-87, but I think that was probably due to my having refrained from shooting them, the duck being useless for the table.

A brief description regarding the locality affected by this species may be of interest. The River Indus, after having been much narrowed about Torbela by the near approach of the mountains on each side, widens out in the Chach Plain to a considerable breadth (possibly 6 or 7 miles in places) to be again constricted at Attock. In the Chach Plain, where the river is widest, there are numerous islands in the bed of the stream, and it is in the channels between these islands and the banks of the river that the Golden-eye lies. A similar widening of the river takes place further south below Kalabagh, and probably there, too, the species will turn up.

I never met with this species away from the river, and, like Dr. Stoker, usually found it in flocks of four or five individuals. According to the notes in my copy of Hume and Marshall's "Game Birds of India," the name given to me for this duck by the local shikarries does not agree with that given to Dr. Stoker. The most interesting piece of information given me by my

informants was the short period they considered the species to be away from the neighbourhood. They said it was absent only during three months—April, May and June—but I had no opportunity of verifying this statement, and, as with the name given to me for the species, do not place much faith in the information.

From Mr. Baker's remarks I gather that he considers the Golden-eye to be a chance visitor to the Indus Valley, and that he looks on Dr. Stoker's suggestion of its being a regular cold-weather visitant as incorrect. In this I cannot agree with him, and in my opinion it is a regular and by no means uncommon cold-weather visitor to the River Indus above Attock.

The Chach Plain is easy of access from Campbellpore, Attock and Rawal Pindi, and I suspect that anybody visiting it (during the cold weather) in search of the Golden-eye will find his quest as near a certainty as any piece of shikar can be.

J. W. YERBURY, LIEUT.-COL., R.A.

ARMY AND NAVY CLUB,  
LONDON, May, 1900.

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No. VII.—NOTES ON A *DIPSAS MULTIMACULATA*  
IN CAPTIVITY.

On the 10th April, I had two live specimens of *Dipsas multimaculata* brought to me, full-grown and unscathed.

They were found together—one coiled in a depression of the ground beneath a small lime bush; the other in the lower branches of the same bush, a few inches away, probably courting. On examination, I found the larger of the two palpably gravid in the hinder parts. Both were put together in the same cage, but on the morning only one was to be seen. I examined the cage most carefully, and satisfied myself that there was no possible means of escape [and since this event I have kept several snakes, and smaller ones, in the same cage with no similar occurrence]. The only inference was that one had devoured the other, and, as luck would have it, the pregnant specimen remained.

Her interesting condition forbade my investigating the truth of my suspicions.

She lay coiled on the floor in one corner of her box for several days, and, on the 19th April, deposited the first of a total of seven eggs which were laid as follows:—

- 1st, between 9-30 a.m. and 4-30 p.m., 19th April.
- 2nd, ,, 10-15 a.m. and 2 p.m., 20th ,,
- 3rd and 4th, between 2 p.m. and 4-30 p.m., 20th April.
- 5th, night of 20th April.
- 6th, between 7 a.m. and 8-30 a.m., 21st April.
- 7th, night of 21st April.

The eggs were white, with isomorphous poles. One was opened, and contained a small pinkish, gelatinous embryo, occupying a chamber embedded in the yolk substance, and lying in contact with the soft shell.

The rest were placed under variable conditions to await incubation, but unfortunately all putrefied.

The parent during captivity occupied her time coiled on the floor, and never climbed into the branch given her for that purpose.

She was most intrepid, hurling herself boldly with little or no hesitation at an aggressor, as I repeatedly elicited when putting my face near to the glass of the cage, or in any way molesting her; nevertheless, she lives amicably now with several other snakes, *viz.*, *Chrysopelea ornata*, *Dendrophis pictus*, and *Tropidonotus stolatus*.

Her method of striking is very remarkable. The anterior part of the body is thrown into transverse figure-of-eight loops, which overlap one another, causing a considerable retraction of the head which lies centrally. The whole of the body sharing in this contortion is raised off the ground, and the snake poises thus, awaiting its opportunity, when the head is suddenly thrown vehemently forward as far as the loops by their straightening will permit, the jaws being widely opened in the act.

By this means, this snake which measured three feet one inch, could strike at a distance of at least six or even eight inches.

The first loop is sometimes thrown to the right and sometimes to the left.

She is still in captivity, but, like all imprisoned animals, her incarceration, though only of one month's duration, has subdued her spirit considerably, and I now have some difficulty in provoking her to adopt the attitude of menace.

F. WALL, Capt., I.M.S.

RANGOON, *May*, 1900.

#### No. VIII.—OCCURRENCE OF *PODICEPS CRISTATUS* IN ASSAM.

On the 21st April, on the Juttiani jheel, a small piece of water between the Moran and Pathalipam Tea Estate in Dibrugarh, Mr. L. Ilbert shot a fine specimen of a male Crested Grebe (*Podiceps cristatus*). It was first seen floating about on a comparatively open piece of water, off a small island of stunted trees. I have also heard of a second bird having been shot close by; of this I could get no further particulars than that "it was eaten by the cook!" This is the first record of the Crested Grebe in Assam proper, though Hume met with it in Manipur.

E. C. STUART BAKER, F.Z.S.

DIBRUGARH, ASSAM,  
*June*, 1900.

## No. IX.—RED ANTS AS AN ARTICLE OF FOOD.

That there is any economic value attached to the red ants (*Ecophylla smaragdina*) is, I think, so little known that the following note may be of interest. Mr. Hunt, the Forest Officer of Bastar, has supplied me with the details. The Murries of Bastar—the southernmost Native State in the Central Provinces—use the red ants as a regular article of diet.

Throughout the year, but more especially during the dry season, the Purjas—a sub-class of the Murries—collect nests of the red ants, and after tearing them open, shake out the contents into a cloth, and beat the insects—mature and immature—into a pulpy mass with a stone, and when all are dead, enclose them in a packet, about the size of a Goose's egg made of sal leaves. In this condition the article is taken to the bazaar and sold, about 16 being sold for a pice, or 4 cowries each. To prepare the squashed ants for food, they are mixed with salt, turmeric and chillies, and ground down between stones, and are then eaten raw with boiled rice. They are sometimes cooked up with rice flour, salt, chillies, &c., into a thick paste, and in this condition the food is said to give the eater of it great power of resistance against fatigue and the sun's heat.

A. M. LONG.

RAIPUR, C. P., September, 1900.

## No. X.—A NEW SPIDER.

Mr. Pocock's valuable note on the genus *Pacilotheria* enables me to announce what I expect will prove to be a new species of this genus. If so, the range of *Pacilotheria* will have to be extended to cover probably the greater part of India, for my specimen was taken in a house at Dehra Dun. It is a male. The lower side is entirely black, or very dark brown about the thorax and mouth. The legs are entirely black above and below, except the patella joint of each leg (palpi included), which is flesh-coloured above and darker below. The upper surface of the cephalo-thorax is flesh-coloured. The abdomen is also flesh-coloured above, as regards the *skin*, which shows through a velvety coating of black hairs with brown tips, but its general effect is dark brown. When the spider sits still with his legs bunched up he bears an odd resemblance to a black flower with a fleshy centre and a flesh-coloured ring round the corolla. It has been sent to the British Museum. I am sorry I did not measure the animal, but it is now stiff. The size, however, is about that of the one in the plate accompanying Mr. Pocock's paper.

F. GLEADOW, I.F.S., F.R.M.S.

DEHRA DUN, August, 1900.

No. XI.—OCCURRENCE OF *TROPIDONOTUS HIMALAYANUS*  
IN BURMA.

We have lately received from the North Chin Hills, altitude 5,250', a specimen of this snake, which we observe, on a reference to Boulenger's "Reptilia," has not been recorded from this Province.

It requires no description, being a normal specimen.

The ventrals numbered 175, and there are two anterior temporals on each side.

It is worthy of remark that the black nuchal spot and orange colour characteristics noted to differentiate this snake from *T. subminiatus* were absent in this specimen.

F. WALL, CAPT., I.M.S.

G. H. EVANS, A.V.D.

RANGOON, August, 1900.

No. XII.—ON THE OCCURRENCE OF *SIMOTES SPLENDIDUS*  
IN BURMA, OR A PROBABLE NEW SPECIES.

This specimen came to us from Sagaing, in the dry zone of Upper Burma, on the 3rd July. Unfortunately, only the head and two or three inches of the neck and a few inches out of the middle of the body were sent. The portions received were quite perfect, and doubtless the whole specimen had not been preserved, as the Burman had not at hand a bottle of sufficient size to accommodate the whole snake, which, from the size of the head and girth of body, we suppose would measure about two feet, judging by other species of *Simotis* (*violaceus* and *cyclusurus*) with which we are familiar.

It accords closely with the description of *S. splendidus* in Boulenger's work, but differs in the following points:—

Rostral—the portion seen from above is slightly greater than distance from frontal.

Internasals—of which there are four, are peculiar, the median pair are smaller, and project backwards to the middle of the præfrontals.

Præfrontals—are four in number, a small median pair only half the length of the larger outer pair.

Frontal—distinctly less than distance to end of snout; equals parietals.

Postoculars—three, right and left.

Ventrals—are very distinctly angulate.

It appears to us that there is little doubt that this is a new species, but we are chary of pronouncing it so decisively, seeing that we have only one specimen, and that not complete, also that it possibly may be an abnormal "*splendidus*."

F. WALL, CAPT., I.M.S.

G. H. EVANS, A.V.D.

RANGOON, August, 1900.

No. XIII.—COCCIDIPHAGOUS LARVÆ OF *EUBLEMMA*.

Mr. G. C. Dudgeon, in the last number of the Journal (Vol. XIII., No. 2), gives an interesting note on the life-history of *Eublemma amabilis*, and mentions that this is the second species that has been reported as preying upon *Coccidæ*. I can add two more to the list. I have bred *Eublemma cretacea*, Hmps., from the Coccid *Ceroplastodes cajani*, Mask., and *Eublemma subangulata*, Hmps., from a species of *Antonina*. *Eublemma amabilis* occurs very commonly in Ceylon, feeding upon a local species of Lac insect, *Tachardia albizzæ*, Green.

It is probable that very many—if not all—of the species of this genus will eventually be found to have the same habit.

A closely allied insect—*Thalpocharis coccidiphaga*—does good service in Australia, in reducing the numbers of several injurious species of *Coccidæ*, e.g., *Eriococcus coriaceus*, Mask., and *Lecanium oleæ*.

E. ERNEST GREEN, F.E.S.,  
Government Entomologist, R.B.G.

PERADENIA, CEYLON, August, 1900.

## No. XIV.—ON RHINOCEROS SHOOTING.

I have read with much interest Captain P. Z. Cox's notes on Somaliland, and I know he will excuse me if I venture to criticise his advice to sportsmen to shoot Rhinoceroses in the belly. Every good sportsman will agree that shooting at large "into the brown" of any beast is a practise much to be deprecated, and the advice given in his notes is only too likely to lead to this. Perhaps I may be excused if I give a few instances of my small experience with the Rhinos. The first one I ever fired at I had followed for several hours, and it was standing, facing away from me, with its head turned half round towards me, at about 70 yards; I may remark that I was extremely badly equipped for this style of shikar, as I had only a double-barrel 12-bore rifle. I thought to myself this is a fine opportunity for the head shot, and let drive behind the ear. The Rhinoceros fell on to its knees and stumbled forward for about ten yards, when it got up, and out of a cloud of dust charged straight down on me like an avalanche. I had just time to dodge it, and it passed on, and I never saw it again; probably it had a headache, but nothing worse. The next chance we had, my friend was with me, (he had a double-barrel '500 express, magnum charge, and bullets with a steel core,) two Rhinos, which we had been following for some time, charged at our wind and passed within about five yards. I was behind a bush and could not see them. He dropped the first one stone-dead in its tracks with a shot behind the shoulder. It was a nearly full-grown calf, and he gave the other one the second barrel, in the same place. I ran after it as it went off. The going was very bad, I lost my hat, a large portion of my nose, and I

nearly broke my leg, but I presently came up to it, with the blood pouring from its mouth, it having been hit through the lungs. I killed it with my 12-bore with a shot in the neck. Some days afterwards we saw a couple of large Rhinos going up a hill, and following them up came up to them in some thick scrub-jungle. They were feeding, and the first thing I saw was the horn of the big male coming bobbing along straight towards me about forty yards off. Having, after my first experience, no faith in head shots, I was rather in a dilemma, but taking advantage of a slight change of direction, when I saw a piece of his neck and shoulder, I let fly, and as he wheeled round and bolted gave him the other barrel, which so damaged his hind leg that we came up to him about half a-mile further on. My friend put in a couple of bullets from his '500, and as he charged I broke his shoulder with the 12-bore. We had a lively five minutes or so with him in the bushes, and then I got close up and finished him off with a shot in the neck. As we did not want to kill an unnecessary number of these fine beasts we only went after one more. We stalked him together in some grass jungle, and fired together at him at eighty yards. The '500 express took him in the neck, the 12-bore just behind the shoulder, and he sank down on his knees as dead as a stone. It would appear from the above that though the head shot, except with very heavy artillery, is not of much use, a shot behind the shoulder, as was proved in three of the cases mentioned, is pretty fatal, and that it is quite possible to give a good account of Rhino without hitting below the belt.

H. D. OLIVIER, LIEUT.-COL., R.E., F.Z.S.

BOMBAY, August, 1900.

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No. XV.—THE EASTERN PINTAILED SAND GROUSE (*PTEROCLES ALCHATUS*) BREEDING IN INDIA.

I cannot see either in Oates, Jerdon, or Hume and Marshall any record of the Eastern Pintailed Sand Grouse (*Pterocles alchatus*) breeding in India, which I think I may claim to have proved breeds in the Peshawar Valley. Two days ago, eggs were brought me by a man, who declared one was that of the Common and the other that of the Pintailed Sand Grouse. Doubting his word I made arrangements to go out this morning with him and see if I could gather any information for myself. I first went to the place where these Sand Grouse water, where I found, close to a village called "Kasim," the Common Sand Grouse fighting in in packs and a very few pairs, while to my surprise the Pintails all came in in pairs (I saw 5 or 6 pairs). I shot one pair of the latter, and then proceeded to search a few miles further on in a vast open plain for nests. I only found two nests, each containing three eggs of the Common Sand Grouse; in each case I approached so close to the bird on the nest that there was no necessity to shoot it in order to identify it. On my return I dissected the female Pintail Sand Grouse, and found an egg inside

quite ready for laying, and I have no doubt that it would have been laid to-day in the same plain I was searching in had the bird lived.

I regret to say the egg was broken badly, first pierced by shot and again broken in extraction. I have kept the remains of the shell, and should this prove to be unique I should be pleased to send it for identification. I hope in a few days to have collected a few more eggs of this bird, and am sending a man out to the same place, but as it is some twelve miles from here I should not go again myself unless absolutely necessary as the weather is too hot.

I should be much obliged if you would let me know what former records there are, if any, of *Pterocles alchatus* breeding in this part of India, and whether you consider the above sufficient proof of its doing so.

J. S. BOGLE,

MARDAN, PUNJAB, 10th June, 1900.

Q. O. Corps of Guides.

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#### NO. XVI.—BUTTERFLIES AS WEATHER PROPHETS.

I daresay some of you have already heard of the remarkable intimation of the approach of that timely rain which saved this Presidency three months ago, which was given by one of our commonest butterflies, *Euphlea core*; but it has been suggested to me that so curious a phenomenon ought to find a place in our proceedings, so I have drawn up a short note of the facts. The migration of *Euphlea core* northwards at the beginning of the monsoon has been noticed in our Journal several times. It is a languid, slow-flying butterfly which is found throughout India and appears at all seasons. For one day each year in the beginning of June the whole community is seized with an impulse to go north, and from morning till night they may be seen passing, in hundreds or thousands, slowly and irresolutely, but all in one direction. Sometimes this movement continues for two days, and among the hosts of *Euphlea core* may be seen a few travellers of two allied species, *Danaïa aglæa* and *D. limniace*. I have been told by an observant native that this phenomenon takes place three days before the monsoon bursts. I have not found this to be invariably the case, but there can be no reasonable doubt that the object of the northward movement is to escape from the coming rain. It is very observable in the Canara district, where the rainfall, as you know, is much heavier than it is further north. For the last ten years I have kept notes of the dates on which I observed the migration, and I find that it ranges from the first to about the tenth of June, and is always closely connected with the coming of the regular rain. This year I did not notice it, and do not think it occurred at the usual time. As you will remember, the season was a very peculiar one. There were no storms in May, nor even distant thunder and lightning. Our first shower was on the 8th of June,

## ERRATA.

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Page 541. Heading of Miscellaneous Note No. XVII, for *Assam*  
read *Tirhut*.

Same page, in same note, last line but one *for a month later* read *for*  
*two months later*.



I think ; then followed some very ambiguous weather till the 25th, when heavy but irregular rain set in and continued for nearly a week. Again squally weather set in on the 12th of July, and continued a few days, after which the weather set fine. A land breeze blew in the morning, and the weather altogether was like what we expect in October. There had been little regular monsoon so far and now there seemed to be little hope of any. The prospect, in fact, was as gloomy as it could be. On the 22nd of July, however, crossing the Esplanade at 9 o'clock in the morning, I noticed *Euplexa core* on all sides, flying northwards ; and meeting a friend soon after, I said, "It is all right—the monsoon is coming in three days." This was repeated, and I was subjected to some chaff ; but on the following evening there was a remarkably heavy shower, then for four evenings we had thunder and lightning, the first we had in Bombay since the previous October, till on the 28th the monsoon broke properly, with S.-W. wind and heavy rain. The next day, I think, we had 9 inches, and from that time there was never again any apprehension of a failure of the monsoon. In view of these facts I think we are forced to the conclusion that butterflies know something which is not revealed to the Meteorological Reporter to Government.

E. H. AITKEN.

BOMBAY, *September, 1900.*

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No. XVII.—LATE STAY AND EARLY ARRIVAL OF  
DUCK IN ASSAM.

Garganey (*Q. circia*) were noticed here up to the 10th May. I had several brought me before that date. They were all exceedingly fat. On the 20th of the same month a male Red-crested Pochard (*N. rufina*) was brought me. It was snared by bird lime in an old bed of a river near here. It did not appear to be a wounded bird and was very fat. The plumage of the body was similar to that of the female, except that the feathers on the breast were of a dark brown colour. The head was a dull brownish-yellow colour. The colours of the soft parts were :—bill dullish red, iris bright crimson, legs orange-yellow tinged with brown, webs blackish-brown.

The earliest arrival noted, was on the 19th of last month. On that date a male Gadwall (*C. streperus*) in female garb was brought me by a fowler. The earliest date of arrival of this species according to Baker is the 15th October or a month later than that noted by me. Garganey (*Q. circia*) and White-eye (*N. ferruginea*) have also made an appearance in several places.

CHAS. M. INGLIS.

BAGHOWNIE FACTORY,

DARBHANGA, *29th September, 1900.*

## No. XVIII.—BIRDS' NESTING IN THE TONS VALLEY.

(1) No authentic account of the nest and eggs of *Microcichla scouleri* (the Little Forktail) having apparently yet been published, I write to describe a nest with eggs which I came across this year.

On the 12th May I observed a pair of Little Forktails feeding by a small mountain torrent (in thick forest)—a tributary of the Tons (Jumna) at an elevation of nearly 7,000 feet.

After watching the pair for sometime, I saw one of the birds fly underneath a rock, over which a small cascade was falling. With some difficulty one of my men succeeded in gaining the spot, and he announced the presence of a nest, with eggs.

The nest was placed in a niche in the side of a rock, underneath a larger rock. It was in a dark, damp recess, constantly splashed by the falling water, and quite invisible from outside.

The nest is a neat but rather massive cup-shaped structure composed of green moss, and lined entirely with brown leaf skeletons. It contained 3 nearly fresh eggs, which are white, rather sparingly spotted with pale reddish, and which measured as follows:—

·80" × ·58", ·85" × ·59", ·79" × ·57".

Mean ·81" × ·58".

(2) The eggs of *Lophophanes dichrous* (the Brown Crested Tit) have never been obtained, I believe, so far. The nest of this bird was found by me on three previous occasions described on page 192, Vol. IX, and page 468, Vol. XII of the Society's Journal—these nests, however, all contained young.

On the 14th April, 1899, while riding along the Chakrata-Simla road above Mundali, at an elevation of about 9,300 feet, I heard the characteristic call of this tit from a neighbouring tree. I dismounted and sending my pony on a short distance, awaited possible developments, sitting quietly on the bank. I soon saw the birds, a pair, in a wild pear tree (*Pyrus aria*) and had not long to wait before one of them disappeared into a small round hole in a dead branch near the top of the tree. I waited no longer, but having climbed the tree investigated the hole, out of which the bird now flew. The branch was quite rotten so that I easily obtained access to the nest by enlarging the hole with my fingers. The nest was made of moss, lined with the fur of rats and flying squirrels, and contained 5 fresh eggs, white, spotted and blotched fairly thickly all over with chestnut markings.

They measured as follows:—

·52" × ·68", ·52" × ·70", ·50" × ·63", ·50" × ·65" and ·51" × ·68".

Mean ·51" × ·67".

CHAKRATA, N.-W. P.,

August, 1900.

B. B. OSMASTON,

Indian Forest Service.

## No. XIX.—A SHOOTING EXPEDITION ON THE PAMIRS.—II.

(Concluded from page 394 of this Volume.)

It was ten days after this that I fired the next shot, and then it was an ibex, not a poli, that I bagged. We found the herd grazing down in the bed of a nulla as we were going up to look for poli; on inspecting them, and, finding the best head to be certainly under 45in., I decided to leave them alone, as I hoped there might be poli further on. As we advanced up the nulla they of course saw us and went up the hill. After having searched the head of the nulla and found no poli, I thought we might have a try for the ibex in the evening on the way back. There they were down in the bed of the nulla grazing on the green grass again. It seems to be the rule on the Pamirs for the wind to blow all day long down the valleys. On that occasion it was so, and a stalk seemed impossible. By a great stroke of luck, however, the wind changed and blew up stream in our faces as we looked, and about the same time the herd was hidden by an undulation of the ground. Knowing that the change of wind was probably only temporary, I ran down the valley as quickly as I could. Just as I was getting within shot the wind changed again, and immediately the herd appeared making up hill. My first shot at the big buck was a miss, but the second one knocked him over. The horns were well shaped and slightly over 43in. This was the biggest ibex I saw on the Pamirs, but, judging from some of the old heads lying about, the horns run very big there. I measured heads of 51in., 50in., and 48in., and found a very big head on one occasion when I had not got my tape with me. The skull and what I estimated to be about 4in. or 5in. of the horns were embedded in the ice of a frozen river, and the remainder of the horns, as spanned by myself and my shikari, were 50in. to 51in., making the total length from 54in. to 56in. The horns were absolutely rotten and useless for a museum, otherwise I would have had this head cut out of the ice and taken it back with me. To have a chance of getting one of these big ibex, I think one should give up three weeks or so entirely to them, and try nullas some distance from the encampments and places which are difficult to get at. The natives shoot a good many ibex. It is a very much more valuable beast to them than the *Ovis poli*, as the skin of the latter is practically useless, while the ibex skins make the only leather that is any good for the pubbo or sock-like boot worn in those parts.

Next day I came across the only lot of female poli I saw during my trip. The yak I was riding discovered their presence long before I did, as he scented them while they were hidden from me by an undulation of the ground. Except during the ratting season, I believe the rams and ewes are never found together, and while I was on the Pamirs almost all the ewes had left the higher nullas and had gone down to a more suitable climate for the expected lambs. It now looked as if I was not to obtain

another poli, I searched nulla after nulla ; some I drew blank, others contained only small rams. At last one day I came to the mouth of a branch nulla near the foot of a pass leading into Afghan territory. The first four miles or so of this nulla were visible from where we stood, and the telescope revealed no signs of game. The local shikari now swore that there was no more grazing ground in the nulla than what we could see ; beyond was only snow and stones. However, I had by this time acquired a thorough distrust of any information of this sort, so announced my intention of going on and seeing for myself. It turned out lucky for me that I did so. After going a few miles up the nulla a lot of likely looking ground came into view, and before long Rakhmat had found a flock of ten poli lying down high up on one of the shale slopes. They were too far off to judge the size of the horns with any certainty, but one or two of them seemed good. At about three o'clock they got up, and, descending the hillside, began to graze their way towards us. Soon all but two were hidden by a piece of rising ground, and in a first rate position for a stalk ; these two had gone right down into the bed of the nulla, and, grazing there, quite commanded our line of approach. After waiting for about an hour in the vain hopes that they would join the rest, Rakhmat persuaded me to try and crawl over the hundred yards or so for which we would be in their sight. We managed this most successfully ; the two rams were so engaged on the young grass, which was just beginning to come up, that they never raised their heads. Once under cover, we lost no time in getting to the ridge behind which the remainder of the flock were, but I was rather disappointed to find that they were not quite so close as I had expected. Getting out the binoculars, I had a good look at them. One of them carried a magnificent head, out and away better than anything I had secured ; except for his back, which was light-grey, he was almost snow white. Another of the flock had a very fair head, the remainder being small. These two big ones were slightly apart from the rest of the flock. They were about 250 yards off, and grazing among some boulders of exactly the same colour as themselves. The sun was in our eyes, and it was difficult to make out the rams. Rakhmat wanted me to shoot, but at the moment I had first put the glasses on the big head I had determined on no account to draw a trigger on him until I felt certain of hitting him effectively. I was explaining this in a whisper to Rakhmat, when suddenly the poli threw up their heads and dashed off up hill. Evidently we had nothing to do with their alarm, as they kept looking straight below them. Rakhmat, who was searching the ground below with the glasses, whispered " wolf " to me, and shortly after I made out the brute slinking away across a patch of snow. The poli were evidently very thoroughly alarmed, as, led by the old white ram, they made steadily up the hill without stopping until they crossed a ridge high up above us,

From where we lay a lot more ground was visible, and I took out my glasses to have a good look at it. The instant I put them to my eyes I found an old bear waddling across their field. The poli were now out of sight, and the bear was a long way off, so I did not think there would be any harm in having a shot at him ; the only drawback was that it was getting very late. We signalled up the Kirghiz and the yaks, and were soon all three riding up the nulla at a trot. We did not dismount until we were well within 500 yards of the bear, and then, as we had a broad sheet of snow to cross, I thought we could trust to his blindness no longer. The sun was going down, and time was short. We raced across the hard snow (in full view), then into a nulla and up on to a ridge, by which time it was distinctly a case of "bellows to mend" with the three of us. The bear was slowly walking up a snow slope about 100 yards off us, and I was afraid I would not have time to pull myself together before he crossed the ridge. There was no time to lose, so, as he topped the slope, I fired. He fell, and spun round and round biting at his hind quarters, where I had evidently hit him. My next four rounds missed fire, and by that time the bear had got on his legs again and disappeared over the ridge. It was rather a question what to do, as there was evidently something very wrong with either the rifle or cartridges. The Kirghiz, however, gave me no time to consider, but dashed off in pursuit, so I was bound to follow. Luckily, the bear was not just round the corner, where I quite expected to find him. The next we saw of him he was going very strong on the other side of the main valley. Throwing myself down and using a rest, I aimed again. That round went off, and Rakhmat marked the shot under. I screwed up the Lyman another hundred yards and had another try. Another misfire, and then round after round refused to go off. The bear was getting further and further off, and in a short time would be covered by a ridge. Blessings were being plentifully bestowed in three different languages on rifle, cartridges, and bear, when suddenly a round went off, and, by an extraordinary fluke, stretched the animal dead. No time was lost in getting off the skin, but it was long after dark before we reached camp.

Next day I devoted to examining the rifle, cleaning the bear skin, and having a bath, for in the spring on the Pamirs, one's only chance of a tub is when one happens to be in camp in the middle of the day. It would require a good deal more hardihood than I possess to try a tub in the early morning or evening. I soon found out what was wrong with the rifle ; some dirt had got into the hole in the head of the bolt in which the striker works, thus preventing the latter from projecting far enough to detonate the cartridge. No doubt my best plan would have been to have gone on hammering away at each round until it went off, and not to have ejected it and tried a new one after each misfire. These things, however, often fail to strike one just at the right time.

The following day we went off to the same place to look for the big ram, for I was quite determined to add that grand pair of horns to my bag.

While the bear was being skinned, I had carefully noted a sheltered grassy spot as a most likely place for them to resort to when they came down again from the hill-tops. I had kept this to myself, and hoped to astonish the shikaris by sighting the poli here at a very long range. However, I was disappointed, and by midday we had covered almost every bit of ground with the glasses and found nothing. Sitting down, we had a consultation as to where they could have got to. I could hardly think that they had been so terribly frightened as to cross the hill-tops. "Khoda janta," said Rakhmat mournfully, "you, however, would fire at that bear." After a few hours' rest we got out the glasses again; no traces of the poli could we find, and it became time to start for camp. On our way down the nulla we stopped every few minutes to use the glasses as some fresh bit of ground revealed itself. I was feeling heartily sick of this work, which seemed quite hopeless, when I heard a whistle from Rakhmat, who had taken a line of his own, some distance off. Running up to him, I found him propping up the telescope on stones, and laying it as one lays a field gun. "I've found them," said he, beaming all over and evidently very proud of himself; and very good reason he had to be so. The rams were lying down among boulders high up on a hill, behind which the sun was setting. The light was atrocious, they were so far off as to be mere specks even through the telescope, and it was only after a most careful examination that one could see that they were beasts at all. My spirits, which had gone down below zero, rose again, and even a blizzard which we had to face the whole way home failed to damp them.

This snow storm was the beginning of some very bad weather. For seven days we were shut up in our camp. Sometimes it stopped snowing for a few hours, and the sun shining through the thick fog melted the snow which had fallen. The usual thing, however, was a howling icy wind and a storm of snow which more resemble fine white dust than anything else. My very small stock of literature had been exhausted long before, and time hung very heavily on my hands. I wrote, I played "patience," I tried to read the same book over for the third time, I sewed buttons on my clothes, and patched holes in them. I even went so far as to cut all the buttons off one coat so as to have the pleasure of putting them on again. There is nothing more wearying than being snowed up for several days in a small tent; but it is an experience that any man that shoots hill game must expect to go through. However, all things come to an end some time or other, and at last one morning I woke to find it a beautiful day. Off we started at once to look up the big ram, and we sighted the flock almost as soon as we entered their nulla. They were on ground which at first sight looked very favourable for a stalk. It was easy to approach under cover, and the wind was blowing steadily in our faces. There was one thing I did not like about the place at all however. It was just at the junction of two branch nullas, each of which terminated a short distance up in big glacier. I have noticed that in such places there are

very often erratic little currents of air, quite independent of the general direction of the wind. My misgivings turned out to be only too well founded; just as we were finishing the stalk I felt a puff of wind on my back, and the poli immediately appeared cantering up hill. I had a chance of taking a long shot at the big ram as he stopped for an instant, but refused it.

"Nothing under a certainty," was my fixed resolve. After this we gave the big poli what Rakhmat called "three days' leave" and employed the time in searching other ground, but without finding anything shootable, though I picked up and measured an old ibex head of 51in.

On the fourth day we went off to look for our poli again, expecting to find them almost immediately. After a few minutes' work with the glasses I found a single beast grazing below one of the glaciers: this, however, on closer inspection, turned out to be only an ibex, and we searched all the usual places for the poli without finding them. Thinking they might be up at the head of one of the branch nullas, we were proceeding up it when suddenly I caught sight of a suspicious-looking speck high upon the sky line on the other side of the nulla. One look through the glasses was enough, and I sank to the ground, the shikaris at once following my example. It was the big ram. Though a long way off, his horns showed up splendidly against the sky and looked magnificent. Luckily, he was not looking straight down below, and had not spotted us. He was soon joined by the rest of the flock and after standing, looking in all directions for a long time, they lay down where they were. We were in rather an awkward position, as the place we were on was in full view of the poli, and there was a good 100 yards to go before we could get to the nearest cover. True, we were a long way off, but they were evidently on the alert, and I had learnt from experience how keen-sighted they could be. There was no good stopping where we were, as the rams were almost certain to come further in our direction on getting up, and we should then be hopelessly stuck. Putting the glasses on the flock, of which only the heads of three rams were now visible, I started Rakhmat off, with instructions to crawl for the cover, to avoid crossing any patches of snow, and to stop instantly on a whistle from me. Off he went, and managed to reach cover without the poli stirring. As soon as he got there I started off the Kirghiz, but before he had covered 20 yards a ram got up and stared in our direction, and a whistle from me stopped him. After looking towards us for some time, the ram lay down again with his back towards us, and on a sign from me the Kirghiz re-commenced his crawl. At last he, too, was safely under cover, and, signing to Rakhmat to watch the flock with his telescope, I started off. The going was most laborious, over sharp stones most of the way, varied by occasional patches of freshly-thawed mud. I was halted by Rakhmat three or four times, but managed to join the shikaris without alarming the poli. Shortly afterwards they got up and, as I had expected, began to come down in our direction. If only the wind

had been all right we should have had a capital chance of a successful stalk. Unfortunately, the sky, which had looked so favourable when we started, had clouded over, and a gale blew, now in our faces, now on our backs. The sooner we got further away the better, I thought, and ordered a retreat. When we had gone about half a mile, I sent Rakhmat up a ridge which commanded the nulla, and he brought back the information that the poli were now down on the grass. After waiting for an hour or so in the vain hope that the wind would settle, it began to snow, and I returned to camp.

The next day the poli were on the same ground, but the wind was so unsettling that I resisted the temptation to go after them. The following day, however, it was fine and the poli in the same place. I tried a stalk which would have been successful but for the old ram, whose white face I suddenly discovered staring at us over a rock as we were covering the last couple of hundred yards. We gave the poli another three days' leave and then went after them again. This time we only found eight, two of the flock, the second biggest and another, being missing. We again made a mess of the stalk, being defeated by the old ram, and the flock bolted up into the snow perilously near the crest-line, over which we were much afraid they would go. After standing there for a long time, however, they lay down, and we returned to camp, finding on our way with the telescope the two missing rams high up a branch nulla.

Early in the morning we rode up again to the poli ground and carefully searched the usual places, finding nothing. We then went off to the place where we had last seen the rams; not a trace of them could we find though Rakhmat and I examined every yard of the ground with the glasses. The flock was not there, and I now set to work to examine the snows above to see from the tracks if they had left that part of the country or not. As I feared, there was a great road leading up to a pass, and it seemed now certain that the poli had crossed in the night. Very sick, we sat down and held a consultation. I was quite determined to find the big ram again; the only question was, What was the best way to get the camp there? The Kirghiz at first said he did not know what country was on the other side, but when I announced my intentions of following the tracks over the hill-tops, and seeing for myself, he said he thought he knew of a pass on which we could take the baggage. After breakfast, Rakhmat proposed that we should look up the other two rams, which would probably be somewhere about where we had last seen them. This I agreed to do, though I felt that I should not be a bit consoled for the loss of the big head, even if I accounted for the pair of them. We now advanced cautiously up the branch nulla where we had last seen them. The lower half we drew blank, as we had expected, as the ground had been visible from below with the telescope. On going higher up still, we found nothing, and it looked as if we had come to the end of the grazing ground. Only a few hundred yards further

on was a great glacier, completely blocking up the nulla. After advancing a yard or two, Rakhmat, who was leading, dropped as if shot, the Kirghiz and I followed suit, and Rakhmat told us that he had caught sight of a single ram lying just under the glacier. A hasty look with the glasses revealed two rams, without doubt the two we were after, and if they moved a few yards in our direction a stalk looked easy. This at last they did, and telling the Kirghiz to stop where he was and go to sleep—a thing he was a great adept at—and on no account to show his head, Rakhmat and I started off. A long and troublesome detour had to be made up a hill, over great boulders, and occasional patches of deep soft snow, in one of which Rakhmat managed to go up to his armpits. Then an equally tiresome descent, and we arrived about 260 yards off the glacier under which and below us the two rams ought to be. On the way, I could not help thinking what a capital place we had caught them in. On two sides of them was a great wall of ice making their only road of retreat in our direction, for I calculated that even if they made off down hill, the Kirghiz would be sure to show himself and turn them. Taking the rifle and peering over, I made out two rams grazing well within shot, and was taking out the glasses to see which was the better head, when, to my astonishment, my eye fell on a third and fourth poli a little lower down. My delight may be imagined. This could only mean that the whole flock was before me, and the big ram somewhere within shot, and with the odds heavily in my favour. I soon made him out, his white coat making an excellent target against the dark ground. Taking careful aim, I fired. "Lugga" from Rakhmat, though the ram showed no signs of it, as together with the rest of the flock, he raced up the slope. They were now on a level with us, and not more than a 100 yards off. As the big ram stood for a second, I put the sight on him, but just as I was about to fire, he staggered and fell.

The rest disappeared over the ridge, and, leaving the fallen one, I rushed forward to get a shot at the second biggest. A run of 50 yards and the flock was in sight again, going in single file up a steep slope. "The leader is the one," cried Rakhmat, who had the glasses on them. My first shot was a miss, but the second broke the ram's shoulder, though it failed to stop it. My next shot was another miss, and then Rakhmat called out that there were no more cartridges. He said he thought he must have dropped them all in the snow drift he had fallen into. There was one more cartridge in the magazine, but I was not going to risk that at a long shot. Telling Rakhmat to go and try and find the cartridges, and to keep his eye on the wounded ram, I ran back to inspect the big one. He was a magnificent fellow, and no mistake. "A 60-incher at the very least," I thought, as I pulled the tape out of my pocket and began to run it over the horns. "Sixty-five inches, by jove, with a fraction of an inch to spare." A trophy in itself well worth a journey to the Pamirs. Calling up the Kirghiz, who had my camera, I took a

couple of photos of the beast as it lay, and went up to look after the wounded one. I met Rakhmat, who had not managed to find the cartridges, and he pointed out with the telescope the wounded ram, lying down under a big stone high up on the hillside. He was immensely delighted when he heard what the big head measured, and when I told him that it was one of the biggest poli that had ever been shot by a sahib.

The wounded ram had now to be brought to bag and as I had only one cartridge, it was necessary to go to work carefully. Rakhmat's idea was that if it was disturbed again, it would go steadily up-hill and perhaps manage to cross the range. The Kirghiz thought that its lying down was a sign that it was very hard hit, and that it probably would not require another bullet. Finally I decided to make a detour and advance on it from above, and leaving Rakhmat behind with the telescope to signal if the ram moved, the Kirghiz and I started up the hill. It was a regular grind getting up that steep slope, not that one would have thought anything of it at ordinary altitudes, but as we were close to a pass whose height I knew, I calculated that we were at something over 17,000 feet and every step made me blow like a broken-winded horse. However, at last our climb was over, and I could see Rakhmat down below signalling for us to cross the spur. On doing so nothing could be seen. I could not recognise the spot I had marked from below, and the Kirghiz was equally at a loss. I knew we must be very close and had the rifle ready, when suddenly up jumped the ram from under a stone about 20 yards below us, and darted down hill. It went at such a pace, I did not care to risk my only cartridge on it; but fortunately, before it had gone 100 yards, it came on a patch of snow, trying to cross which it stuck for a second or two, giving me an excellent chance. I luckily bowled it over, and we ran down to inspect number two. The horns turned out to be 57 in., a good head, but not much by the side of our big one. We were not long in getting the skin off, and buried the meat under stones. It was getting late, and there was no time to bring up the yaks, which we had left grazing about six miles down the valley. The heads must have weighed 60lb. a piece—no light load over bad ground and at that altitude. The two shikaris, however, volunteered to carry them down, while I lent a back to a load consisting of rifle, tiffin basket, and two poshteens. I found this quite as heavy as I cared about, and was uncommonly glad when we got to the yaks. It took us some time to get them ready and load the heads on them, and then, by the light of the moon, which was just appearing, we started for camp. The yaks seemed as keen to get back as we were, and did the ten miles or so of grassy plain mostly at a trot, with not more than the usual chorus of grunts and whines.

On skinning the heads the next morning, we found that the big one had been hit at least twice before, which no doubt accounted for his excessive

wariness. A bullet from a small bore had made a neat little hole in one of the horns, and we found what seemed to be fragments of an Express bullet about the base of one of the ears. These pieces were all coated with tissue or muscle and looked as if they had been there some time. Perhaps an examination of the body might have revealed other scars. We made him out to be thirteen years old. Next day, to the great delight of my servants, who had had quite enough of the Pamirs, we started back for India.

Perhaps a few remarks on the best time for visiting the Pamir, shikaris, equipment, &c., may be useful to any one who is thinking of making an expedition after the big sheep.

In April and the beginning of May the shooting is comparatively easy; the poli are then on bare patches of grass surrounded by snow. When alarmed they bolt up-hill, get more or less stuck in the deep snow, and give a succession of easy shots. By the middle of May the snow has cleared off to a great extent; the shooting is then not so easy, but it is certainly better sport and the climate is pleasanter. I should say that May and June are probably the two best months in the year for poli, though no doubt any one who does not mind hard work would get shooting all through the summer and autumn. Winter shooting is, I think, out of the question.

Poli seem to be very much the same in their habits as ammon, and although small ones may perhaps be stalked without much trouble, big old rams know very well how to take care of themselves. None of the local shikaris I employed on the Pamirs were any good with the glasses, and only one of them knew anything about stalking. They one and all denied the existence of game in any place where the shooting entailed going into much snow or extra hard work.

I found the Mannlicher a perfect weapon for poli. Its flat trajectory gives it an immense advantage over the Express in an open country like the Pamirs, where it is often very difficult to get close to one's game. It is quite powerful enough for any hill game I have come across. I never lost or had any trouble with a wounded poli, though they have the reputation of taking a lot of killing.

As regards clothes, tents, &c. The ordinary kit for Himalayan shooting is good enough with a few additions. A long poshteen (sheepskin coat) reaching down to one's feet is wanted to wear in camp, or when riding or sitting about. The Yarkandi poshteen is preferable to the better known Peshawar one, being much lighter and I think more comfortable to wear. They can be got in Srinagar or Leh. The long felt boots, which most sportsmen wear in camp when shooting in the Himalayas, should be lined with lambskin for the Pamirs. Boots should be soft, well-greased, and big enough to wear several pairs of warm socks with. Personally, I discarded boots in favour of chuplies. With these I wore two pairs of woollen and one pair of thick quilted putto socks. I found this foot gear excellent, and always

managed to keep my feet warm. On the Pamirs, in the spring at any rate, one is constantly in snow or water, and one's feet are wet all day long ; while at the same time the cold is often intense. The chuplies I wore were Peshawar made, Kashmir ones would be quite useless, they stretch very badly when wet.

Really good warm gloves are a necessity. A sun hat should be taken, as the sun is sometimes rather trying. In the spring the nights are terribly cold and something more than ordinary bedding is necessary. Besides a good warm sleeping bag, I recommend taking thick putto sleeping suits to be worn over flannel ones.

One's servants should be treated liberally in the way of clothes ; in fact they require very much the same sort of outfit as one does oneself.

Flaps of tents should be made so that they can be laced tightly up, and an extra strip of cloth should be sewn all round the bottom of the tent. Servants' tents should be big enough to hold three or four extra men, as yak drivers, shikaris, etc., all want shelter. Yourts, the tents of the Kirghiz, can be hired, but they are generally big enough to hold twenty or thirty men, and would, I should think, be a nuisance, taking a long time to pitch and strike. For a standing camp, however, they would be excellent. Had I known that I was going to take three weeks over the shooting of my big poli, I would certainly have sent for one from the nearest encampment.

A liberal allowance of stores, tinned vegetables, &c., should be taken, as a diet of nothing but mutton is apt to pall on one. It is astonishing, also, what a quantity of jam, butter, and bacon will be consumed in a very cold climate, even by a man who generally would not touch these things. Tea will be found the best thing to drink, though a little hot whisky and water will not come amiss after a hard day's work. A liberal supply of tea and sugar should also be taken for one's servants.

Most people will find the rarified air on the Pamirs rather trying. I am certain that the great secret of being able to stand this is never to work on an empty stomach. Besides a well-filled tiffin basket, which should always be strapped on to the saddle of one of the riding yaks, it is not at all a bad thing to have a few biscuits or a piece of chocolate in one's pocket. Natives when crossing a high pass often carry about them a few dried apricots, one of which they eat occasionally. This, they will tell one, is an antidote against the bad air, but anything eatable would do equally well, the great thing being to put something in one's stomach.

Riding yaks can be hired anywhere. The Kirghiz never walk if they can help it, and I think it is well not to be too proud to follow their example. At first one is rather inclined to try and show the natives what a fine walker a sahib is, and to refuse to ride. I think this is rather foolish. There is no great pleasure about walking on the Pamirs ; one generally has quite as much of it as one wants when actually stalking game. Of course, one should

frequently dismount to use the telescope, and when once game is sighted the yaks are left to graze in some sheltered spot.

A. LE M. B.

(From "The Field," Vol. 94.)

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No. XX.—*DIPSAS CYANEA*.

With reference to our note on the occurrence of *Dipsas cyanea* in Burma, I have lately been informed by Mr. H. Hampton that, since the publication of the volume on "Reptilia," in 1890, Boulanger reported in the Ann. Mus. Civ. Genova, Serie 2nd, Vol. XIII., 1893, that *Dipsas cyanea* was recorded from Tavoy by W. L. Selater.

G. H. EVANS, *Vet'y.-Major*.

RANGOON, 14th October, 1900.

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No. XXI.—DESCRIPTION OF A NEW SNAKE OF THE GENUS

*ABLABES* FROM BURMA.

BY G. A. BOULANGER, F.R.S.

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*ABLABES HAMPTONI*.

Snout short, convex, profile curved from the frontal region to the lip; eye three-fourths the length of the snout; rostral once and-a-half as broad as deep, just visible from above; nasal divided; inter-nasals a little longer than broad, a little shorter than the præ-frontals; frontal once and two-thirds as long as broad, longer than its distance from the end of the snout, shorter than the parietals; loreal small, longer than deep; a large præ-ocular, with a second very small shield below it; two post-oculars, temporals 1+2; eight upper labials, fourth and fifth entering the eye; four lower labials in contact with the anterior chin-shields, which are much longer than the posterior. Scales smooth, in 15 rows. Ventrals, 194, and undivided; sub-caudals, 76. Uniform greenish-grey above (in spirit), white beneath and on the upper lip.

Total length, 1,050 millim.; tail, 220.

This species, which is closely allied to *A. doriae*, Blgr., differing in the broader rostral shield, was discovered by Mr. Herbert Hampton at Magok, on the Irrawady, about twelve miles north of Mandalay. Together with the snake, which I have the pleasure of naming, Mr. Hampton has presented to the British Museum examples of the following reptiles obtained by him at the same place, which are interesting from the point of view of the geographical distribution:—*Gymnodactylus khasiensis*, Jerdon; *Trirhinopholis nuchalis*, Blgr.; *Lycodon fasciatus*, And.; *Simotes violaceus*, var. *multifasciatus*, Jan.; *Naia tripudians*, var. *cæca*, Gmel.—(From the Annals and Magazine of Natural History, seventh series, vol. 6, p. 409, 1900).

## PROCEEDINGS

OF THE MEETING HELD ON THE 10TH JULY, 1900.

A meeting of the members took place on Tuesday, the 10th of July, 1900, when Colonel H. D. Olivier, R.E., presided.

## NEW MEMBERS.

The election of the following new members was announced :—

Mr. G. M. Morris (Secunderabad), Mr. J. H. Robertson, I.C.S. (Madras), Mr. H. H. Jellett (Seoni-Chapara, C.P.) Mr. C. S. Horny (Seoni-Chapara, C. P.), Mr. L. G. Ilbert (Sibsagar, Assam), Lieutenant R. E. Salkeld (Ferozepur), Mr. E. Fountonkli (Ahmednagar), Captain H. H. Harington (Bhamo, Burma), Risaldar S. K. Bapat (Surat), Mr. W. J. Reid, I. C. S. (Dibrugarh, Assam), Mr. C. Rose (Dibrugarh, Assam), Lieutenant F. W. Iles (Dibrugarh, Assam), Dr. H. N. Coltart (Dibrugarh, Assam), and Mr. T. Burness (Dibrugarh, Assam).

## CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary acknowledge receipt of the following contributions to the Society's Museum since the last meeting:—

| Contribution.                                                                                                               | Description.                                                                  | Contributor.                         |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------|
| 1 Rose Finch.....                                                                                                           | <i>Rhodospiza obsoleta</i> .....                                              | Lieut. S. R. Douglas, I.M.S.         |
| 1 Bat.....                                                                                                                  | <i>Cerivoula picta</i> .....                                                  | Mr. H. H. Forteach, I.F.S.           |
| 1 Bronze-winged Jacana.                                                                                                     | <i>Metopidius indicus</i> .....                                               | H. H. the Rao of Cutch.              |
| 1 Pheasant Tailed Jacana.                                                                                                   | <i>Hydrophasianus chirurgus</i> .                                             | H. H. the Rao of Cutch.              |
| A quantity of Specimens of Lizards, Reptiles, Fishes, Birds, and Mammals, &c., from Muscat and Omar Province, Persian Gulf. | .....                                                                         | Lieut.-Col. A. S. G. Jayakar, I.M.S. |
| 1 Cobra, juv. (alive) .....                                                                                                 | <i>Naia tripudians</i> .....                                                  | Capt. H. M. Moore, I.M.S.            |
| 1 Bustard's egg, from the Orange Free State, S. A.                                                                          | <i>Otis kori</i> .....                                                        | Major R. H. Nicholson, R.A.M.C.      |
| 1 Black-throated Hill Partridge.                                                                                            | <i>Arboricola atrogularis</i> .                                               | Capt. W. G. Nisbett.                 |
| 1 Western Bamboo Partridge.                                                                                                 | <i>Bambusicola fytchii</i> .....                                              | } Capt. W. G. Nisbett.               |
| 1 Ashy-headed Green Pigeon.                                                                                                 | <i>Osmotreron phayrei</i> .....                                               |                                      |
| 1 Red-headed Trogon.                                                                                                        | <i>Harpactes erythrocephalus</i> .                                            |                                      |
| Some Bats from Thana District.                                                                                              | .....                                                                         | Mr. J. Dodgson, I.F.S.               |
| 2 Skins of the Narcondam Hornbill.                                                                                          | <i>Rhytidoceros narcondami</i> .                                              | Mr. R. F. Lowis.                     |
| 3 Pied-crested Cuckoos (alive).                                                                                             | <i>Coccytes jacobinus</i> .....                                               | Mr. F. A. Reddie.                    |
| 1 Earth Snake (alive) .....                                                                                                 | <i>Gongylophis conicus</i> .....                                              | Capt. J. K. Kendall, M.A.            |
| 1 Snake (alive) .....                                                                                                       | <i>Trop. stolatus</i> .....                                                   | Mr. C. Glover-Wright.                |
| 3 Snakes .....                                                                                                              | <i>Bungarus cæruleus</i> , <i>Lycodon jara</i> , and <i>Lycodon aulicus</i> . | Major F. J. Jenkins, R.A.M.C.        |
| 1 Anderson's Silver Pheasant.                                                                                               | <i>Gennæus andersoni</i> .....                                                | Capt. W. G. Nisbett.                 |

| Contribution.                                                                                                                                                                             | Description.                         | Contributor.                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------|
| 1 Speckled Wood Pigeon ...                                                                                                                                                                | <i>Dendrocygna hodgsoni</i> .....    | Capt. W. G. Nisbett.            |
| 1 Pin-tailed Green Pigeon.                                                                                                                                                                | <i>Sphenocercus apicicauda</i> ..... | Do.                             |
| A quantity of Moths and Butterflies from Lanowli.                                                                                                                                         | .....                                | Mr. Paul Gerhardt.              |
| A Collection of Land Shells from Ceylon, comprising 7 species of <i>Acavus</i> , 5 species of <i>Corilla</i> , 2 species of <i>Cyclophorus</i> , and 7 species of <i>Hemiplaeta</i> , &c. | .....                                | Mr. Oliver Collett.             |
| Flustra from Bombay harbour.                                                                                                                                                              | .....                                | Mr. L. A. Macaulay.             |
| 1 Himalayan Palm-Civet (alive).                                                                                                                                                           | <i>Paradoxurus grayi</i> .....       | Mr. B. B. Osmaston, I.F.S.      |
| 1 Mounted Skeleton of a Cobra.                                                                                                                                                            | <i>Naja tripudians</i> .....         | Capt. J. G. Hojel, I.M.S.       |
| 1 Mounted Skeleton of a Water Snake.                                                                                                                                                      | <i>Tropidoxotus piscator</i> .....   | Capt. J. G. Hojel, I.M.S.       |
| Fœtal specimens of Tiger cubs.                                                                                                                                                            | <i>Felis tigris</i> .....            | Mr. James Marten.               |
| 1 Skin of the White-backed Skunk from Florida.                                                                                                                                            | <i>Conepatus mapurito</i> .....      | Col. W. G. H. Henderson, I.M.S. |

MINOR CONTRIBUTIONS.

Captain H. J. Kelsall, R.A., Major D. C. Phillott, Mr. W. Webb, Mr. J. F. Flewker, Captain W. G. Nisbett, Mr. James Marten, Captain F. T. Williams, Colonel H. C. E. Lucas, I.S.C., Mrs. Bapty, Mr. W. Forbes-Skene, Mr. J. Grege, Mr. Eric Oliver, Lieutenant S. R. Douglas, I.M.S., and Mr. R. S. Pearson, I.F.S.

It was mentioned that the Himalayan Palm-Civet (*Paradoxurus grayi*) presented by Mr. B. B. Osmaston had been handed over to the Victoria Gardens, as it was too large to keep in the Society's Museum.

CONTRIBUTIONS TO THE LIBRARY.

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Annals of the South African Museum, Vol. II.

Irish Naturalist, Vol. IX., Nos. 5 and 6.

The Canadian Entomologist, Vol. XXXII., Nos. 5 to 6. Bulletin of the Italian Entomological Society, Trimestre, I.

Notes on a second Collection of Batrachians made in the Malay Peninsula and Siam, from November, 1896 to September, 1898, with a list of the Species recorded from those countries, by Stanley Smith Flower, F.Z.S.

Royal Botanic Gardens, Ceylon, Administration Report, 1899, Part IV. Anales del Museo Nacional de Montevideo. Tomo III., Fasciculo XIII.

PAPERS READ.

The following papers were then read :—

1. Description of a new Lizard from the Batu Caves, Selangor, by G. A. Boulanger, F.R.S.

2. Description of a new Snake from the Perak Hills, by G. A. Boulanger, F.R.S.

3. Notes on *Ophidia* collected in Burma, by Captain F. Wall, I.M.S., and Vety. Capt. G. H. Evans.

4. Fishing in Indian Waters (Part VI.), by F. O. Gadsden, R.I.M.

MISCELLANEOUS NOTES.

(a) Note on the large red Flying-Squirrel (*Pteromys inornatus*), by P. H. Clutterbuck, F.Z.S.

(b) The Large Barred Owlet (*Glaucidium cuculoides*) capturing quail on the wing, by G. C. Dudgeon, F.E.S.

(c) On the occurrence of the White-winged Wood-Duck (*Asarcornis catulatus*) in Upper Burma, by Vety.-Captain G. H. Evans, A.V.D.

(d) The Golden-eye (*Clangula glaucion*), by Lieutenant-Colonel J. W. Yerbury, R.A.

A vote of thanks was passed to the authors of the various papers and notes—all of which will appear in full in the Society's *Journal*.

THE JOURNAL.

The Honorary Secretary said that owing to the popularity of the subject, the Committee have resolved to publish further illustrations of the "Indian Ducks" in connection with Mr. E. C. Stuart Baker's paper on "Indian Ducks and their Allies" which has been appearing in the Society's *Journal*.

The following have now been put in hand :—Plate No. XI, the Gadwall (*Chaulelasmus streperus*); Plate No. XII, the Pintail (*Dafla acuta*); Plate No. XIII, the Garganey or Blue-wing Teal (*Querquedula circia*); Plate No. XIV, the Pochard or Dun-Bird (*Nyroca ferina*), and they will appear in subsequent numbers of the *Journal*. The drake and duck will both be figured in these plates.

The coloured drawings have been done by Mr. G. E. Lodge from Indian specimens in the Hume Collection at the British Museum, and Mr. Ogilvie Grant and Mr. E. Comber (the Secretary of the Society's Bird and Mammal Section) have kindly supervised the sketches. The expense of the coloured illustrations is so heavy that the Committee hope that the members will try and induce their friends to join the Society, and so enable them to continue publishing these costly plates which are so greatly appreciated.

#### SPECIAL VOTE OF THANKS.

A special vote of thanks was passed to Mr. Charles Maries for his valuable contribution of more than a hundred bird skin, many of which were new to the Society's collection.

#### THE LATE MR. W. F. SINCLAIR.

Mr. E. H. Aitken said:—I think that this meeting might fittingly place on record some expression of its sense of the loss that the Society has sustained by the death of Mr. W. F. Sinclair, of the Civil Service, who retired only a few years ago. He must have been well known to some of those present to-night, and his name must be familiar to all. He was one of the oldest members of the Society, having joined it not long after it was started, and he was assuredly one of the most valuable, for to his keen interest in almost all branches of natural history he added extensive and accurate knowledge, amazing industry, and an uncommon gift of writing in an interesting way. The peculiar character of this Society exactly suited the genius of Mr. Sinclair, for, while his science was accurate and sound, his treatment of the subjects he wrote on was always popular and extremely interesting. The following is a rough list of the papers, both long articles and brief notes, which he contributed to our Journal:—In the first three volumes appeared those admirable papers on the "Waters of Western India," which were so much enjoyed at the time and will bear reading over and over again. In the fourth volume he had two similar papers—"A Creek of the Konkan" and "Down the Coast." In the fifth there was an article on the "Physical Geography of the neighbourhood of Bombay" and a review of some "New Books on Indian Zoology." Afterwards he gave us the following:—

"Shingle and Shells from the Beach"; "Up a Hill"; "Food of the Flying Fox"; "Notes on Indian Breeds of Dogs"; "Moonlight Shadows"; "The Habits of the Coopersmith"; "The *Gloriosa superba*"; "A Single Valve of *Tridacna squamosa*"; "The Great Scaly Clam from Thana Creek"; "The Snake Bird"; "Small Deer"; "Fertilisation of the Vanilla Flower by Bees"; "Annelide Reefs"; "*Nux Vomica*"; "The Destructiveness of the Bandicoot Rat"; "A Stranded Dolphin"; "The Destructive work of Termites"; "Elephants' Ankle Joints," and some excellent reviews of works on natural history.

And while his fertile pen enriched our Journal, his liberality enriched our library, and his industry our collections. When he was at Alibag the constant stream of specimens which flowed in from Mr. Sinclair was almost an embarrassment to even our indefatigable Secretary. Skins, eggs, bones, shells,

and great jars of "mixed pickles" kept coming in faster than they could be examined and put in their places. And the list would be long of the books and journals which he gave to our library. Even after he went to England he kept up his connection with, and his interest in, this Society, and continued to send us "Nature." We have received no direct intimation of his death, but the fact was mentioned three or four months ago in one of the papers, and, as I said, I think we ought to put on record our sense of the great loss that we and the cause of science have sustained. I beg to move a resolution to that effect.

Colonel Olivier seconded the resolution, and after Dr. Pollen had addressed a few remarks, endorsing what Mr. Aitken had said, the resolution was put to the meeting, and carried unanimously.

#### PAPERS READ.

The following papers were then read and discussed:—(1) Notes on Gréville's Zebra (*Equus grevii*), by Colonel H. D. Olivier, R.E., F.Z.S.; (2) Descriptions of some new species of Spiders from British India, by R. I. Pocock, of the British Museum; (3) The Birds of Cachar, by E. C. Stuart-Baker. Miscellaneous Notes—(a) Red ants as an article of food, by A. M. Long. (b) On Rhinoceros Shooting, by Colonel H. D. Olivier, R.E., F.Z.S.; (c) Butterflies as Weather Prophets, by E. H. Aitken.

A vote of thanks was passed to the authors of the various papers and notes, all of which will appear in full in the Society's Journal, and the meeting then terminated.

#### PROCEEDINGS

##### OF THE MEETING HELD ON THE 9TH OCTOBER, 1900.

A meeting of the members took place on Tuesday, the 9th of October, 1900, when Dr. D. MacDonald, M.D., B.Sc., presided.

#### NEW MEMBERS.

The election of the following thirty-one new members was announced:—Professor A. L. Covernton, M.A. (Bombay), Mr. S. J. Gillum (Bombay), Lieutenant H. D. McLaughlin (Sirdarpur, C. I.), Captain G. V. Holmes (Sirdarpur, C. I.), Captain E. Tomkins, R.A. (Bombay), Mr. A. K. Oliver (Bombay), Dr. E. Wells Witham, M.D. (Dibrugarh, Assam), Mr. F. W. Elmes (Dibrugarh, Assam), Mr. D. Douglas (Dibrugarh, Assam), Dr. C. F. X. Gracias (Damaun), Mr. Claude H. Hill, I.C.S. (Poona), Mr. R. A. Collie (Dibrugarh, Assam), Lieutenant-Colonel A. E. J. Croly, R.A.M.C. (Poona), Mr. R. E. Pigott (Arconam), Mr. M. R. Jardine (Bombay), Mr. G. C. Morris (Ceylon), Lieutenant M. C. Nangle (Loikaw, Burma), Mr. J. W. D. Johnstone (Gwalior, C. I.), Lieutenant-General Sir George B. Wolseley, K.C.B. (Madras), Mr. S. E. Greaves (Bombay), Lieutenant J. W. Watson, I.M.S. (Chaman, Baluchistan), Mr. C. J. Stuart (Kurnool), Dr. Munna Lal, L.M. & S. (Banda, N-W P.), Mr. G. K. Walker, C.V.D. (Muktesar, N-W P.), Captain H. Ainsworth, I.M.S. (Goonna, C. I.), Mr. G. W. Hatch, I.C.S. (Ratnagiri), Mr. A. S. A. Westropp, I.C.S. (Dharwar), Lieutenant J. H. Mowbray

Nusseerabad, Captain A. H. McMahon, C. S. I., C. I. E. (Malakand), Mr. H. R. G. Hasted (Russelkonda, Ganjam District), and Dr. F. H. Norvill, M. D. (Lakhimpur Assam).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary acknowledged the receipt of the following contributions to the Society's Museum :—

| Contribution.                                                                               | Description.                                                                                       | Contributor.                  |
|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------|
| 1 Snake.....                                                                                | <i>Coluber hodgsonii</i> .....                                                                     | Lt.-Gent. W. Osborne I.S.C.   |
| Some photographs of Birds and nests.                                                        | .....                                                                                              | Major D. C. Phillott          |
| 2 Dusky Horned Owls (mounted).                                                              | <i>Bubo c. romandus</i> .....                                                                      | Mr. C. Maries.                |
| 1 Snake (alive) .....                                                                       | <i>Trimeresurus gramineus</i> ...                                                                  | Mr. P. Gerhardt.              |
| A quantity of Birds' eggs, comprising 13 different species new to the Society's collection. | .....                                                                                              | Mr. C. K. Maedonald.          |
| 1 Spotted Owlet (alive).                                                                    | <i>Athene brama</i> .....                                                                          | Mr. F. G. Hutchinson.         |
| 1 Snake .....                                                                               | <i>Lycodon anlicus</i> .....                                                                       | Col. W. B. Ferris.            |
| 1 Rock Horned Owl (alive).                                                                  | <i>Bubo bengalensis</i> .....                                                                      | Mr. L. K. Martin.             |
| 1 Snake .....                                                                               | <i>Dendrophis pictus</i> .....                                                                     | Mr. H. R. Hume.               |
| 1 Snake .....                                                                               | <i>Silybura macrolepis</i> .....                                                                   | Mr. F. A. Hill.               |
| 1 Snake (alive) .....                                                                       | <i>Callophis nigricans</i> .....                                                                   | Mr. A. M. Kinloch.            |
| 1 Indian Monitor (alive).                                                                   | <i>Varanus bengalensis</i> .....                                                                   | Mr. J. McGlashan.             |
| 1 Speckled Wood Pigeon.                                                                     | <i>Dendrotreron hodgsonii</i> .....                                                                | Capt. W. G. Nisbett.          |
| 1 Bronze Winged Dove.                                                                       | <i>Calcophaps indica</i> .....                                                                     | Do.                           |
| 1 Himalayan White-cheeked Laughing Thrush.                                                  | <i>Grarula leucolophus</i> .....                                                                   | Do.                           |
| 1 Western Bamboo Partridge.                                                                 | <i>Bambusicola fytchii</i> .....                                                                   | Do.                           |
| Two Paintings of Wild Geese                                                                 | .....                                                                                              | H. H. the Rao of Cutch.       |
| 1 Crocodile .....                                                                           | <i>Crocodilus palustris</i> .....                                                                  | Mr. E. H. Brock.              |
| 1 Toad .....                                                                                | <i>Cacopus systoma</i> .....                                                                       | Do.                           |
| 1 Black-capped Kingfisher.                                                                  | <i>Halcyon pileata</i> .....                                                                       | Col. H. D. Keary.             |
| 1 Red-headed Trogon.                                                                        | <i>Harpactes erythrocephalus</i>                                                                   | Do.                           |
| 2 Green Tree Vipers (alive)                                                                 | <i>Trimeresurus gramineus</i>                                                                      | Mr. P. Gerhardt.              |
| 2 Sea Snakes .....                                                                          | .....                                                                                              | Mr. F. W. Townsend.           |
| 1 Sambar head (malformed)                                                                   | <i>Cervus unicolor</i> .....                                                                       | Capt. A. E. Hatch.            |
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| 3 Snakes .....                                                                              | <i>Trimeresurus anamallensis</i> ,<br><i>Trimeresurus gramineus</i><br><i>Xylophis perroteti</i> . | Mr. A. M. Kinloch.            |
| 2 Snakes .....                                                                              | <i>Tropidonotus plumbicolor</i> .                                                                  | Major F. J. Jencken, R. A. M. |
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CONTRIBUTIONS TO THE LIBRARY.

Journal of the Asiatic Society of Bengal, 1900, Vol. LXIX, Part II, No. 1.  
Fifteenth Annual Report of the Wellington Acclimatisation and Society for 1900.

The Indian Forester, Vol. XXVI, Nos. 6 to 8 for 1900.

Transactions of the South African Philosophical Society, Vol. XI, Part 1, for 1900.

General Report on the work carried on by the Geological Survey of India for the year ending the 31st March, 1900.

Annales du Muséum du Congo Publiées par ordre du Secrétaire d'état. Botanique, Series II.

The Legumes and Cereals of Goa and Damaun, their properties, &c., by Dr. C. Gracias.

Description and properties of a Blister Fly (*Cantharida indigena*) found in the province of Nagar Avely, by Dr. C. Gracias.

Illustrations of the shallow-water *Ophiuroidea* collected by the Royal Indian Marine Survey ship "Investigator" by R. Koehler.

Legislation for the protection of Birds other than Game Birds, by T. S. Palmer.

North American Fauna, No. 17.

The Canadian Entomologist, Vol. XXXII, Nos. 7 to 9.

The Sea Fisheries of Malabar and South Canara, Vol. III, Part 2, by E. Marston.

The Agricultural Ledger, 1900, Nos. 4 to 13.

Nature, Vol. 62, Nos. 1601 to 1609.

Department of Land Records and Agriculture, Bombay, Bulletin Nos. 20 and 21.

The Proceedings and Transactions of the Nova Scotian Institute of Science, Vol. X, Part I.

Memoirs of the Geological Survey of India (Palæontologica Indica), Series XV, Vol. III, Part 2.

Memoirs of the Geological Survey of India (Palæontologica Indica), Series IX, Vol. II, Part 2.

Memoirs of the Geological Survey of India, Vol. XXVIII, Part 2.

Bulletin of the Geological Institution of the University of Upsala, 1899,  
Vol. IV, Part 2, No. 8.

Forestry in British India.

Two copies, Year Book of the United States Department of Agriculture  
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Eastern Lepidoptera, Heterocera, by Col. C. Swinhoe. Parts I and II.

Report of the administration of the Government Museum and Connemara  
Public Library for 1899 and 1900.

Annual Report of the working of the Lucknow Provincial Museum for  
1900

Indian Museum Notes. Vol. IV, No. 6; Vol. V, No. 1.

Illustrations of the Zoology of the R. I. M. S. "Investigator."

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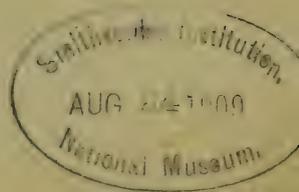
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E. C. Stuart Baker del.

CYANOPS RUBESCENS.  
The Ruddy Barbet.

Mintern, Bros Chromo Lith. London.

JOURNAL  
OF THE  
BOMBAY  
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THE BIRDS OF CACHAR.

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

WITH PLATE I.

(Continued from page 405 of this Volume.)

(Read before the Bombay Natural History Society on 9th Oct., 1900.)

80 (6) LIOPTILA GRACILIS.—The Grey Sibia.

*Hume, No. 429 bis ; Blanford, No. 205.*

I have met with this bird several times of late years, and one year, 1896, it occurred in vast numbers all round Hungrum and the adjacent lofty peaks. I also had two birds shot in the Jetinga valley, not above 300 feet altitude, in January, 1895. Its nest and eggs, which I have taken more than once, are like those described by Godwin-Austin.

(126) SITTA FORMOSA.—The Beautiful Nuthatch.

I have now met with this bird two or three times on the high peaks about Hungrum. Its actions when clambering about trees are remarkably like those of a Woodpecker, and its voice is a much lower pitched note than that of any other Nuthatch with which I am acquainted.

135 (7) CERTHIA DISCOLOR.—The Sikkim Tree Creeper.

*Hume, No. 245 ; Blanford, No. 344.*

I got a specimen of what I believe to have been this bird in May, 1898, at Hungrum, but it was difficult to say what it was, and I cannot be quite sure. The lower plumage had been knocked all to pieces owing to the bird having been shot from underneath at close quarters with a charge of large shot,

## 136. SPHENOCICHLA ROBERTI.—Roberts' Wedge-billed Wren.

On the 24th May, 1898, I was so fortunate as to come across a specimen of this rare Wren. A Naga brought it to me together with the remains of a nest composed entirely of a mass of fine grasses, tendrils, and bents, without any lining. This was said to have been placed at the bottom of a long crevice in a large tree about 20 feet from the ground. This crevice was pointed out to me afterwards, but though I waited long by the tree the pair to the male never shewed itself.

The eggs, four in number, were just on the point of hatching; they were pure white, and were broad ovals in shape, rather pyriform but obtuse at the smaller end. The shell, which was very fragile, had a faint gloss, probably more pronounced when the eggs were fresh.

The bird is as described by Blanford, but the brown of the upper plumage is a fine *golden* brown, and the outer webs of the wing-quills, and rectrices are slightly tinged with rufous. There are, moreover, faint indications of supercilia formed by the white sub-tips to the feathers above the eye.

The legs are dark brown; soles, claws, and edges of the scutellations pale slatey; irides rich brown; bill very pale bluish-slatey, the base of maxilla and culmen much darker.

It was caught on the Hungrum Peak, which is about 6000 feet, and is the next Peak to Hengdan on which Roberts' bird was caught.

The Nagas call this wren "Ting linrui," "the bird which runs up trees," the same name that they apply to Nuthatches and Creepers, and the man who got it for me said that all its actions were those of a tree creeper.

## 142 (8) ACROCEPHALUS ORIENTALIS.—The Eastern Great Reed-Warbler.

*Hume, No. 515 bis; Blanford, No. 354.*

This Reed-Warbler is not very rare in the plains during the cold weather, and I believe some birds are permanent residents as I have one specimen obtained in June.

## 142 (9) ACROCEPHALUS BISTRIGICEPS.—Schrenks' Reed-Warbler.

*Hume, No. 517 ter; Blanford, No. 365.*

I have one specimen of this little Reed-warbler shot by my collectors in January in the Chutla Bheel.

142 (10) *ACROCEPHALUS AGRICOLA*.—The Paddy-field Reed-Warbler.

*Hume, No. 517 ; Blanford, No. 367.*

Mr. H. A. Hole first drew my attention to the fact that this bird was not rare in Cachar, and since then I have received and collected several specimens. It probably is a permanent resident in Cachar, but I am not yet sure of this.

160 (11) *PHYLLOSCOPUS FULIGIVENTRUS*.—The Smoky Willow-Warbler.

*Hume, No. 525 ; Blanford, No. 409.*

One of my collectors obtained a male of this species near Silchar in November, 1895, and I myself shot a female in the hills the following January.

178. *CRYPTOLOPHA CANTATOR*.—Tickell's Flycatcher-Warbler.

*Hume, No. 576 bis ; Blanford, No. 438.*

I have several times met with this bird lately in N. Cachar. It is resident and I have taken its nest.

178 (12) *ABRONNIS SOHISTICEPS*.—The Black-faced Flycatcher-Warbler.

*Hume, No. 571 ; Blanford, No. 441.*

On the 10th of May, 1899, whilst crossing a tiny bridge over a streamlet running through bamboo jungle, I noticed a small bird perched on the top of a dead bamboo, not 5 feet away from me to the left. I at once saw that it was an *Abrornis* with a black face that I had not seen before in N. Cachar, and knew that it could be no other than the present species. From the way it stuck to the bamboo for a second or so and then flew a few yards away, I thought it had a nest, so looked into the bamboo and was rewarded by finding one. The bamboo was one about  $2\frac{1}{2}$ " to 3" diameter, dead and semi-burnt, and was lying resting against a clump of living bamboos. Close under one of the nodes the bamboo had been burnt through and was also split downwards, in this hole just above the next node the nest was placed. For some six inches the bamboo was loosely filled with moss-roots and fibres, and on these lay the true nest, a lovely little mass of moss and feathers lined with the softest down. The eggs, four in number and hard set, were exactly like those of *A. superciliaris*. I failed to get the bird itself, but am absolutely sure that my identification was correct.

It was taken at an altitude of some 3,200 feet.

Hitherto this form has not been found east of Sikkim, and I never expected to find it in N. Cachar. It must be extremely rare as I have never before or since met with it.

194 (13) *LANIUS NIGRICEPS*.—The Black-headed Shrike.

*Hume, No. 259 ; Blanford, No. 475.*

It was only by mistake that I came to exclude this Shrike from my list, as it is the most common Shrike in N. Cachar. In the winter it is found throughout the plains, although a large majority of the birds so visiting them are immature. About April they return to the hills, though a few may remain and breed in the broken ground just below them.

Very few eggs will be found here after May, the larger number between the 15th of that month and the 15th April.

The Black-headed Shrike excels all his relations in his power of song, and is really a beautiful song bird, the other day I heard him compared favourably with the Sky Lark. He will sit on a branch above his nest and sing sometimes for half-an-hour without interruption.

197 (14) *LANIUS PHENICUROIDES*.—The Rufous Shrike.

*Blanford, No. 480.*

A most unmistakable specimen of this rare Shrike was shot by one of my collectors on the 15th February, 1895. The bird, an old male, is an exceptionally typical specimen ; the whole lores and ear-coverts are black, the colour of the head contrasts very strongly with the back, and the underparts are very nearly pure white.

It was shot near Silcoorie in the plains of Cachar whilst perched on the top of a tea bush.

This is the first record of the Rufous Shrike anywhere to the east of the Indian Empire.

216 (15) *ORIOULUS KUNDUO*.—The Indian Oriole.

*Hume, No. 470 ; Blanford, No. 518.*

Amongst a collection of birds collected by the late Mr. M. G. Peddie in the extreme north of this district, I came across a fine male *O. kundoo*, and, a few days ago, I heard from Mr. Primrose, of Cachar, that he had got a bird which he believed to be a young one of this species. This has since been sent to me, and proves to be only a young *Oriolus indicus*.

239 (16) *CYORNIS SAPPHIRA*.—The Sapphire-headed Fly-catcher.

*Hume, No. 312 ; Blanford, No. 571.*

I have met with this beautiful species a few times on the highest peaks in the east, but nearly all my specimens are in the plumage described by Oates as the "Autumn plumage of the young male," and this though they were collected in April, May, and July. I have seen no specimen from N. Cachar in the full male plumage.

(247) *ANTHIPES LEUCOPS*.

I have obtained a good many of these birds since 1894 ; they are permanent residents on all ranges over 4,000 feet, and in the winter descend now and then to 2,000 and 2,500 feet.

(302) *ZOOTHERA MONTICOLA*.

This would appear to be resident, as I have now taken two or three nests. These and the eggs are in every way identical with those of *Z. marginata*.

(304) *COCHOA VIRIDIS*.

Since writing the third number of the Birds of Cachar, I have obtained two fine male Green Thrushes, both trapped on the nest. This latter agrees exactly with that described in "Nests and Eggs."

(358) *ÆTHOPYGA SATURATA*.

Mr. Primrose found this Sun-bird breeding in the plains, and I have taken its nest at Hungrum, close on 6,000 feet altitude, so that its breeding range would not seem to be affected much by the height of the country.

(364) *DICÆUM CRUENTATUM*.

The bird, to which I referred in this Journal, Vol. xi, p. 467, has not been, and is not likely to be, definitely settled to be either new or a hybrid, but I can find no record anywhere of any birds of *Dicæum cruentatum* having been obtained with the red on the breast.

(375) *SERILOPHUS LUNATUS*.

This must be struck out altogether. I have compared my birds with true *S. lunatus*, and though a few slightly approach these in the colouration of the head, they are still true *rubropygius* and not *lunatus*.

396 (17) *CYANOPS RUBESCENS*.—The Ruddy Barbet.

This bird must, without doubt, be considered a good species. I have killed and trapped a good number of birds now in addition to the two type specimens, and in the case of fully adult males there is no

grading between *C. asiatica* and this form. Young males have the scarlet-and-maroon less developed, whilst young females do not have it at all, and cannot well be distinguished from the young females of *C. asiatica*; on the other hand, old females have a trace of the maroon back, and often splashes of vermilion on the lower plumage.

## (401) CYANOPS ROBUSTIROSTRIS.

I have now another specimen of this little Barbet, shot by the late Mr. M. G. Peddie at Bakhimpore, near Hathikhali, N. Cachar.

The bird is exactly like my own specimen, and has the same golden sheen on the forehead instead of the dark shade which the young *C. cyanotis* has prior to the appearance of the black.

## (406) ALSOCOMUS PUNICEUS.

Mr. V. Woods, Executive Engineer, Assam-Bengal Railway, tells me that he shot this species more than once in the plains, and he thinks the bird was not *very* rare there.

## (418) CROCOPUS PHÆNICOPTERUS.

Since writing No. VI. of these papers, I have seen a number of these pigeons, and they would not appear to be rare on the outskirts of the forests bordering Manipur and the North Lushai Hills.

## (442) ALCEDO BEAVANI.

In the adult male the bill is wholly black—red on either upper or lower mandible is a sign of immaturity or sex.

## (443) ALCEDO GRANDIS.

The female has nearly the whole of the lower mandible red, and the base of the upper mandible reddish.

447 (18) HALCYON PILEATA.—The Black-capped Kingfisher.

*Hume, No. 130; Blanford, No. 1045.*

Mr. A. Primrose, of Kattal, Cachar, has sent me a most beautiful specimen of this species which he obtained in Cachar, and he also writes that he has since seen another specimen which, however, he failed to get.

## (453) CHÆTURA NUDIPES.

I shot a female in the last few days of May, 1899, which contained an egg ready for expulsion; it was rather damaged in the fall, but was blowable, and makes a valuable, if not very perfect, specimen. The shell is *very* fragile, and I am inclined to think would have possibly slightly thickened before being laid. It is rather rough and has an *unfinished* appearance, which is probably exactly what it is. The

small end is quite smooth and polished. There is no gloss, and the texture is slightly chalky. It measures 1·08" × 73", and is a more pointed oval than are most Swifts' eggs.

(470) *MEROPS PHILIPPINUS*.

A very large flock of these birds visited Haflang in the cold weather of 1897-98, and stayed for some days. They are common in the plains of Cachar, breeding everywhere. In 1899 large flocks again visited the Hills in October and November.

(474) *PTILOLÆMUS (ANORRHINUS) AUSTENI*.

A young bird, shot by the late Mr. M. G. Peddie, which is now in my collection, has the whole head rufescent, the feathers being broadly margined with this colour, whilst the scapulars, feathers of the back, and smaller wing-coverts are all faintly edged darker. This bird is a young female, and has the quills all white tipped as in the male—in fact, the bird, if adult, would appear to be exactly like the male instead of differing from it, as does the female of *P. tickelli*. Mr. Peddie's experience with these birds was very much the same as Hartert's. He came across a large flock associating with a flock of *Anthracoceros albirostris*. He shot two of the former and one of the latter, this in mistake, and leaving them where they fell, followed up the flock again. He eventually got a third *Ptilolæmus*, the one now in my possession, but failed to find any of the other birds on his return journey. On no other occasion did he ever meet with this hornbill himself, although on one occasion he had two old birds, two young ones, and two eggs brought in to him by natives. On his bird are the following remarks ticketed: "Bill and inside of mouth dirty yellow; orbital skin light yellow; irides dull brown; legs horny green; soles dirty yellow; claws dusky black."

The colours all agree with those of my bird except the irides, which are in my specimen a rich red-brown.

(499) *GLAUCIDIUM BRODIEI*.

I have recently obtained a rufous specimen of this little owl. The brown is all much tinged with rufous, and all the usual white markings are replaced by pale rufous.

I shot one in the act of eating a young male *Pericrocotus speciosus*, the marks on which shewed that the owl must have killed it itself.

525 (19) BUTEO FEROX.—The Long-legged Buzzard.

*Hume, No. 45 ; Blanford, No. 1239.*

My collectors obtained a specimen of this Buzzard in December, 1898. It is a typical male specimen, but has no grey on the outer webs of the quills, which are also barred throughout; the tail is much mottled with brown in indistinct bars.

(541) MICROHIERAX MELANOLEUCUS.

Inglis's and Primrose's birds are of this species, not *M. fringillarius*. I have compared mine with the original type in the Indian Museum, Calcutta, with which all six agree, and their birds are the same as mine. They vary very much in size, and even in *M. melanoleucus* there is a certain amount of black on the flanks.

597 (20) NUMENIUS PLEOPUS.—The Whimbrel.

*Blanford, No. 1455 ; Hume, No. 878.*

A young male of this species, one of a pair, was shot by Mr. V. Woods, of the Assam-Bengal Railway, at Haflang on the 1st September, 1899

## THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN  
"THE FAUNA OF BRITISH INDIA,"  
SERIES II. PART IV.

BY SIR G. F. HAMPSON, BART., F.Z.S., F.E.S.

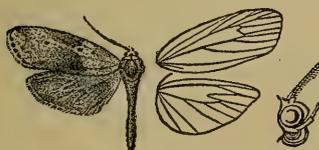
(Continued from page 520 of this Volume).

## Genus METEUGOA.

Type.

*Meteugoa*, Hmps., Cat. Lep. Phal., B. M., II., p. 335 (1900)..... *ochrivena*.

Proboscis fully developed; palpi obliquely upturned and reaching vertex

*Meteugoa ochrivena* ♂  $\frac{3}{2}$ 

of head; frons with a conical prominence; antennæ of male ciliated; tibiæ with the spurs moderate; abdomen elongate. Forewing narrow, somewhat lanceolate; vein 2 from middle of cell; 3 from long before angle; 5 from just

above angle; 6 from just below upper angle; 7·8 and 9·10 stalked; 11 free. Hindwing with vein 2 from middle of cell; 3 from long before angle; 5 from just above angle; 6·7 coincident; 8 from close to end of cell; the upper angle of cell extremely produced in male and the discocellulars highly angled.

1404a. METEUGOA OCHRIVENA.

## Genus HOLOCRASPEDUM.

1412. HOLOCRASPEDUM NIGROPUNCTA.

## Genus XANTHOCRASPEDA.

1483. XANTHOCRASPEDA MARGINATA.

## Genus SICCIA.

Type.

*Siccia*, Wlk., II., 539 (1854)..... *caffra*.*Æmene*, Wlk., II., 541 (1854)..... *taprobanis*.*Melania*, Wlgrn., Wien. Ent. Mon., VII., p. 145 (1863) *caffra*.*Panassa*, Wlk., XXXII, 607 (1865)..... *taprobanis*.*Autoceras*, Feld., Reis. Nov., p. 2 (1874), non descr..... *taprobanis*.

Sect. I. Antennæ of male with very short branches ending in a bristle.

A. Forewing with dentate medial line..... 1385. *taprobanis*.B. Forewing with the medial line reduced to spots ..... 1387. *guttulosana*.

Sect. II. Antennæ of male ciliated.

A. Forewing without olive-fulvous bands.

a. Forewing with v- or y-shaped black discoidal spot.

a<sup>1</sup>. Forewing with the ground colour white... 1391. *sagittifera*.



1388*b*. *SICCIA SERIATA*, Hmps., Cat. Lep. Phal., B. M., II., p. 395, pl. xxix, f. 10 (1900).

♀. Head and thorax grey-white; tegulæ, patagia and metathorax with black points; abdomen fuscous with ochreous anal tuft. Forewing grey-white with five black spots on costa; a subbasal black point; ante- and post-medial black points below costa; a series of five spots between middle of cell and termen, the spots at middle and end of cell larger; a series of four spots in submedian fold, the last with obliquely placed spot above it; a terminal series of points. Hindwing fuscous with very obscure discoidal spot.

*Habitat*.—Assam, Naga Hills, 6,000'. *Exp.* 32 mill.

1388*c*. *SICCIA SORDIDA*, Butl., Trans. Ent. Soc., 1877, p. 372; Moore., Lep. Ceyl., II., p. 65, pl. 104, f. 4.

*Emene subcinerea*, Moore, P. Z. S., 1878, p. 34.

„ *modesta*, Moore, P. Z. S., 1878, p. 34.

„ *quinquefascia*, Hmps., Ill. Het. B.M., VIII., p. 52, pl. 140, f. 15 (1891).

Pale grey-brown; palpi blackish; meso-thorax, ends of patagia, tibiæ and tarsi spotted with black; abdomen with the anal tuft and ventral surface yellowish-white. Forewing with black point at base and subbasal points below costa and cell; an antemedial series of points from below costa to submedian fold; a point in middle of cell; a medial dentate line arising from a spot on costa, bent outwards below costa and angled inwards in submedian fold; a discoidal lunule; a minutely dentate postmedial line bent outwards below costa, angled at veins 6 and 4, then bent inwards below the cell and outwards again to inner margin, an interrupted line beyond it excurved below costa and at middle, then incurved; a terminal series of points, and points on the cilia at apex and middle. Hindwing white tinged with brown towards apex; in female pale fuscous.

The form *subcinerea-modesta* has the hindwing of male fuscous, the cilia whitish.

The form *quinquefascia* has the forewing largely suffused with black.

*Habitat*.—China, Shanghai, Nankin; Formosa; Punjab, Kangra, Mynpuri; Nilgiris; Coimbatore; Ceylon; Singapore; Bali. *Exp.* ♂ 18. ♀ 22 mill.

*SICCIA FULVOCINCTA*, Hmps., Cat. Lep. Phal., B.M., II., p. 397, pl. xxix, f. 13 (1900).

♀. Grey; head and thorax tinged with olive-fulvous; tibiæ and tarsi blackish with white bands. Forewing strongly irrorated with fuscous; some olive fulvous marks at base; subbasal, antemedial, medial, and post-medial olive-fulvous minutely dentate bands, defined on each side by blackish lines, angled outwards below costa and at middle; a point at middle of cell and discoidal lunule; traces of a maculate subterminal line; cilia olive-fulvous and fuscous chequered with white. Hindwing fuscous, the cilia pale.

*Habitat*.—Nilgiris ; Madura. *Exp.* 36 mill.

Genus *ÆOLOSLIA*.

*Type*.

*Æolosia*, Hmps., *Cat. Lep.*, Phal. B. M., II, p. 404 (1900)... *multipunctata*.

Palpi upturned, reaching vertex of head, the 3rd joint porrect ; antennæ of female simple ; tibiæ with the spurs moderate. Forewing with vein 3 from well before angle of cell ; 5 from above angle ; 6 from below upper angle ; 7 from angle ; 8·9·10 stalked ; 11 oblique. Hindwing with veins 3·4 stalked ; 5 from above angle ; 6·7 stalked.



*Æolosia multipunctata* ♂  $\frac{3}{2}$

1404b. *ÆOLOSLIA MULTIPUNCTATA*, Hmps., *Cal. Lep.* Phal. B. M., II, p. 405 (1900).

♀. White ; tegulæ, patagia and thorax spotted with black ; abdomen banded with black above on each segment. Forewing with numerous small black spots in the interspaces forming about eight curved series and a series on cilia. Hindwing with small black discoidal spot ; an indistinct curved postmedial series ; the terminal area suffused with fuscous ; a ciliary series of spots.

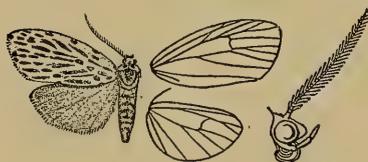
*Habitat*.—Hsipaw, Burma. *Exp.* 24 mill.

Genus *PAREUGOA*.

*Type*.

*Pareugoa*, Hmps., *Cat. Lep.* Phal., B. M., II, p. 405 (1900). *multistrigata*.

Proboscis fully developed ; palpi upturned, slender, reaching vertex of head ; frons with conical prominence ; antennæ of male bipectinate with moderate branches ; tibiæ with the spurs moderate. Forewing rather narrow ; vein 2 from middle of cell ; 3 from before angle ; 4·5 shortly stalked ; 6 from below upper angle ; 7·8 stalked ; 9 absent ; 10 free ; 11 anastomosing with 12. Hindwing with vein 2 from beyond middle of cell ; 3·4 coincident ; 5 from just above angle ; 6·7 stalked ; 8 from middle of cell.



*Pareugoa multistrigata* ♂  $\frac{3}{2}$

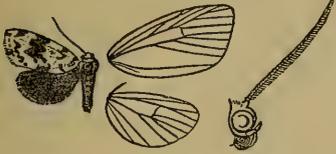
1402a. *PAREUGOA MULTISTRIGATA*.

Genus *HYPOSICCIA*.

*Type*.

*Hyposiccia*, Hmps., *Cat. Lep.* Phal., B. M., II., p. 406 (1900). *amnea*.

Proboscis fully developed ; palpi upturned, not reaching vertex of head ;



*Hyposiccia amnæa* ♂  $\frac{1}{2}$

antennæ of male ciliated, tibiæ with the spurs moderate. Forewing with vein 2 from middle of cell ; 3 from before angle ; 4·5 from angle ; 6 from below upper angle ; 7·8·9 stalked ; 10 free ; 11 anastomosing with 12. Hindwing with vein 2 from towards angle of cell ; 3·4 from angle ; 5

from above angle ; 6·7 stalked ; 8 from middle of cell.

- A. Forewing with the ground-colour white .....1386*a*. *amnæa*.
- B. Forewing with the ground-colour grey-brown.....1385*a*. *mesozonata*.

Genus PARASICCIA.

*Type.*

*Parasiccia*, Hmps., Cat. Lep. Phal., B. M., II., p. 407 (1900), *maculifascia*.

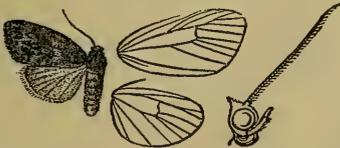
Proboscis fully developed ; palpi upturned, reaching vertex of head ; antennæ of male bipectinate with moderate branches, serrate or ciliated ; tibiæ with the spurs long. Forewing with vein 2 from beyond middle of cell ; 3 from near angle ; 5 from above angle ; 6 from below upper angle ; 7·8·9 stalked ; 10·11 free. Hindwing with vein 2 from beyond middle of cell ; 3·4 from angle ; 5 from well above angle ; 6·7 stalked ; 8 from middle of cell.

- Sec. I. Antennæ of male serrate with very long bristles and fascicles of cilia .....1336. *maculifascia*.

Sec. II. Antennæ of male ciliated.

1391*a*. PARASICCIA NOCTURNA, Hmps., Cat. Lep. Phal., B. M., II., p. 410 (1900).

Head and thorax blackish ; abdomen dark grey ; forewing dark grey ; a diffused sinuous subbasal line ; a minutely dentate antemedial line angled on median nervure ; a spot in middle of cell and a discoidal lunule ; an obscure medial line strongly dentate at angle of cell ; a minutely dentate postmedial line angled at veins 6 and 4, then retracted ; an irregularly dentate subterminal line expanding towards costa ; a terminal series of points. Hindwing fuscous-grey.



*Parasiccia nocturna* ♂  $\frac{1}{2}$

*Habitat.*—Khâsis. *Exp.* ♂ 26, ♀ 30 mill.

Genus IDOPTERUM.

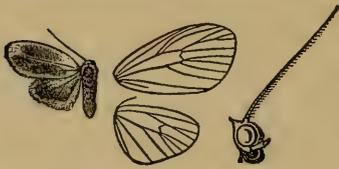
1414. IDOPTERUM OVALE.

Genus OVIPENNIS.

*Type.*

OVIPENNIS, Hmps., Cat. Lep. Phal., B. M., II., p. 410 (1900), *dudgeoni*.

Proboscis fully developed ; palpi porrect, extending to just beyond the frons ; antennæ of female ciliated ; tibiæ with the spurs short ; abdomen dorsally clothed with rough hair. Forewing rather narrow, the costa arched, the apex rounded ; the termen obliquely rounded ; vein 2 from middle of cell ; 3 from well before angle ; 5 from above angle ; 6 from below upper angle ; 7·8·9 stalked, 7 from beyond 9 ; 10·11 almost from a point, 11 curved. Hindwing with vein 2 from beyond middle of cell ; 3 from before angle ; 5 from just above angle ; 6·7 stalked ; 8 from middle of cell.



*Ovipennis dudgeoni* ♀  $\frac{1}{2}$

1416. OVIPENNIS DUDGEONI.

Genus MACHÆROPHORA.

1482. MACHÆROPHORA FULVIPUNCTA.

Genus ASURIDIA.

*Type.*

*Asuridia*, Hmps., Cat. Lep. Phal., B. M., II., p. 412 (1900). *carneipicta*.

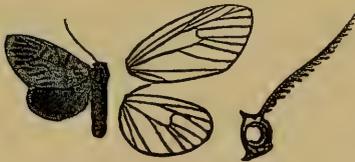
Proboscis aborted, minute ; palpi porrect, not reaching beyond the frons ; antennæ of male with bristles and cilia ; tibiæ with the spurs moderate ; abdomen clothed with rough hair. Forewing rather narrow, the costa arched ; vein 2 from middle of cell, oblique ; 3 from near angle ; 4·5 from angle ; 6 from below upper angle ; 7·8·9 stalked ; 10·11 stalked ; 11 anastomosing with 12. Hindwing with vein 2 from beyond middle of cell ; 3 from close to angle ; 5 from well above angle ; 6·7 stalked ; 8 from towards angle of cell.

A. Hindwing pale crimson ..... 1465a. *nigriradiata*.

B. Hindwing fuscous-black ... .. *metaphæa*.

1465b. ASURIDIA ΜΕΤΑΡΗΛΑ, Hmps., Cat. Lep. Phal., B. M., II., p. 413, pl. xxix, f. 20 (1900).

♀. Head, thorax and abdomen ochreous-yellow ; tegulæ more orange.



*Asuridia metaphæa* ♂  $\frac{1}{2}$ .

Forewing ochreous irrorated with black scales ; the costa black towards base ; obliquely-placed subbasal black marks in cell and above and below submedian fold ; an antemedial slightly sinuous line incurved to costa ; an oblique medial line angled inwards almost to the medial line in cell ; a discoidal

point ; the postmedial line very oblique from costa to vein 4 where it is acutely angled, then retracted to lower angle of cell, the veins beyond it broadly streaked with black to near termen ; a fine terminal black line. Hindwing fuscous-black, the base, inner margin, and cilia ochreous.

*Habitat.*—Sikhim, 2,800'. *Exp.* 28 mill.

Genus THUMATHA.

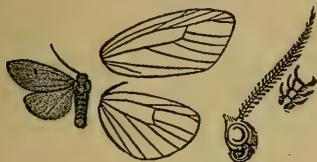
1484. THUMATHA FUSCESCENS, insert (syn.), *Scœodora rava*, Lucas, P. Linn. Soc. N. S. W. (2), IV, p. 1079 (1890).

Genus NEASURA.

Type.

*Neasura*, Hmps, Cat. Lep. Phal. B. M., II., p. 422 (1900) ... *hypophœola*.

Proboscis fully developed; palpi slight, porrect, not reaching as far as the frons, which is clothed with rough hair; antennæ of male minutely serrate with very long bristles and cilia, tibiæ with the spurs moderate; abdomen clothed with rough hair. Forewing moderately broad; vein 2 from middle of cell oblique, 3 from long before angle; 4·5 coincident; 6 from below upper angle; 7·8·9 stalked; 7 from after 9; 10 free; 11 anastomosing with 12. Hindwing with vein 2 from middle of cell; 3 from before angle; 5 from well above angle; 6·7 on a long stalk; 8 from near angle of cell.



*Neasura apicalis* ♂ †

1485. NEASURA APICALIS, insert (syn.), *Setina bipunctata*, Wlk., Journ. Linn. Soc. Zool., III., p. 185 (1859).

Genus TRICHOLEPIS.

1480. TRICHOLEPIS ERUBESCENS.

Genus ASURA.

Type.

- Asura*, Wlk., II., 484 (1854) ..... *cervicalis*.
- Pitane*, Wlk., II., 531 (1854); nec., Wlk., II., 462 ..... *conferta*.
- Pallene*, Wlk., II., 542 (1854) ..... *structa*.
- Cyllene*, Wlk., II., 543 (1854); nec., Newm., Col., 1840 ..... *humilis*.
- Nepita*, Moore, Lep. E. I. C., p. 302 (1859) ..... *conferta*.
- Lyclene*, Moore, Lep. E. I. C., p. 300 (1859) ..... *humilis*.
- Stonia*, Wlk., XXXI, 187 (1865) ..... *bipars*.
- Cymella*, Feld., Reis. Nov., p. 3 (1874), non. descr. .... *congerens*.
- Setinochroa*, Feld., Reis. Nov., p. 9 (1874), non. descr. .... *infumata*.
- Adites*, Moore, Lep. Cey., II., p. 61 (1882) ..... *hilaris*.

Sect. I. (*Asura*). Antennæ of male bipectinate with long branches, of female with very short branches.

1421. ASURA CONFERTA.

Sect. II. Antennæ of male with moderate branches, of female ciliated.

- A. Forewing yellow with antemedial and two medial series of points 1477. *nubifascia*.
- B. Forewing yellowish-white with antemedial and two medial series of points. 1478. *melanoleuca*.
- C. Forewing grey-brown, strongly irrorated with black ... *umbrifera*.

1478a. ASURA UMBRIFERA, Hmpsn., Cat. Lep. Phal., B. M., II., p. 431, pl. xxx, f. 14 (1900).

Pale brown, head, thorax, abdomen and forewing strongly irrorated with fuscous. Forewing with rather obscure antemedial, medial, and postmedial dark lines, the two first angled in cell, the last just beyond lower angle; a diffused irregular very ill-defined subterminal band. Hindwing pale grey-brown with traces of ante- and post-medial dark lines.

*Habitat*.—Tibet, Yatung. *Exp.* ♂ 30, ♀ 36 mill.  
Sect. III. Antennæ of male with bristles and cilia.

- A. Forewing of male with glandular swelling on costa beyond middle, the median nervure bent up to subcostal nervure before end of cell, which then expands again; vein 5 absent; 6·7 and 8·9 stalked from the looped end of cell.

1426a. ASURA LUTARA, Moore, Lep. E. I C., p. 300 (1859).

*Setina dividata*, Snell., Veth's Midden Sumatra, Lep., p. 37 (1880).

♂. Yellow; mesothorax with black spots; fore tibiæ banded with black; abdomen with the terminal segments black. Forewing with subbasal black point; an antemedial spot below the costa and two below the cell; the antemedial line angled outwards in cell and submedian fold, then oblique; the medial line incurved and almost or quite touching the antemedial line in cell; a spot in the loop at end of cell, the postmedial line very highly and irregularly dentate, running out to points at veins 6 and 3 and up to subcostal nervure at vein 4, then oblique, a series of points beyond it, the spots at veins 6·7 and 3 nearer termen.

♀. Forewing with the discoidal spot in normal place, the postmedial line not bent up to costa at vein 4; abdomen not black at extremity.

*Habitat*.—Burma, Rangoon; Sumatra; Java. *Exp.* ♂ 20, ♀ 26 mill.

B. Forewing of male with the cell very narrow; vein 5 from upper angle of cell; 6 stalked with 7·8·9, often also in female.

a. Forewing with subterminal series of spots ..... *metamelas*.

b. Forewing without subterminal series of spots ..... *dasara*.

1426b. ASURA METAMELAS, Hmpsn., Ill. Het., IX., p. 84, pl. 158, f. 11 (1893).

♂. Yellow; shoulders with black points; tips of patagia fuscous; fore tibiæ and tarsi banded with black; abdomen with the terminal half clothed with black hair. Forewing with black point at base; the costa black towards base; an oblique subbasal line interrupted in cell; the antemedial line slightly angled below costa, then oblique and interrupted in submedian fold; a medial spot below costa and line from cell to inner margin incurved below vein 3 and anastomosing with the antemedial line; a postmedial point below costa representing the displaced discoidal spot; the postmedial line highly and irregularly dentate, bent up to the subcostal nervure at vein 4; a series of spots beyond it from costa to vein 3; the spot at vein 4 displaced inwards. Hindwing with some fuscous marks on termen towards apex.

♀. Abdomen without black; forewing with the markings finer; the sub-basal line broken up into spots, the medial line not connected with the antemedial line; the discoidal point prominent; the postmedial line less irregular.

*Habitat*.—Ceylon, Pundaloya. *Exp.* 22 mill.

*Subp.* Forewing with the postmedial line obscured by a large area of fuscous suffusion.

*Habitat*.—Belgaum; Nilgiris.

1426c. ASURA DASARA, Moore, Lep. E. I. C., p. 303 (1859). Butl., Ill. Het. B. M., VII., p. 32, pl. 132, ff. 7 and 8.

*Barsine chromatica*, Swinh., Trans. Ent. Soc., 1891, p. 135.

♂. Yellow; shoulders and meso-thorax with black points; abdomen tinged with fuscous towards extremity, or wholly fuscous. Forewing with subbasal black point; the costal edge black towards base; an antemedial curved fuscous band; an obscure discoidal spot; a postmedial band formed by elongate fuscous patches in the interspaces from below the costa, very obliquely curved to nearly or quite join the antemedial band below the cell, then excurved again. Hindwing pale yellow.

♀. Forewing with the ante- and postmedial bands usually reduced to dentate lines and well separated; a prominent discoidal spot.

*Habitat*.—Kangra; Sikhim; Khásis; Nilgiris; Sumatra; Java. *Exp.* ♂ 26, ♀ 30 mill.

c. (*Lyclene*). Forewing with the cell normal.

a. Forewing with very highly and irregularly dentate postmedial line.

a<sup>1</sup>. Forewing yellowish with the costa and termen tinged with crimson ..... *pubibunda*.

b<sup>1</sup>. Forewing without crimson on costa or termen.

a<sup>2</sup>. Forewing with terminal series of black points 1426. *undulosa*.

b<sup>2</sup>. Forewing without terminal series of points... *obsoleta*.

b. Forewing without highly dentate postmedial line.

a<sup>1</sup>. Forewing not white with brown markings.

a<sup>2</sup>. Forewing with postmedial line.

a<sup>3</sup>. Forewing with the medial and postmedial lines connected by a streak at angle of cell 1463. *euprepioides*.

b<sup>3</sup>. Forewing with the medial and postmedial lines not connected by a streak at upper angle of cell.

a<sup>4</sup>. Forewing with terminal black line ..... 1462. *conjunctana*.

b<sup>4</sup>. Forewing without terminal black line.

a<sup>5</sup>. Forewing with the interspaces streaked with crimson ..... 1476. *flavivenosa*.

b<sup>5</sup>. Forewing with the interspaces not streaked with crimson ..... 1429. *semifuscia*.

- b. Forewing with postmedial series of spots or streaks often conjoined into an irregular band
- a<sup>3</sup>. Hindwing black or fuscous; forewing sometimes uniform black ..... 1460. *varians*.
- b<sup>3</sup>. Hindwing yellowish or pinkish.
- a<sup>4</sup>. Forewing with prominent series of medial spots; hindwing with fuscous terminal band..... 1461b. *umbrosa*.
- b<sup>4</sup>. Forewing with medial line.
- a<sup>5</sup>. Forewing with antemedial line or diffused band.
- a<sup>6</sup>. Forewing with the medial line strongly excurved below costa, then confluent with the antemedial band ..... *nebulosa*.
- b<sup>6</sup>. Forewing with the medial line more or less straight and oblique.
- a<sup>7</sup>. Forewing with the whole terminal area fuscous, confluent at middle with the medial line..... 1438. *fuscalis*.
- b<sup>7</sup>. Forewing with the termen yellow or pink.
- a<sup>8</sup>. Forewing with series of elongate postmedial streaks, often conjoined into a broad band ..... 1453. *inconspicua*.
- b<sup>8</sup>. Forewing with much narrower postmedial band composed of short confluent streaks.
- a<sup>9</sup>. Forewing with the postmedial band not confluent with the medial line at inner margin ..... 1440. *rubricosa*
- b<sup>9</sup>. Forewing with the postmedial band confluent with the medial line at inner margin..... 1454. *congerens*
- c<sup>8</sup>. Forewing with postmedial series of short well-separated streaks or points.
- a<sup>9</sup>. Forewing dull semihyaline yellowish with terminal series of points ..... 1456. *floccosa*.
- b<sup>9</sup>. Forewing pale yellow; hindwing with oblique medial line..... 1455. *ruptifascia*.
- b<sup>5</sup>. Forewing with antemedial series of well separate points.

- a*<sup>6</sup>. Forewing with broad diffused medial band ..... 1442. *ila*.
- b*<sup>6</sup>. Forewing with narrow medial line.
- a*<sup>7</sup>. Forewing with the postmedial streaks arising from the medial line below vein 4 ..... 1432. *parallelina*.
- b*<sup>7</sup>. Forewing with the postmedial streaks or points well separated from the medial line.
- a*<sup>8</sup>. Forewing with the medial line slightly incurved at median nervure.
- a*<sup>9</sup>. Forewing with the medial line excurved below the cell ..... 1461. *andamana*.
- b*<sup>9</sup>. Forewing with the medial line not excurved below the cell ..... 1437. *strigipennis*.
- b*<sup>8</sup>. Forewing with the medial line straight or slightly excurved at middle..... 1441. *arcuata*.
- c*<sup>4</sup>. Forewing without medial line.
- a*<sup>5</sup>. Forewing with broad postmedial band with irregular outer edge.
- a*<sup>6</sup>. Forewing with the ante- and postmedial bands confluent at inner margin..... 1458. *nubilalis*.
- b*<sup>6</sup>. Forewing with the ante- and postmedial bands well separated at inner margin... 1459. *humilis*.
- b*<sup>5</sup>. Forewing with postmedial series of five points ..... 1439*a*. *disticha*.
- c*<sup>2</sup>. Forewing without postmedial bands, streaks, or points.
- a*<sup>3</sup>. Forewing deep orange.
- a*<sup>4</sup>. Forewing with the costa towards apex and termen black ..... 1451. *cylletona*.
- b*<sup>4</sup>. Forewing with the costa towards apex and termen not black.
- a*<sup>5</sup>. Forewing with complete subterminal series of black spots ..... 1449. *infumata*.
- b*<sup>5</sup>. Forewing with the subterminal spots reduced to four or absent ..... 1452. *discisigna*.
- b*<sup>3</sup>. Forewing pale ochreous-yellow.
- a*<sup>4</sup>. Forewing with subterminal series of spots.
- a*<sup>5</sup>. Forewing with terminal series of points ... 1443. *solita*.
- b*<sup>5</sup>. Forewing with two points on middle of termen..... 1446. *sexpuncta*.
- c*<sup>5</sup>. Forewing without terminal series of points. 1448. *dharma*.

- b<sup>4</sup>. Forewing without subterminal series of spots.
- a<sup>5</sup>. Forewing with discoidal black spot ..... *calamaria*.
- b<sup>5</sup>. Forewing without discoidal black spot.
- a<sup>6</sup>. Forewing crimson ..... 1417. *anomala*.
- b<sup>6</sup>. Forewing greyish with crimson streaks on inner margin and costa and antemedial and medial dark lines..... 1415. *rubrimargo*.
- c<sup>6</sup>. Forewing greyish with crimson streaks in the interspaces and black streaks on the veins ..... 1475. *esmia*.
- d<sup>6</sup>. Forewing uniform pale brown..... 1481. *uniformis*.
- b<sup>1</sup>. Forewing white with brown markings.
- a<sup>2</sup>. Forewing with the postmedial area occupied by a broad brown band with curved series of white points on it ..... 1423. *frigida*.
- b<sup>2</sup>. Forewing with narrow postmedial brown band or line ..... 1422. *hilaris*.
- 1426a. ASURA PUDIBUNDA, Snell, Veth's Midden Sumatra, Lep., p. 38, pl. 3, f. 16 (1880).

Head, thorax, and abdomen ochreous; vertex of head and patagia with black points; thorax irrorated with black scales; tibiæ and tarsi pink banded with black. Forewing ochreous suffused with pink on costal area beyond middle and on postmedial area; the basal area with patches of black scales and subbasal black point; an antemedial black line excurved from below costa to vein 1; a medial line obtusely angled in cell; a discoidal spot; a postmedial line running out below costa to a very elongate tooth on vein 6 retracted to lower angle of cell; then with a long tooth followed by two shorter teeth; a curved subterminal series of black points, those on veins 5 and 7 displaced inwards, and oblique below vein 4. A fine black line on costa towards apex and on termen; cilia irrorated with black except at tips. Hindwing tinged with pink; the underside with blackish postmedial spots on costa beyond middle and below apex.

*Habitat*.—Khásis; Sumatra. *Exp.* 20 mill.

1426. ASURA UNDULOSA, del. *Lyclene assamica*.

1426b. ASURA OBSOLETA, Moore, P. Z. S., 1878, p. 32, pl. 3, f. 7.

♂. Yellow; patagia and metathorax with black points; fore tibiæ and tarsi banded with black. Forewing with subbasal black point; a small wedge-shaped subbasal spot below costa and two below the cell followed by the curved antemedial series of spots; a medial point below costa and line from subcostal nervure to inner margin excurved below cell and angled inwards in submedian fold; a discoidal point; a highly and irregularly dentate post-medial line strongly bent outwards below costa and to inner margin, and

with longer teeth on veins 7, 6 and 4, a series of spots beyond it, with the spot on vein 4 displaced towards termen.

*Habitat*.—Sikhim; Pulo Laut. *Exp.* 22 mill.

1463. ASURA EUPREPIOIDES, insert (syn.) *Hypocrita inclusa*, Snell., Tijd. v. Ent. XX., p. 68, pl. V., ff. 2 a. c. (1877).

1462. ASURA CONJUNCTANA, insert (syn.) 1463a. *Mitochondria eschara*.

1429. ASURA SEMIFASCIA, del. var. *metamelas* and *Lyclene obsoleta*.

1461c. ASURA NEBULOSA, Moore, P. Z. S., 1878, p. 35.

♀. Yellow; mesothorax with obscure brownish mark; abdomen yellowish-white. Forewing with subbasal black point; the costal edge streaked with black towards base; an antemedial and a curved medial brownish and fuscous line, confluent below the cell and expanding into a large patch on inner area; a very broad brown-edged fuscous postmedial band with sinuous inner edge becoming confluent with the medial band towards inner margin, its outer edge angled at veins 6 and 4. Hindwing yellowish-white with indistinct diffused fuscous subterminal band.

*Habitat*.—Sikhim. *Exp.* 24 mill.

1453. ASURA *obliqua* insert *Lyclene INCONSPICUA*, Moore, P. Z. S., 1878, p. 32, which has precedence.

1456. ASURA FLOCCOSA, insert (syn.) 1457, *Mitochondria subcervina*.

1437. ASURA STRIGIPENNIS, del. *Lyclene inconspicua*, and insert (syns.) *Barsine circumdata*, Wlk., XXXI, p. 262 (1864) and *Lyclene fruhstorferi*, Auriv., Ent. Tidskr., XV., p. 172 (1894).

1459. ASURA HUMILIS, del. *Setina calamaria*, *S. nebulosa*, *S. dasara*, *Barsine chromatica* and *Setina punctata*, and insert (syn.) *Lyclene semicirculata*, Heyl., C. R. Ent. Soc. Belge., XXXV., p. 415 (1891).

1449. ASURA INFUMATA, del. *Setina discisigna*.

1452. ASURA *aurantiaca* insert *Setina DISCISIGNA*, Moore, P. Z. S. 1878, p. 35, which has precedence, and (syn.) 1450. *Mitochondria fuscifusa*.

1448a. ASURA CALAMARIA, Moore, P. Z. S., 1888, p. 392.

*Setina punctata*, Elwes, P. Z. S., 1890, p. 389, pl. 32, f. 18.

♀. Pale ochreous; shoulders and mesothorax with black spots; fore tibiae banded with fuscous; extremity of tarsi fuscous. Forewing with subbasal black point and discoidal spot. This may be an extreme form of *dharma*.

*Habitat*.—Simla, Dalhousie, Sikhim; Borneo; Java. *Exp.* 24-30 mill.

#### Genus NEPHELOMILTA.

##### *Type*

*Nephelomilta*, Hmspn., Cat. Lep. Phal. B. M., II., p. 468 (1900). *suffusa*.

Proboscis aborted, minute; palpi porrect, not reaching beyond the frons; antennæ of female ciliated; tibiae with the spurs short. Forewing with vein 2 from beyond middle of cell, oblique; 3 from before angle; 4·5 stalked; 6 from below upper angle; 7·8·9 stalked; 7 from beyond 9; 10·11 free;

hindwing with vein 2 from beyond middle of cell ; 3·4 stalked ; 5 from far above angle ; 6·7 stalked ; 8 from middle of cell.



1439. NEPHELOMILTA SUFFUSA.

*Nephelomilta suffusa* ♀  $\frac{1}{2}$ .

Genus MILTOCHRISTA.

- |                                                               | <i>Type.</i>         |
|---------------------------------------------------------------|----------------------|
| <i>Miltochrista</i> , Hübn., Verz., p. 166 (1827).....        | <i>miniata</i> .     |
| <i>Calligenia</i> , Dup., Cat. Lep Eur., p. 59 (1844).....    | <i>miniata</i> .     |
| <i>Ammatho</i> , Wlk., III., 759 (1853).....                  | <i>delineata</i> .   |
| <i>Cabarda</i> , Wlk., XXVIII., 435 (1863).....               | <i>sequens</i> .     |
| <i>Castabala</i> , Wlk., XXXI., 270 (1864).....               | <i>roseata</i> .     |
| <i>Mahavira</i> , Moore, P. Z. S., 1878, p. 11 .....          | <i>flavicollis</i> . |
| <i>Gurna</i> , Swinh., Cat. Het. Mus. Oxon, p. 123 (1892) ... | <i>indica</i> .      |
- Sect. I. (*Miltochrista*). Forewing of male with the median nerve bent upwards at extremity, the discocellulars short.
- A. Forewing with strongly dentate postmedial line ... 1425. *dentifascia*.
  - B. Forewing without dentate postmedial line ..... 1424. *strigivenata*.
- Sect. II. Forewing of male normal.
- A. (*Mahavira*). Antennæ of male serrate with very long bristles and fascicles of cilia.
    - a. Forewing without series of black spots ..... 1317. *flavicollis*.
    - b. Forewing with series of black spots ..... 1386. *macutifascia*.
  - B. Antennæ of male with bristles and cilia.
    - a. (*Gurna*). Hind tibiæ of female with the medial spurs absent ..... 1420. *indica*.
    - b. (*Barsine*). Hind tibiæ of female with two pairs of spurs.
      - a<sup>1</sup>. Forewing with the cilia blackish.
      - a<sup>2</sup>. Forewing with the cilia black near middle only... *cardinalis*.
      - b<sup>2</sup>. Forewing with the cilia wholly black.
      - a<sup>3</sup>. Hindwing black with yellow fascia on basal half of costa ..... 1427. *postnigra*.
      - b<sup>3</sup>. Hindwing yellow or crimson.
      - a<sup>4</sup>. Hindwing with terminal fuscous band ..... 1469. *pumicea*.
      - b<sup>4</sup>. Hindwing without terminal fuscous band, the veins of terminal area often streaked with black.

- a*<sup>5</sup>. Forewing crimson, or with crimson markings.
- a*<sup>6</sup>. Forewing with the medial line strongly angled inwards in cell to join or almost join the antemedial line.
- a*<sup>7</sup>. Forewing with the medial line strongly angled inwards in submedian fold ..... 1468. *cuneonotata*.
- b*<sup>7</sup>. Forewing with the medial line not angled inwards in submedian fold.
- a*<sup>8</sup>. Forewing with the postmedial line minutely dentate ..... 1467. *exclusa*.
- b*<sup>8</sup>. Forewing with the postmedial line not dentate.
- a*<sup>9</sup>. Forewing suffused with crimson ..... 1470. *cruciata*.
- b*<sup>9</sup>. Forewing yellow with crimson streaks in the interspaces ..... 1471. *inflexa*.
- b*<sup>6</sup>. Forewing with the medial line not angled inwards in cell.
- a*<sup>7</sup>. Forewing without crimson spot in the interspaces ..... 1469*a*. *mesortha*.
- b*<sup>7</sup>. Forewing with crimson spots in the interspaces ..... 1474. *delicia*.
- b*<sup>5</sup>. Forewing without crimson markings. .... 1431. *multistriata*.
- b*<sup>1</sup>. Forewing with the cilia not blackish.
- a*<sup>2</sup>. Forewing fuscous with yellow spots, lines, and termen ..... 1277. *roseata*.
- b*<sup>2</sup>. Forewing not fuscous.
- a*<sup>3</sup>. Forewing with crimson spots and streaks in the interspaces ..... 1473. *gratiosa*.
- b*<sup>3</sup>. Forewing without crimson spots and streaks.
- a*<sup>4</sup>. Forewing with the veins of terminal area streaked with black.
- a*<sup>5</sup>. Forewing with subbasal series of spots.
- a*<sup>6</sup>. Forewing with series of spots just beyond the antemedial series.
- a*<sup>7</sup>. Forewing pure white with medial yellow band ..... 1461*a*. *eccentropis*.
- b*<sup>7</sup>. Forewing with the ground-colour yellowish.. 1436. *maculifasciata*.
- b*<sup>6</sup>. Forewing with medial series of spots.
- a*<sup>7</sup>. Forewing with the postmedial line strongly dentate ..... 1430. *nigralba*.
- b*<sup>7</sup>. Forewing with the postmedial line slightly bent outwards beyond the cell ..... 1464. *radians*.

- c*<sup>6</sup>. Forewing with continuous or almost continuous medial line.  
*a*<sup>7</sup>. Forewing with continuous or almost continuous postmedial line.  
*a*<sup>8</sup>. Forewing with the postmedial line not dentate at vein 6..... 1465. *zebrina*.  
*b*<sup>8</sup>. Forewing with the postmedial line strongly dentate at vein 6 ..... 1428. *prominens*.  
*b*<sup>7</sup>. Forewing with the postmedial line reduced to series of spots ..... 1434. *delicata*.  
*b*<sup>5</sup>. Forewing without subbasal series of spots ..... 1483. *linga*.  
*b*<sup>4</sup>. Forewing with the veins of terminal area not streaked with black.  
*a*<sup>5</sup>. Forewing with purplish-fuscous streaks in the interspaces beyond the postmedial line. *phæoxanthia*.  
*b*<sup>5</sup>. Forewing without fuscous streaks beyond the postmedial line  
*a*<sup>6</sup>. Forewing with medial line ..... *proleuca*.  
*b*<sup>6</sup>. Forewing without medial line.  
*a*<sup>7</sup>. Forewing with postmedial series of points.  
*a*<sup>8</sup>. Patagia and base of forewing with black spots ..... 1447. *spilosomoides*.  
*b*<sup>8</sup>. Patagia and base of forewing without black spots ..... 1444. *magna*.  
*b*<sup>7</sup>. Forewing without series of points.  
*a*<sup>8</sup>. Forewing pale ochreous..... 1445. *perpallida*.  
*b*<sup>8</sup>. Forewing pure white..... 1445a. *hololeuca*.  
1424. MILTOCHRISTA CARDINALIS, Hmpsn., Cat. Lep. Phal. B. M., II., p. 480, pl. xxxii, f. 8 (1900).

Vertex of head and thorax brilliant scarlet; palpi, frons, antennæ, pectus, legs, and abdomen black. Forewing brilliant scarlet with a black streak on median nervure from origin of vein 2 widening gradually to termen; cilia black near middle. Hindwing black. Underside of forewing with the terminal area suffused with black from below costa to above inner margin, interrupted by a crimson streak at vein 4.

*Habitat*.—Sikhim. Khâsis. *Exp.* ♂ 20, ♀ 28 mill.

1468. MILTOCHRISTA CUNEONOTATA, del. *Barsine scripta*.

1467. MILTOCHRISTA EXCLUSA, del. *M. rhodina*.

1473. MILTOCHRISTA GRATIOSA, insert (syn.) *Barsine lucibilis*, Swinh., Cat. Het. Mus. Oxon., p. 107, pl. 3, f. 6.

1433. MILTOCHRISTA LINGA, insert (syn.) *Barsine tripartita*, Wlk., XXXI., p. 250 (1864).

1433a. MILTOCHRISTA PHÆOXANTHIA, Hmps., Cat. Lep. Phal. B. M., II., p. 493, pl. xxxii, f. 23 (1900).

♀. Head and thorax yellow; abdomen yellowish-white. Forewing bright yellow with purplish-fuscous markings; an ill-defined antemedial line produced to long teeth in cell and submedian fold and to a short tooth below costa, on vein 1 retracted towards base; a postmedial line strongly bent outwards below costa, then oblique and minutely dentate; a series of streaks in the interspaces beyond it extending to termen at apex and tornus, and almost to it at vein 4; a series of slight brownish terminal points. Hindwing pale yellow slightly tinged with fuscous towards apex.

*Habitat*.—Khâsis. *Exp.* 24 mill.

1433b. MILTOCHRISTA PROLEUCA, Hmps., Cat. Lep. Phal. B. M., II., p. 494, pl. xxxii, f. 28 (1900).

♂. Head, thorax and abdomen white irrorated with fuscous. Forewing white, the costa tinged with fuscous, the inner area irrorated with fuscous; a fine medial black line, incurved from below costa to submedian fold where it is angled outwards. Hindwing pale fuscous, the cilia white.

*Habitat*.—Sikhim. *Exp.* 24 mill.

1445. MILTOCHRISTA PERPALLIDA, Hmps., Cat. Lep. Phal. B. M., II., p. 495, pl. xxxii, f. 22 (1900) = *pallida*, Moore, nec Bremer.

Genus PHILENORA.

*Type.*

*Philenora*, Rosenst., A. M. N. H. (5), XVI, p. 382 (1885) ..... *undulosa*.

*Scædora*, Meyr., P. Linn. Soc. N. S. W. (2) I, p. 731 (1886). *omophanes*.

*Notata*, Hmps., Ill. Het. B. M., VIII, p. 47 (1891) ..... *parva*.

*Ochrota*, Kirby, Cat. Het., p. 352 (1893) ..... *unicolor*.

*Diphtheraspis*, Meyr., P. Soc. Queensland, VIII, p. 74 (1894).. *modica*.

*Bettonia*, Butl., P. Z. S., 1898, p. 418 ..... *unicolor*.

The typical section is without the patches of androconia on fore- and hindwings.

Sect. I. (*Notata*). Male with large elliptical patch of black androconia in, below, and beyond cell of forewing on underside and a similar patch on upperside of hindwing below costa.

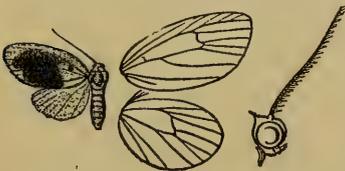
1411. PHILENORA PARVA.

Genus CYCLOMILTA.

*Type.*

*Cyclomilta*, Hmps., Cat. Lep. Phal. B. M., II, p. 512 (1900). *melanolepia*.

Proboscis aborted; palpi minute, antennæ of female with bristles and cilia; tibiæ with the spurs moderate. Forewing elliptical, the costa and inner margin strongly arched, the apex rounded; vein 2 from middle of cell, curved at base; 3 from well before angle; 5 from above angle; 6 from well below upper angle; 7·8·9·10 stalked; 7 from beyond 9; 11 free. Hind-



*Cyclomilta melanolepia*, ♀ †

wing with vein 2 from beyond middle of cell; 3/4 shortly stalked; 5 from above angle; 7 from before upper angle; 8 from towards end of cell.

1458a. CYCLOMILTA MELANOLEPIA, Hmps., Cat. Lep. Phal. B. M., II, p. 512.

♀. Orange-yellow; abdomen and hindwing paler. Forewing with blue-black subbasal spot in cell; a large fuscous-grey patch from middle to near termen not reaching costa; its outer edge irregular and irrorated with large black scales most thickly between veins 3 and 5.

*Habitat*.—Sikhim, 1800'. *Exp.* 28 mill.

Genus SCHISTOPHLEPS.

1492. SCHISTOPHLEPS BIPUNCTA.

Genus CHAMAITA.

Sect. I. Forewing with vein 10 absent in both sexes.

1493. *Chamaita neuropteroides*, insert *C. trichopteroides*, Wlk., J. Linn. Soc. Zool., VI, p. 121 (1862); and *Homopsyche nudarioides*, Butl., A.M. N.H.(5), X, p. 226 (1882), which have precedence. Assam; Borneo; New Guinea; New Britain.

Sect. II. Forewing with vein 10 absent in male, from cell in female.

1434. CHAMAITA NYMPHA.

Genus PALÆOPSIS.

1491. PALÆOPSIS DIAPHANELLA.

Genus HEMIPSILIA.

*Hemipsilia*, Hmps., Cat. Lep. Phal. B. M., II, p. 532 (1900).

Proboscis well developed; palpi porrect, not reaching as far as frons;



antennæ of male ciliated; tibiæ with the spurs short; wings thinly scaled. Forewing with the cell very long; vein 2 from middle; 3 from long before angle; 5 from well above angle; 6 shortly stalked with 7·8; 9

*Hemipsilia coa-vestis*, ♂  $\frac{1}{2}$  absent; 10 from cell; 11 curved and becoming coincident with 10. Hindwing with the cell very long; vein 2 from middle; 3 from long before angle; 5 from from middle of cell; 6·7 stalked; 8 from middle of cell.

1489. HEMIPSILIA COA-VESTIS.

Genus NUDARIA.

A. Forewing without fulvous-yellow patches.

a. Forewing without dark wedge-shaped patch above tornus.

a<sup>1</sup>. Forewing with postmedial line.

a<sup>2</sup>. Forewing with the postmedial line oblique

from median nervure to inner margin ...1487. *fasciata*.

b<sup>2</sup>. Forewing with the postmedial line bent

outwards to inner margin .....1488. *margaritacea*.

b<sup>1</sup>. Forewing without postmedial line .....1486. *suffusa*.

b. Forewing with dark wedge-shaped patch above

tornus.....1488a. *fumidisca*.

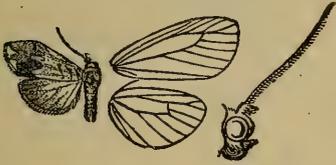
- B. Forewing with fulvous-yellow postmedial patch below costa, and three patches on terminal area conjoined at base .....1488c. *discipuncta*.

1487. NUDARIA FASCIATA, insert (syn.) 1488b. *N. promelana*.

Genus GYMNOCHROMA.

*Gymnochroma*, Hmps., Cat. Lep. Phal. B. M., II., p. 537 (1900).

Proboscis fully developed; palpi porrect, not reaching beyond the frons and clothed with rough hair; head, thorax, and abdomen clothed with rough hair; antennæ ciliated, the basal joint long and fringed with rough hair in front; tibiæ with the spurs moderate. Forewing rather narrow; vein 2 from middle of cell; 3 from long before angle; 5 from middle of discocellulars; 6·7 stalked; 8 absent; 9



*Gymnochroma fulvipicta* ♂  $\frac{3}{4}$ .

from angle; 10·11 free. Hindwing with vein 2 from middle of cell; 3 from long before angle; 5 from far above angle; 6·7 strongly stalked; 8 from middle of cell; wings sparsely clothed with hair-like scales.

1486a. GYMNOCHROMA FULVIPICTA.

Genus DIDUGA.

Sect. I. (*Androstigma*). Antennæ of male pectinate, the apical part serrate; hindwing with rounded patch of androconia at tornus.

1398. DIDUGA ALBICOSTA.

Sect. II. (*Diduga*). Antennæ of male ciliated; hindwing without patch of androconia.

A. Forewing with crenulate yellow costal fascia.

a. Forewing uniform fuscous, except the costal fascia and terminal band..... 1397. *flavicostata*.

b. Forewing becoming dull rufous towards inner margin ..... 1398a. *rufidisca*.

B. Forewing with yellow postmedial spot only

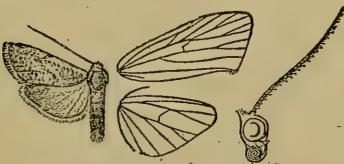
on costa ..... 1396. *fumipennis*.

Genus CONOSIA.

Type.

*Conosia*, Hmps., Cat. Lep. Phal. B. M., II, p. 542 (1900)..... *aspera*.

Proboscis fully developed; palpi porrect, reaching as far as frons; antennæ of male with bristles and cilia; tibiæ with the spurs moderate, abdomen clothed with rough hair. Forewing with the costa nearly straight, the apex rectangular; the inner margin with a slight tuft at tornus; vein 2 from middle of cell; 3·4 on a long stalk; 5 absent; 6·7 and



*Conosia aspersa* ♂  $\frac{1}{2}$ .

8·9 on long stalks ; 10 free ; 11 anastomosing with 12. Hindwing with vein 2 from middle of cell ; 3·4 on a long stalk ; 5 absent ; 6·7 stalked ; 8 from middle of cell.

1377a. CONOSIA ASPERSA, Wlk., Journ. Linn. Soc. Zool., VI, p. 104 (1862).

*Lithosia cylinooides*, Wlk., Journ. Linn. Soc. Zool., VI, p. 107 (1862) ; Swinh. Cat. Het. Mus. Oxon., p. 123, pl. 14, f. 17.

Head and thorax grey-brown ; abdomen grey with some fuscous before the anal tuft, which is yellowish. Forewing grey irrorated with brown ; a medial blackish band strongly angled below costa or often almost entirely obsolete except a spot on costa ; traces of a curved subterminal line. Hindwing fuscous, paler towards base ; the cilia pale.

*Habitat.*—Mergui ; Borneo.

*Exp.* ♂ 26, ♀ 32-36 mill.

Genus EUGOA.

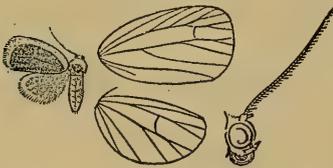
1402. EUGOA BIPUNCTATA, insert (syn.) *Lithosia trifasciata*, Snell., Veth's Midden Sumatra, Lep., p. 33 (1880).

Genus CYCLOSIELLA.

*Type.*

*Cyclosiella*, Hmps., Cat. Lep. Phal. B. M., II, p. 548 (1900) ..... *dulcicula*.

Proboscis fully developed ; palpi upturned, short ; antennæ of male



ciliated ; tibiæ with the spurs moderate. Forewing short and broad, the costa arched, the apex rounded ; vein 2 from middle of cell curved at base ; 3 from before angle ; 4·5 stalked ; 6·7 and 8·9 stalked ; 10·11 free. Hindwing with vein 2 from close to angle of cell ; 3·4 stalked ;

*Cyclosiella dulcicula*, ♂  $\frac{3}{2}$ .

5 absent ; 6·7 stalked ; 8 from middle of Cell.

1409. CYCLOSIELLA DULCICULA, Assam ; S. India.

Genus TRISCHALIS.

A. Forewing with whorl-shaped mark on inner area ..... *subaurana*.

B. Forewing without whorl-shaped mark on inner area..... *absconditana*.

1408a. TRISCHALIS SUBAURANA, Wlk., XXVIII, 432 (1863).

*Pallene metalligera*, Butl., A. M. N. H. (5), X., p. 226 (1882).

♀. Golden yellow. Forewing with pale purplish-fuscous line from middle of cell recurved to above inner margin near base, then more prominent, running up to vein 2 and round back again to vein 1 before middle ; a pale purplish-silvery line, often diffused, from below costa beyond middle, curved to middle of termen and tornus ; some silvery scales on apical part of costa. Hindwing paler.

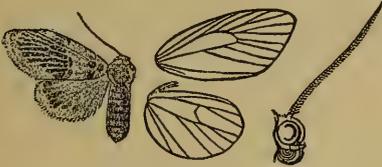
*Habitat.*—Andamans ; Labuan ; Borneo ; New Britain. *Ex.* 22 mill.

1408. TRISCHALIS *flava*, insert *Tospitis* ABSCONDITANA, Wlk., XXVIII., 432 (1863), which has precedence. Assam, Ceylon.

Genus STIGMATOPHORA.

Type.

*Stigmatophora*, Stgr., Stett. Ent. Zeit., XLI, p. 399 (1881) ... *micans*.  
 Proboscis well developed; palpi porrect to just beyond frons; antennæ



*Stigmatophora palmata*, ♀ 1.

ciliated; tibiæ with the spurs rather long. Forewing with vein 2 from middle of cell, oblique; 3 from before angle; 5 from above angle; 6·7 and 8·9 stalked; 10·11 from cell. Hindwing with vein 2' from middle of cell; 3 from near angle; 4·5 stalked; 6·7 stalked; 8 from

middle of cell.

- A. Forewing white with black streaks .....1403. *strigivenata*.
- B. Forewing pale yellow with purple-black streaks, 1435. *palmata*.
- C. Forewing yellow with crimson streaks.....1404. *roseivena*.

Genus TROPACME.

1410. TROPACME CUPREIMARGO.

Genus HEMONIA.

1383. HEMONIA ORBIFERANA.

The Genera *Curoba*, *Macrobrochis*, *Migoplastis*, *Dilemera*, and *Nyctemera* belong to the *Hypsiidæ*.

The Genera *Eligma*, *Secusio*, *Argina*, *Tatargina*, and *Deiopia* belong to the *Arctianæ*.

The Genera *Kerala*, *Lobocraspis*, *Ptyopterota*, *Anachrostis*, *Tolpia*, *Galleridea*, *Cacyparis*, *Chandica* and the *Nycteolinæ* belong to the *Noctuidæ*.

1351. *Lithosia colon* is a synonym of *ILEMA BIPUNCTA*, Hübner. The type in Coll. Staudinger is from Natal, not Sylhet.

A PLEA FOR THE COLLECTIVE INVESTIGATION OF  
 INDIAN *CULICIDÆ*, WITH SUGGESTIONS AS  
 TO MOOT POINTS FOR ENQUIRY, AND A  
 PRODROMUS OF SPECIES KNOWN TO  
 THE AUTHOR.

BY GEO. M. GILES, LT.-COL., I.M.S.

(Read before the Bombay Natural History Society on 11th  
 December, 1900.)

Within the last week we have received in India the details of the experiments conducted in the London School of Tropical Medicine under the direction of Dr. Manson, which conclusively demonstrate that malaria can be transmitted to man through the agency of mosquitoes. A number of mosquitoes of the genus *Anopheles* were allowed to bite a patient suffering from tertian ague in Italy. They were then transported to England and made to bite two healthy young English students. Both these gentlemen developed tertian malarial fever, and the characteristic parasites of the disease were found in their blood.

I can see in this experiment no possible source of fallacy. It is absolutely conclusive of the fact that this is at the very least one of the methods of the transmission and propagation of the disease; and a very little consideration will shew any one conversant with the data of parasitism that it is also necessarily the only one, saving only by the intravenous injection of the blood of a patient suffering from malaria into the vessels of a healthy subject, a method hardly likely to occur in nature.

The reason for our assurance of this is that the malarial parasite requires two successive hosts—a human being and a mosquito—to attain sexual maturity and propagation. In the blood of the fever patient it multiplies non-sexually; in the tissues of the mosquito it does so sexually. Now there are a large number of parasites which have an exactly parallel history, the most familiar being that of the tape-worm, which lives and multiplies asexually in *Herbivora* and other eaten animals, and passes its sexually mature life in the *Carnivora*, and other animal-eating animals. Just as it is possible to introduce an asexually multiplying malarial protozoon mechanically into the veins of a healthy man, so would it, doubtless, be practicable in these days of abdominal surgery to lay open the intestine and introduce into it a living tape-worm, which

would, doubtless, continue to thrive in its new host. But in the ordinary plan of nature the eggs discharged from the bowel of the eating animal are discharged in situations when they are likely to be swallowed by the eaten animal, and in the latter produce the asexually multiplying bladder worm. This, when swallowed with its eaten host, develops in the eating animal once more into the sexually multiplying tape-worm.

Now, although we are acquainted with a large number of parasitic life-histories of this character, we know of no instance in which a parasite with such a history is capable of maintaining the continuity of the species in any other manner, and it will be, indeed, astonishing if the malarial parasite should prove an exception to what has been hitherto found to be an unvarying law of parasitism.

In fact, no one who has any special knowledge of the subject will believe that there can under the circumstances be any other route of infection. Either the idea that the mosquito is the alternative host of the malarial parasite is a huge mistake, or it is, under natural circumstances, the one and only method of infection. There is no tenable middle position.

Most of the apparent exceptions depend on the fact that, like most other two-host life-history parasites, the host carrying the sexual phase of the malarial parasite may do so for years without any perceptible inconvenience. A bladder worm may have to lie imbedded in the tissues of an ox for years before the animal is turned into beef and devoured by a man.

Then its opportunity has come and it develops into a tape-worm, each sexually multiplied strikile of which is a complete hermaphrodite sexually mature animal.

So with the malarial parasite. An infected person may have no visible symptoms, but lurking in his tissues are the parasites ready to start again on their course of asexual multiplication should any accident bring the resisting power of the host sufficiently low.

Hence persons who have had no recent opportunity of being bitten by mosquitoes often do develop a typical ague, but the fact remains that they must have been bitten at some time, and as a matter of fact, the interval is a concern of but little moment to the parasite. The patient, in fact, though apparently well, has latent malaria; in other

words, he harbours but a harmless number of quiescent parasites, and the exception is only apparent. The fact of the possibility of the transmission of malaria in this way having thus been now conclusively demonstrated, we may take it as practically certain that every malarial patient has at some time been bitten by an infected mosquito. Further, it appears probable that only mosquitoes of the genus *Anopheles* are capable of acting as the host of the asexual stage of the parasite, but this is not certain. Now the malarial parasite is responsible for by far the greatest proportion of all sickness and death in the tropics.

Cholera and Plague are comparatively insignificant enemies that perhaps kill a few thousands a year, in an impressive way it is true. But the quiet, insidious malaria sweeps off its millions, and the utmost effort that has yet been made in India has been the vote of the magnificent sum of Rs. 30 per mensem by the city-fathers of Calcutta, to hire a man to destroy mosquito larvæ. I doubt if India will ever be a pleasant residence for the white man for the greater part of the year, but I am by no means sure that the tropics would not be well nigh as healthy a residence as the temperate zone, could we but do away with malaria.

Under these circumstances, it is obvious that the first step in the attack of the problem of prevention is the acquisition of an exact knowledge of the life-history of the various species of mosquito of each malarial country, and this is a task which might well be taken up by the members of this Society, and it is to urge upon you how much might be done by a body animated by a common interest in natural history, such as the Bombay Natural History Society, that I am so glad to comply with the request that your Honorary Secretary has done me the honour to make to me of contributing a paper on the subject to your transactions. Such experiments and observations are badly wanted, for the number of workers is extremely small, and it is surprising how difficult it is to induce people to go to the least trouble either to observe or even to avail themselves of what is already known to protect themselves from the attacks of the most widely spread and destructive of tropical diseases.

Such being the case, I would suggest to the members of the Society the following points for collective effort and investigation:—

1. To make a representative collection of the mosquitoes of India. In which connection I shall be happy to receive, and, as far as possible

name all collections sent to me. Wherever possible, it will be well to send a series of specimens, so that it may provide for sending duplicate specimens to Mr. Theobald, who is also working at the group for the British Museum, and to admit of specimens being returned for the reference of the collector, as well as providing specimens for the Society's collection.

2. The identification of larvæ and pupæ with their corresponding adult insects, which is best ascertained by "breeding out." In conducting such experiments it is important to copy, as nearly as possible, natural conditions. It is, for example, very difficult to keep *Anopheles* larvæ alive for any length of time, except in a large apparatus in which natural conditions are followed. A large naund, half filled with mud from an *Anopheles* pool, and filled with its water covered with a correspondingly large net, is required.

3. The manner in which each species tides over the season unfavourable to its multiplication. *Anopheles*, e.g., at any rate, in Northern India, is rare in the hot weather, but I am inclined to believe that a careful search will discover all stages of the insect all the year round. And, in any case, the adults, though scarce in the hot weather, are never entirely absent, but it may be that larvæ also survive in suitable localities. At present, in the North-West Provinces, for example, larvæ are to be found in great numbers, but pupæ are very rare. It may be, therefore, that the duration of larval life is protracted, and that the change with the pupal stage is indefinitely postponed by a cold which is yet insufficient to kill the larvæ outright.

It has been suggested that the adults deposit their eggs on dry ground, in places likely to be covered with water in the rains. Zoologically speaking, this is in the last degree improbable, but the question should be tested. To do so, a known *Anopheles* pool should be covered in, after it has dried up, with wire gauze.

If the idea be founded on fact, larvæ should be found during the following rainy season in the pool thus protected from the visit of adult females.

It has also been suggested that the larvæ can resist dissection. I have experimented on this point and find that the larvæ die and decompose long before the mud in which they have been stranded is anything like dry, but confirmatory observations are desirable.

4. *The method and place of deposition of ova.*—As regards *Anopheles* there is a good deal of doubt. I have never found the eggs except on water, and it is in the last degree unlikely that they are ever deposited elsewhere. Observations of insects placed under such unnatural surroundings as the interior of a test tube are valueless in such connection, as the gravid insect must drop her eggs somewhere. As a colleague of mine remarks; he knew of a case of a lady who was confined in a brake-van, but it does not follow that a train in motion is the natural lying-in place of the human female. I have known *Culex pipiens* deposit eggs in a pill box, but the ova so deposited though promptly placed in water, failed to hatch out.

It is rather difficult to distinguish the eggs of *Anopheles*, owing to the smallness of the groups. The best plan of searching for them is to skim the surface of the pool with a table-spoon and to examine the water so skimmed in a shallow glass vessel placed on a sheet of white paper by means of a powerful hand lens. A very good weapon for skimming is the table appliance known as a "crumb-scoop."

5. *Methods of destroying mosquitoes.*—I fear that the task of preventing malaria by the systematic destruction of *Anopheles* larvæ, is a much larger order than we have been led to believe. It has been gravely suggested that a map of such pools should be prepared for every town, but in India, in the rains, such maps would have to be on a large scale, for they are simply everywhere. As a rule, you will not find them in large collections of water, especially in the open, but every depression in the road-side ditch, every garden irrigation tank, every hydrant-fed puddle is full of them. I have met with them in a depression in the asphalted platform of a busy railway junction, in brickfields, in soakage pools, in river beds in the hot weather; in fact, in every possible situation. Nor do they seem very particular as to the cleanliness of the water, or as to its being rich in green algæ. It would, indeed, require a small sanitary army, and an inquisitorial search of private premises, such as would never be tolerated in India, to deal with them by kerosine or other larvæicides.

But this admitted, there is no doubt a good deal might be done in the way of diminishing their numbers even if they cannot be exterminated, and in the matter of individual prophylaxis a great deal could be accomplished, as these insects rarely fly far, and there must be

hundreds of Europeans whose bungalows are so far from neighbours, that they might secure a practical immunity from mosquitoes of all sorts, by the expenditure of a very little trouble and attention. In this part of the world at any rate the great source of mosquitoes of all sorts, *Anopheles* included, are the small pukha tanks which are to be found in nearly every compound for storing water for the garden. In most gardens there will be half a dozen of these connected with each other and the well-head by means of cemented channels. All that is required is to insist that these and all naunds and other small storages of water shall be emptied to dryness, and left so for a few hours, once every week or ten days.

If every one in an European cantonment would do this they would be but little troubled with mosquitoes even in the rains and might almost banish them in the hot weather. Secondly in the rains search the compound and its environs for pools. Fill up the small ones with a few shovels of earth and kerosine the large ones. The excavation made at the end of the run for the bullocks from the well-head is an almost certain find for *Anopheles* in the rains. It should be kerosined weekly. Such measures, however, cannot deal with adult mosquitoes that are already harboured in the house, and they are long-lived insects. It is usual to lime-wash houses in the cold weather. This should be preceded by a thorough fumigation with sulphur; pastiles for which purpose, each sufficient for 1,000 cubic feet of room-space, have been made for me by Messrs. Waldie of Cawnpore. Favourite lurking places, such as bath-rooms, should be periodically fumigated by burning one of these pastiles. It is almost needless to say that all doors and other openings should be closed before lighting the pastile and that it should be left closed for a few hours. Again a good deal can be done by keeping "chicks" down at dusk and dawn; just the times they are usually freely opened. It seems well nigh impossible to induce people to adopt these simple and not very onerous precautions, but will some of the members give the matter a systematic trial and report on the result thereof?

With the view of assisting members who are unaccustomed to the entomological Branch of Natural History studies, your Secretary has kindly consented to reproduce the following notes on methods of collecting which I have drawn up for private circulation among friends

who helped me by collecting but which has not as yet been issued as I have not yet received the fair proof:—

NOTES ON THE COLLECTION AND  
PRESERVATION OF MOSQUITOES.

Mosquitoes or gnats are small, two-winged insects (*Diptera*) and are all, except in the small genera *Corethra* and *Mochlonyx*, provided with a long, suctorial proboscis. In all cases, the males have beautifully plumed antennæ, while those of the females, though also 14 or 15-jointed, have only a few scanty hairs. They are too well known to require minute description, and are unlikely to be confused with any family but the *Chironomidæ* or midges, from which they may be distinguished by the fact that, in all mosquitoes the veins of the wings are fringed with scales, like those of butterflies and moths.

Springing from either side of the root of the proboscis are two feelers or palpi which, in the males, are usually about the length of the proboscis, but, in the females, differ in length in the different genera.

Behind the wings are a pair of club-shaped organs, the halteres or ballancers, which represent the hinder wings of four-winged insects, but in gnats are probably auditory organs. The thorax also carries three pairs of legs, each consisting of two short pieces, the coxæ, at their root, followed by the femur, tibia, and five tarsal joints, the first of which last is generally as long as, or longer than the tibia. Each leg ends in a pair of claws, often of complex form in the males, between which are plume-shaped epipodia which, by retaining air, enable the insect to pitch and float upon the surface of water.

The abdomen shows eight visible segments and terminates in the males in a pair of claspers, and in the females in lobed appendages.

Like all other *Diptera*, gnats undergo a complete metamorphosis.

The adult insects deposit their eggs on the surface of standing water, and from these are hatched out larvæ, which may be found, in warm climates, in almost every small collection of water.

After about ten days, the larvæ change into small, tadpole-shaped creatures, the nymphs or pupæ, provided with a pair of breathing horns, springing from the back of the thorax. While in this stage they do not eat, and after about three days, the pupa-skin bursts along the middle, and the full-grown gnat slowly extricates itself and flies off. They generally pair immediately after, but many species do not deposit their eggs until they have obtained a feed of blood. As a rule, it is only the females that bite, and they only occasionally; the more habitual food of these insects being the juices of plants.

The adult insects are found, not only in houses, but in groves, forests, and in any other situations where shade can be obtained during the day, while the larvæ and pupæ are common in all small collections of water where there is

no strong current. In the hills, they are common in pools in water courses. They are to be found in all countries from the Tropics to the Polar regions, and some species have so wide a distribution as to rival that of man. In all countries the adults may be found at all seasons of the year, the maintenance of the species being secured by the survival of impregnated females, which hide and remain quiescent during seasons unfavourable to the well-being of the larvæ. No instance of survival of quiescent larvæ is known, but the possibility of such a habit should be borne in mind and looked for.

In attempting to describe a mosquito, the exact position of all bandings, *e.g.*, whether at the base or apex of joints and segments, and of all spots on the wings, or elsewhere, should be carefully noted.

The gnat family (*Culicidæ*) includes some seven or eight well-established genera, of which the two following are most important :—

**ANOPHELES.**—Palpi about as long as the proboscis in both sexes, but tapered in the females, while they are clubbed in the males. They rest on walls, &c., with the body at an angle to it, the proboscis pointing at the wall. Their eggs are deposited either singly or in small groups; and their larvæ have no long breathing tube but lie nearly horizontal at the surface of the water. There are about 30 species.

**CULEX.**—Palpi about as long as the proboscis in the male, but rarely clubbed; very short in the female. Rest on walls with the body parallel to the surface; eggs deposited in boat-shaped masses consisting of 200 to 300 eggs. Larvæ lie in the water as if suspended by the tail from the surface, and are provided with a long breathing tube, springing from the back of the eighth abdominal segment. There are over 160 known species.

Less important genera are

**AEDES.**—Palpi very short in both sexes.

**MEGARHINA.**—Palpi usually long in both sexes—Large, brilliantly coloured, sylvan species.

**CORETHRA** and **MOCHLONYX.**—Small, hairy gnats, unprovided with the usual long proboscis. In the latter genus, the first tarsal joint is short.

#### COLLECTING.

— o —

Mosquitoes may be collected—

(a) By slipping over them a small wide-mouthed bottle, as they sit on a wall or window, for which purpose a small “killing bottle” is best.

(b) By means of a net :—Bend 2 yards of stout iron wire so as to form a ring 9” in diameter, with a handle about 2 ft. long, formed of the two ends twisted together. The net is a bag 2 ft. deep, secured to the ring, and should be made of fine silk gauze (*chiffon*) and a strip of cloth should be

wound round the twisted wire of the handle to afford a more comfortable grip.

(c) By breeding out from larvæ and pupæ:—The larvæ are found in pools, and in domestic collections of water, and when undisturbed, generally remain at the surface.

Place a score or so of full-grown larvæ and pupæ, in the water in which they have lived, in a tumbler, and tie over it a covering of gauze supported on a twig or piece of wire, bent into an arch.

In the course of a few days the adult insects will escape from the pupæ and be found in the gauze. They should not be killed for a day or two, and it is better to introduce a slice of banana into the net so as to enable them to feed, and so fill out to their full size.

When a sufficient number of specimens have appeared and been pinned the remaining larvæ should be preserved in a small phial, in rectified spirit, or in 4% formaline solution, and marked with a distinguishing letter or number in order to identify them with the adult pinned insect.

#### KILLING COLLECTED MOSQUITOES.

The first step in the preservation of collected specimens is to kill the mosquitoes, and for this the best plan is to employ a "killing bottle" which any one can easily manufacture for himself.

Those supplied by dealers are always far too large for small *Diptera* such as the *Culicidæ*.

Select a wide-mouthed phial about  $3\frac{1}{2}$ " high by 2" wide, fitted with either a well-fitting cork, or preferably with a metal screw-top.

In the latter case the disc of cork in the top of the cap should be removed and replaced with one of thick rubber, which may be secured in position by means of ordinary bicycle tyre-repairing cement. Mix equal bulks coarsely powdered cyanide of potassium, and dry plaster of Paris, and put a depth of  $\frac{3}{4}$ " in the bottom of the bottle; dust over this a little dry plaster; and then pour over all,  $\frac{1}{2}$ " in depth, of liquid plaster of the consistence of cream. When the plaster has set, the bottle is ready for use.

A bottle such as this is very handy for slipping over and catching sitting mosquitoes, as in a few seconds the insect is stupefied, and drops into the bottle uninjured by attempts to escape. When the insect has been taken by the net, the bottle is passed into it, and it is easy to slip the bottle over it as it sits on the gauze. The mosquito should never be left in the bottle for more than 90 seconds or it will get too stiff to be conveniently set; and it should be pinned immediately.

Another very effectual killing agent is tobacco smoke, which may be applied by holding a lighted cigarette a few inches beneath the net and letting the stream of smoke play over the entangled insect—or by puffing smoke from the lips into the pill box or bottle, if it has been caught in that way.

Chloroform is useless for the purpose, as the insects recover after setting, but a scrap of blotting paper moistened with dilute hydrocyanic acid, and slipped into the pill box or bottle, answers very well.

PRESERVING THE INSECT.

It is of course very easy to mount mosquitoes as microscopic specimens in balsam, or to preserve them in bottles in spirit; *but such specimens are absolutely useless for identification*, as their coloration depends entirely on the reflection of light from the scales with which they are clothed, and is lost if they be immersed in balsam or any other fluid.

For identification, the insects must be pinned as described below:—

*Requisites—*

1. No. 20 Insect pins: (Obtainable from D. F. Tayler & Co., New Hall Works, Birmingham). A quarter of an ounce, costing about half a crown, will last a long time.
2. Card discs—cut from rather thin cardboard by means of a 20-bore gun-punch.
3. A small flat piece of cork, covered with white paper, on which to place the insects while pinning them.
4. Ordinary toilet pins of medium size.
5. An insect box.—Any small wooden box, not less than 1½ inches deep, may be utilized for the purpose by covering the inside of the bottom with a sheet of “cork carpet,” cork, or solah pith. If intended for transmission by post, they must be very strongly made. If intended for receiving a permanent collection, they should have dust-proof lids and be made as nearly air-tight as may be. In any case a small muslin bag, full of naphthalin or camphor, should be securely pinned into a corner of the box so that it cannot move, and it is a good additional precaution to paint the entire inside with strong spirituous solution of perchloride of mercury.

TO PIN THE MOSQUITO.

1. Take a disc and write on it date and place of collection. “House,” “bites,” “sylvan”—or other information; also a distinguishing letter if there be several species.
2. Place the disc, writing upwards, on the piece of cork and then take an insect pin in a pair of forceps close to the point and transfix the disc near the middle.
3. Place the mosquito on the cork on its back.
4. Take a pin, with the disc on it, in a pair of forceps near the head and, holding it so, pass the point through the thorax of the insect between the roots of the legs from venter to dorsum.
5. Pass a common pin through the disc, near the edge, and force the point of this into the cork at the bottom of the box,

6. Spread out and arrange the legs and wings in suitable position by means of a fine handled needle.

After a few trials, it will be found that pinning an insect in the way above described involves far less trouble than making it into a microscopic specimen; but, if materials for pinning be wanting, fairly recognizable specimens may be made by mounting the insect dry, in a deep cell or in one of the slides recommended by the late Dr. Carpenter for mounting *foraminifera*.

These consist of a slip of deal  $3'' \times 1'' \times \frac{1}{16}''$  with a hole  $\frac{3}{4}''$  in the middle. This perforation forms the wall of the cell and is closed on both sides with ordinary cover squares, secured in place by perforated labels, so that the specimen between the covers can be viewed from either side. The sides of the perforation should be brushed with creosote to prevent mildew, and the preparation dried as rapidly as possible in the sun.

Wings mounted dry as microscopic specimens are however valuable, but when made, great care should be taken to mark with corresponding letters, slide and pinned specimen, without which latter such slides are valueless.

Specimens may also be transmitted fairly safely, in short lengths of glass tubing of a size just sufficient to admit the insect, but too small for it to shake about easily. The tubes should be simply tied up in a square of muslin, as if sealed; the contents are certain to mildew; but whatever plan you adopt, ON NO ACCOUNT PACK INSECTS IN COTTON WOOL, as it is impossible to extricate them from it without breaking them.

Just as mature insects can be obtained from larvæ, so it is generally possible to get larvæ from the former; but a somewhat larger apparatus is necessary. Take an earthenware dish, at least 1 foot in diameter and 4 inches deep and fill it with puddle water which has been strained through muslin to avoid the fallacy of its already containing larvæ. A cover is made for this consisting of a square of thin plank a few inches wider than the dish, with a large hole occupying the greater part of its centre. In the four corners are small holes into which are fixed four small upright sticks about 18'' high so as to form the supports of a miniature mosquito net made of gauze or the material known as "leno," and is made close by means of tin tacks, to the edges of the plank.

The whole thing can be lifted off and on to the dish, and when in position a mosquito introduced into the net is securely confined. The triangular corners of the board can be utilized to carry banana or syrup as food, or may be smeared with mud in order to ascertain if the species ever deposit eggs in such situations. It is best to experiment with females that have had a feed of blood; or, in the case of sylvan gnats, with specimens taken in the open, as unless fully fed, they will rarely deposit their eggs. The form of the egg boats, or groups in which the eggs are deposited, should be carefully noted, and the larvæ preserved, when sufficiently grown.

It is rarely necessary to confine males as most species couple immediately after escape from the pupa.

The above appliance is also useful for obtaining from larvæ, large numbers of individuals for use in observations on malaria, filariasis, &c. A piece of cardboard is slipped under the opening so as to close it, and in this way the contained mosquitoes can be carried without injury to the subject of experiment, and liberated under his mosquito net by simply removing the card and inverting the net.

The writer will be extremely grateful for any specimens collectors may send him to the undermentioned address—

G. M. GILES, M.B., F.R.C.S., *Lieut.-Col., I.M.S.*,  
Byfield Mannamead, Plymouth,  
England.

(Author of "A Handbook of the Gnats or Mosquitoes." London : John Bale, Sons, and Danielsson, 83, 85, Gt. Titchfield Street, London, W.)

#### A PRODROMUS OF THE INDIAN CULICIDÆ.

Two years' ago, when I took up the task of collecting the literature of the *Culicidæ*, it is an actual fact that no more than four species were recorded as having been found in all India. There was in fact hardly any other known country with such scanty records of the subject.

The subjoined list includes 32 species, and I have little doubt the final total of species will be found to be not far off a hundred, as new species are constantly turning up, and I find that many European species are to be met with in the Himalayas, while the wide range of climate of the plains renders the occurrence of a wide variety of forms a practical certainty.

The species enumerated below it must be understood are merely those that have been verified by myself. When Mr. Theobald's work on the collections that have been made for the British Museum appears, the number will doubtless be largely increased. In the case of new species it must be understood that the names are provisional, as it is very possible that, though we are in correspondence, some may have been described under a different new name by him.

The short descriptions are based on a systematic plan in which only a few points are noticed, and the number preceding the name refers to the position the species takes, or would take, in the system of tabulation adopted in my recently-published Handbook of the group.

Family CULICIDÆ.

Subfamily CULICINÆ.

Genus I. MEGARHINA, R. Desvoidy.

6. MEGARHINA IMMISERICORS, Walker.

Caudal adornment yellow and black. Tarsi with certain broad bands whitish. Thorax metallic green; scales on costa blackish. Calcutta, Travancore, Ceylon, Burma.

8. MEGARHINA SIKKIMENSIS, Giles.

Caudal adornment yellow and black. Tarsi with certain joints or bands whitish. Thorax chocolate-coloured, with a greenish lustre. Col. Brit. Mus. sent by Mr. G. A. Dudgeon.

Genus II. ANOPHELES, Meigen (1818).

5. ANOPHELES ROSSII, Giles.

Wings with four black spots on the white costa, and some of the other veins with alternate portions white-scaled and black-scaled, forming indistinct additional spots; tarsal joints pale grey with minute apical bands; abdomen indistinctly banded, the lighter basal portion of the segments greatly preponderating; thorax without longitudinal markings. Found throughout India.

15. ANOPHELES FULIGINOSUS, Giles.

Wings very dark, but with three small white interruptions on the costa; abdomen uniformly black. The last two hind-tarsal joints white, the rest black, saving a minute ring on articulation between the second and third joints; apex of palpi white. Found throughout India.

16. ANOPHELES NIGERRIMUS, Giles.

Wings intensely black, except two very small yellow interruptions on the costa, the outer one of which is sub-apical, and a few white dots on the longitudinal veins; abdomen entirely black; tarsi with apical whitish rings to some of the joints; apex of palpi black.

This may possibly be identical with *An. pseudopictus*, Grassi. Found throughout India.

21. ANOPHELES LINDESAII, Giles.

Wing not distinctly spotted, but with the costa and some of the anterior veins black-scaled, giving a diffused darker appearance to this portion of the wing, the rest of its scales being grey, with the exception of a small whitish spot at the apex of the wing; tarsi without bands. Thorax black, with a large well-defined patch, forming the

greater part of the dorsum, grey, saving a very fine black median line. Abdomen nearly black, the hinder border of the segments darkest.

Taken at Bakloh, Punjab Himalayas, and also at Naini Tal; not common.

Possibly purely a hill species. I have not been able to find its larvæ.

Genus III. PSOROPHORA, R. Desv.

4. PSOROPHORA sp.

♀. Wings brindled with alternate ochreous and dark brown scales; apical and internal fringe with eight dark interruptions. Legs banded, ochreous, and white. Palpi of ♀ half the length of the proboscis.

Received from Major Close, I.M.S., Moradabad.

5. PSOROPHORA sp.

I am inclined to think that the above are identical, but the point cannot be decided without comparison. Both are large insects covered with woolly tomentum and looking much more like dung flies than like ordinary mosquitoes.

Myingan, Burma. Coll. Brit. Museum.

Genus V. CULEX, L.

1. CULEX MIMETICUS, Noe. (1899).

Wings spotted; anterior margin black, interrupted by three linear, pale yellow intervals about equal to the black spots in length. Body with smooth tomentum? Abdominal segments with pale basal bands; tarsal joints with white basal bands. Proboscis banded. The femora of the middle legs are thickened at the base. A small species which mimics *An. superpictus*, the wings presenting a strong superficial resemblance to those of that species. Length about 5.6 mm.

Taken at Bakloh, Punjab Himalayas, in May; at Shahjahanpur, N.-W. P., in early October; in the Nilgiri Hills; and apparently common all over India.

3. CULEX ANNULATUS, Schrank.

With five, or more rarely four, black wing-spots. Tomentum smooth; tarsi conspicuously banded; thorax not dorsally ornamented; palpi of the male longer than the proboscis.

Bakloh, Naini Tal, in the rains.

4. CULEX SPATHIPALPIS, Rondani (1872).

Wings with three black spots formed by accumulations of scales; tarsi with obvious bands; tomentum smooth; thorax dorsally

ornamented with white marks ; palpi of the male rather shorter than the proboscis, the last joint somewhat spatulate (approaching the characters of *Anopheles*).

Naini Tal, in the rains.

13. *CULEX TÆNIATUS*, Meigen.

*C. elegans*, Ficalbi (1889), *C. rossii*, Giles (1899), "Jour. Trop. Medicine," p. 64.

Wings unspotted ; joints of the tarsi with basal snow-white rings ; thorax black with a pair of submedian, snow-white lines forming a V behind, and two lateral semilunar patches, prolonged posteriorly into fine lines of the same ; abdominal segments black with basal white bands best marked in front ; nape with six silvery lines.

A truly cosmopolitan species, common throughout India. Varies greatly in size. A dwarf variety from Calcutta is the smallest true gnat I have met with.

21. *CULEX ALBOPICTUS*, Skuse.

Wings unspotted ; tarsal joints banded white, on the first two of the fore and middle, and on all those of the hind legs ; dorsum of thorax traversed by a line of silvery scales for rather more than its anterior half ; the pleuræ silvery spotted ; abdominal segments narrowly banded silvery, and with lateral silvery spots : femora slightly tipped silvery.

Mr. Theobald regards this as a synonym of *C. scutellaris*, Walker, but as the latter has three thoracic stripes, not one, I conclude the species are distinct. Appears common all over India.

45. *CULEX IMPELLENS*, Walker.

Wings unspotted ; tarsi brown with very minute basal lighter band to all the joints, and a light knee-joint ; thorax unadorned, brown ; abdomen brown, with yellowish basal bands to the segments. Proboscis brown, with a broad yellowish band beyond the middle.

Shahjahanpur ; October. This corresponds with my notes on the type, but, without actual comparison, the identification must not be considered final. This species persists throughout the cold weather in the N.-W. P.

✓ 45a. *CULEX TRITÆNIORHYNCHUS*, sp. n.

Wings unspotted ; tarsi minutely basally banded pale ochreous ; thorax unadorned, fuscous ; abdominal segments fuscous, with rather

narrow yellowish-white basal bands. Proboscis with three ochreous bands.

Travancore—From Captain James, I.M.S.

46a. *CULEX PERTURBANS*, Walker.

Wings unspotted ; tarsi with lighter basal bands ; thorax unadorned ; abdomen with ochreous apical bands. Proboscis with a single ochreous band, a little beyond the middle. Wing scales of the usual form.

54. *CULEX DIVES*, Schiner.

Wings unspotted ; tarsal joints basally white-ringed ; thorax and abdomen dark brown, with minute white dots laterally. Apices of palpi, bases of antennæ, and frons white-scaled.

I have not personally verified the occurrence of this form, and perhaps its habitat hardly entitles it to be considered an Indian species.

√ 63a. *CULEX PSEUDOTÆNIATUS*, sp. n.

Wings unspotted ; tarsi black with white rings formed on the bases and apices of contiguous joints. Thorax black, elaborately adorned with fine white lines (almost as in *C. tæniatus*, Meig.) ; abdominal segments black with narrow basal bands : venter pale fawn. The general colouration is an intense violet-black.

Mr. Theobald regards this as a synonym of *C. notoscriptus*, Skuse, but there are several notable differences, and Skuse's description is too minute to assume these as due to oversight.

Bakloh and Naini Tal.

√ 64a. *CULEX GUBERNATORIS*, sp. n.

Wings unspotted ; tarsi each with two bands, one at the base of the first, the second over articulation between first and second joints ; thorax sooty, with a round anterior median and four lateral spots at the corners of the notum ; abdominal segments black with large snowy lateral spots, and a minute terminal median spot on the last : venter sooty. Allahabad Government House Garden.

√ 98a. *CULEX BITÆNIORHYNCHUS*, sp. n.

Wings unspotted ; tarsal joints deep brown with ochreous bands at base and apex so that two joints combine to form rings at the articulations ; thorax unadorned, black, covered with mingled black and golden scales ; abdominal segments black with distal ochreous bands. Proboscis black with two ochreous bands at the tip and in the middle. Travancore—from Captain James, I. M. S.

95. *CULEX ATRIPES*, Skuse.

Wings unspotted; tarsi uniformly coloured; thorax dark violet, with prothoracic lobes, the pleuræ, and a spot in front of the wings silvery; abdominal segments not banded, but with a silvery spot on either side; knees with a minute spot.

The specimens I refer to this species were received from Calcutta and are considerably rubbed. I am very doubtful as to the identification as the venter is not entirely silvery but more or less banded.

In the absence of perfect specimens, however, it is inadvisable to attempt to establish a new species.

√ 95a. *CULEX PANALECTORIS* (Alcock's gnat), sp. n.

Wings unspotted; tarsi unbanded, nearly black; thorax dark mouse colour, adorned with lighter lines of the same tint precisely as in *C. tæmatus*, Meig.; abdomen sooty, dorsally unadorned, but with lunate silvery apical bands to the segments as in *C. ventralis*, Walker.

This species may possibly be *C. ventralis*, Walker, but the wings do not correspond to my notes on the much mutilated type in the British Museum.

Received from Major Alcock, Superintendent, Indian Museum, Calcutta.

97. *CULEX FATIGANS*, Wied.

Wings unspotted; tarsi uniformly brown; thorax with a median and two lateral dark lines, the latter much the most conspicuous; abdominal segments brown, with basal whitish bands; knees unspotted. This is a most puzzling species. Mr. Theobald tells me that it would be possible to differentiate some 30 species or varieties more or less running into each other. In most of these there are no signs of thoracic ornament. He differentiates all, however, from *C. pipiens*, L., by the closeness of the posterior transverse to the middle transverse vein. In any case, during the dry weather, it is out and away the commonest of Indian mosquitoes, and some of its forms are to be found throughout the year. During the past hot weather it was a perfect plague in Lucknow.

√ 99a. *CULEX PULCHRIVENTER*, sp. n.

Wings unspotted; tarsi unbanded, black; thorax golden-scaled, with a fine median and broader lateral bare black lines; abdominal

segment black, snowy basal bands, and the venter elaborately adorned with golden snowy white and black markings.

Naini Tal.

100. *CULEX FUSCANUS*, Wied.

Wings unspotted; tarsi unbanded; thorax rather dusky, with grizzly hairs arranged so that the ground-colour shows through as four (darker) lines; abdominal segments dusky, with light grey apical bands.

“East India.”

I have as yet met with no species corresponding to this description.

108. *CULEX CONCOLOR*, R. Desvoidy.

Wings unspotted; tarsi unbanded; thorax pale red with three indistinct brown lines; abdomen pale yellow with dark incisuræ, *i.e.*, apically lighter; wings with the veins nearly nude.

Appears to be common all over India in the rains.

✓ 122a. *CULEX MICROPTERUS*, sp. n.

Wings unspotted; tarsi unbanded; thorax dorsally unadorned but with white spots on pleuræ; abdominal segments black, with white basal bands expanding into lateral spots, and a distal fringe of yellowish hairs; wings proportionately very small.

Allahabad, Lucknow; in the rains.

✓ 130a. *CULEX ALBOLINEATUS*, sp. n.

Wings unspotted; tarsi unbanded, brown; thorax unadorned, black-grounded, with bronzy tomentum; abdominal segments black with greenish-white basal bands and a broad brownish-white median line.

Shahjahanpur; October.

131. *CULEX PIPIENS*, L.

Wings unspotted; tarsi unbanded, brown; thorax pale testaceous, unadorned, black when denuded; abdominal segments reddish-brown, with yellowish basal bands, narrow in middle, but expanding laterally; knees unspotted.

Naini Tal.

✓ 131a. *CULEX VIRIDIVENTER*, sp. n.

Wings unspotted; tarsi unbanded, dusky; thorax chocolate-brown with bronzy tomentum; abdominal segments with yellowish basal bands having a blunt backward median prolongation; venter almost naked, save for a few colourless scales, green in fresh specimens; knees with minute lighter dots.

Mr. Theobald regards this as one of the numerous varieties of *C. fatigans*, Wied., but the deltoid extension of the abdominal bands makes it easily distinguishable in the fresh state ; and it is moreover a hill species, whose larvæ are capable of maintaining them in pools in the course of hill torrents.

150. *CULEX* *OBTURBANS*, Walker.

Wings unspotted ; tarsi unbanded ; thorax with brown tomentum, unadorned ; abdomen cupreous-greenish, with a white dot near the tip.

Appears to be common all over India during the rains.

Subfamily *CORETHRINÆ*.

Genus VII. *CORETHRA*.

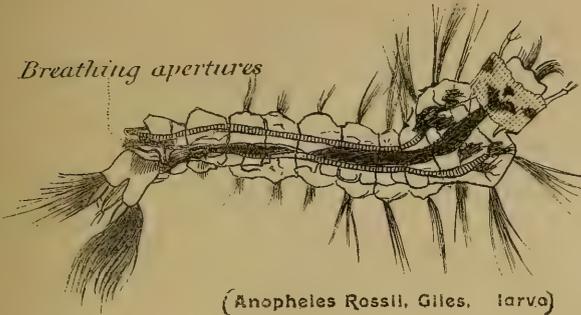
9a. *CORETHRA ASIATICA*, sp. n.

Wings unspotted ; legs uniformly coloured, antennæ unbanded ; generally pale, the thorax with a faint darker median line.

Shahjahanpur, N.-W. P. ; October.

This is the first record of the occurrence of any member of the subfamily, so far as I am aware, in Asia.

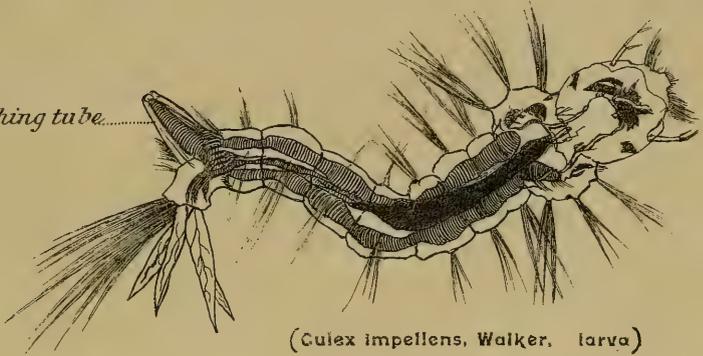
Breathing apertures



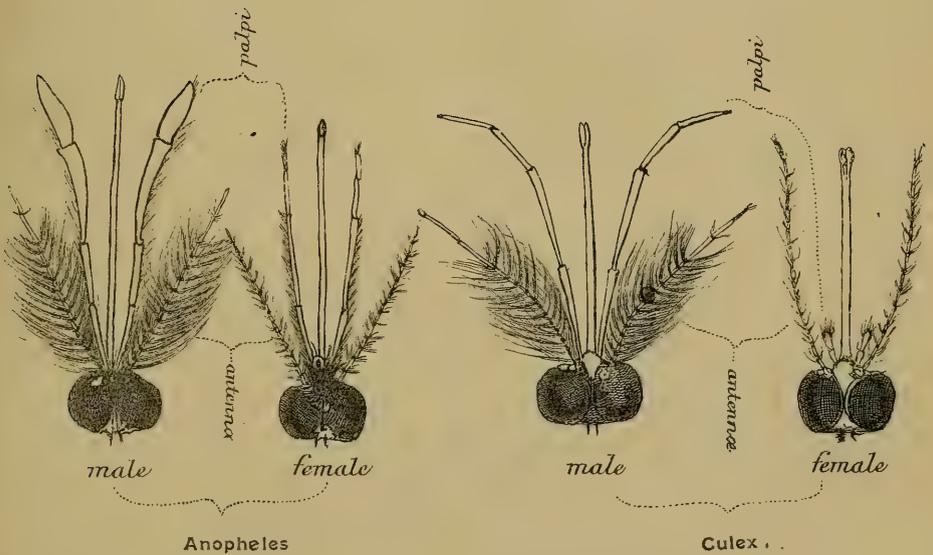
(*Anopheles Rossii*, Giles, larva)

The anterior parts are shown in the prone position and the hinder ends in profile, owing to the body being twisted by the pressure of the cover glass.

Breathing tube



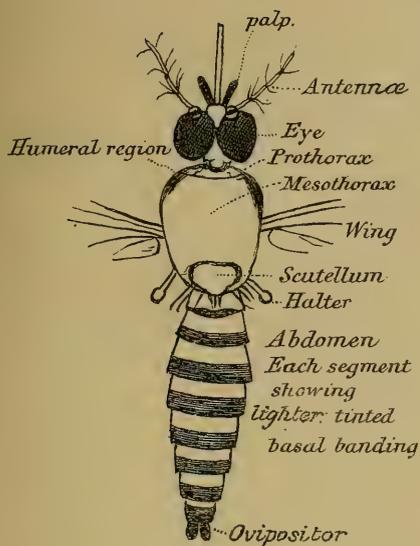
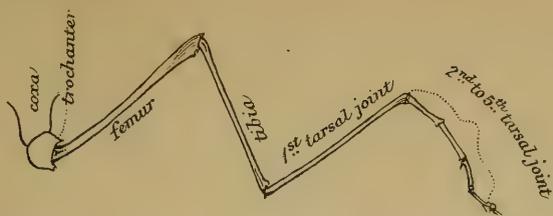
(*Culex impellens*, Walker, larva)



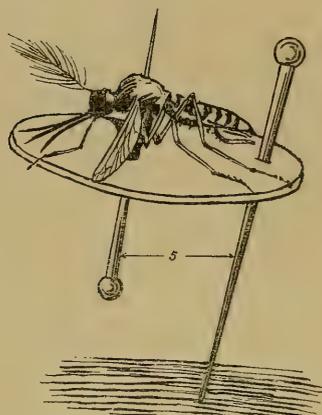
*Anopheles*

*Culex*

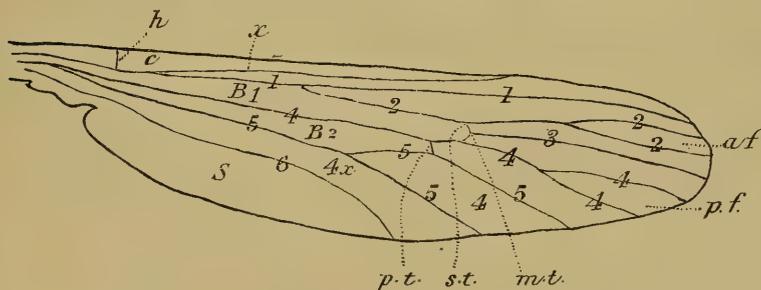




*C. fatigans*, Wied.



Mosquito pinned on disc.



Wing of *C. Impellens*, Walker. x 33 diams.

- x.....auxiliary vein
- 1 to 6.....first to sixth longitudinal veins
- h.....humeral transverse vein
- s. i.....supernumerary transverse vein
- m. t.....middle transverse vein
- p. t.....posterior transverse vein
- c.....costal cell

- S.c.....Subcostal cell
- B.1.....first basal cell
- B 2.....second basal cell
- A.....anal cell
- Ax.....axillary cell
- S.....spurious cell
- a. f.....anterior fork cell

p. f.....posterior fork cell



## BURMESE SNAKES.

NOTES ON SPECIMENS INCLUDING 45 SPECIES OF OPHIDIAN  
 FAUNA COLLECTED IN BURMA FROM 1ST JANUARY  
 TO 30TH JUNE, 1900.

BY CAPT. F. WALL, I.M.S., AND VET.-CAPT. GEO. H. EVANS, A.V.D.  
 (Read before the Bombay Natural History Society on 6th Feb., 1901.)

We have confined our remarks to departures noted from Boulenger's work, incorporating a few notes of general interest.

(1) *ABLABES PORPHYRACEUS*.—Four specimens, from Taounggyi, Southern Shan States, east of the Salween River, and North Chin Hills. Anterior chin shields—contact with four lower labials (4). Ventrals—217. Colour—all the adult specimens are of a pale brownish-lilac colour with from 14 to 17 large elliptical links thrown transversely across the body and ending close to the ventrals. These links are dark purplish-black, thinly outlined with dull white, and enclose large islets of the ground-colour, or a slightly modified shade of the ground-colour. They encompass from 6 to 8 scales vertebrally in the fore-body, where they are longer than the interspaces, but decrease in width posteriorly, where they become much narrower than the interspaces. About mid-body a pair of longitudinal purplish-black stripes with dull white edges appear, and as these pass backwards and become more distinct, the links gradually fade. The first link, which lies on the neck, throws forward a purplish-black streak to each eye, and a similar streak occupies the median line of the crown.

Under parts dull white and immaculate.

A young specimen,  $9\frac{3}{8}$ " in length, presents a very different aspect. The ground-colour is dull yellowish-white, and the body is crossed by 15 dark purplish-black elliptical bars on body and 4 on tail, all equally distinct and of uniform colour throughout. These are picked out marginally with dull white, and the longitudinal stripes seen in the hind-body of adults are entirely wanting. Ingesta—a full-grown mouse (1).

(2) *AMBLYCEPHALUS ANDERSONII*.—One specimen from Taounggyi, Southern Shan States. Length— $14\frac{1}{2}$ "; tail  $1\frac{7}{8}$ ". Inter-nasals—more than  $\frac{1}{3}$ rd, less than  $\frac{1}{2}$  prefrontals. Prefrontals— $\frac{3}{4}$ – $\frac{4}{5}$  parietals. Ventrals—158. Subcaudals—35.

(3) *BUNGARUS CERULEUS*.—Three specimens, variety *magnimaculata* (2), from Monywa and Meiktila, U. B. In a paper on snakes collected in Burma in 1899, contributed by us to the Bombay Natural History Society's Journal, Vol. XIII, No. 2, we gave a description of what we suspected to be a new "krait," and mentioned that since the advent of the current year we had obtained two more specimens from the Southern Shan States and Meiktila. Since then we have received particulars regarding one of these specimens from Mr. Thompson, to whom we were indebted for it. Mr. Thompson, it appears, found the specimen in Monywa, U. B. (the locality our first specimen came from) in 1893, and not in the Southern Shan States as reported by us, and was

so convinced that it was a krait hitherto undescribed, that he carried it about for seven years from station to station till, through his kindness, it finally reached our hands. Until such time as we have collected more specimens and can positively separate it from *B. cæruleus*, we propose to refer to it as *Bungarus cæruleus*, variety *magnimaculata*. Length—4' (1); 4'-3½" (1). Anterior chin shields—larger than posterior (2), and in contact with four lower labials (2). Ventrals—226 (1); 228 (1). Variety—*semifasciatus*. One specimen from Rangoon (spirit specimen, old). Postoculars—1 R. (two confluent). Anterior chin shields—contact four lower labials. Sub-caudals—54.

(4) BUNGARUS FASCIATUS.—Seven specimens from Rangoon and districts L. B. and U. B. Length—5'-9" ; tail 5½". This was an enormous specimen, and was flushed near the Chinese Cemetery, Rangoon, and was surrounded by natives. It took to water (a shallow pool), and refused to budge in spite of stones and other missiles thrown at it. It made no attempt to escape, and was finally despatched with a shot gun.

(5) CALLOPHIS MACCLELLANDII.—One specimen from the Pegu Yomas (hills). Frontal— $\frac{3}{4}$ - $\frac{3}{4}$  parietals. Anterior chin shields—contact four labials. Ventrals—229. Colour—light red with thirty-one thin black white-edged bands round body and four round tail. These black bands are complete (*i.e.*, ventral) and one scale in breadth. The intervals are 6—7 scales broad and have a small black spot on each side midway. A broad black collar with equally broad white bands across head behind eye, anterior to which the head is again uniform black excepting labials, which are white.

Under parts pale pinkish-yellow with large black islets implicating 3-4 ventrals between each black band in whole length. Chin and throat uniform whitish.

This specimen was most unfortunate: he was trodden on by a wounded elephant while going over soft ground, and despite this fact was undamaged. It was, indeed, bad luck to be bottled after such a narrow escape.

(6) CALLOPHIS MACULICEPS.—Two specimens, Moulmein and Rangoon. Ventrals—185 (1); 188 (1).

(7) CANTORIA VIOLACEA.—One specimen from Wakema, L. B. Frontal—greater than distance to end of snout. Anterior chin shields—contact four labials (L). Ventrals—260. Sub-caudals—53. Colour—the cross bands are pale yellow, and number 56 on body and 13 on tail.

(8) CERBERUS RHYNCHOPS.—Twenty-two specimens from Rangoon, Moulmein, and Myaungmya, L. B.

This species is extremely common in Rangoon, and judging from the numbers that we have met with in certain creeks connected with the Rangoon river, they must exist in many thousands. We have been accustomed in our evening walks to visit frequently one little creek in particular. This channel is about 10 yards across where it enters the river, but half a mile inland

narrowing more and more till eventually it is nothing more nor less than a drain a couple of yards wide. In this drain, which is some 300 yards long, we frequently see as many as three of these snakes in an evening, often more. At low tide, when the water is more or less stagnant in the ditch, they are commonly seen lying quite still on the mud, partially or wholly immersed, at other times moving slowly in quest of food, searching and prying into every crevice and corner, as they move stealthily along the bank, sometimes wholly disappearing down a crab hole for a minute or more, but generally keeping in the drain and only wandering, so far as we have been able to ascertain, on to the adjacent land which is flooded at high water or, what is more probable, are left there when the tide recedes. Sometimes they practice a curious and interesting manœuvre as follows:—Lying perfectly still for an interval with their length parallel to the run of the ditch, they cautiously make a sweeping movement with the caudal extremity of their body across the drain, first on one side and then on the other, thus driving any creatures within reach, forwards within their sight and sometimes within their grasp. At high water the current appears to stimulate them to active movement, and at this time they may be swimming vigorously or hiding behind some object which breaks the force of the current, where they will lie waiting for creatures to be brought within their grasp. As a rule, they move with the tide allowing themselves to be carried on, and the majority return on the ebb in preference to being left where the water is scanty or absent. At the last of the ebb, where the increased incline in the bed towards the mouth of the creek causes a rapid flow, they may be seen coming down frequently (a dozen or more in the course of a few minutes), and here with their caudal extremities they often lash themselves to any convenient object—an anchor rope, bamboo stake, or submerged branch—and from this purchase sway to and fro in the current. We have observed them lying on branches overhanging the stream even to a height of three feet and more above the water, having doubtless been left there by the ebbing tide. They are not easily alarmed, for one can get within a yard or two of them without much caution. We have often jumped the ditch close beside them, and then placing a cane beneath them tossed them into the air in order that they might fall on the road hard by where they could be easily captured. On land, when aroused, they are extremely active, and strive to escape rather than menace, except when a stick is placed across the back, or they are grasped by anything, when, like other snakes of the most timid disposition, they will strike and bite the offending object with great malice. In the process of catching them we have observed that they emit a peculiar and unpleasant odour not dependent on the evacuation of the cloaca. We, on one occasion, found a mud fish in the act of being ingested, but their chief food in these creeks, at any rate, appears to be the walking perch which are extremely plentiful, and it is generally the fry that is selected

We have kept several specimens in captivity, and even in the earliest days of their incarceration they have been wonderfully phlegmatic and pacific, taking no notice of objects thrust at them or even rapping the glass, not even retracting the head when their snouts lay in contact with the glass on the other side.

(9) *CHRYSOPELEA ORNATA*.—Eleven specimens from Rangoon, Thayetmyo, L. B., and Taounggyi, Southern Shan States. Anterior temporals—one (R and L) (1); this was occasioned by a confluence of what should have been two. Labials—9, 4th, 5th, and 6th touching the eye (R and L) (1); 10, 5th and 6th touching the eye R (1); 10, 5th and 6th touching the eye L (1). Anterior chin shields—contact with six lower labials R and L (1). Scales—keeled in all specimens, sometimes indistinct. Ventrals—two last (as well as anal) bifid (1). Sub-caudals—93.

Ova—Two enlarged ovarian follicles—27th May, 1900.

Nine eggs (five in one ovary, four in the other) 29th June, 1900. Ingesta—Gecko—*Hemidactylus frenatus* (1); a gecko's tail (1); a lizard, *Calotes versicolor* (1).

It is worthy of note that before the advent of the rains we procured two specimens only, *viz.*, one from Thayetmyo, L. B., and the other from Taounggyi, Southern Shan States. After the rains broke in Rangoon (about 30th April) during the months of May and June we obtained nine specimens, all in Rangoon; (with the exception of a break from 6th to 14th May, it has rained more or less continuously in Rangoon since 30th April, before which date we had no rain).

(10) *COLUBER OXYCEPHALUS*.—One specimen from Nyounglôn (Amherst District), L. B. Frontal—less than distance to end of snout. Anterior chin shields—contact with five lower labials. Scales—in 23 rows usually, sometimes 24, but nowhere 25. Sub-caudals—131. This was a fine specimen, and measured 7', tail 1'-8½". He was perched in a tree overhanging the bed of a dry *nullah*, in which some Karens had dug a sand well. The Karens lit a fire under the tree in order to do some cooking; the smoke ascending to the branches caused him to beat a hasty retreat; he came down straight through the party and was captured; he was very vicious at first, and made a low hissing noise. None of the Karens volunteered to carry the snake to camp, as they said though the bite of the snake was not fatal, the pain and swelling occasioned by it would assuredly lay a person up for three months. The snake some days previous had received a *dah* cut a little distance from the tail; the vertebral column was severed, and the wound was full of maggots, otherwise the specimen was perfect.

(11) *COLUBER RADIATUS*.—Seven specimens from Rangoon and Prome, L. B., Myingyan, U. B., and Taounggyi, Southern Shan States. Length—5'-3"; tail 11½". Temporals—one anterior (R and L) (1). Scales—19 (7). Colour—a very young specimen we received is exactly similar in markings

to adults, but had not the same richness of colour; (the specimen had, however, been in spirit some time).

(12) *CYLINDROPHIS RUFUS*.—One specimen from Bhamo, U. B. Scales—19. Sub-caudals—6. 2nd, 3rd, 4th entire; remainder divided.

(13) *DENDROPHIS PICTUS*.—Five specimens from Bassein, Pegu, Salween, Rangoon, L. B. Frontal—less than distance to end of snout (1). Post-oculars 3, R and L (1). Temporals (1). Anterior R. and L. (1). Ingesta—a tree frog too digested to recognize (1). One in captivity was very timid; when originally caught by the tail its efforts were confined to struggling to escape. It did not menace at all. When caged it cringed when the glass was tapped, and readily sought the remotest part of the cage to avoid molestation; never striking.

*DIPSAS CYANEA* (?)—A slough was sent us by a gentleman residing near the large Kokine lake, some four miles from Rangoon town. He found the slough in an upstairs bed-room of his house. With the exception that half the tail was missing it was perfect. Length—4'-7"; tail (?) Labials—7 (3 and 4) touching the eye, R and L. Anterior chin shields—contact four labials R and L. Scales—mid-body 23. There is little doubt in our minds that this diagnosis is correct. The locality is some three miles from where we procured our first specimen already recorded.

(14) *DIPSAS HEXAGONOTUS*.—Nine specimens from Rangoon, Thayetmyo, Bassein, L. B., Mandalay, Katha, U. B., and Taounggyi, Southern Shan States. Anterior chin shields—contact three labials, L. (1). Scales 19 (8), 21 (1). Sub-caudals—89. Ingesta—Lizard, probably *Calotes mystaceus* much digested (1). Ova—one captured 17th June, 1900, contained six eggs, the largest of which measured  $1\frac{1}{8}'' \times \frac{9}{30}''$ . These were hardened in alcohol, but we failed to discover any rudiments of an embryo.

(15) *DIPSAS MULTIMACULATA*.—Thirteen specimens from Rangoon, Thayetmyo, Myaungmya, L. B., and Taounggyi, Southern Shan States. Labials—9, 4th, 5th, and 6th touching eye, L. (1). Ova—seven eggs deposited 19th to 21st April (already recorded in B. N. H. Society's Journal, page 534, vol. XIII). Desquamation—one in captivity shed a slough 16th May, 1900, and again 1st August, 1900, being a week over the latter process.

(16) *DISTIRA LAPEMIDOIDES*.—Two specimens from Bassein, L. B.

(17) *DISTIRA ROBUSTA*.—One specimen from Pegu, L. B.

(18) *DRYOPHIS MYCERIZANS*.—Twelve specimens from Pegu, Prome, Thayetmyo, L. B., Pagan, Mandalay, Ye-U, U. B., and Taounggyi, Southern Shan States. Loreal—present (4). This may or may not separate the third labial from the præfrontals. Ventrals—197 (1), 202 (1), 206 (1). Sub-caudals—129 (1). One specimen, collected by a Burman, which reached us 23rd May, 1900, contained three apparently mature young. There was no vestige of an egg envelope, and they would accordingly have been discharged as young. One by two kinks was folded into three, and all were much convoluted

and mixed up with one another, so that at parturition it appeared as if all would have been discharged *en masse* in a sausage-shape mould. Whether this knotted condition was the result of contortions made in their death throes after immersion in spirit, which is possible, we cannot more than conjecture at. It is remarkable that no specimen was obtained in or about Rangoon.

(19) *DRYOPHIS PRASINUS*.—Six specimens from Rangoon, Moulmein, L. B., Ye-U, U. B., and Taounggyi, Southern Shan States. Frontal—less than distance to end of snout (5), (?) (1); equals parietals (3), less than parietals (1), greater than parietals (1), (?) (1). Temporals—1, anterior R. and L. (2), R. (1), (?) (1), the remainder 2 anterior. Labials—9, with 5th and 6th touching the eye, R. and L. (1). Anterior chin shields—contact 5 labials (1). sub-caudals—161. Ova—one specimen, recently procured by a Burman and received by us on 23rd May, 1900, contained seven eggs with no trace of an embryo.

(20) *ENHYDRINA VALAKADIEN*.—Six specimens from Myaungmya and Arrakan, L. B. The one from Arrakan was much mutilated, and its identity could, therefore, only be guessed at.

(21) *GERARDIA PREVOSTIANA*.—One specimen from the Rangoon river. Frontal—greater than distance to end of snout. Ventrals—145. Colour—all the parts referred to in Boulenger's work as white or whitish were buff in our fresh specimen.

(22) *HIPISTES HYDRINUS*.—One specimen, from Moulmein, L. B. Scales—midbody 42-43. Ventrals—171.

(23) *HOMALOPSIS BUCCATA*.—One specimen from Bassein, L. B. Frontal—less broad than supraocular, transversely divided. Loreals—two (1+1). Postocular—one, R. and L. Labials—13, R. and L., none touching the eye. Ventrals—157.

(24) *HYPsirhina ENHYDRIS*.—Seven specimens from Prome, Bassein, Thaton, and Thayetmyo, L. B.

Frontal—greater than distance to end of snout, (4); greater than parietals (2). Anterior chin shields—contact with three labials, (3) ? (3). Ventrals—171; last bifid (1). Sub-caudals—74, (2); 75, (1); 76, (1).

(25) *LYCODON AULICUS*.—Eight specimens from Rangoon, L. B., Ye-U, Meiktila, U. B., and Taounggyi, Southern Shan States. Postoculars—3 R, (1).

(26) *LYCODON FASCIATUS*.—Two specimens from North Chin Hills and Southern Shan States. Already recorded in the B. N. H. Society's Journal, Vol. XIII, page 372. Loreal—Does not touch the internasals.

(27) *NAIA BUNGARUS*.—Three specimens from Minhla, U. B., and Andamans. The specimen obtained from the latter place was given to us by Captain Fitzpatrick, I. M. S., who informed us that it was the only record of this snake having been killed at Port Blair, for two or three years, at least so old residents at Port Blair informed him.

(28) *NAIA TRIPUDIANS*.—*Monocellus*.—Twenty specimens from L. B. and U. B. *Anocellus*—two specimens, one from Thayetmyo, L. B., the other from Meiktila, U. B. Ingesta—one contained four mice. On the 15th May, 1900, two were found coiled together under a stack of wood in a timber yard. They were promptly despatched and both proved to be monocellate females.

(29) *PSAMMODYNASTES PULVERULENTUS*.—Two specimens from Rangoon. Labials—8, 3rd, 4th, and 5th touching the eye (2). Ova—one killed on 11th January, 1900, contained ten eggs, (five in each ovary), small, immature? and with no trace of embryo. Both specimens were obtained alive. The first, an adult, was caught on a grassy slope in a well-wooded part of country. This specimen was very active, and made strenuous efforts to escape when liberated. When molested, it poised in a menacing attitude with head, neck, and anterior part of body retracted, and erect; but beyond repeated rapid protrusions of the tongue, it exhibited no anger, and we could not get it to strike. From this attitude it would lunge itself forward, almost jump, and by repeating this action make vigorous efforts to reach cover. The second was a hatchling  $4\frac{3}{4}$ " long, which we found on the 8th June while crossing a road, running through dense jungle, and in its efforts to resist capture it literally progressed by a series of leaps. In effecting this the fore-body for a third or so of its length was erected, and each jump must have measured at least 3" to 4". We liberated and watched this little creature repeat this performance on subsequent occasions. When a cane was laid across it, it immediately wrapped its caudal extremity round, and struck out with open jaws. In captivity it was simply astonishing to see with what ease it could attach itself and crawl along perpendicular sides of its prison bottle, which was about 4" in diameter. In colouration it was exactly similar to adult specimens.

(30) *PSAMMOPHIS CONDANARUS*.—Four specimens, from Prome, L.B. and Taounggyi, Southern Shan States. Sub-caudals—71. Ingesta—A lizard, *Calotes versicolor*?, partially digested (1).

(31) *PYTHON MOLURUS*.—One specimen from Minhla, U. B.

(32) *SIMOTES CRUENTATUS*.—Nine specimens from Mandalay, Bhamo, U.B., and Rangoon, L. B. Loreal—Absent R. and L. (1), this owing to a confluence with præfrontals. Temporal—anterior absent R. and L. (1), owing to almost total confluence with parietals. Labials—7, 3rd and 4th touching the eye R. and L. (1). All these peculiarities occurred in the same specimen. Anterior chin shields—contact five labials R. and L. (1). Ventrals—170, (1). Four were captured alive and kept; they were all very timid, and could not be provoked to strike.

(33) *SIMOTES CYCLURUS*.—Nine specimens from Rangoon, Salween, L. B. and Taounggyi, Southern Shan States. Præoculars—one, R. and L. (1); one R. (1), (*i.e.*, the sub-ocular of Boulenger is absent). Temporals—one anterior R. (2), 1 L. (1). Scales—21, (1). Sub-caudals—37, (2). Colour.—The speci-

men obtained from Shwegun on the Salween River is deserving of mention. This was a light brown with a ruddy tinge in the ground-colour, many scales edged either whitish or blackish and so arranged as to form streaks. Eleven subovate large black-edged vertebral spots on the body, and two on the tail. Head markings unusually distinct. This specimen had also only one præocular R. and L. (*i.e.*,) the sub-ocular of Boulenger was absent. One captured alive was remarkable in having the entire belly coral red, and was profusely spotted within the angulate ventrals, but immaculate beneath tail.

(34) *SIMOTES THEOBALDI*.—Three specimens from Thayetmyo, L. B., Shwebo, and Ye-U, U. B. Nasals—In one specimen undivided L, undivided ? R. Postoculars—one R. and L. (1), the lower being confluent with fifth labial. Anterior chin shields—Contact with five lower labials R. and L. (1), R. (1). Ventrals—164, (1); 168, (1); 180, (1). Sub-caudals—30, (1); 33, (1); 39, (1). One, a young specimen, exactly resembled the adult form except that the colours were perhaps clearer, and the marks better defined.

(35) *SIMOTES VIOLACEUS*.—Six specimens from Katha, U. B., and Taounggyi, Southern Shan States. Variety *semifasciatus*—5. Frontal—greater than distance to end of snout (5); slightly greater than parietals (2); slightly less (1). Temporals—two anterior R. and L. S. (1), L. (1). Anterior chin shields—In contact with five lower labials R. and L. (1), 3 L. (1). Ventrals—157, (1). Sub-caudals—29, (1); 30, (1); 31, (1); 32, (1); 33, (1). We have frequently remarked upon the diversity of colouring and markings in the genus *Simotes*, and of all the *Simotes* we know, we think perhaps this species surpasses its fellows in variation.

Three of the above specimens (*semifasciatus* together with the next *fasciatus*) we received in the same bottle from Katha, and before removing them we were fully prepared to find four separate species, and certainly never thought that all would prove of a like kind. One was light brown (the colour of weak tea with milk), a second was of a deep brown (the colour of a dark varnished cedar-wood pencil), a third blackish. These three were crossed with narrow black irregular bars, 1-2 scales wide, distinct vertebally, but broken up laterally to contribute towards a general sparse mottling in the flanks. The intervals were 3-4 scales wide. The chevron head, and other markings were less distinct in the light specimen, and more so in the dark specimen. The two specimens from Taounggyi were of a rich purplish-red colour with very similar bars, except that each bar was alternately distinct and less distinct. Variety—*fasciatus* (1), is what we propose to designate the fourth specimen we received from Katha. Frontal—greater than distance to end of snout, and greater than parietals. Temporal—two anterior, R. and L. Sub-caudals—32. Colour—Light brown (colour of weak tea with milk), with 19 cross-bars on body, and three on tail. These bars involve 1-2 scales, and the intervals 7-8 scales, and are equally distinct in the whole length. They are of the same colour as the ground



Leaf 8 400-1000

P.P. 619-626

(28) *PRINIA INORNATA*.—The Indian Wren-Warbler.*Oates*, No. 466; *Hume*, No. 543.

Very common. Breeds from beginning of June to middle of September. It breeds in the indigo, sugarcane, surpat grass, and ekre. Numbers of nests and eggs get destroyed every year when the indigo is cut. Several times I have found nests and eggs in the plant brought to the vats. Five are the normal number of eggs. I once took six. I have only one pinkish-coloured egg; they are very rare. I have many of both the other types mentioned in "Nests and Eggs."

Family LANIIDÆ.

Subfamily *Laniinæ*.(29) *LANIUS NIGRICEPS*.—The Black-headed Shrike.*Oates*, No. 475; *Hume*, No. 259.

Very scarce here. I have only secured a single specimen and seen several others. The earliest arrival was noticed on the 22nd October. My single specimen was shot on the 15th May.

(30) *L. TEPHRONOTUS*.—The Grey-backed Shrike.*Oates*, No. 477; *Hume*, No. 258.

I have found this species almost as rare as the last one, but Mr. Scroope, who has had better opportunities of moving about the district, says it is not uncommon during the cold weather, especially near sugarcane. Earliest arrival noticed on the 5th October, and latest seen on the 4th May.

(31) *L. CRISTATUS*.—The Brown Shrike.*Oates*, No. 481; *Hume*, No. 261.

Abundant during the cold weather. The earliest arrival was noted on the 27th August, and the latest on the same date as the last species. This is one of the earliest of our cold weather visitants.

(32) *TEPHRODORNIS PONDICERIANUS*.—The Common Wood Shrike.*Oates*, No. 488; *Hume*, No. 265.

We have never come across this species in the subdivision, but near Darbhanga and Somastipur it is not very rare. It cannot, however, be said to be common anywhere. I saw a pair building in March, but the nest was deserted, and another pair shot on the 17th May were evidently breeding.

(33) *PERICROCOTUS SPECIOSUS*.—The Indian Scarlet Minivet.*Oates*, No. 490; *Hume*, No. 271.

On the 31st January a male Minivet, of what I took to be this species, was seen by me near Narhar. It was one of the *black* backed species, with red and black tail, and I do not know what other species it could have been. I am well acquainted with this species, having often shot it in Cachar. Unfortunately I was unable to secure the species, and have never come across another.

(34) P. ROSEUS.—The Rosy Minivet.

Oates, No. 499 ; Hume, No. 275.

This species was procured in Behar by Hodgson, but I have never come across it within our limits.

(35) P. PEREGRINUS.—The Small Minivet.

Oates, No. 500 ; Hume, No. 270.

Very common. It breeds from the end of March to middle of June, most eggs being obtained in the latter month. Hume invariably found their nests at a considerable height from the ground, but most of mine were taken at heights varying from 9 to 15 ft. The larger number were situated on young mango trees, one or two were on babools (*A. arabica*), another was built on the nearly leafless branch of a pipal (*F. religiosa*) near where a pair of Buzzard-Eagles (*B. teesa*) had their nest. Only three nests were got on immense mango trees at heights varying from 30 to 50 ft. It is almost impossible to locate the nest, unless the birds are watched carefully, so closely on they resemble the tree on which they are built. I once found a young one and three fresh eggs in a nest ; but three are the usual complement, and some birds only lay two. The eggs of this species vary considerably in shape and also colour, some of mine being nearly spherical, and others more oval and in colour they vary from a pale greenish-white ground with brown markings to a beautiful blue ground also with the same markings.

(36) P. ERYTHROPYGUS.—The White-bellied Minivet.

Oates, No. 501 ; Hume, No. 277.

I have never come across this species, but Oates records it from Tirhut, and it may be found within our limits.

(37) CAMPOPHAGA MELANOSCHISTA.—The Dark Grey Cuckoo-shrike.

Oates, No. 505 ; Hume, No. 269.

A rather scarce cold weather visitant. I can find no notes as to date of arrival or departure. Mr. Scroope has come across it several times, in the same place, near Madhubani.

(38) GRAUCALUS MACII.—The Large Cuckoo-shrike.

Oates, No. 510 ; Hume, No. 270.

Fairly common during the cold weather. First arrival noted on the 29th September ; it leaves at the end of March. I have never found it breeding here.

Family Oriolidae.

(39) ORIOLUS INDICUS.—The Black-naped Oriole.

Oates, No. 514 ; Hume, No. 471.

On the 11th January, 1898, I saw an oriole, west of Narhar, which was probably this species. It was close enough for me to distinctly see that it had a black nape. It was neither *O. melanocephalus* nor *O. kundoo*, both common birds here,

## (40) O. KUNDUO.—The Indian Oriole.

Oates, No. 518; Hume, No. 470.

Only a seasonal visitant here. The first arrival was noted on the 20th March, and it leaves in November. It breeds from the end of April to the first week in July. All nests taken were situated in either mango or sissou trees with one exception which was built in a fork of a jack (*A. integrifolia*) tree. They were from 10 to 30 ft. from the ground. The nests have far more grass stems about them than those of *O. melanocephalus*, and are not, in my opinion, nearly so neat as those of this species. I have never found more than three eggs in any nest, sometimes there only being a single young one. I have also taken a fresh egg and two incubated ones out of the same nest. I once saw a female koel (*E. honorata*) robbing a nest of this species; before my arrival she had already disposed of one egg, and the oriole was flying round her screaming vociferously. I finished the robbery as, had the eggs been left, the koel would probably have disposed of them also, and they were much safer in my keeping. An oriole was seen one evening flying over some water, its tail feathers being now and then partially immersed in the same. I could not make out whether it was drinking or picking insects off the surface.

## (41) O. MELANOCEPHALUS.—The Indian Black-headed Oriole.

Oates, No. 521; Hume, No. 472.

Very common. Permanent resident, breeding from March to August. In the latter month, however, all nests contain young. The nests taken were invariably situated on mango trees from 12 to 30 ft. from the ground. I have never got more than three eggs from a nest; one contained a single highly incubated egg. The eggs of this species are smaller than those of the last species, and are, I think, more elongate. The following are the colours of the soft parts of a nestling yet in down:—*Bill*, rosy pink, pale plumbeous at tip; *iris*, light brown; *legs*, pale plumbeous; *claws*, pink.

Family *Sturnidæ*.

## (42) PASTOR ROSEUS.—The Rose-coloured Starling.

Oates, No. 528; Hume, No. 690.

A very rare bird in this district. I have only a single specimen, a male shot in some thorn jungle on the 14th December. It was the only one of its species, and was feeding in company with *S. contra* and *M. bengalensis*. Another was seen at the same place on the 1st March in company with a pair of *S. menzbieri*. Mr. G. Dalgliesh shot one, in the latter month, out of a small flock which were with some mynahs in a carrot field at Dalsing Sarai.

## (43) STURNUS MENZBIERI.—The Common Indian Starling.

Oates, No. 532; Hume, No. 681.

A common cold weather visitant. It arrives in October and leaves in March.

## (44) STURNIA MALABARICA.—The Grey-headed Myna.

*Oates*, No. 538 ; *Hume*, No. 688.

Very common. It commences building in the middle of April, but does not lay till the middle of May, and goes on till the middle of July. Most of the few nests taken were in holes in mango trees, usually old holes formerly tenanted by woodpeckers or barbets, but I have seen them take possession of a newly-excavated one, turning out the rightful owners. I have never found more than four eggs in any nest, and on one occasion, one contained only a single young one.

## (45) TEMENUCHUS PAGODARUM.—The Black-headed Mynah.

*Oates*, No. 544 ; *Hume*, No. 687.

I have never seen it wild in the subdivision, but Mr. Scroope found it common in the neighbourhood of Pandoul in the south of the district during June, but saw it nowhere else. He also found it breeding there in a hole in a *Siris* tree (*A. speciosa*) in July. I saw a young bird in a cage that had been got from a nest there. I believe they disappear from there after breeding, as on visiting Pandoul about Christmas time, I was told that they had just returned again. Near Baghownie, however, they are not very rare and are resident. At one place, four or five miles from the factory one or two are nearly always to be seen. I was unsuccessful, however, in finding their nests, though a female shot in July was certainly breeding. Mr. G. Dalglish has also procured specimens near Dalsing Sarai.

## (46) ACRIDOTHERES TRISTIS.—The Common Mynah.

*Oates*, No. 549 ; *Hume*, No. 684.

Abundant everywhere. I have often found their nests on trees and palms. A peculiarly coloured specimen shot at Jainagar has been recorded in this Journal. I saw a deformed bird, with a regular humped back, several times at the same place.

## (47) A. GINGINIANUS.—The Bank Mynah.

*Oates*, No. 551 ; *Hume*, No. 685.

Very common locally; it breeds here in numbers in the banks of the Kamla from the middle of April to the beginning of July. I have never found more than sixteen pairs breeding in company, sometimes there being only three pairs together. In 1899 many nests were washed away by the river rising, sixteen were destroyed in April and two in June, and on the 10th of the latter month, a nest containing two eggs was found which was also washed away by the 13th. Numbers of these Mynahs congregate in the indigo fields while the plant is being cut, picking up the numerous insects found there; they also keep much with cattle, sometimes picking insects off the animals' legs.

## (48) ÆTHIOPSAR FUSCUS.—The Jungle Mynah.

*Oates*, No. 552 ; *Hume*, No. 686.

Fairly common, but much scarcer than the former species. I do not think they breed within our limits as I have never come across their nest, nor

have I noticed the birds during April and May. They probably go to Nepal, which is close at hand, during that period. On the 28th June I saw a young bird which had probably left its nest about the middle of the month.

(49) STURNOPASTOR CONTRA.—The Pied Mynah.

Oates No. 555 ; Hume, No. 683.

Abundant. Breeds from the third week in April to the middle of July. Besides building in trees, I have found nests in Palmyra palms (*B. flabelliformis*) and in bamboos. Hume says "As a rule these birds do not build in society"; here they nearly always do so.

(*To be continued.*)

## “KILLS” BY CARNIVOROUS ANIMALS.

SOME REMARKS ON THE METHOD OF THEIR IDENTIFICATION.

BY W. A. WALLINGER, DIVISIONAL FOREST OFFICER, DHARWAR.  
*(Read before the Bombay Natural History Society on 6th February, 1901.)*

Most men who have gone in for large game shooting at all extensively in India learn—as indeed they should—to distinguish more or less readily between a “kill” by a panther or a tiger, and one directly attributable to other carnivora, such as hyænas, wolves, wild dogs, etc. The distinctive features are usually pronounced and unmistakable. Old hands, who must, I fear, find many shortcomings in my observations, will, perhaps, forgive me for giving some prominence to these distinctive features here, for the benefit of young, and therefore less, experienced sportsmen. That no number of rules laid down by any inductive or deductive system of theoretical reasoning can ever, in any branch of big game shooting, do away with that all-important factor experience almost goes without saying; but to place on record general rules, which, according to individual sportsmen, appear to regulate wild animals not only in taking life, and producing the phenomena known as “kills,” but in their other ways and methods of procedure is bound *ipso facto* to be of some benefit to all concerned. For instance, there are signs of the presence of a tiger in a jungle, which, though they may be very apparent to a really good shikari, are ignored or undervalued by men of less experience. In sport as in all else, theory is in itself of no use, except in so far as it makes us believe in the connection of phenomena (Gœthe).

I.—*Maxims regulating Panther “Kills.”*—The following maxims which govern “kills” by panthers are, therefore, stated with all deference in the order of their importance :—

- (i) Marks of the four canine teeth are always clearly observable on the throat.
- (ii) The carcase is dragged, and not—save under exceptional circumstances—lifted.
- (iii) The carcase is usually moved, even if not in an exposed position.
- (iv) An effort is made to hide the carcase either (a) by depositing it in a nullah, (b) up a tree, or (c) by deliberately covering it with leaves and grass.
- (v) The region of the pelvis is the point from which the consumption of the carcase is started, the tendency being to work towards the chest.

- (vi) The skin, and even long hair, is consumed.
- (vii) The stomach is never ruptured, nor are the intestines injured.
- (viii) The outline of the unconsumed portion of the carcase, when seen early enough, is remarkably even and clean; the ribs looking like the work of a butcher's saw.
- (ix) Signs on the ground of a struggle for life on the part of the animal killed, or even of extreme terror before death, are practically absent.
- (x) Marks of claws may be visible on the shoulders or elsewhere.
- (xi) Blood is conspicuous by its absence, both in the carcase, and around the "kill."

The inclination to *drag* a "kill" is very pronounced, and, unless suddenly carrying away a dog from a human abode, they make no effort to *lift* a "kill." Even under these conditions, they will start dragging as soon as the first feeling of alarm—which such a daring deed must no doubt invoke—has worked off.

I had a good greyhound carried off one night from my tent in the Nandgaon Range of the Nasik District, some years ago, without knowing anything about it till the next morning. With the exception of the "pugs" of the panther for about 50 yards, there were no signs of the fate of the dog; but when this distance had been reached, although the panther was a big brute, and had killed a good sized bullock two days previously, he deliberately put the dog down, and started to drag.

II.—*Distinction between Tiger and Panther "Kills."*—As to whether a particular carcase is the property of a tiger or a panther, in the total absence of "pugs," we have nothing, as far as I am aware, to guide us, except (a) the size of the teeth-marks, (b) their position, (c) the size of the animal killed, and (d) other information of the presence of a tiger in the vicinity.

III.—*Unusual "Kills."*—Beating for a panther in the Dharwar District last February, the men suddenly came to a standstill, and undertook a hasty but general retreat. After a protracted delay, the cause of which I was naturally unable to fathom, they came along, bearing on a pole, a tiger cub! The animal (4½ feet to 5 feet) had been killed by a panther, quite 24 to 36 hours previously. It had not been eaten by the panther, nor had any other animal touched it. The teeth-marks were on the throat (Condition I), and if further evidence were required, the panther had the night before slain a

young buffalo, about half a mile from the spot, and there were, moreover, "pugs" even closer. The mother was shot by the late Mr. Dunlop at Christmas; and the subsequent history of the cubs is distressing. One, as we have seen, was killed by a panther; and another was shot, in a starving condition, by Mr. Cox sometime later.

But perhaps the most extraordinary "kill" ever seen by me was at Christmas. A panther killed a cow, which, when seized, gave birth prematurely to a calf. The cow was ignored, and the calf treated as an ordinary kill." (Conditions II, III, IV *a* and *c*, and VII).

Looked at from an ethical standpoint, of mercy and absence of cruelty towards their prey, tigers and panthers must undoubtedly be given credit for taking the lives of their victims most expeditiously, and therefore most mercifully. The approach, as a rule, is a stealthy one (of itself merciful) and death must be almost instantaneous. Very different, as we have seen, is the condition of things where wild dogs are concerned, and the methods adopted by wolves, and more particularly by hyænas, can hardly be regarded with toleration by mankind.

Since writing this paper (for which I have been collecting materials for several years) my attention has been drawn to the fact that Mr. Inverarity has already dealt with the subject. Through the kindness of the Honorary Secretary, in sending me the Journal, I have been able to read his valuable paper, which is to be found in Vol. III. To aspire to the knowledge displayed, and the vast array of personal experiences cited, is for me impossible. I am only thankful to find that his opinions so nearly coincide with my own; and I would refer all interested in this question to that volume.

*IV.—Applicability of the Maxims to Tigers.*—The foregoing remarks have, it will be observed, been restricted exclusively to panthers. I myself feel disposed to consider all of them as equally applicable to tiger "kills." But my experience is somewhat limited, and subsequent discussion with men who can lay far greater claim to knowledge and experience has shown that some divergence of opinion exists. It appears, for instance, that it is no uncommon feature for a tiger to grasp the back of the neck of its victim and not its throat, though I have never observed this circumstance myself.

Among other instances of a similar character I can recall a typical case of a tiger that I did *not* shoot in the Surat Dangs. This animal, I calculated, must, during the night, have walked quite 15 miles. He killed a large cow early in the morning, dragged it some 50 yards (*cf.* Conditions II and III), dropped it into a nullah with precipitous banks, and even covered it with leaves (Condition IV). Subsequent examination of this "kill" showed, as I expected, that the cow had been seized by the throat (Condition I) and that Conditions V and IX were also fulfilled. In order to give some idea of the conflicting ways in which some authorities have dealt with this matter, I must, at the risk of appearing prolix, give at least one quotation at length :—

" We often hear," says Baldwin in his "Large and Small Game of Bengal," "of the tiger striking down his prey with his paw, and doubtless occasionally he does so, but I am of opinion that this is not his usual mode of proceeding: he more generally, I believe, springs from an ambush, or by grovelling along the ground approaches to within springing distance, then with a mighty bound, or succession of springs, he launches himself on his victim, and seizing it with his fangs by the back of the neck (not the throat) brings it to the ground, and then gives that fatal wrench or twist which dislocates the neck and at once puts an end to the struggle. I have examined the carcasses of many scores of bullocks killed by tigers, and have in the great majority of cases found the neck broken, and the deep holes at the back of the neck caused by the tiger's fangs. Sometimes, though certainly less often, I have discovered undoubted evidence that the dead bullock had, in the first instance, been felled by a blow from the terrible forearm of the tiger. Again we hear of the tiger, having despatched his victim, proceeding to drink the blood from the neck, but this is never the case; frequently there is very little blood to be seen on the dead bullock or deer. I have never noticed the veins in the throat of a carcass laid open or torn as if for the purpose of getting at the blood, and if the tiger were in the habit of lapping the blood of a creature just killed, there certainly would be marks to show this on the throat." On this subject the author further observes :—"Having dragged his victim under some bushes, into a clump of grass or a neighbouring nullah (*cf.* Conditions II, III, and IV), he usually devours a portion of the carcass, com-

mencing always at the tail" (*cf.* Condition V). Looking at some of the other authorities to hand, and comparing them, I find that—

- (a) Lieutenant-Colonel Gordon Cumming ("Wild Men and Wild Beasts") agrees that a tiger "always commences to feed near the hind quarter."
- (b) "Hawkeye," in the *South of India Observer*, 1868, maintains that a tiger "invariably commences at the hind quarters of the animal slain," and a panther "at the fore quarters or chest." He favours the idea that the paw is used to strike down the prey, and that tigers must have room to spring.
- (c) Blanford in his "Fauna of British India" says it is "certainly incorrect to suppose that cattle are killed by tigers with a blow of the paw, though he thinks smaller animals may be. He sides with Baldwin in thinking that the neck of the victim is invariably broken, and that the great blood-vessels of the neck are untouched. He says he has known instances of buffaloes being ham-strung by tigers, and admits that they are in the habit of dragging their 'kills' (Condition II), and that claw-marks are confined to scratches on the fore quarters" (Condition X).
- (d) Sanderson, too, thinks that the neck is dislocated, but that this is brought about by the tiger seizing his victim's throat, and thrusting the neck upwards and backwards. He agrees to the hiding of the carcass under leaves (Condition IV) and that the hind quarters are consumed first (Condition V); but maintains that the intestines are ruptured, and denies that tigers spring on their prey—they "rush in."
- (e) General Hamilton ("Record of Sport in Southern India," p. 171) apparently favours the view that it is customary for tigers to strike their prey down with a blow of the paw.
- (f) In Colonel MacMaster's "Notes on Jerdon's Mammals of India," p. 199, we find an account of a tiger stalking a cow, which, "having seized her (where is not stated), sucked the blood."

- (g) Sterndale ("Mammalia of India") does not think that tigers have "a uniform way" of killing: he thinks that they sometimes do it by a blow on the head, but more frequently by seizing the throat and dislocating the vertebræ. He says a tiger "seldom springs," but "rushes" on his quarry.
- (h) I find in the *Kanara Gazetteer*, a valuable article on tigers contributed by Colonel Peyton (late Conservator of Forests). In describing their method of attack, he says:—  
 "Tigers either steal in or rush on the herd. . . .  
 When they secure one of the herd they drag it into the thicket, sometimes at once, but often when they come back towards dusk to feed. . . . Opinions vary regarding the way in which a tiger seizes its prey. Some sportsmen hold that the tiger seizes its prey by the throat; others hold that the victim is caught by the nape of the neck. In 9 cases out of 10 the animal is seized by the throat. . . . In seizing their prey tigers use their terrible forepaws to bring the victim down and dislocate his neck. . . . In eating its prey the tiger as a rule begins on the rump, and less commonly at the breast."

It seems a pity that so much difference of opinion should exist where—while admitting that circumstances must alter individual cases—unanimity should, I think, prevail. The only way in which we can hope to arrive at this is for individual sportsmen to carefully observe all the tiger "kills" that come under their notice and to chronicle their observations.

V.—*The applicability of these maxims to other Carnivora.*—Some, but never all, of the corroborative features mentioned in the maxims may occasionally be noticed in the case of "kills" by other animals.

(a) *Hyænas.*—For instance, a hyæna may attack the throat of a goat (Condition I), but the circumstance is, I believe, very unusual. As an example, I can recall an occasion during the hot weather, sitting over a goat one evening, below a kopje in the Panch Mahals. A panther was expected, but a hyæna appeared instead. On arrival he surveyed the goat with some nicety, and walked round it, gradually approaching nearer and nearer. He then came quite close up, and

was butted off two or three times. Finally, he seized a suitable opportunity to grasp the goat in the rear. We here have, I consider, a somewhat typical example of the repulsive methods of attack adopted by these loathsome quadrupeds in taking the lives of their victims.

There may also be signs of the kill having been dragged (Condition II); but on a close inspection of the spoor, it will be found that, as a rule, only the limbs have been allowed to trail, for a hyæna by nature prefers to lift the "kill." He usually fulfils Condition III, with the fixed idea, however, of conveying the carcase to his lair. Dr. Jerdon relates a story of a small dog being carried away to a hyæna's lair, which was subsequently recovered alive, and but little injured.

The stomach is frequently ruptured, thus departing from Condition VII, and so on. It is interesting to note, that if, on going up to a "kill", tied up over night, we find no carcase, and the rope so cleanly cut as to almost indicate the use of a knife, then it would *not* be correct, without further evidence, to jump to the apparently obvious conclusion that your *shikari* or his friends are responsible. Unless the contrary is proved, this is the work of a hyæna and should be forthwith treated as such. A panther will never, to my knowledge, use his teeth on a rope; indeed he is inclined to distrust a "tie," whose rope is too palpably visible—an important fact, which no sportsman should ever overlook in "tying up."

(b) *Wild Dogs*.—In the case of wild dogs, my experience is restricted to an isolated case, so that I can lay no claim to speak at all authoritatively about them. On one occasion, in Surat Dangs, I happened to disturb a small pack on a carcase recently bagged by them. Signs of teeth marks were plentiful in all directions, and the ears were torn.

The fact that these animals hunt in packs and consume their prey on the spot with great expedition, must alone make the chance of studying their "kills" rare. Sterndale in his *Indian Mammalia* says:—"The evidence produced tends to confirm the opinion that the wild dog endeavours to seize the quarry by the flanks (*cf.* Condition I), and tear out the entrails (*cf.* Condition VII). Shakespear in "The Wild Sports of India" gives an account of a sow killed by wild dogs. "Just as I came to it I saw some eight wild dogs, who had that

moment run into, and killed, a large wild sow. One had his muzzle in the entrails of the hog (see Condition VII), and I hit him with a rifle-ball at about 90 yards off.”

(c) *Wolves*.—Wolf “kills” used to be common enough in the Niphad Taluka of the Nasik District some years ago. In those days I did not pay that careful attention to their precise method of procedure which would have tended to enhance the interest of this paper. But I have had some experience of the systematic procedure adopted by these animals. There can be no doubt that they frequently form and adopt a preconcerted plan of attack, and it would appear to be perfectly immaterial to them where the quarry is eventually seized.

A few quotations from well-known writers will, I think, amply repay perusal. Among several similar instances Sterndale quotes the case of “three wolves seen to chase a herd of gazelle across a ravine in which two others were lying in wait.” A very interesting and significant passage occurs in Baldwin’s “Large and Small Game of Bengal,” which I must quote *in extenso* :—

“I have mentioned, when writing on the hyæna, that the animal, when seizing its prey, such as a sheep, goat, or other unfortunate, does not invariably fasten on the neck or throat, as the leopard does, but often on the flank or hind quarters. The same remark applies to the wolf, and I may add that both these animals, having pulled down a victim, almost invariably, I believe, commence their repast by tearing a hole in the stomach or flank, and not at the tail, like the large cats” (*cf.* Conditions V and I). The same author tells of a goat seized by wolves, on which he surprised them. “On examining the dead goat, I noticed that large portions of the flesh were torn off the side and hind quarters, but not a mark on the throat or back of the neck; she had evidently been seized by the flank and pulled down.”

VI.—*The Diagnosis of Panther “Kills.”*—In the diagnosis of a “kill,” it would be unwise to regard *all* the conditions as indispensable. That two, or even more, of the important ones may be departed from and the “kill” yet be the property of a panther, I have proved in my own experience.

On one occasion, Mr. Brown (I.C.S.) and I examined a “kill,” not four miles from Godhra, in the Panch Mahals. We could find (a) no teeth-marks on the throat, and (b) no clear signs of any dragging,

although the carcase had been moved quite 20 yards. Beyond one indistinct "pug" at a small tank close by, there was nothing therefore to conclusively show that we were dealing with a panther, although some of the other conditions were present. The panther put in an appearance, however, when it was nearly dark, and dispelled all doubts. To account for the absence of Condition II in this case is apparently impossible. In the case of Condition I, the young buffalo killed may have died a natural death, since the owner subsequently admitted that it was somewhat sickly and had remained out overnight by accident.

SOME HINTS TO BEGINNERS ON COLLECTING AND  
PRESERVING NATURAL HISTORY SPECIMENS.

BY E. COMBER.

PART III.

(Continued from page 280 of this Volume.)

*Note.*—In the last part of these papers, owing to a printer's error, at page 278 of this volume, the paragraph commencing at line 36, "I will only add . . . . . improvements afterwards," is out of its proper place. It should follow line 3 of the same page, and refers to 'carbolized' specimens.

*Reptiles and Amphibians.*

Having completed with the birds, the warm-blooded animals, we now come to two classes of air-breathing Vertebrates, *viz.*, the Reptiles and the Amphibians, which were formerly all grouped together, and for our purposes can still best be treated in one paper. The first named are divided into three widely different orders, which include, respectively, (*a*) the Crocodiles, (*b*) the Tortoises and Turtles, and (*c*) the Lizards, Chameleons and Snakes, while the Amphibians, or Batrachians, as they are sometimes styled, comprise the Frogs and Toads, Newts and Cæcilians or Blind-worms.

Naturally a group containing such a variety of forms, differing so greatly in size and habits, requires considerably different treatment in the hands of the collector, so I think it will be best to deal with each order separately and in turn.

Firstly, then, the giants of the class, pigmies though they be compared with the monsters that in bygone ages stalked about this earth, claim our attention; but, interesting as *Crocodiles* are as museum specimens, there is not much in the way of original work amongst them for the hands of the ordinary naturalist, for the reason that the number of species is limited—in India there are but three—and these, being conspicuous by reason of their size, and familiar from earliest childhood by the halo of horrible romance that surrounds them, have always received their full share of the attention of naturalists, both from the point of view of specimens and in the record of their life-history. So long as they and 'Shikar' exist in the country there will be no lack of specimens obtained annually, for every one is glad of a chance for a shot at a 'mugger' as he lies sunning himself on the bank by the river or tank. One thing in connection with shooting

them is perhaps worth noting, and that is the point of aim : This should be the bones of the neck, anywhere in front of the shoulders. If you succeed in smashing the vertebral column with your bullet, his jaws will fly open and he will lie still, paralysed ; but lose no time in running up to get hold of him by the tail, for he may soon ' come to ' sufficiently only to disappear in the watery depths to be seen no more. Should your bullet strike him anywhere else,—even if it inflicts a mortal wound,—he will still probably be able to get beyond your reach by struggling to the water, and it is not the nature of the beast to trust himself far from the edge as a rule, except at night, when, they stray some distance from the water in search of food. It is also possible, of course, to catch them with a baited line, but the rifle is the readiest means, and any one anxious to try the sport of fishing for them, I would refer to the account that Mr. Hornaday gives of his experiences in "Two Years in the Jungle."

Having secured the beast, the first procedure, as in the case of all vertebrates, will be to measure your victim and carefully record the dimensions. The most important measurement in this case is the total length, from snout to tip of tail, which can be supplemented by that of the tail alone and the girth behind the shoulders. All but the very smallest specimens must, of course, be skinned, which operation does not materially differ from that of the larger mammals. Mr. Hornaday thus describes the process of curing the skin after removal : "When the skin is thoroughly clean, immerse it in a strong bath of salt and water, and allow it to remain twenty-four to thirty hours. Then take it out, rub the inside and the leg-bones thoroughly with strong arsenical soap, after which apply powdered burnt alum liberally over the inner surface, so that not a single spot is missed. Then hang the skin up by the head (no danger of stretching in this case), and allow it to dry in the wind and *shade*."

Small specimens, or the skins of moderate sized ones, can be preserved by immersion in spirits, as described below in the case of the smaller reptiles.

*Tortoises and Turtles* (Chelonia). Of these we have a far greater variety than in the case of the crocodiles, amounting to 43 species according to Mr. G. A. Boulanger's volume of the "Fauna of British India." Excellent Manual as this is, so far as concerns the scientific

description of the species, genera and families, no attempt has been made to include more than the briefest reference to the geographical range of each species, and no such thing as habits or life-history is, as a rule, even mentioned. Former publications—such as Dr. A. Günther's "Reptiles of British India"—did of course include something of these very important items in our knowledge of the animals that inhabit the country; but the *Chelonia* appear to have been strangely neglected by the majority of Indian naturalists. Why exactly this should be, it is difficult to say, for tortoises and turtles, to my mind, form quite as interesting a study as snakes. Yet every one who comes across a snake is always ready to secure it and send it down to replenish the Society's already excellent collection, whereas our museum contains no collection whatever of the Indian *Chelonia*. Here then is another opportunity for any of our enthusiastic members to assist with really valuable work, not only by the contribution of specimens, but by the collection of field-notes on the various species that are found in their locality. As an instance of the kind of thing that is useful, and as a sort of standard for the beginner to aim at following up, I should here like to refer to the series of papers that appeared in the first three volumes of our journal under the title of "The Waters of Western India" by a member who wrote over the *nom de plume* of "Keswal." Seldom have we had the chance of publishing papers so interesting and instructive as these, which at the same time contained such a mass of really useful information about the animals mentioned therein. The turtles of the districts dealt with in these articles are by no means forgotten, and, I fancy, the few pages there devoted to them contain more information than has appeared in all our subsequent volumes.

However, to return to our subject from the point of view of the collector. There is not much to be said on the capture of specimens included in the order under consideration. You will, I fancy, do best by acquainting the natives of the neighbourhood with your requirements, and especially can fisher-folk assist with the water-frequenting kinds, as they are constantly getting them in their nets, much to their annoyance.

When you have secured your turtle, there is, however, in his case, one difficulty that confronts you, and that is the killing of him without

damage as a prospective specimen, owing to the 'shell' that encloses the body, and consisting of a dorsal part or carapace and a ventral part or plastron. The best way is, no doubt, to settle him with poison, for which purpose a cloth soaked in chloroform and tied over the head is recommended. Unfortunately—or rather I suppose I should say fortunately—such drugs are not often handy, especially away in the jungles when most wanted. My advice is to hand him over to the cook for execution, with instructions not to effect this by chopping off his head, and to damage him as little as possible. Of course if it is only proposed to retain the 'shell' such precautions are not necessary; but, although useful for purposes of identification, and even then not always sufficient, it cannot strictly be considered as a 'specimen.' To prepare one properly as such it is first necessary to cut with a saw the shell between the fore and hind-limb openings on each side, and cut the skin right round by the tail, so that the plastron may be folded back. All the flesh and bones of the body can then be removed, the legs and tail being skinned as those of a mammal, but by turning them inside out if possible, without cutting the skin down to the toes. For purposes of preservation apply arsenical soap and alum, and dry as in other cases before putting away.

*Snakes and Lizards* (Squamata). In the third order of the reptiles we again find a far greater number of species than in the *Chelonia*, those in our country exceeding 200 in the case of lizards, and 250 snakes, with one solitary representative of the sub-order containing the peculiarly specialized chameleons.

These have always been carefully studied by naturalists all the world over; but even if it can be said that the Society's collection of snakes is more complete than any of the other collections, there are still many species that we have not got and that members could supply specimens of. In the case of lizards we have never found an enthusiast 'to put our house in order,' nor do they take the popular fancy as snakes do, with the result that the collection is by no means representative.

For the hunting and collecting of both snakes and lizards there is no royal road to success, and good steady work in the field will alone provide specimens. One comes across snakes at all sorts of odd and unexpected moments, and those that live on the ground, at any rate, seldom repay special and systematic search. With tree-snakes a

generally watchful eye in likely-looking situations will more often result in their discovery, whereas with the sea-snakes the wily 'khalassi' will again be able to help. In the case of lizards there is some fun to be had, for although one cannot go far anywhere without coming across them, that watchful eye will be upon you long before you have noticed him, and the finding is a very small portion of the getting of him in 'the bag.' For agility there are very few terrestrial animals that can come near the general run of lizards—though perhaps he cannot give many points to the cockroach;—and when you have got tired of hunting them yourself, the village urchin will be glad to help for a small consideration. In that case, as with outside assistance of all kinds, there is one drawback, and one too that it is as well to keep an eye upon. If your specimens are obtained by others collecting for you, you learn nothing of the haunts and habits of the different kinds, and in time you may find you come to rely upon them more and more—in fact you get lazy and shirk the work—with the result that there may eventually develop a tendency to become more of the specimen-hunter than the field-naturalist. I do not say naturalist because the man, who has spent his whole life, perhaps, within the walls of a museum, is so designated, even though he knows nothing whatever of the live beasts except from the writings of others, that he knows so much about as specimens. On the subject of how and in what spirit to go about collecting, there is more to be learned from a perusal of "The Naturalist on the Prowl" than any other book I ever came across: for while most entertaining reading, it instils into one the pleasures to be obtained and profit to one's knowledge by observing while specimen-hunting. When one does come upon a rare or strange beast that will be a valuable addition to one's collection, the first, and almost natural, inclination is to slay it on the spot without, what is styled, waste of time. As a matter of fact it is in many cases more likely to be time usefully and profitably employed to sit down first and observe it, remembering that, if you really want to be a naturalist, the power of observation and the record of results therefrom are of more importance than any other qualifications. The value of pencil and paper is more often than not overlooked by the beginner, who should accustom himself to the making of notes on all possible occasions. Notes on little things,

which at the time hardly appear worthy of record, very soon become valuable as they accumulate and can be put into shape, sorted out under different heads. Without notes the field-naturalist, beyond himself getting a general idea of the results of his observations, will soon find he is incapable of giving to others the benefit of them in full by putting them in writing.

I have enlarged upon this point at this place, because it is with the reptiles that we are most behind the times in that respect.

This is what one of our most respected members—Mr. G. W. Vidal—wrote in our Journal eleven years ago in connection with the imperfections of existing records of the distribution of snakes:—"As our collections increase it is useful to take stock from time to time, however limited may be the field of inquiry selected, to see what additions have been made to our knowledge of the distribution of species. In no branch perhaps of Natural History has the distribution of species been so incompletely worked out, as in the case of the *Ophidia*. A glance at the existing works of reference will show how very little is known of the habitat of the great majority of the species described . . . . . Our Society has already done much useful work in this direction, thanks to the individual as well as the collective energy of its members. But a grand field is still open to collectors, and much still remains to be done in taking stock, and preparing catalogues of the numerous and valuable contributions already received."

What was so true when the above was written is equally so to the point to-day, and in reading the earlier numbers of our Journal one cannot help wondering whether there is now-a-days the same 'individual as well as collective energy of its members' that Mr. Vidal records. There can be no question of the individual energy of a certain number of members, but considering the largely increased membership I am afraid even that individual energy is by no means so universal amongst them, and collective energy even less so.

There is one thing that should encourage the collecting of all small reptiles, and that is the simplicity of their preservation. Except in the case of large snakes, there is no tedious process of skinning and curing to be done, for they are best preserved entire in ordinary methylated spirits. Alcohol (spirits of wine) is of course a better

medium in which to preserve them, but its high cost in this country, owing to the heavy import duty, precludes its use.

With small specimens it is sufficient to make several incisions along the median line of the abdomen to allow the spirit to thoroughly saturate every part, but it is better, and with larger specimens is necessary, to make a single longer incision and through this remove entirely the viscera. In making this opening-cut, it is most important that it should be commenced, or ended, some distance in front of the anus, so as not to touch the anal shield, for this is in many instances an important mark of identification, whether single or bifid, and should consequently be left intact.

The specimen should then be simply immersed in the spirit, contained in suitable wide-mouthed vessels with close fitting stoppers of some kind ; for this purpose something is generally to be found about the back premises of any bungalow—something that lately contained pickles or what-not from the grocers—and of all the many suitable jars the best of all is an old prune bottle. Before putting a specimen into spirits for preservation do not forget to write the details on the label with an ordinary lead pencil ; this will be quite permanent and will not smudge or run. Give them also plenty of room at first until they have become thoroughly impregnated.

One disadvantage, however, of spirit as a preservative medium is that it is troublesome to carry about a sufficient supply, and careful packing is necessary ; especially is this noticeable when away from home, which is probably the time one will most require it and will come across specimens that are wanted to be preserved. Spirits you cannot carry in a concentrated form, and to the field-collector I would strongly recommend Formalin as a substitute. The great advantage of it is that a small bottle of formalin—say half a pint—will suffice for supplying one and-a-half gallons of preserving liquor, for it is to be diluted with no less than twenty-five times its own bulk of water before use. And further with it the vessel can be crammed as full as you like with specimens without their taking any harm. Formalin, I may mention, is obtainable from the leading druggists in Bombay, and no doubt in any other large towns of India, the cost being about Rs. 4 for a 20-oz. bottle. When it was first introduced, as a preservative medium, it was thought by some that it would

quickly supersede all others ; but this has not altogether been borne out by results of actual experience. For instance, it has proved quite unsuited for all specimens containing calcareous matter, such as molluscs, echinoderms and crustaceans ; also for insects, in which connection I will only instance spiders ; and for reptiles it has certain disadvantages as a permanent medium. For ' flabby ' animals, such as jelly-fishes, &c., it is superior to any other known medium. To the field collector, however, it is invaluable even for reptiles, and specimens brought home in it can, as convenient, be transferred to spirits.

For travelling the most convenient kind of vessel for carrying either formalin solution or spirits will be found to be a wide-mouthed stone jar with screw top, packed in a straw-lined basket. These the Society used to distribute at one time to members wishing to have them. Specimens of all kinds can be labelled and popped into this at once, to be transferred to suitable small bottles or jars of clean spirit afterwards.

*Batrachia* (Frogs and Toads), or *Amphibia* of some authorities. This class of vertebrates is divided into three orders, viz., (a) the *Ecaudata*, (frogs and toads proper) of which our standard text-book enumerates 124 species ; (b) the *Caudata*, (newts, &c.), only represented in our limits by one species that is found in the mountains of Yunnan and Sikkim ; and (c) the *Apoda* (Cæcilians or Blindworms) little-known creatures that may be described as worm-like, limbless, and generally tailless beasts that come into this class from the fact that they go through a fish-like larval stage, corresponding to the tadpole of frogs, with a subsequent metamorphosis as they approach maturity. Of these there are but five known species in India.

As mentioned already our most recent book on these animals deals only with the scientific description of the adult—and to really understand that description one must of necessity be a bit of a specialist—with a brief mention of the habitat. If one wishes to know anything more about their life-history and habits, one must refer to Dr. A. Günther's standard work ' Reptiles of British India '—a great quarto volume published in 1864, or other older works. In this, however, only thirty-seven kinds of frogs and toads are described, being all that were then known to science, and such a book is not as a rule available for purposes of reference by many beginners. Occa-

sionally, I must admit, Mr. Boulenger in his book does vouchsafe us a note on some habit of a species, and as an example I mention one that will serve to show what the opportunities are for investigation among this class. Regarding the Bull-frog (*Rana tigrina*)—the largest of all our Indian species, that is found all over the country, from the base of the Himalayas to Ceylon, not to mention the whole Malay Peninsula and Archipelago, and China—we are informed that it “is said, when frightened, to jump over the surface of the water much in the same way as on land.” To this the editor of the work puts a footnote as follows:—“The species that is so well known by this habit in India has never been accurately determined. It is, however, a smaller species than *R. tigrina*, and is, I think, *R. cyanophlyctis*. Probably *R. hexadactyla* has the same habit.”

Judging by this it is very evident that our knowledge of even the best known of our Indian frogs is very far from complete, and if our Society is to continue to occupy the position that it has since those original 6 members met together and formed it, and if we are to show results in any way commensurate with the enormously increased membership of recent years, it can only be by the help of members generally in every department. In our Museum we have nothing that can be considered in any way even as a nucleus of a representative collection of amphibians, and on looking through the whole series of our Journals one must search deep for any reference to or notes on them. It may perhaps be contended that frogs are not an interesting subject, and that there is little or nothing to record of their habits. Believe me such is not the case with any animal if we will only take the trouble to know him as he is at home, and is certainly not true of frogs: uninteresting they may appear to some, but I venture to think that it will be found the holders of such views are just those who have never attempted to improve their acquaintance with the gentle froggie, and consequently are least qualified to form an opinion. There is, undoubtedly, if one comes to think of it, much to be observed and learned regarding him; for instance, what style of neighbourhood does he inhabit? What time of day or night does he take his food, and of what does it consist? What kinds of birds or beasts are especially partial to him as an article of diet? What time of the year are the eggs laid? How long is it before they

hatch? What are his experiences during the tadpole stage and what is its duration? And finally where does the enormous population of his kind appear from the moment the monsoon rains commence? There must be some means by which the various frogs tide over the dry season to allow them to show in thousands where what was a few days ago dry earth, baked nearly as hard as stone, with possibly no water-pool within miles. To state an instance. Two nights after the monsoon bursts the Bombay "Oval" is thickly populated, judging by the croaking chorus. Where, I say, do they all come from? Have they been lying in a state of hibernation in nice juicy mud below that hard crust, where the scorching sun affects them not, only to emerge when it softens and is once more to their mind and constitution habitable? Our knowledge of such matters, it must be admitted, is in a very rudimentary state!

Then again our recognised hand-book is absolutely silent on the subject of the tadpoles of all those hundred odd kinds of frogs and toads. Are we to conclude that a tadpole is but a tadpole and nothing more, all being alike? Or is it owing to lack of material regarding them that their nursery days are passed over in silence? Specimens of them in the tadpole stage, when their species can be accurately determined, should be of value in a collection as well as the adult animal.

The preservation of both adult and tadpole presents no difficulties, being treatment in the formalin or spirit jar just like snakes and lizards as described above.

*(To be continued.)*

NOTE ON GREVY'S ZEBRA (*EQUUS GREVII*).

BY LIEUT. COLONEL H. D. OLIVIER, R.E., F.Z.S.

*(With a Photograph.)**(Read before the Bombay Natural History Society on 9th October, 1900.)*

I wonder whether any of our members know a book on Natural History by the Rev. J. C. Wood, which came out in parts in the early Sixties? Well, I was brought up on that book, with a dash here and again of Livingstone's Travels, and Moffat's Adventures. It is, I think, this course of literature that is responsible for my strong desire, to see, at all events, a Zebra in its wild state, the desire to shoot one, if I did see it, must I fear, have been due to something born with me, for "shikari nascitur non fit" is quite as true as the usual proverb.

I well remember those early pictures representing the plains of Africa teeming with endless herds of game, pictures, I believe, in no way exaggerations of the truth, and in which there were *inter alia* great herds of Zebra. I remember too that their shapes resembled nothing quite so much as the horses on the Parthenon, with their thick necks and hogged manes. So last year when I went to Somali Land one of my main objects was to get to the Zebra country, to see the Zebra for myself, and in due course I not only saw my first Zebra but shot him.

The shape was the same as the pictures represented and the stripes were the same or nearly so, but the large herds and the open plains were not to be found. It is possible that elsewhere the Quagga (now nearly extinct), or Burchell's Zebra, which are the species common in South Africa, do move in more open country, and in larger herds; but Grévy's Zebra, which is the animal I am talking about now, and the only one found in the Somali Land, is certainly disappointing in this respect.

Grévy's Zebra was named by a Frenchman from a specimen in the Jardin des plantes at Paris; the first specimen, which ever reached England, arrived there about this time last year, when a pair of them were sent by King Menalik to the Queen. One was a male who was too old to travel and arrived in bad condition and is since dead; the other, the female, is still alive.

This Zebra stands about 5 feet high and is very beautifully marked. The markings on the head are especially curious and apparently almost precisely similar in various specimens. The stripes are different from those in Burchell's Zebra and in the Quagga, which latter I believe is not striped throughout; in Burchell's Zebra the stripes seem to be broader and fewer, and the animal is smaller I believe. But I am not sufficiently acquainted with the South African species to explain where the exact difference lies. I must trust to my friend Dr. Sclater's dictum that there is a great difference in the markings. When seen in the jungle the stripes are not very distinct, and the general impression is of a light grey animal. The hoofs seem to be very

hard and their print is exactly like that of a horse, in fact the edge is so hard that it is almost possible at times to think they must be shod. The size of the ears is very remarkable, and but for the fact that they are rounded at the top, they would be very much like donkey's ears. I noticed that all the game of Africa, including the hares, were provided with immense ears, and evidently depend on them a good deal ; this is only what might be expected in a close country, and we find the same thing in such Indian Deer as the Sambur which live in thick jungle.

I first came across Grévy's Zebra at Hadanich on the Sug River, a branch of the Dachato, both rivers lie in the Abyssinian sphere of influence, which is the reason why this animal has not of late years been much shot by sportsmen. They are not found much north of the eighth degree of latitude.

I found them in herds of from three to eight in number. I never saw more than this number in one herd, and I never found them away from the dense scrub jungle, which covers the whole of the low ranges which lie in this part of the world between the various streams which run down to the Webbe river. There are in this tract of country occasional open glades, and in these, and in the cleared patches where travelling tribes of Somalis have had their Camps, the Zebras are to be found feeding in the early morning ; they also come down, as far as I can gather every night, to the water to drink. The jungle is a stony waste of dense thorny bushes, or of a small fruit-bearing shrub whose name I do not know, but which forms the chief staple of food for the rhinoceros, which are also found here. There is little other game except a few oryx and gerenouk, and of course hundreds of the little Sakharu antelope or Dikdik, of which I have seen over a hundred in a day, always in separate pairs, in fact, as Major Swayne says, they jump in places from almost every bush, certainly from every clump of bushes.

However, to return to the Zebra, the best method of securing them is to search along the water for their tracks of the night before, and then to follow them up. If this is done, and if one comes upon them in an open patch, and if one sees them there before they see you, they were I found very easy animals to get near, but if I happened to come up to them in the thick bush, as was more commonly the case, I found them quite the contrary, for the bush is so dense that one can get within 50 yards of any animal without seeing them, and then, as the ground is stony, and it is almost impossible to move absolutely silently, they of course hear you and away they go. On such occasions by throwing myself on the ground I could often see their legs under the bushes as they trotted off, which was not much good to me, but unless the ground was favourable and a lucky ravine gave one a better chance, one rarely saw anything else, and once disturbed I found them very distracting animals to follow. I got my first one very easily, getting a shot at it with a Mannlicher at about 250 yards, in an open space



Photographed by Col. Olivier, F.E., F.Z.S.

**GRÉVY'S ZEBRA (MALE)**  
(*Equus grevii*)

Mintern Bros. Photo Imp. London.



where a herd of three was feeding. I might have easily shot another, as one of them stood stupidly looking at me from about 150 yards off, but it was not a full grown one so I let it go. It took me however a long time to get the second specimen I wanted, on two occasions I followed a herd from 6 o'clock in the morning till 3 in the afternoon without ever getting a shot, although I was over and over again within a hundred yards of them. It is tiring work tracking in such a close country, and at 7° of latitude the thermometer stands pretty high, and I was very glad when one morning after several blank days I came across a herd of eight feeding in the open, and after an easy stalk got within eighty yards and secured my second specimen. No one I hope would want to shoot more than two of them. They are beautiful animals, and I shall not soon forget the spectacle presented by a splendid stallion which jumped up out of some long grass close in front of us one day when we were tracking rhino, and galloped away with the sun shining on its glossy back and sides. They always seemed, as of course all wild animals do, to be in the very pink of perfection, and both of those I shot were extremely fat. This fat was much appreciated by the Somalis, who however had views about eating their flesh, saying it was heating.\* I have with me a skin and also photograph of the last Zebra I shot, and I can honestly say that I was not disappointed in my Zebra when I did come across him on his native heath. I only hope you will be able to say the same of my account of him.

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\* N. B.—Most flesh would be heating if eaten in the quantities which Somalis indulge in; personally I found it very palatable.

BIRDS COLLECTED DURING FIVE YEARS' RESIDENCE IN THE  
HYLAKANDY DISTRICT, CACHAR.

PART VIII.

By C. M. INGLIS.

(Continued from Vol. XII, page 683.)

ADDENDA ET CORRIGENDA.

Order *Passeres*,

Family *Crateropodidæ*.

- 290 *Hume, Cat. No. 387 ; Oates, No. 160.* TURDINUS ABBOTTI (Blyth).—  
Abbott's Babbler.

This species is common here.

- 32 *Hume, Cat. No. 461 ; Oates, No. 282.* MOLPASTES BENGALENSIS (Blyth).—  
The Bengal Red-vented Bulbul.

Very common. It usually builds in the tea bushes.

- 33 *Hume, Cat. No. 460 ; Oates, No. 288.* OTOCOMPSA EMERIA (Linn.).—The  
Bengal Red-whiskered Bulbul.

Exceedingly common.

- 34 *Hume, Cat. No. 456 ; Oates, No. 290.* OTOCOMPSA FLAVIVENTRIS (Tick.).—  
The Black-crested Yellow Bulbul.

Scarcer than the last. It is rather difficult to make a good skin of this  
bird ; the feathers on the neck being rather sparse, do not lie well.

Family *Sittidæ*.

- 35 *Hume, Cat. No. 251 ; Oates, No. 316.* SITTA CINNAMOMEIVENTRIS (Blyth).—  
The Cinnamon-bellied Nuthatch.

This is the only Nuthatch I have ever noticed here and that on only one  
occasion. It was seen at Cutlicherra near the bungalow.

- 291 *Hume, Cat. No. 253 ; Oates, No. 325.* SITTA FRONTALIS (Horsf.).—The Vel-  
vet-fronted Nuthatch.

I have never seen this species myself, but Mr. Primrose has kindly sent  
me a skin shot by him in the Chutla Bheel.

Family *Dicruridæ*.

- 229 *Hume, Cat. No. 279 ; Oates, No. 334.* DICRURUS ANNECTENS (Hodgs.).—The  
Crow-billed Drongo.

A single specimen secured. I sent the skin to Mr. Finn, who kindly identi-  
fied it for me.

Family *Sylviidæ*.

- 293 *Hume, Cat. No. 515 ; Oates, No. 363.* ACROCEPHALUS STENTOREUS (Hemps.  
and Ehr.).—The Indian Great Reed Warbler.

A single specimen, also identified by Mr. Finn. I owe him, Mr. Baker, and  
the late Mr. Hole thanks for the trouble they have taken in identifying birds  
for me.

- 294 *Hume, Cat. No. 518 ; Oates, No. 393.* ARUNDINAX AEDON (Pall.).—The  
Thick-billed Warbler.

Only a pair of these birds obtained.

Family *Muscicapidæ*.

- 295 *Hume, Cat. No. 309 ; Oates, No. 573.* CYORNIS PALLIDIPES (Ind.)—The White-bellied Blue Flycatcher.

Two specimens, both females, procured. Mr. Finn kindly identified them for me. I fancy this must be a rare species in Cachar.

- 296 *Hume, Cat. No. 301 ; Oates, No. 579.* STOPAROLA MELANOPS (Vig.)—The Verditer Flycatcher.

I have not found this species at all common here.

Family *Turdidæ*.

- 297 *Hume, Cat. No. 500 ; Oates, No. 641.* RUTICILLA AUROREA (Pall.)—The Daurian Redstart.

I secured no specimens in this district, but obtained a male at Larsingah in the Happy Valley.

- 298 *Hume, Cat. No. 358 ; Oates, No. 679.* MERULA PROTOMOMELÆNA (Cab.)—The Black-breasted Ouzel.

Not observed in the district, but Mr. Primrose kindly gave me a specimen which he obtained in the adjoining one.

Family *Hirundinidæ*.

- 299 *Hume, Cat. No. 85 ter ; Oates, No. 821.* HIRUNDO DAURICA (Linn.)—The Daurian Striated Swallow.

A single female in my collection obtained at Roopacherra, I do not think it is common, the few other striated swallows that I have shot being *nepalensis*.

Family *Motacillidæ*.

- 300 *Hume, Cat. No. 594 bis ; Oates, No. 837.* MOTACILLA CITREOLA (Pall.)—The Yellow-headed Wagtail.

A cold-weather visitant. Scarcer than the other species.

Family *Dicæidæ*.

- 301 *Hume, Cat. No. 241 ; Oates, No. 915.* DICÆUM IGNIPECTUS (Hodges.)—The Fire-breasted Flowerpecker.

By some mistake I entered this species in my list. In going through my Cachar skins lately, I noticed the error.

- 302 *Dicæum hybridum?* (Baker).

Mr. Baker has remarked on this bird in Vol. XI, No. 3, p. 467 of this Journal, and I have nothing to add thereto. The specimen is now in Mr. Baker's collection.

Order *Accipitres*.

Family *Falconidæ*.

- 303 *Hume, Cat. No. 22 ; Blanford, No. 1246.* LOPHOSPIZIAS TRIVIRGATUS (Temm.)—The Crested Goshawk.

Must be very rare. I have never come across it myself, and the only skin I possess I owe to the generosity of Mr. Primrose. He shot it in the Chutla Bheel District.

- 304 *Hume, Cat. No. 57; Blanford, No. 1249.* PERNIS CRISTATUS (Cuv.)—The Crested Honey Buzzard.

I have a single specimen, one of the lighter coloured type, and this is the only one I have ever seen in the District.

Order *Grallæ.*

Sub-order *Fulicariæ.*

Family *Rallidæ.*

- 305 *Hume, Cat. No. 904; Blanford, No. 1403.* GALLICREX CINEREA (Gmn.)—The Water Cock.

Mr. Primrose kindly sent me a pair. He procured them at Dwarbund in the Chutla Bheel, which is not far from the Hylakandy District.

## THE FERNS OF NORTH-WESTERN INDIA.

Including AFGHANISTAN, the TRANS-INDUS PROTECTED STATES, and KASHMIR : arranged and named on the basis of Hooker and Baker's *Synopsis Filicum*, and other works, with New Species added.

BY C. W. HOPE.

(Continued from page 461 of this Volume.)

## PART III.—THE GENERAL LIST.—(continued.)

4. **A. viride**, Hudson : Syn. Fil. 195 ; C. R. 477 ; Bedd. H. B. 148.

AFGHAN. ; Kurram Valley, 6-11,000', Aitch. 1879.

TRANS-IND. STATES : *Chitral*, F. E. Younghusband 1894, *Baraul* 11,000', Harriss 1895.

KASHMIR : *Gilgit*.—Col. Tanner 1880, Dr. Giles, Nittar Valley 10-11,000', Duthie ; Tilail 12,000', Clarke ; Gulmarg, &c. ; 12-13,000', Lev. ; Shisamarg, Trotter, 1889 ; Kamri Valley 10-11,000', Duthie 1892 ; Kishenganga Valley 10-12,000', MacLeod 1891 ; below Punji Pass 10,000', McDonell 1893 ; Masjid Valley 13-14,000', Duthie 1893.

PUNJAB : *Hazara* ; Makra Mt. 10-10,500', Trotter ; *Chamba* ; Upper Chenab Valley 12,000' (perhaps in Kashmir), Baden-Powell 1879 ; Bandal Valley, McDonell 1882.

N.-W. P. : *Kumaun*—Pindari Glacier 12,000', and near Martoli, S. and W. ; 11-15,000' (7 localities) Duthie ; 11,000' Trotter ; 11-16,000' MacLeod.

DISTRIB.—*N. Amer.* ; Greenland, Newfoundland, N. Brunswick, Brit. Columbia, Sitka Id., Rocky Mts. (California). *Europe* :—"Arctic Europe to the Pyrenees ; Dalmatia" (Syn. Fil.). United Kingdom, France, Germany, Bohemia, Italy, Greece, from near sea level to 10,000'.

Mr. Clarke said, in 1880 :—"I find no example from India in the Kew collection" ; and half a sheet from "Kashmir 9-11,000'" is the only material, I think, in the British Museum. There is still a wide gap, between Chamba and Kumaun, from which I can find no record of the collection of this plant.

5. **A. Trichomanes**, L. ; Syn. Fil. 196 ; C. R. 477 ; Bedd. H. B. 144.

AFGHAN : Griffith, *Kurram Valley* 7-9000', Aitch. ; 7000', Collett 1879.

TRANS-IND. STATES : *Baraul* 5-10,000', Harriss ; 7-9500' Gatacre.

KASHMIR : Jacquem. ; *Gilgit* (Trans-Ind.), Sai 5500', Tanner ; *Baltistan*—Sátpura Nála 10-11,000', Duthie ; Kashmir 7-10,000', Aitch. ; Kamri and Liddar Valleys, and Tajwás Nála, 6-10,000', Duthie ; Woolar Lake 5500', Gulmarg 9500', Trotter ; Gulmarg 7000', Gammie ; "common 6-10,000'," MacLeod.

PUNJAB : *Hazara*—Black Mt. 7-9000' Duthie ; 6000' Oertel ; Thandiána 8500', Trotter ; *Chamba*, 75-9000', McDonell ; *Kullu* 5-8000', Trotter ; *Lahaul* 10-11,000', Trotter ; *Simla Reg.* 55-8000', common. "A very common fern ; from 5 to 9000'" (Blanf. in List).

N.-W. P. : *D. D. Dist.*—Jaunsar, Gamble ; Mussoorie, 6-6500, not uncommon ; *T. Garh.* 7-11,000' ; *Kumaun* 6-12,000', very large at 11,000' from Duthie.

DISTRIB.—*N. Amer.* : Sub-arctic Greenland, Canada, and westward to Rocky Mts., Brit. Columbia; United States; Bermuda, and southward to Panama; W. Ind. Islands. *S. Amer.* from Guiana and Venezuela to Bolivia. *Europe* : Brit. Isles; continent of Europe “throughout its length and breadth, from Iceland and Lapland to the Rock of Gibraltar; throughout the Mediterranean Region; and from the extreme west of Ireland to the extreme East of Europe” (Britten’s European Ferns). *Asia* : Trans-Caucasus, Persia, Siberia, N. Ind. (Him.), Sikkim (?), Bhotan. S. Ind.—Kulhatty on the Nilgiris *Bedd.* Java. Japan. *Australasia* : Australia, Tasmania, N. Zeal. *Afr.* : Azores and Macaronesian Isles; Morocco; Abyssinia; Somali Land, *Mrs. Lort Phillips*. Cent. Afr.—Ruwenzori Mt., *Scott Elliot*. Cape of Good Hope.

6. **A. septentrionale**, Hoffm., Syn. Fil. 198; C. R. 478. *A. septentrionale*, Linn. (under *Acrostichum*) *Bedd.* H. B. 145.

AFGHAN : *Kurram Valley*, 9-11,000, *Aitch.* 1877 and 1879, “profuse on rocks”; above Peiwar Kotal 7000’, *Collett* 1879.

TRANS-IND. STATES : Baraul 72-9500’, *Hariss*, *Gatacre*, 1895.

KASHMIR : T. T.; *Gilgit Dist.*—*Dr. Giles*; *Lev.* 1872; *W. S. Atkinson* 1874; *Clark* 9500’ 1876; *Aitch.* 12,000, 1877; *Nagmarg*, *Trotter* 1888; *Kishenganga Valley* 5-12,000’, *MacLeod* 1891; *Sonamarg* 8000’, *Gammie* 1891; *Nittar Valley*, the *Kajnáj Range*, and *Astor Dist.*, *Liddar Valley* 7-11,000’, *Duthie* 1892-93.

PUNJAB : *Chamba*—Upper *Chenab Valley* (perhaps in Kashmir), 8-10,000’, *Baden-Powell* 1879; *Pangi* 8500’, *McDonell*; *Lahaul*, *Capt. Hay* 1856; *Chandra Valley* 10-11,000’, *Rohtang Pass* 12,000’, *Lahaul* 13,000’, *Trotter*; *Simla Reg.*—*Kunáwar Jacquem.* *Vicary* 1833; *Bisahir*—*Parbani Forest* 9000’, *Lace*.

N.-W. P. : *Garhwal*, *Jacquem.*; *T. Garh.* 7-10,000’, *Duthie*; *Brit. Garh.* 11,000 S. and W., 14,000’, *P. W. Mackinnon* 1881; *Kumaon*—*Vicary* 1831; in *Herb. Hort. Saharanpur*; *Milam Valley* and *Tola* 11,500’ S. and W.; 10-12,000’—14 localities, *Duthie*.

DISTRIB.—*N. Amer.* : Rocky Mts. and New Mexico. *Europe* : Norway, Sweden, Russia, Brit. Isles to Spain, Italy and Sicily, Caucasus. *Asia* : Caucasian, Ural, and Altai Regions, Siberia; *Thibet*, T. T. 1857.

My specimens from the Lahaul Hill State, collected by Mr. Trotter, are ticketed 10-12,000’ altitude; but in a letter, written while on his tour in those parts, my friend mentioned that he had got the fern at 13,000’. In his privately printed list of Punjab Ferns, Mr. Trotter says that the Rev. Mr. Heyde, the Moravian Missionary, long located in Lahaul, assured him that *A. septentrionale* was found quite up to the snow line, nearly 19,000’ above the sea level. Mr. Trotter further says—“I have collected it in several places from 7,500’ to 9,500’ alt., and it has once been found (*vide* Miss Farrant) as low down as the Baramula Pass (Kashmir), 6000’. I have never gathered this species except on “Arthur Seat”, Edinburgh, at an elevation of about 300 feet above the sea,—more than forty years ago.

7. **A. unilaterale**, Lam., *Ency.* II. 305 (1786), the oldest name; C. R. 481; *Bedd.* H. B. 152. *A. resectum*, *Smith*; *Syn. Fil.* 210. *A. unilaterale*, Lam., *Baker* in “Summary of New Ferns”, 1891.

PANJAB : *Chamba*.—Dalhousie, Clarke, McDonell (in List); *Kullu*—7000', Trotter; *Simla Reg.*—Simla, 5 stations 5-5000', Gamble, Collet, Blanf., Trotter, Bliss.

N.-W. P. : *D. D. Dist.*—Sowārna Nāla, 4500', Mackinnons 1879, P. W. Mackinnon and Hope 1881; *Kumaun*—near Naini Tal, 3000', (?) Hope 1861, between Dandiha and Karela 5-6000', Duthie 1884, Dhankuri to Khati 75-8000', Trotter 1891.

DISTRIB.—*Asia* : N. Ind. (Him.) Nepal, *Wallich* (*A. latum*, Wall. Cat. 209, not of Swartz); Sikkim and Bhotan, common. Assam—Khasi Dist. 1-5000', common. Bengal—Chittagong. Manipur W. 2000', *Clarke*. S. Ind. "Madras Presidency, in all the Western Forests up to 5000' (*Beddome* in Handbook). Burma, *Kurz*. Burma—Tenasserim? Ceylon. Malayan Penins. and Isles, Borneo—*Hose*. Tonkin—*Balansa*. Japan. China—*Henry*. Polynesia. *Afr.* : Guinea Coast, Fernando Po, and Angola; Nyassa Land, *A. Whyte*; Mascareen and Seychelles Isles.

Trotter calls his Kullu, and Blanford his Simla, plant—*var. uda*, W. S. Atkinson, but I think these are merely young states of the larger plant got by Bliss at Simla, by the Mackinnons in the Dehra Dun, and by myself near Naini Tal. Parish's immature Tenasserim specimen is doubtfully this, and *Kurz's* specimen from Burma has *sori* much shorter than usual.

8. *A. planicaule*, Wall.; Syn. Fil. 211. *A. laciniatum*, Don, *var. planicaule*, (sp.) Hook. C. R. 482. *A. laciniatum*, Don, *Bedd. H. B.* 154, in part.

PUNJAB : *Chamba*—McDonell (in List); *Simla Reg.*—Simla and vicinity 5000' and upwards, pretty common, 8 stations; Kunawar; Sirmur 1831.

N.-W. P. : *D. D. Dist.*; Jaunsar; Mussoorie and vicinity 4700'—6500', not uncommon; *T. Garh.*—below Laluri 3-4000', and Manma to Barahat, Duthie; Sahra 7000', Gamble; *Brit. Garh.*, below Kinoli 5000', Duthie; "*Garhwal*," T. T.; *Kumaun* 3-9000', common.

DISTRIB.—*Asia* : N. Ind. (Him.) Nepal, *Wallich*; Sikkim, Bhotan. Assam—Khasia Hills 2-6000', "very common." Bengal—Chuttia-Nagpur, Parasnath Mt. 1858. Manipur 6000', *Watt*. S. Ind.—Madras Presidency, (*A. laciniatum*) "All the Western Mts. 3-8000' (*Beddome* in H. B.); Bombay Presidency—Mts. of Malabar (Clarke in Rev.), Ceylon. Japan. China—Ningpo Mts., *Faber* 1885 (so named by Mr. Baker; pinnae blunt.), Yunnan, *Delavay* 1883 (segments blunt), *Hancock*. *Afr.* : Madagascar, *Buchanan*, *Baron*.

Mr. Clarke says the abundant Khasia form is the type of *A. laciniatum*, Hk. Sp. Fil. iii. t. 200 A., but he does not differentiate the localities for his *var. planicaule* (sp.) Hk. sp. Fil. iii. t. 200 B. *Beddome* writes of "typical *planicaule*" of S. India, and "typical *laciniatum*" of N. India; but I am not sure whether he means that both typical plants are to be found in both localities. Typical *A. laciniatum* (as Hooker understood it—see his figure in the *Species Filicum*) is unknown in N.-W. India, and I consider *A. planicaule* good species. I do not think I have seen a type specimen of Clarke's *var. depauperata*, which he says comes principally from Kumaun. Plants that Blanford and Trotter have named *var. depauperata* are only small *planicaule*.

I was with Blanford in 1886, when we gathered some small plants of *planicaule* on an exposed dry cliff below Simla, and these he called *depauperata*; but I consider them quite typical *planicaule*, which grows largest on trees in moist forest. Clarke thinks that the existence of this variety (*depauperata*) destroys the value of the specific differences relied on by Hooker and Baker for distinguishing *A. planicaule* from *A. laciniatum*. I should say that the existence of *var. depauperata* requires proof; and Beddome, while saying that it is also found in South India, believes it to be only a starved form of *laciniatum*. I have not seen *A. laciniatum* growing, but judging by herbarium specimens it seems quite distinct from *A. planicaule*. Much depends upon descriptions and the describers.

9. **A. germanicum**, Weiss; Syn. Fil. 212; Bedd. Suppt. H. B. 31.

AFGHAN: Safed Koh 9000', Collett No. 97, 1879, in Herb. Hort. Calc.

KASHMIR: *fide* Bedd. in Suppt. H. B.; *Kishenganga Valley*,—McDonell 1891.

PUNJAB: *Chamba*—Rāvi basin 6000', and Chenab basin 8500', Dr. J. S. Stewart, 824; "only once got at each station"; in Herb. Hort. Kew.

DISTRIB.—*Europe*: Great Britain—very rare; mountainous regions throughout W. and Centr. Europe: pretty general.

This is not mentioned by Baker and Clarke as an Indian species; but in 1888 I found the Chamba specimens in the Kew Herbarium. Dr. Stewart was Conservator of Forests in the Punjab, and the author of a book on Punjab Plants. Some six years ago Mr. McDonell found a scrap of *A. germanicum* among specimens of *A. ruta-muraria* he had gathered sometime previously in Kashmir, and sent it to me for confirmation of his discovery. Beddome's entry, in his Supplement of 1892, "Kashmir," without locality or name of collector, is vague, and might lead one to believe that the fern is common in that State.

10. **A. Ruta-muraria**, L.; Syn. Fil. 213; C. R. 482; Bedd. H. B. 156, and Suppt. 30.

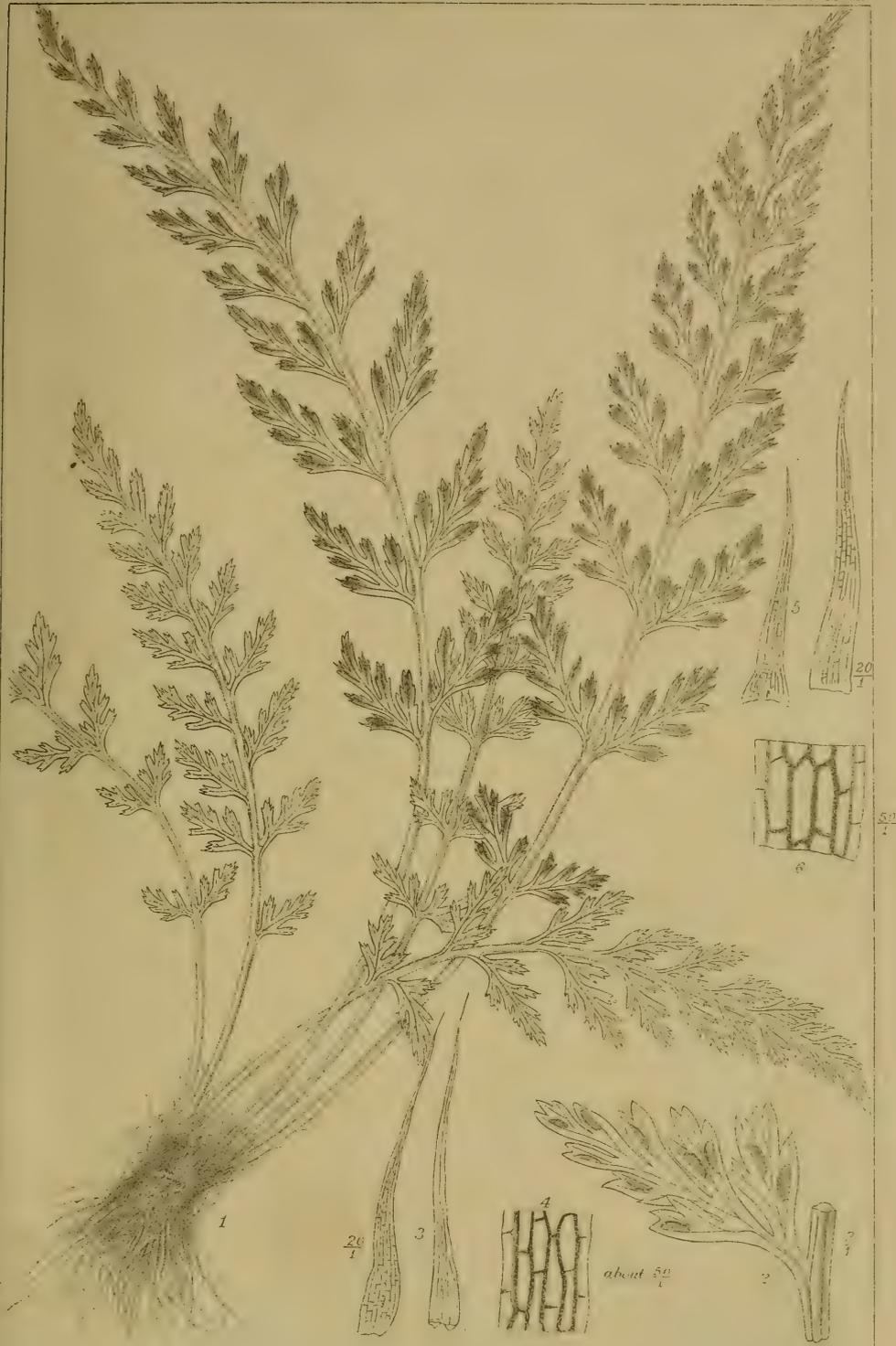
AFGHAN: *Kuram Valley*—Shend Toi, Aitch. 1879, "common on rocks"; Lakman Khel Tangi, Duthie's collr. 1894.

KASHMIR and BALTISTAN: 5-8500', T. T., Lev., Clarke; Sind Valley 7-8000', Lev. 1875, *Baltistan*: Shingo Valley—Shivaram Nāla 10-11,000', Duthie; Kishenganga Valley—McDonell 1891; near Gurais 7-9000', Duthie 1892, Masjid Valley, 13-14,000', Duthie 1893; Sitalwān gorge 5000', Martand ruins and Sib Bāba Temple McLeod 1891 (in List).

N.-W. P.: *Kumaun*—Byāns, Kāli Valley, near Kangua 10-12,000', Duthie 1884; Kutti Yangti Valley 10-11,000', and Dhauli Valley 10,000', Duthie 1886.

NEPAL, W.:—*Kāli Valley*, near Kangua 11-12,000', Duthie 1884.

DISTRIB.—*Amer.*: *U. S.*; many parts. *Eur.*: Throughout—from Arctic Regions, to Spain and Portugal, Italy, Medit. Isles, Greece, Turkey. *Asia*: Turkish Armenia Ural Mts. to Caucasus; Turkestan 6000'; Thibet; Siberia. *Afr.*: Algiers, Cape Colony.



J.N. Fitch del.

A. C. Mukerjee lith.

## ASPLENIUM SAULII Hook.

1. Plant natural size.
2. A pinna  $\times 3$ .
3. Scales from base of stipes  $\times 20$ .
4. Portion of scale No. 5  $\times 50$ .
- 5 & 6. Scales from higher up on stipes  $\times 20$  and  $50$ .



Duthie's discoveries of four stations in Kumaun, and another—adjacent—in West Nepál, carry this fern much farther eastward in India than it was before known to grow. The gap between West Kashmir and Kumaun ought to be filled up. There is much variety in cutting in Duthie's specimens, as there is also in both cutting and size in the European plant, of which botanists have made several varieties. I have a plant I gathered on the inside wall of a ruined stove-house, exposed to the weather, in a garden near Edinburgh, on the old walls of which the species was abundant, which had 80 or 100 living fronds, and, as pressed, occupies a fan-shaped area 11 by 8 inches. This shows what the plant is capable of.

11. *A. Saulii*, Hook.; Syn. Fil. 216. *A. pekinense*, Hance, Syn. Fil. 213. (See Baker in Summary of New Ferns, Ann. Bot., Vol. V., No. XVIII), C. R. 483; Bedd. H. B. 156. *A. Saulii*, Hk., var. *pekinense*, Hance Bedd. Suppt. H. B. 31. Plate XVIII.

KASHMIR.—*Jhelam Valley*, 2-2500', Lev. 1875, 4000',—Trotter 1889; between Rámpur and Uri, "common; a few plants at Chakoti", MacLeod 1891; Chakot 3600', McDonell 1891.

PUNJAB: *Hazára*—Dhamtaur 4500', Leo Qertel 1890. *Chamba*—Rávi Valley, near Rák 4000, McDonell 1882; *Kullu*, Trotter (in List).

DISTRIB.—*Asia*: Japan, *Oldham*. China—Szechuan, *Blakiston*, *Maingay*, *Robinson*; Peking Mts., *Hancock*; Ningpo Mts., *Faber*.

Mr. Baker in his Summary of New Ferns, 1891, unites *A. pekinense*, Hance, with *A. Saulii*, Hook., saying—"Further material shows that *A. Saulii*, Hook. in Blakiston's Yangtsze, 303 (1862) is a larger, more compound, form of the same species (*A. pekinense*, Hance), and *A. Saulii* is the older name. It has lately been found by Levinge in the Himalaya (Chamba and Jhelam Valleys). I think Clarke is right as to Levinge's locality being in Kashmir, and the Jhelam does not flow through the Chamba State. In the Calcutta Herbarium, there are two sheets from Japan, named *A. sepulchrale*, Hook. = *A. pekinense*, Hance, *vide* Baker, of which the stipes are 6-8 in. long, and the fronds up to 10-11 in. l. by nearly 5 in. br.,—almost tripinnate. Dr. Christ's var. *latius*, published in 1897, is quite covered by the original description of *A. pekinense*, and by specimens in the Kew Herbarium from various parts of China and Japan.

12. *A. Adiantum-nigrum*, L.; Syn. Fil. 214; C. R. 483; Bedd. H. B. 156.

AFGHAN.: Griffith, in Herb. Hort. Kew.

TRANS. IND. STATES: *Baraul* 4-7800', Harris; 4000' Gataca.

KASHMIR: *Badrawar* 5400', and *Poosiana*, Clarke; "frequent 5-8000", (Cl. in Rev.); *Chandrabhága Valley* 7000', *Baden-Powell* 1879; *Lolab* 6000', and *Rembiára Valley* 6500', *Trotter* 1888; *Lolab*—*Dardpura* 5-7000'; "very common in the *Lolab*, on dry

clay bands" (embankments), MacLeod 1891; Martand Ruins 5500', McDonell 1891 Sind Valley 6-8000', T. T. (very large); Sind Valley—Kangan 6000', Gammie 1891: one sorus diplazoid; "Kashmir", W. Gollan, No. 9126 Herb, Saharanpur.

PUNJAB: *Hazara*—4—6500', Trotter 1886 and 1890; Murree 7000', Lev. 1875; Black Mt.—Panj Gali, Duthie 1888; Kagán and Siran Valleys 4—5000', Duthie's collr. 1896-97. *Chamba*—"Dalhousie and Chamba 4-6000', (Cl. in Rev.); Dalhousie, Colonel Dyas; McDonell (in List); "Chamba 5-6000'" J. Marten 1897; from Herb. Sahar.; *Kullu*, Edgew. in Herb. Hort. Calc.; *Simla Reg.*, Bates.

N.-W. P.: *T. Garh.*—Dr. Bacon; Herschel 1878; Ganges Valley—Gúmghúm Gád 8-9000', Duthie 1883; Lambatách 7000', Gamble 1891.

DISTRIB.—*Eur.*: United Kingdom; Norway and Denmark, through Holland, Belgium, Germany, France, Switzerland, Austria, Spain, Portugal, Mediterranean Region, Greece, Turkey.—*Asia*: Armenia, Syria, Arabia, Persia; Siberia; Java. *Afr.*: Azores, Canaries, Madeira (very common, ascending to 4000'), Cape Verde Isles. Kamerun Mts.; St. Helena; Algeria; Abyssinia; Natal; Cape Colony; Masc. Isles.

In the Kew Herbarium is a specimen marked "Mussooree, Dr. Bacon." This, and a specimen in the Saharanpur Herbarium, "Mussooree, Herschel," I have entered under *T. Garhwál*, as I do not think the plant grows in Mussoorie, or very near it. Mr. Gollan's fronds from Kashmir are the largest I have ever seen, and even larger fronds must have preceded them, judging by the old stipes left on the caudex.

13. *A. fontanum*, Bernh.; Syn. Fil. 216, excluding vars.; C. R. 484; Bedd. H. B. 158, excluding *var. exiguum*. Plate XIX.

AFGHAN.: *Kurum* Valley 11,000', Aitch. 1879; Peiwar Kotal 8000', Collett; Malána, Harsukh (Duthie's Collector) 1894.

TRANS-IND. STATES: *Baranul*—Mirga 8000', General Gatacre 1895.

KASHMIR: *Gilgit*: Tanner, Giles; *Baltistan* 10-11,000', Duthie 1892; elsewhere in numerous localities 45-12,000: Winterbottom 1847, Lev. 1875, Trotter, Gammie, Duthie, MacLeod, McDonell.

PUNJAB: *Hazára*—Black Mt., Duthie, 1888, Kagan Valley 5300', Trotter, 1889, 45-6090', Inayat (Duthie's Collr.) 1896-97. *Chamba*—10,000', Baden-Powell; over 8000', McDonell; *Simla Reg.*—Bisáhir: Jangi Forest 9500', Luce.

N.-W. P.: *T. Garh.*—Ganges Valley, 8-9000', Duthie; *Kumaun*—Niti Valley 10,000', Mackinnons 1882; Byáns—Kali Valley 11,000', Kutti-Yangti Valley 10-11,000', Duthie 1884 and 1886.

W. NEPAL: Kutti Valley 10-11,000', J. R. Reid.

DISTRIB.—*Eur.*: England? Scandinavia? Belgium, France, Switzerland, Germany, Hungary, Italy, and Greece. *Asia*: Lycia, Ural Mts.

I have not gathered *A. fontanum*; but I possess numerous specimens collected by Trotter, Levinge, McDonell, Duthie, and MacLeod, in *Házára*, Kashmir, Chamba, Tehri Garhwál and Kumaun, and others from Afghanistan to West Nepal, and have seen many more collected by them, and, except as to size, I can say that the specimens are very uniform. Mature plants vary from 2½ to 12 inches in height, including root-stock. The longest I have seen are Major



J.N. Fitch del.

A.C. Chowdhary lith.

*ASPENIUM FONTANUM* Bernh.

1. Portion of a large plant, natural size.
2. Frond of a large plant, natural size.
3. Portion of a frond  $\times 2\frac{1}{2}$ .
4. Caudex from another frond.
5. A small plant, natural size.



MacLeod's from Kashmir, at an altitude of 4500': I have is 12 inches high; and I noted, when going over his collection, another plant which had 16 fronds covering, as dried, an area of 15 by 10 inches. Major MacLeod noted that the size of the frond is reduced at high elevations, e.g., on Kuchil Peak, 12,000, alt., to only 3 inches. Two specimens from Kagan Valley, in Hazára, collected by Trotter, are 3 and 9 in. high, respectively; and from Chamba I have plants 3 in. and 7 in. There is never any resemblance or passage to the next species. The Indian specimens agree with the description of *A. fontanum* Bernh. in the *Syn. Fil.* in that they are all distinctly bipinnate: *A. exiguum* is never more than bipinnatifid. *A. fontanum* is always of a pale grass-green colour: almost yellowish sometimes: *A. exiguum* is dark green. And, corresponding to the cutting and venation, the position of the sori in the two plants is quite different. In *A. fontanum* the sori are all placed in the pinnules and segments, on the veinlets, without any relation to the costa of the pinna: in *A. exiguum* they are in a row on each side of and close to the costa. *A. fontanum*, so far as I know, never has fronds with the rhachis prolonged and rooting at the point; nor have I ever seen it proliferous on the pinnae. Both these features are characteristic of *A. exiguum*.

There is a wide hiatus in the record of distribution of *A. fontanum* between Chamba and the Ganges Valley in Tehri Garhwál (broken only by Mr. Lace's gathering in Bisáhir), the intervening ground, except near Simla, not having much searched for ferns. Blanford does not record it from the Simla Region; nor is it in Mr. Bliss's collection. In Kumaun *A. fontanum* is got at from 10,000 to 12,000 feet above the sea, and thus, apparently, the farther south the fern goes the higher the minimum altitude to which it descends. It ought, therefore, to be got at high altitudes in the Punjab Hill States, eastward of Chamba, and in Tehri and British Garhwál. A great deal of the European material, called *A. Halleri*, Willd. (under *Aspidium*), which by some botanists is reduced to *A. fontanum*, is more like *A. exiguum* than like *A. fontanum*; but the fronds of *A. Halleri* are broader for their length, and the sori do not lie along the costa or secondary rhachis. Willd. said of *A. Halleri*—"ab. *A. fontano* abunde distincta species."

14. *A. exiguum*, Bedd., Ferns of Southern India, p. 49, tt. 146. *Asplenium fontanum*, Bernh., var.  $\beta$ . *exiguum*, Bedd. H. B. 158. *A. fontanum*, Bernh. C. R. 484. *A. Glenniei*, Baker, Syn. Fil. (2nd Ed., p. 488.) *Athyrium gracile*, Fournier, Plant. Mex., p. 102.

Though Colonel Beddome, in his Handbook of 1883, dropped this fern as a species, I am obliged to revive it, because I cannot clearly separate from it a comparatively common North-West Himalaya fern. *A. Glenniei*, Baker, which is

identical with the Himalayan plant, is a later name. For Colonel Beddome's description, which was written from specimens found in only one locality in the Nilgiri Mountains, in S. India, and which hardly covers the Himalayan plant, I substitute the following, which was written many years ago :—

*Plants* isolated, or united in tufts by the matted roots ; *Caud.* erect, short ; *St.*  $\frac{1}{2}$ — $2\frac{1}{2}$  in., rarely more than  $1\frac{1}{2}$  in., densely tufted, soft, castaneous, clothed at base with linear hair-pointed dark-coloured scales, upwards more or less so clothed, scales gradually changing upwards to soft hairs ; *fr.* linear-lanceolate, bipinnatifid, never nearly bipinnate, 2—9 in. l.,  $\frac{1}{2}$ — $1\frac{1}{4}$  in. br. ; *rh.* flattened, winged, green in upper two-thirds, the castaneous colour of stipes extending farthest up the inferior side and sometimes in patches ; *pin.* 20-25 jugate, oblong with an expanded base, or cuneate, sometimes leafy and then obliquely triangular and less cut, subpetiolate, blunt, costæ inconspicuous, undulate laterally, lower pinnae more distant, shorter but scarcely narrower at base, sometimes trifoliate in shape ; *segm.* 3-6 jugate, having 1-6 teeth according to number of veinlets, lower margins concavely cut or scooped out, lowest anterior much cut away ; *colour* dark green ; *veins* immersed, obscure ; *sori* costal, one at the base of each segment, two or more in lowest anterior ; *fr.* often very attenuate upwards and rhachis prolonged and then rooting at tip ; *segm.* sometimes all truncate or emarginate at apex, and there proliferous.

PUNJAB : *Kullu*—7-9000', Trotter ; *Simla Reg.* 6-9000', not common ; Gamble, Collett, Cattell, Blanford, Hope, Trotter, Bliss.

N.-W. P. : *D. D. Dist.*—Jaunsar, Barasti 7000', Gamble ; Mussoorie—6000' Edgew., Dr. Bacon, Jameson's Collr. 1850 ; 5500'—7000', Lev. 1872, Mackinnons 1878, Hope 1880-1895 (seen and studied yearly), plentiful in places on rocks in damp forest ; "*Garhwal*" Lev. 1872 ; *T. Garh.*—Ganges Valley 6-7000', Duthie ; *Kumaun*—Naini Tal, by the lake-side, Hope 1861 ; Harsila, Davidson 1875 ; below Naini Tal 5-6000' Trotter ; Dhaulti Valley 10,000', Duthie 1885-86 ; MacLeod 1883. "N.-W. India", Falconer.

DISTRIB.—*N. Amer.* : "Mexico, *Mr. Consul Glennie*" ; Mexico—Rochers de Pedregal, *Bourgeau*, 1865-66, Chihuahua—Mapula Mts., *Pringle* 1866, Sonora, *Lloyd* 1890. United States—Arizona : Huachucha (?) Mts., *Lemmon* 1882.—*Asia* : N. Ind. (Him.) Sikkim (?) Wangtu, *Hook, fil. and Thoms.* 1847. S. Ind. : Nilgiri Mts., above Kalthatty waterfall, rare, *Beddome* 1864, Barliar 2500', *Gamble*. China—Moupin, *David* 1889 ; Mengtez ; Yunnan, *W. Hancock* 1893 : "shady rocks, very local."

I have found no difficulty in separating this Himalayan plant from *A. fontanum*, Bernh. ; but it is not without hesitation that I come to the conclusion that it is the same as Beddome's Nilgiri plant. Beddome found his plant only in one station, and he then thought it nearly allied to *A. camptorhachis*, Kze., which Baker unites with *A. lunulatum*, Sw.—Gamble has a dozen plants ticketed *A. exiguum*, which he got near Barliar, on the Nilgiris, 2500' alt., all small and narrow, and with prolonged rhachises. In the *Synopsis Filicum*, under

*A. fontanum*, Bernh., *A. exiguum*, Bedd., from the Nilgiris, is mentioned as being a less divided form, with narrow fronds and ebeneous rhachis; and the authors go on to say that a similar plant had been gathered in Mexico by Mr. Glennie. But in the 2nd Ed. Mr. Baker set up what appears to be Beddome's plant as a new species—" *A. Glenniei*, Baker; Hab. Mexico, *Consul Glennie, Bourgeau*, 252—Very like some of the forms of *fontanum*." When at Kew in 1888 I pointed out to Mr. Baker and Col. Beddome that the specimens of *A. Glenniei* in the Royal Herbarium were merely a common N.-W. Himalayan fern, which I had been calling *A. exiguum*, Bedd. Prolongation of the rhachis into a naked tail often bearing a young plant, was a character given by Beddome in his description of the species, though this was not mentioned in the Handbook where he degraded it to the rank of a variety. This is a normal though not an invariable character of the Himalayan plant, as it is said to be also of *A. micropteron*, Baker, Syn. Fil. 488,—“rhachis much produced beyond lamina, rooting at the tip. Hab. San Luis, 7000', Pearce.” *A. micropteron*, however, differs materially in having a flattened and broadly winged rhachis, and also in cutting of pinnæ. I think that there is here (excluding *A. micropteron*) only one species, quite distinct, however, from *A. fontanum*, and that the N.-W. Himalaya is its headquarters; because the plant there grows to a much larger size than in either South India or Mexico—judging from the few specimens sent thence—and is very plentiful in certain parts of the range about Mussoorie. Mr. Baker's type specimen of *A. Glenniei* has not a prolonged and rooting rhachis; but in the British Museum there is one plant, among *A. fontanum*, ticketed—"U. S. Pacific Coast Flora, (new to U. S.) var. 'Conservatory,' Huackue (Huachuea?) Mts., Arizona, August 1882, Lemmon Herbarium, Oakland, California," which is exactly the Mussoorie fern, and it is prolific on the pinnæ throughout, and at the apex of the frond. And there are, in the same herbarium, two specimens from America named *A. Glenniei*, Baker, which are exactly the Mussoorie plant. In the Calcutta Herbarium there are three specimens, named *A. Glenniei*, from America, one or two of which is the Mussoorie fern: the third is not.

The Mexican plant had been named *Athyrium gracile* by Fournier, in his Fil. Mex. 102, published in 1872, and Mr. Baker gives this as a synonym of his *A. Glenniei*. He was obliged to reject *gracile* as the specific name, because there was already *Asplenium gracile* of Feé, and also another plant so named by Pappé and Rawson. Fournier's plant is in the "*Herbier de la Commission Scientifique du Mexico, recueilli par M. Bourgeau 1865-66.*" Lemmon's plant collected in Arizona 1882, was identified by Baker as *A. Glenniei*, and was cited as *A. Glenniei*, Baker, by Eaton in the Bulletin of the Torrey Botanical

Club, 1883, p. 29; and the specimens collected by Pringle and Lloyd in Mexico in 1886 and 1894 also were so named. The entry in the Bulletin of the Torrey Club is as follows:—

“51. *Asplenium Glenniei*, Baker, described at p. 488 of the second edition of *Synopsis Filicum*, was scantily collected in the Huachuea Mts. by Prof. Lemmon. It is a small fern growing in little tufts like *A. montanum*; but the fronds are lanceolate, tapering both ways, 2-6 inches long, pinnate, with many pairs of oblong, toothed or pinnately lobed, deep-green pinnae. The sori are abundant, rather large, slightly curved outwards, and placed mostly very near the midrib of the pinnules. The fern comes near the old world *A. fontanum*, but it is not closely allied to any of our common species. I am obliged to Mr. Baker for the description.”

If the Nilgiri (S. Ind.) plant be admitted to be the same as the American and Himalayan plants (Beddome added “Himalayas” as a habitat in his Handbook) then Beddome’s name, being the older, must have priority over Baker’s name *A. Glenniei*. *A. yunnanense*, Franchet in Bull. Bot. Soc. France, 1885, p. 28, which Mr. Baker, in Ann. Bot. 1892, placed as a variety of *A. fontanum*, Bernh., near *var. exiguum*, and of which Beddome, in his supplement of 1892, after describing it, says—“seems hardly to differ from typical *fontanum*,” must, I think, also come under *A. exiguum*.

I have mentioned under *A. fontanum*, Bernh., some of the differences from it of *A. exiguum*; but indeed it would be more difficult to point out identical characters, or even resemblances between the two plants. *A. exiguum* varies considerably in width of frond and pinnae, and in cutting, but the variations are all away from the direction of *A. fontanum*. *A. exiguum* is abundant in many places within the municipal limits of Mussoorie, the hill sanitarium in the District of Dehra Dún, where I have chiefly observed it, at altitudes of about 5500’ to almost 7000 feet, on limestone rocks in the forest, generally with a north aspect. It grows in rock crevices, among moss, and spreads itself out like a star, the prolonged fronds bending backwards until they bury their tips in the moss seeking for cracks, or crevices, or earth, in which to root. The fronds last for two years, at least, living through the winter, in frost and snow, and through the succeeding dry, hot, weather in a shrivelled and apparently dead state until the rainy season comes in June or July, when they uncurl, and then frequently, if they have not already done so, produce young plants on their tips. This is followed by the springing up of fresh fronds from the same roots, generally not proliferous in that season, so far as I have seen. Judging from the numerous herbarium specimens I have seen, *A. fontanum* of the Himalaya has a more erect habit than *A. exiguum* has, and is never proliferous. Blanford says *A. exiguum* is rare in the neighbourhood of Simla. In Gamble’s collection I found 3 sheets with 11 specimens—from Simla. On the five days’ march from Simla to Bági,



J. N. Fitch del.

K. P. Dass lith.

*ASPENIUM VARIANS* Hook. et Grev.

1. Large Plant: natural size.
2. Pinna of a frond of same, enlarged 2 diams.
3. Small Plant: natural size.
4. Frond from the same, enlarged 2 diams.



eastward, on the great Thibet Road, in 1886, I saw only two or three specimens, at about 8000' altitude; but the fern may be more abundant at a lower level, off that road. In 1861 I saw one plant of *A. exiguum* at Naini Tal, by the side of the lake, but none anywhere else there, or on the way to Almora, 30 miles northward. There is no passage from this species to the next.

15. *A. varians*, Hook and Gr.; Syn. Fil. 216; C. R. 485; Bedd. H. B. 158. Plate XX.

AFGHAN.: *Kuram Valley*, Aitch. No. 469, 1899: "not common"; Peiwar Kotal 8000', Collett. 1879.

KASHMIR: *Baltistan*—near Skardo, T. T. Punch Pass 9000' and near Pashána 7500', Winterbottom 1847; Chittapáni, Jhelam, and Liddar Valleys 4-8000', Trotter, Duthie, MacLeod.

PUNJAB: *Hazára*—from Black Mt. eastward to Murree, 7-9000', Duthie, Oertel, Trotter, Levinge, Hope, and Duthie's collector. *Chamba*—Chenáb and Rávi Valleys 6-7000', McDonell, J. Marten; *Kullu*, 5-9000', Trotter, Coventry; *Simla Reg.* 5-10,500', common, but nowhere abundant; Bisáhir, Brandis and Lace 7000'.

N.-W. P.: *D. D. Dist.*—Jaunsar, Lokandi 8000', Gamble; Mussoorie, Jacquem.; common on rocks in forest at 5500'—7000'; *T. Garh.* 5-13,000', Duthie, C. G. Rogers, Gamble; *Kumaun*, frequent

DISTRIB.—*Asia*: N. Ind. (Him.)—Sikkim 9000', *Hooker fil.*, Kurseong 3000', *Lev.*; Bhotán 6500', *Griffith.* Assam—Khasi and Jaintia Hills. S. Ind.: common on Nilgiris and mountains on west side, 3000' and upwards (*Bedd. H. B.*). Ceylon, 3000, and upwards, Japan. N. China. *Afr.*—Cape Colony, Caffraria, Natal.

Mr. Clarke says that this species and *A. fontanum*, Bernh., are very nearly allied: I demur. He also says that it is not difficult to separate the Himalayan examples from *A. lanceolatum*, Huds.; while Beddome says a form found at Kulhati in the Nilgiris quite runs into the European *lanceolatum*. In Gamble's collection is a sheet from Levinge, ticketed "*A. lanceolatum*, Huds., Kulhati, Nilgiris, 5000', 26-6-83", two plants on which are distinctly *A. varians*, and a detached frond very like *A. lanceolatum*, only the segments are more sharply toothed and the sori longer. I got a specimen in Murree (N.-W. Himalaya) a good deal like *A. lanceolatum*; but I should say that that species, besides being thicker in texture, is less distinctly bipinnate than is *A. varians*, is less sharply toothed, and has shorter sori. The stipes and rhachis also are stouter than those of *A. varians*; and other differences might be pointed out.

16. *A. tenuifolium*, Don.; Syn. Fil. 220; C. R. 485; Bedd. H. B. 159, F. S. I., t. 130.

N.-W. P.: *D. D. Dist.*—Sowárna Nála 4500', Mackinnons 1878; P. W. Mackinnon and Hope, 1881.

DISTRIB.—*Asia*: N. Ind. (Him.)—Nepál, *Wallich*; Sikkim and Bhotán, 5-9000, common. Assam—Khasia 4-5500', frequent. Burma—Moulmein, *Parish*. S. Ind.: higher ranges of the Nilgiris, Pulneys and Anamallays. Ceylon—Newera Elya,

In his list of the ferns of the Punjab, printed for private circulation, Mr. Trotter wrote :—" it has been collected at 'The Glen' near Simla by Dr. Watt, Dr. Cattell and myself," but Mr. Blanford did not admit this; and Mr. Trotter did not include *A. tenuifolium* in a manuscript list he subsequently sent me; so I suppose the plants were only *A. varians*, which is quite different in cutting. Beddome's figure accurately represents the Dehra Dún plant.

Sub-genus *ATHYRIUM*, *Roth.*

[*A. Hohenackerianum*, Kze., was given by Dr. Cattell in his "Handy Guide to the known Ferns of the Himalaya", Lahore, 1877, as having been found at the Chadwick Falls, Simla, and the entry was repeated in Mr. Trotter's privately printed list. Mr. Levinge, in a letter to Mr. Baker, preserved in the Kew Herbarium, said—" No. 54 " (Trotter's pamphlet). " I do not believe that *A. Hohenackerianum*, Kze., was ever found in the Punjab. What Dr. Cattell got at the Chadwick Falls, Simla, (also alluded to by Blanford) was most likely *Aspl. drepanophyllum*, as I got the latter at Naini Tal in the N.-W. Himalaya'. I agree with Mr. Levinge's belief, but not in the suggestion as to what Dr. Cattell's plant was, for there is no evidence to support it.]

17. *A. drepanophyllum*, Baker; Syn. Fil. 226; C. R. 487. *Athyrium falcatum*, Bedd.: Bedd. H. B. 164. *Athyrium drepanophyllum*, Baker: Bedd. Suppt. H. B. 32.

N.-W. P.: *D. D. Dist.*—Badráj Mt. near Mussoorie, 5000', Mackinnons' Native Collector 1879.

*Kumaun*—below Naini Tal; in Herb. Gamble, coll. et com. Lev.: "2 or 3 miles above Ránibágh road up to Naini Tal, 3-4000'—Levinge in letter to Hope, 25th February 1892.

DISTRIB.—*Asia*: N. Ind.: Assam—Khasia Hills, *Mann*; Bengal—Parasnáth Mt., 3-4000', *Clarke*, *Rev. A. Campbell*; Palámow-Jaigir 2000', Gamble. Centr. Provs. (Ind.), Pachmarhi, *Blanford*, *Duthie*. "Centr. Ind.", *Col. R. Oakes*. Rájputána—Mt. Abu, King 1860. Penins. Ind.—Mts. of Malabar, from Mahableshtar and Belgaum southward to the Anamallays: *Clarke in 'Review'*; Ganjám Dist.; Myhendá Hill 4500', and Anamallay Mts., dry grassy places, 5000', *Bedd.* in H. B.

18. *A. thelypteroides*, Michx.; Syn. Fil. 226; C. R. 488. *Athyrium thelypteroides*, Michx.; Bedd. H. B. 164.

AFGHAN.: Shend Toi Valley 9-10,000, Aitch. 1880.

KASHMIR: Palgam 8500', Sind Valley 10,000, C. B. Clarke; 6-12,000, in various localities, Trotter, McDonell, Gammie, MacLeod, Duthie.

PANJAB: *Hazára*: Machpuri Mt. 8000, Trotter; Kagán Valley 14,400', Duthie's collr., 1896. *Chamba*—Kajiár 7000', Sara 11,000' C. B. Clarke; 7-8000', Baden-Powell, McDonell; *Kullu*—Jalori Pass 10,000', Trotter; *Simla Reg.*—Along ridge E. of Simla, from between Mahasu and Phagu to Hattu Mt., 8-10,000', Edgew., Bates, Collett, Blanf., Hope, Trotter, Bliss,

N.-W. P.: *T. Garh.*—8-13,000, Mackinnons and Duthie; *B. Garh.* 9-10,000', Duthie; *Kumaun* 7-13,000', Davidson, Duthie, MacLeod.

NEPAL, W.: 10-11,000', Duthie.

DISTRIB.—*N. Amer.*: Canada and U. S. A. *Asia*: N. Ind. (Htm.) Sikkim and Bhotán. Japan, *Faurie.* China—Yünnan, *Henry* and *Delavay*; N. Shensi, *Giraldi.* Amur Land.

I do not think the description in the *Synopsis Filicum* is altogether accurate, for the Himalaya plant at least; because I cannot find any double (diplazoid) sori at the basis of the pinnae. Nor should I say, looking at the Himalaya plant, that the species is "easily distinguished by its long sori in very regular rows." The involucre, especially near the main rhachis, are often very narrow in proportion to their length when in advance of or failing the development of the sporangia, and then they look long; but when the fructification is well developed, the sori look broad and short. They are longish, however, in some American specimens. The veins are generally quite straight where the sori are; but the inner or dehiscing side of the *involucre* is more or less curved, according to its width, so that its shape is more or less segmental, sometimes nearly semi-circular: Colonel Beddome describes the sori as short, oblong. Towards the apex of the frond, and the apices of the upper pinnae, the sori begin to vary in shape, some being curved across the vein, some didymochlaenoid, and some short-diplazoid—*i. e.*, the returning half of the sorus and involucre is quite separated by the vein from the basal half. In this case the upper part of the involucre is hardly as long as the lower. I look upon these variations in the form of the sorus and involucre as of importance only as showing that there is no sound distinction, in shape of sorus at least, between *Euasplenium*, *Athyrium*, and *Diplazium*, unless the last sub-genus be restricted to the plants which have long, narrow, double sori, such, *e. g.*, as *A. lanceum*, Thunb., and *A. bantamense*, Baker. *Asplenium (Dipl.) japonicum* is almost as much *Athyrium* as is *A. thelypteroides*, or *A. McDonelli*. I agree with Mr. Clarke that no varieties or even forms can be made out of this fern; but Dr. Christ, in a paper written jointly by him and Dr. Baroni, published at Florence in 1897, on the Ferns and Fern-allies of the Shen Si Province of China, has set up a new species—*A. Giraldi*. A comparison of the specimen of this new species which Dr. Christ sent to Kew with *A. thelypteroides* shows no variation whatever from the latter-named species. *A. thelypteroides* is gregarious, and careful examination would probably show that the rhizome is slowly creeping, though thick, and the plants in a bed may be connected.

19. **A. McDonelli**, Bedd. in Journ. Bot., March 1889, p. 73, under *Athyrium*. *Athyrium McDonelli*, Bedd., H. B. Suppt. 34. Plate XXI.

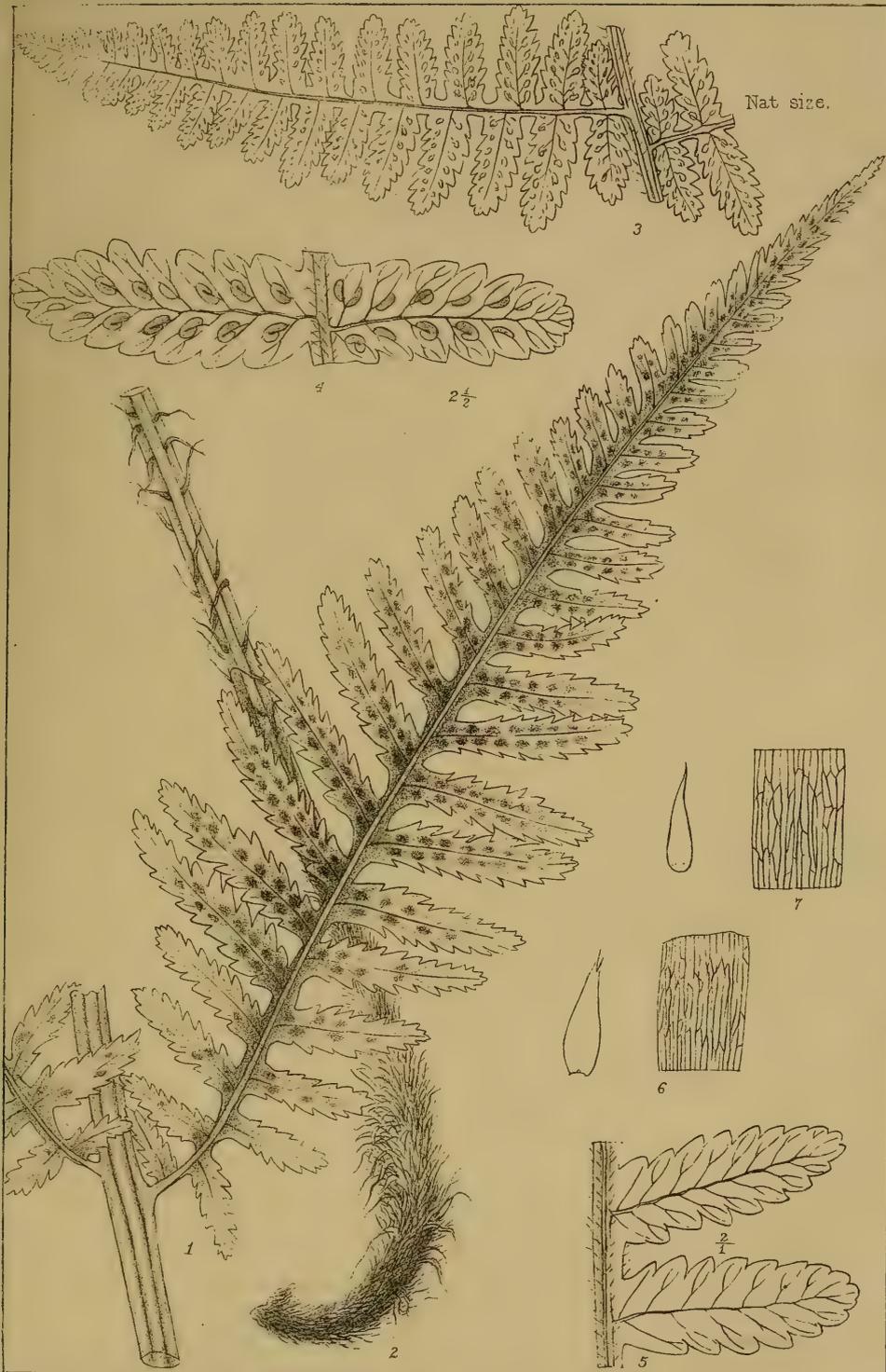
KASHMIR: Panjab 5500', Banjar—Harpal-Rai Nála 5000', Kitardaji 6000', McDonell, August 1891; Loláb Valley: Bámaháma and Aud'rbug 45-6000, MacLeod, September 1891.

PANJAB : *Chamba*.—Ravi Valley, Chadbent Forest 6,000', McDonell, 1882.

DISTRIB.—*Asia* : Japan—Yezo Prov., *l'Abbé Faurie*, 1889.

Colonel Beddome described this species in 1889 from two fronds, then shown to him by Mr. McDonell and myself. Mr. McDonell's frond had a bit of rhizome attached : mine had only an incomplete stipe. He (Mr. McDonell) had sent it to me several years before as *A. thelypteroides*, but I then noted that it was different and probably new. A third frond of the same gathering in Chamba I found, in 1896, in the Calcutta Herbarium. These were the only three fronds Mr. McDonell had up to that time got. After returning to India he was deputed to Kashmir, to have charge of the Forest Department of that State ; and in 1891 he found *A. McDonelli* plentiful in several localities there (W. and S. Kashmir, I think) ; and it seems probable that this fern has its headquarters in Kashmir, and that the Chamba station is an outlier. Mr. McDonell has explored Chamba thoroughly, and he is so sharp an observer that any other station there could hardly have escaped him. But, very curiously, the only specimen sent to Kew, as this fern, by its discoverer is, for me, *A. thelypteroides*. Mr. J. Marten, who has, more lately, been exploring in Chamba, does not seem to have found it.

The place of this species is clearly alongside of *A. thelypteroides*, and not where Colonel Beddome has placed it—after the *A. nigripes* group. The sterile fronds of young plants are hardly distinguishable in the herbarium, from similar fronds of *A. thelypteroides*, the cutting being sometimes almost identical. The main points of difference are :—(1) the rhizome, which is distinctly, though sometimes slowly, creeping in *A. McDonelli*, and erect or only procumbent in the other species (but see the suggestion at end of the last article) ; (2) the wider sinus between the segments or pinnules, which in *A. McDonelli* extends nearer to the rhachis, and in well-developed specimens is square or often ob-cuneate at the base ; (3) in *A. thelypteroides*, the frond narrows gradually at the base ; in *A. McDonelli*, it is truncate, the lowest pair of pinnæ being hardly shorter than those above ; (4) the shape of the pinnæ, which in *A. thelypteroides* is invariable (though hardly so wide as 1 in., as the *Synopsis Filicium* has it), but in *A. McDonelli* varies with the size and age of the plant :—In one large specimen from MacLeod, I find the lowest three pairs to be pronouncedly lanceolate, and of the following dimensions :—lowest  $7\frac{1}{4}$  in. l.,  $2\frac{3}{8}$  br. ; next pair above— $8\frac{1}{2}$  in. l., 2 in. br. ; third pair— $8\frac{1}{4}$  in. l.,  $1\frac{7}{8}$  in. br.—the pinnules or segments being themselves cut down half-way to the costa ; (5) in *A. thelypteroides*, the pinnæ are patent ; in *A. McDonelli* in large specimens acutely ascendant, the lowest less so. (6) the venation of the two species is quite different : in *A. thelypteroides* it is simple ; in *A. McDonelli* it is sub-pinnate, the vein forks, and one branch throws off one or even two



Nat size.

J. N. Fitch del.

K. P. Dass lith.

ASPLENIUM *McDONELLI* Bedd.

- 1. Basal pinnae of a large frond, nat size.
- 2. Portion of Rhizome and Stipes from a smaller frond, nat size.
- 3. Portion of frond, from original type specimen, nat. size
- 4. Segments of pinna from do.  $\times 2\frac{1}{2}$
- 5. Segments of pinna from another plant.
- 6. Scale from base of stipes and enlargement of portion  $\times 2$ .
- 7. Scale from stipes, & enlargement.



veinlets after entering the lobe ; (7) and finally, the fructification is different : there is no rigid, straight-backed sorus in *A. McDonelli*, but, on the contrary, the utmost possible liberty and variety of shape. There is generally one sorus to each lobe, on the superior veinlet ; but in the lowest lobe there are sometimes two, and then the lower is attached to the lower side of the inferior veinlet, and the upper to the upper side of the anterior veinlet, so that they are placed back to back, but separated by the space between the two veinlets. All shapes of involucre may be found on the same pinnule : short-asplenioid, athyroid, pear-shaped—spreading on both sides of a veinlet without any apparent sinus or back at either end, and short-diplazoid—as described above under *A. thelypteroides*. Beddome, I think, at first intended to describe *A. McDonelli* as a *Diplazium*, and he says it has the habit of the Ceylonese *D. Schkurii*, and the Cuban *D. conchatum*. It has almost as much right to a place under *Diplazium* as *A. japonicum* has. The description requires revision by the light of the new material from Kashmir. *A. Henryi*, Baker, from China, is doubtfully distinct.

(To be continued.)

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM  
AND BHUTAN,

BY G. C. DUDGEON, F.E.S., &C.,

WITH NOTES BY H. J. ELWES, F.Z.S., F.E.S., &C.,

AND

ADDITIONS BY SIR GEORGE F. HAMPSON, BART., B.A., F.E.S., &C.

PART X.

(Continued from page 425 of this Volume.)

Family HYPsidÆ.

Genus ANAGNIA, Wlk.

1132. *A. orbicularis*, Wlk.

Sikhim. I have not taken this. Mr. Hauxwell sent me a specimen from Thaungyin in Tenasserim which is the only one I have seen. (I have a specimen from Möller's collection.—*H. J. E.*)

Genus HYPsa, Hübn.

1134. *H. marmorea*, Wlk.

N.-E. India. I have no specimens corresponding with the description. Two insects from Bhutan in my collection are identical with two others from Burma and follow in characters the description of *H. butleri*, Swinh. and Butler's figure in Ill. Het. B. M., V. pl. 87, fig. 11, named *Neochera marmorea*, ♀, with the exception that the latter has an extra spot on the thorax and is not shown as suffused with white on the thorax and basal abdominal segments as in my specimens. (I have a specimen from Möller's collection which agrees with males from Assam and Pegu and with Butler's fig. 10.—*H. J. E.*)

1135. *H. butleri*, Swinh.

Bhutan, 2,500 feet. Two specimens taken by me at light in May and September. (I have one male from an old Darjeeling collection which agrees with Naga and Burmese examples.—*H. J. E.*)

1137. *H. monycha*, Cram.

Bhutan. I have only one male taken in May. Sir George Hampson has pointed out to me that *H. monycha* has the 2nd joint of the palpus barred with black, whereas *H. clavata*, Butl., has a lateral black stripe on that joint. (I have one specimen from Sikhim.—*H. J. E.*)

1140. *H. complana*, Wlk.

Sikhim, 1,800 feet. Not common. I have specimens taken in May and July.

1141. *H. tortuosa*, Moore.

Sikhim. Not known to me. (I have a pair of this; the female was taken by Knyvett in April.—*H. J. E.*)

1142. *H. heliconia*, Linn.

Sikhim. I have not seen a specimen. (I have both sexes from Möller's collection probably taken in the Terai.—*H. J. E.*)

1144. *H. egens*, Wlk.

Throughout N.-E. India (*Hampson*). I have not received it, but Mr. Elwes says he has several specimens from Möller's collection.

1148. *H. alciiphron*, Cram.

Sikhim and Bhutan, up to 6,000 feet. A very common insect, attracted to light and fruit in May, July, August and September. The larva feeds on a species of fig in Darjeeling.

1150. *H. producta*, Butl.

Sikhim and Bhutan, up to 3,500 feet. Another common species, distinguished from the last by the presence of an extra black spot on the costa of the forewing near the base which is often united to one of the others. The interspace between the costa and vein 12 of the forewing is usually white as also over the cilia of the outer margin below vein 5. Occurs from May to September.

1150a. *H. chloropyga*, Wlk.

Sikhim. A specimen from Dr. Pilcher's collection is in the British Museum.

1151. *H. enops*, Wlk.

Sikhim. I have one specimen without date or elevation marked. (Specimens from Möller's collection dated October vary much in the width of the black border on the hindwing.—*H. J. E.*)

1153. *H. ficus*, Fabr.

Sikhim and Bhutan. I have taken this in the latter locality in July. It occurs in the Kangra Valley, Punjab, also. (I have one specimen from Sikhim.—*H. J. E.*)

## Genus DIGAMA, Moore.

1155. *D. cribraria*, Fabr.

Sikhim and Bhutan up to 2,500 feet. I have only four specimens, taken in August, September and October. It occurs in large quantity

throughout the rainy season in the Kangra Valley, most plentifully at about 4,000 feet. *D. heaseyana*, Moore, is a synonym.

Genus DILEMERA, Hübn.

1261. *D. arctata*, Wlk.

Sikhim and Bhutan, 4,000 feet. I have only two females of this species in my collection, but have seen many others. It occurs in May. The genera *Dilemera* and *Nyctemera* have recently been transferred from LITHOSIINÆ.

1262. *D. caremissa*, Swinh.

Sikhim. I have not seen this. (I have it from Möller's collection without date or exact locality.—*H. J. E.*)

Genus NYCTEMERA, Hübn.

1263. *N. latecinia*, Cram.

Bhutan 1,000-2,000 feet. I took my specimens flying by day at Fagoo in July, November and December. (Specimens from Möller's collection are dated May and June.—*H. J. E.*)

1266. *N. plagifera*, Wlk.

Sikhim and Bhutan. Common at low elevations. I have taken specimens in October.

1267. *N. cenis*, Cram.

Sikhim and Bhutan. I have four specimens brought in by my collectors, but have never taken it myself. I think it is found at low elevations. (I have taken this myself in December, it also occurs in April.—*H. J. E.*)

1268. *N. varians*, Wlk.

Sikhim and Bhutan. Occurs commonly from May to August at 1,880 feet. The larva is black with lateral and dorsal series of long black hairs mixed with white ones. The pupa is red-brown and is formed in an open web cocoon between leaves, these webs are slightly covered with a chalky substance. (I have taken this at Pashok in June and have much smaller specimens from Bhutan taken in March.—*H. J. E.*)

“THE DISTRIBUTION OF VERTEBRATE ANIMALS  
IN INDIA, CEYLON, AND BURMA.”

BY W. T. BLANFORD, LL.D., F.R.S.

(Abstract.)

Several contributions on the subject of the distribution of *Vertebrata*, or geographical Zoology, in India and the neighbouring countries have been made by Elwes,\* von Pelzel,† Wallace,‡ Sharpe,§ Newton,|| Gadow,¶ Lydekker,\*\* and W. Selater,†† besides the present author.‡‡ The majority of these contributions deal, however, with birds or mammals alone, the first-named class having received the greatest amount of attention.

The completion of the seven volumes containing descriptions of all the *Vertebrata*, in the ‘Fauna of British India,’ affords an opportunity of reviewing generally the distribution of terrestrial vertebrate animals throughout the British possessions in India, Ceylon, and Burma. The limits are those of the British Indian territories and dependencies with the addition of Ceylon (which, although British, is not under the Indian Government), Baluchistan, all the Kashmir territories (with Gilgit, Ladak, &c.), Nepal, Sikhim, Bhutan, and other Cis-Himalayan States, Assam, Manipur, the Burmese Shan States, Karennee, and the Andaman and Nicobar Islands are included; but not Afghanistan, Kashgaria, Tibet, Yunnan, Siam, or the Malay Peninsula south of Tenasserim.

For the study of zoological distribution there are few, if any, regions on the earth’s surface that exceed British India and its dependencies in interest. The area is about 1,800,000 square miles, and although the vertebrate fauna is by no means thoroughly explored, it is well known throughout the greater part of the area and fairly known throughout the whole, better probably than in any other tropical and sub-tropical tract of approximately equal extent. The variety of climate is remarkable; within the area are included the almost rainless deserts of Sind and the locality on the Khasi Hills distinguished by the heaviest rainfall known, the cold arid plateau of the Upper Indus drainage, and the damp tropical forests of Malabar and Tenasserim. The country is bounded on the north by the highest mountain range in the world, and on the south by an ocean extending to the Antarctic regions.

\* ‘P.Z.S.’ 1873, p. 645.

† ‘Africa-Indian,’ ‘Verh. Z.-B. Ges. Wien.’ 1875, p. 62.

‡ ‘Geographical Distribution,’ vol. 1, pp. 81, &c., 1876.

§ ‘Natural Science,’ August, 1893, p. 108.

|| ‘Dictionary of Birds,’ p. 358 (1893).

¶ Bronn’s ‘Kl. Ord. d. Thierreichs,’ VI, 4, Vogel, p. 296 (1893).

\*\* ‘Geographical History of Mammals,’ p. 266 (1896).

†† ‘Geographical Journal,’ 1896, vol. 8, p. 380, ‘Geography of Mammals,’ p. 131.

‡‡ ‘Jour. As. Soc. Beng.’ vol. 39, pt. 2, p. 336 (1870); ‘A. M. N. H.’ (4), vol. 18, p. 277 (1876); Introduction to ‘Mammalia,’ ‘Fauna Brit. Ind.’ p. IV. (1888).

Another element of interest lies in the fact that the peninsula of India is a land of great geological antiquity, there being no evidence that it has ever been submerged, although the greater part of the Himalayas and Burma have at times been beneath the sea.

The plan adopted for the study has been to divide the whole country into nineteen tracts, distinguished by physical characters—such as rainfall, temperature, presence or absence of forests, and prevalence of hilly ground, and to construct tables showing the distribution of each genus of land or fresh water vertebrate in the tracts. Genera have been selected for consideration because families and sub-families are too few in number and too wide in range, whilst species are too numerous and too unequal in importance. It is recognised that there is much difference in the value of genera in different groups, the generic differences in passerine birds, for instance, being as a rule of inferior rank to those in some other orders of birds, or to those generally adopted amongst mammals, reptiles, and batrachians. In the demarcation of regions and sub-regions, terrestrial mammalia are regarded as of primary importance.

The tracts are the following:—

*A. Indo-Gangetic Plain.*

1. Punjab, Sind, Baluchistan, and Western Rajputana.
2. Gangetic Plain from Delhi to Rajmahal.
3. Bengal from Rajmahal to the Assam Hills.

*B. Indian Peninsula.*

4. Rajputana and Central India as far south as the Nerbudda.
5. Deccan from the Nerbudda to about 16° N. lat. and from the Western Ghats to long. 80° E.
6. Behar, Orissa, &c., from the Gangetic Plain to the Kistna.
7. Carnatic and Madras, south of 5 and 6, and east of the Western Ghats.
8. Malabar Coast, Concan, and Western Ghats or Sahyâdri range from the Tapti River to Cape Comorin.

*C. Ceylon.*

9. Northern and Eastern Ceylon.
10. Hill Ceylon, the Central, Western, and Southern Provinces.

*D. Himalayas.*

11. Western Tibet and the Himalayas above forest.
12. Western Himalayas from Hâzara to the western frontier of Nepal.
13. Eastern Himalayas, Nepal, Sikhim, Bhutan, &c.

*E. Assam and Burma.*

14. Assam and the hill ranges to the south, with Manipur and Arrakan.
15. Upper Burma, north of about 19° N. lat.
16. Pegu from the Arrakan Yoma to the hill ranges east of the Sittang.
17. Tenasserim as far south as the neighbourhood of Mergui.
18. South Tenasserim, south of about 13° N. lat.
19. Andaman and Nicobar Islands.

A review of the fauna of these tracts leads to the following conclusions:—

I. The Punjab tract differs greatly in its fauna from the Indian peninsula and from all countries to the eastward, so greatly that it cannot be regarded as part of the Indo-Malay or Oriental region. Of terrestrial mammals, bats excluded, 30 genera are met with, of which 8 or 26½ per cent. are not Indian, whilst of reptiles (omitting crocodiles and chelonians) 46 genera occur, and of these 20 or 43½ per cent. are unknown further east. Of the corresponding orders of mammalia 46 and of reptiles 80 genera occur in the Peninsula, and 24 or 52 per cent. of the former and 57 or 64 per cent. of the latter are not found in the Punjab tract. The differences would be larger but for the fact that certain genera, for instance, *Antelope* and *Boselaphus* (nilgai), are found east of the Indus though not further west, and that a few Indian species straggle into the Punjab area. All the genera met with in the Punjab tract and wanting farther east are either Holarctic forms or peculiar, but with Holarctic affinities.

The Punjab, Sind, and Western Rajputana are in fact the eastern extremity of the area known as the Eremian or Tyrrhenian or Mediterranean sub-region, generally regarded as part of the Holarctic region, but by some classed as a region by itself corresponding to the Sonoran in North America.

II. The Himalayas above the forests and such portions of Tibet as come within Indian political limits (Gilgit, Ladak, Zanskar, &c.) belong to the Tibetan sub-region of the Holarctic region. Of twenty-five mammalian genera hitherto recorded from No. 11 (the Tibetan) tract, 11 or 44 per cent. are not found in the Indo-Malay region. That Tibet forms a distinct mammalian sub-region has already been shown in other papers.\*

III. India proper from the base of the Himalayas to Cape Comorin, and from the Arabian Sea and the eastern boundary of the Punjab tract to the Bay of Bengal and the hills forming the eastern limit of the Gangetic alluvium, should, with the addition of the island of Ceylon, be regarded as a single sub-region and may be conveniently entitled the Cisgangetic sub-region.† The forests of the Sahyadri range and of the Western or Concan and Malabar coast and the hill area of Southern Ceylon have a far richer fauna than the remaining area, but are not sufficiently distinct to require sub-regional separation.

The hill fauna of the Sahyadri range, specially on the highest portions, such as the Nilgiri and Anaimalai Hills, and that of the hill group in South-western Ceylon, contain several Himalayan genera and species, but not sufficient to enable the S. Indian and Ceylonese areas to be classed with the Himalayan forest area in a separate sub-division or sub-region.

The Cisgangetic sub-region is distinguished from the Transgangetic by the presence amongst mammals of Hyænidæ, Erinaceinæ, Gerbillinæ, of three

\* 'Geol. Mag.,' 1892 (3), vol. 9, p. 164; 'P.Z.S.,' 1893, p. 448.

† The terms "Cisgangetic" and "Transgangetic" have already been employed by Professor Gadow, *l.s.c.*

peculiar genera of Antelopes and of some other types; amongst birds by the occurrence of Pterocletes (sand grouse), Phœnicopteri (flamingoes), Otididæ (bustards) and Cursoriinæ; amongst reptiles by the possession of the families Eublepharidæ, Chamæleontidæ, and Uropeltidæ, together with many peculiar Geckonidæ, Agamidæ, and Lacertidæ, and amongst batrachians by about one-half of the genera found in each sub-region being absent in the other. The difference between the reptiles and batrachians by itself would justify the classification of the two areas as distinct regions, a view adopted by several writers.

The following figures show the total number of genera recorded from the Cisgangetic sub-region and the percentage of them not ranging into the Transgangetic area, the Himalayas and Burma:—

|                       | Cisgangetic. | Not Transgangetic.   |
|-----------------------|--------------|----------------------|
| Mammals .....         | 62           | 14 or 22·5 per cent. |
| Birds .....           | 346          | 47 or 13 „           |
| Reptiles .....        | 93           | 39 or 42 „           |
| Batrachians .....     | 17           | 9 or 53 „            |
| Freshwater fishes ... | 58           | 9 or 15·5 „          |

Omitting bats, the number of Cisgangetic mammalian genera is forty-six, of which 14 or 30 per cent. are wanting in the Himalayas and east of the Bay of Bengal.

The difference between the Cisgangetic vertebrate fauna and that inhabiting the rest of the Indo-Malay or Oriental region is partly due to the absence in the former of numerous Eastern types, and partly to the presence of two constituents besides the Oriental genera, which, especially in forest, form a majority of the animals present. One of these two constituents consists of mammals, birds, and reptiles having a distinct relationship with Ethiopian and Holarctic genera, and with the Pliocene Siwalik fauna. This constituent of the Cisgangetic fauna it is proposed to distinguish by the term Aryan. The other constituent is composed of reptiles and batrachians, and may be termed the Dravidian element. The latter is well developed in the south of the Peninsula, and especially along the south-west or Malabar Coast and in Ceylon, but it gradually disappears to the northward, its northern limit, so far as is known at present, not extending to the 20th parallel of north latitude. It is probable that this is the oldest part of the Cisgangetic fauna, and it may have inhabited the country since India was connected by land with Madagascar and South Africa, across what is now the Indian Ocean, in Mesozoic and early Cenozoic times. The other two elements, the Indo-Malay or Oriental and the Aryan, are probably later immigrants, and its wider diffusion may indicate that the Oriental element has inhabited the Indian Peninsula longer than the Aryan has. There appears some reason for regarding the Oriental portion of the fauna as dating in India from Miocene times and the Aryan from Pliocene, whilst in the Pleistocene epoch the proportion of Aryan to Oriental types of mammals in India, as shown by the

fossil faunas of the Nerbudda and the Karnul Caves, was much larger than at the present day.

There are some other peculiarities of the Indian Peninsular fauna to which attention may be called. One of these is the presence of genera and sometimes of species which are found on both sides of the Bay of Bengal, but not in the Himalayas or Northern India. A good example is afforded by the genus *Trayulus*, of which one species inhabits Ceylon and India south of about 22° N. lat., whilst two others are found in Southern Tenasserim and the Malay Peninsula. In Pliocene times, the genus inhabited Northern India. Another instance is the lizard, *Liolepis guttatus*, found in Burma and Arrakan, and also in South Canara on the West Coast of India. Examples amongst reptiles are rather numerous. Moreover, whilst there are numerous alliances between the animals of Peninsular India and those of Africa, there are also some curious connections between India and Tropical America, but these are chiefly amongst invertebrates. Some, however, are found in reptiles. It is probable that such Indo-American connections are vestiges of older life than the Indo-African. They are of course, generally speaking, instances of animal groups once more widely distributed, but now only preserved in a few favourable tropical localities.

IV. The forest area of the Himalayas belongs to the same sub-region as Assam, Burma (except South Tenasserim), Southern China, Tonquin, Siam, and Cambodia, and to this sub-region the term Transgangetic may be applied. It is distinguished from the Cisgangetic sub-region by the absence of the animals already specified as characteristic of that area and by the presence of the following, which are wanting in the Indian Peninsula—Mammals: The families Simiidae, Procyonidae, Talpidae, and Spalacidae, and the sub-family Gymnurinae, besides numerous genera, such as *Prionodon*, *Helictis*, *Arctonyx*, *Atherura*, *Nemorhaldus*, and *Cemas*. Birds: The families Eurylamidae, Indicatoridae, and Heliornithidae, and the sub-family Paradoxornithinae. Reptiles: Platysternidae and Anguidae. Batrachians: Discophidae, Hyliidae, Pelobatidae, and Salamandridae.

The following are the numbers of the genera in the different classes recorded from the Indian portion of the Transgangetic region, but not from the Cisgangetic:—

|                          | Transgangetic. | Not Cisgangetic.   |
|--------------------------|----------------|--------------------|
| Mammals .....            | 74             | 26 or 35 per cent. |
| Birds .....              | 475            | 174 or 36·5 "      |
| Reptiles .....           | 84             | 30 or 35·5 "       |
| Batrachians .....        | 16             | 8 or 50 "          |
| Fresh water fishes ..... | 67             | 18 or 27 "         |

Omitting bats, the number of Transgangetic mammals within Indian limits are fifty-four, of which 22 or 40 per cent. are not Cisgangetic.

The relations of the Himalayan fauna to that of Assam and Burma on the one hand, and to that inhabiting the Peninsula of India on the other, may be

illustrated by the mammals with bats omitted. Of forty-one genera occurring in the Himalayas three are not found in the hills south of Assam or in Burma, whilst sixteen are wanting in the Cisgangetic region. It should be remembered that a large number of the genera are widespread forms. As the result is not in agreement with the views of some who have written on the subject, the relations of species have been examined. It results that eighty-one species of mammalia belonging to the orders Primates, Carnivora, Insectivora, Rodentia, and Ungulata are recorded from the forest regions of the Himalayas. Of these 2 are doubtful, 22 are not known to occur south of the Himalayan range in India or Burma, 21 are wide ranging forms and are found in both Burma and the Indian Peninsula, 1 only (*Hystria leucura*) is common to the Himalayan forests and the Indian Peninsula, but does not range east of the Bay of Bengal, whilst 35 are found in the countries east of the Bay of Bengal, but not in the Peninsula south of the Ganges. Of the 35 8 only range as far as the hills south of the Assam Valley, 16 to Burma proper, and 11 to the Malay Peninsula and Archipelago. Or, in other words, of the 79 Himalayan species 56 or 70 per cent. are common to the Transgangetic region, and only 22 or 28 per cent. to the Cisgangetic. Of the 22 species not ranging south of the Himalayas a large majority are either Holarctic species or belong to Holarctic genera.

The fauna of the Himalayan forest area is partly Holarctic, partly Indo-Malay. It is remarkably poor, when compared with the Cisgangetic and Burmese faunas, in reptiles and batrachians. It also contains but few peculiar genera of mammals and birds, and almost all the peculiar types that do occur have Holarctic affinities. The Oriental element in the fauna is very richly represented in the Eastern Himalayas and gradually diminishes to the westward, until in Kashmir and farther west it ceases to be the principal constituent. These facts are consistent with the theory that the Oriental constituent of the Himalayan fauna, or the greater portion of it, has migrated into the mountains from the eastward at a comparatively recent period. It is an important fact that this migration appears to have been from Assam and not from the Peninsula of India.

V. Southern Tenasserim agrees best in its vertebrata with the Malay Peninsula, and should be included in the Malayan sub-region of the Indo-Malay region.

The continental area of the Indo-Malay or Oriental region is divided into three sub-regions, Cisgangetic, Transgangetic and Malayan.

There are several points left which require explanation. There is the much greater richness of the Oriental constituent in the Cisgangetic fauna to the southward in Malabar and Ceylon, although this is far away from the main Oriental area, and the occurrence also in the southern part of the Peninsula of various mammalian, reptilian, and batrachian genera, such as *Loris*, *Tragulus*, *Draco*, *Lirolepis*, and *Ixulus*, which are represented in Burma and the Malay

countries but not in the Himalayas or Northern India. In connection with this the limitation of the Dravidian element to the south of India should also be remembered. Then there is the occurrence of certain Himalayan species on the mountains of Southern India and Burma, and even farther south, but not in the intervening area. There is also the predominance of the Western, or what I have proposed to call the Aryan, element in the Pleistocene fauna of the Nerbudda Valley, and of Karnul in the north of the Carnatic tract. Lastly we have to account for the apparently recent immigration of Oriental types into the Himalayas.

Whilst it is quite possible that other explanations may be found, it is evident that all these peculiarities of the Indian fauna may have been due to the Glacial epoch. The great terminal moraines occurring at about 7,000 feet in Sikhim, first discovered by Sir J. Hooker,\* whose observations have been confirmed by myself† and others, and the occurrence of similar moraines and other indications of ice action at even lower levels in the Western Himalayas, ‡ clearly show that the temperature of the mountain range must have been much lower than at the present day when no glacier in Sikhim is known to descend much below 14,000 feet.

During the coldest portion of the Glacial epoch, a large part of the higher mountains must have been covered by snow and ice, and the tropical Oriental fauna which had occupied the range, and which may have resembled that of the Indian Peninsula more than is the case at present, must have been driven to the base of the mountains or exterminated. The Holarctic forms apparently survived in larger numbers. The Assam Valley and the hill ranges to the southward would afford in damp, sheltered, forest-clad valleys and hill slopes a warmer refuge for the Oriental fauna than the open plains of Northern India and the much drier hills of the country south of the Gangetic plain. The Oriental types of the Peninsula generally must have been driven southwards, and some of them, such as *Loris* and *Tragulus*, which must originally have been in touch with their Burmese representatives, have never returned. It was probably during this cold period that the ossiferous Nerbudda beds and the deposits in the Karnul caves were accumulated. The tropical damp-loving Dravidian fauna, if it inhabited Northern India, must have been driven out of the country. Unless the temperature of India and Burma generally underwent a considerable diminution, it is not easy to understand how plants and animals of temperate Himalayan types succeeded in reaching the hills of Southern India and Ceylon, as well as those of Burma and the Malay Peninsula.

When the whole country became warmer again after the cold epoch had passed away, the Transgangetic fauna appears to have poured into the Hima-

\* 'Himalayan Journals,' vol. ii, pp. 7, &c.

† 'Jour., As. Soc., Beng.,' xl, 1871, Pt. 2, p. 393.

‡ 'Manual of the "Geology of India," Ed. 1, p. 373; Ed. 2, p. 14, and references there quoted.

layas from the eastward. At the present day the comparatively narrow Brahmaputra plain in Assam is far more extensively forest-clad, especially to the eastward, than is the much broader Gangetic plain of Northern India, and if, as is probable, the same difference between the two areas existed at the close of the Glacial epoch, it is easy to see how much greater the facilities for the migration of a forest-haunting fauna must have been across the Brahmaputra Valley than over the great plain of the Ganges. This difference alone would give the Transgangetic fauna of Burma an advantage over the Cisgangetic fauna in a race for the vacant Himalayas, even if the latter had not been driven farther to the southward than the former, as it probably was during the Glacial epoch.

The theory, however, is only put forward as a possible explanation of some remarkable features in the distribution of Indian vertebrates. At the same time, it does serve to account for several anomalies of which some solution is necessary. If thus accepted, it will add to the evidence, now considerable, in favour of the Glacial epoch having affected the whole world, and not having been a partial phenomenon induced by special conditions, such as local elevation.

*(The above paper was read before the Royal Society on 13th December, 1900, and appeared in the Proceedings of the Society in Vol. 67.)*

## MISCELLANEOUS NOTES.

## No. I.—AN APPEAL FOR ASSISTANCE IN COLLECTING GAD-FLIES, BOT-FLIES, AND WARBLE-FLIES.

With reference to Captain Nurse's Note in the Society's Journal regarding a Horse Bot-fly bred by him at Deesa, the specimens referred to have passed through my hands, and I have been able to identify them as *Gastrophilus pecorum*, ♂ and ♀. In spite of the misleading specific name the host is given in the text-books as *Equus caballus*. In v. d. Wulp's Catalogue of the *Diptera* of S. Asia (1896) only two species of *Æstridæ* are mentioned, viz., *G. equi* and *Therobia abdominalis*; since the publication of that work two species, viz., *Cobboldia elephantis* and *Gyrostoma sumatrensis* (the latter from larvæ only), have been added by Professor Brauer, of Vienna. In addition to *G. pecorum*, as above, Captain Nurse obtained at Simla a specimen of *Æstrus ovis* (an example of this species without locality is also in the B. N. H. S.'s collection). This exhausts our knowledge of Indian Gad-flies.

From the above it will be seen how meagre is our knowledge of the family, and it is in the hope of increasing it that I venture to appeal to members of the Society for assistance in collecting specimens of imagines, larvæ, and pupæ. With this object it will be, perhaps, advisable to give a list of the flies likely to be met with, their hosts, and a slight sketch of their life-histories.

A. Bot-flies : (Larvæ internal parasites in the stomach and intestines).

HORSE :—*Gastrophilus equi, pecorum, nasalis* and *hæmorrhoidalis*—All of these species have the same habits and are easily bred; it is only necessary to place the bots, after having been passed by the horse, in a jam-pot or other receptacle with some dead leaves, saw-dust, &c., for them to pupate under.

ASS :—Probably all four of the above species infest the ass also, while in addition *G. equi, var. asinina* is said to be peculiar to the donkey. This is a point requiring further investigation.

ELEPHANT :—*Cobboldia elephantis*—This is probably the most interesting Bot-fly known, it has been bred (by Professor Brauer alone) from bots passed by an elephant from Bangalore living in captivity at Vienna. The bots were described many years ago by Cobbold, but it was left to Professor Brauer to rear and describe the perfect insect. A coloured drawing of the perfect insect will be found in the *Beiträge zur Kenntniss ausseren ropaischer Æstrodan* by Dr. Brauer in the *Denk. K. A. ad. Wiss. Wien.*, Vol. XLIV., 1896. The bots are said to be passed by the elephants in the early morning, so a hint to the *mahouts* and coolies to examine the morning droppings of their charges may lead to some captures. Should any member of the Society at Bangalore, Baroda, or elsewhere be lucky enough to obtain these bots, their treatment should be the same as that of those bots. I believe the Vienna Museum is the

only museum enjoys a unique distinction in possessing specimens of the perfect insect of this Gad-fly.

It is an interesting question and worthy of investigation as to how these bots get into the elephant's stomach. In the case of the horse the eggs are laid about the knees, fetlocks, and shoulders, whence they are licked off and swallowed. In the case of the elephant some other method must be adopted, and it will probably be found that the eggs are deposited on the *khurbi* and other fodder.

RHINOCEROS:—*Gastrophilus rhinoceronis*, *Gyrostoma sumatrensis*—Larvæ only known. These are unlikely insects to breed. Still some member of the Society may come on fresh rhinoceros dung, or chance on a perfect fly in the jungle.

Bot-flies are sometimes to be caught round horses with a butterfly net, but this method is pure chance. The majority of the specimens will have to be bred; a few may be taken flying round oneself or one's companions, and a few (♂) caught sitting sunning themselves on the bare ground.

B. Warble-flies: (Larvæ in tumours under the skin).

OX:—*Hypoderma lineatum*, *bovis*.

DEER:—*H. acteon*, *diana*.

HORSE (?):—*H. (?) silenus*—A Warble-fly is said to attack the horse, but further evidence on this point is desirable.

SHEEP AND GOAT (?) :—It being almost impossible to breed Warble-flies, one must depend entirely on the capture of the perfect insect. In England and on the Continent, *H. lineatum* (the Common Cattle Warble-fly) is met with not unfrequently in the Spring sunning itself on bare places in roads; *H. bovis* (the Ox Warble-fly) has similar habits, but is much rarer, and appears in the hottest part of the summer; probably all members of the genus have similar habits.

C. (Larvæ in the frontal sinuses, pharynx, &c., of various animals).

THE SHEEP GAD-FLY:—*Oestrus ovis*—This fly may possibly be bred should the larvæ be found soon after being thrown out by the sheep. The perfect insect is taken occasionally sunning itself on tarred palings or other hot places, or in dull weather between the stones of the walls and other cracks and crevices round sheep folds. On these occasions the flies are very lethargic, and can be picked up with the forceps, but they are by no means easy of detection, as they look like dead flies spun up in a spider's web.

THE CAMEL GAD-FLY:—*Cephalomyia maculata*—I bred this fly at Aden from larvæ brought to me by camel men, who said that the maggots had been thrown out by the camels sneezing. The flies are easily reared, the maggots only requiring some dead leaves, saw-dust, &c., for them to pupate under. This Gad-fly is said to infest the buffalo as well as the camel, but this requires confirmation. I have never seen this fly alive in a state of nature, but it ought not to be difficult to obtain larvæ at stations in Sind, Rajputana and the Punjab.

DEER GAD-FLIES:—*Pharyugomyia picta*, *Cephenomyia rufibarbis*—These are the Gad-flies attacking the deer in England; probably some closely-allied species will be found in India. The habits of the perfect insect of *C. rufibarbis* are similar to those of *Hypoderma*.

Col. Bingham obtained (flying round a baggage yak in Native Sikhim, 7-94) a Gad-fly allied to *Microcephalus preywalskiji*, Portschinsky but probably a new species. *Microcephalus* appears to be allied to *Hypoderma*, and is, therefore, probably a Warble-fly.

D. Larvæ—Parasitic beneath the skin of rodents:—

*Cutiterebra*—No species recorded from the oriental region.

E. Habits of larvæ unknown:—

*Therobia abdominalis*—Most unknown.

All Gad-flies are said to frequent bare places on the summits of mountains.

Verb. Sap.—It is useless attempting to catch Gad-flies round domestic animals with a white butterfly net.

*Notes on the Preservation of Specimens, Larvæ, &c.*

When possible, it is desirable to obtain specimens of all stages, egg, larva, pupa and imago. Larvæ and pupæ are best preserved in weak spirit (66 p.c. alcohol).

The perfect insect should be killed in the Cyanide bottle. And here a word of warning. Do not kill the fly too soon after emergence from the pupa, as the integument will not have hardened, and the specimen will be under-coloured (teneral); on the other hand, do not leave your specimens too long, for they will knock themselves to pieces in the breeding cage. Experience alone will tell the proper time.

*Estridæ* brought home in glass-bottomed boxes often knock off the tips of their wings. They should, therefore, after capture, be at once stupified in the Cyanide bottle and then placed in the box. If left loose in the bottle the pubescence gets matted and the specimen spoilt. Gear required. Butterfly net (green gauze bag) any pattern, glass-bottomed boxes (nested, 4 or 5 sizes), Cyanide bottle, glass tubes (nested) for larvæ and pupæ, alcohol, discs cut out of 3-sheet Bristol board with a 20-bore wad-cutter (rectangular strips cut out of visiting cards, &c., do just as well), Kirby and Beard's No. 5 entomological pins. Having caught your fly take one of your discs, write locality, date, and any other item of interest on it, pin the insect about half way up the pin, thrust the cattu through the disc, arrange the legs on the card, and try to get the wings symmetrical, but do not attempt to set like a lepidopteron, it is enough to allow for all parts being easily examined, particularly coxæ, &c. Insects deteriorate rapidly in India from damp, &c., and as good specimens are desirable it is advisable to send home small consignments—"little and often," rather than big lots at long intervals.

Specimens consigned to me as under will be duly acknowledged and worked out. In the event of my absence from London, Mr. Austen has kindly consented to take charge of the specimens until my return.

Address—

COL. YERBURY,  
British Museum (Natural History),  
Care of E. E. Austen, Esq. Cromwell Road,  
S. Kensington,  
London, S. W.

Bots, Warblers, Maggots, &c., kill in boiling water and put in spirit (*circa* 66 p.c. alcohol) or 4 p.c. formal. Trade formaline is 40 p.c. formaldehyde, and this should be watered down to 4 (or even 3) per cent.

J. W. YERBURY.

LONDON, Dec. 1900.

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#### NO. II.—OCCASIONAL NOTES ON BIRDS' NESTING IN THE VICINITY OF POONA.

Several readers of our Journal have informed me that my Notes on Birds' Nesting have interested them, in consequence I am tempted to continue them.

These notes are in continuation of those which appeared in Part II., Vol. XIII., of the Society's Journal.

THE INDIAN RED MUNIA (*Sporæginthus amandava*) is now breeding. This pretty little cage-bird is stated to be uncommon in the Dekhan. This remark is not true so far as Poona is concerned, as it is very plentiful. It builds its nest alike in sugarcane, along the banks of the canal and in long grass, usually near water. The nest is placed low down, is well concealed, and would be difficult to discover but for the habits of the bird. My observations lead me to believe that both birds take part in the construction of the nest, in its earlier stages. As soon as it is domed the female commences laying, while the male continues to complete the nest and brings material to his mate to line it with. This material is something soft, such as feathers, flowering grasses, etc. When the nest is finished it is a most warm and cosy abode. It is while the completion is going on that the nest is so easily discovered, as the male betrays its whereabouts. On the 6th October I obtained three nests containing six fresh eggs each; this, I believe, is the complement. I discovered the nests by watching the male bird.

THE WHITE-THROATED MUNIA (*Uroloncha malabarica*) is very common. Like its cousin, the Red Munia, it is now breeding. It is not over-particular regarding the site chosen for its nest, though it has a preference for thorny bushes and trees. The nest is neater than that of the Red Munia exteriorly, being built of fine grass, but is not nearly so well finished off inside. I have noticed that bits of rag are often used in constructing the nest. Six would

appear to be the full complement of eggs, though I recently obtained 8 fresh eggs from one nest. This bird also continues building after eggs have been laid.

THE SPOTTED MUNIA (*Uroloncha punctulata*) is fairly plentiful during the monsoon, but disappears with the rains. I believe a few do remain to breed, but I have not succeeded in finding a nest yet.

THE LARGE PIED WAGTAIL (*Motacilla maderaspatensis*) is breeding again. I obtained four fresh eggs from nests on the 14th and 26th September.

THE RUFOUS-TAILED FINCH LARK (*Ammomanes phanicura*).—After contributing my last notes I found three more nests, two on the 22nd April, containing two slightly incubated eggs and two young nearly ready to fly, respectively, and the third on the 8th May with two fresh eggs. The first two were situated in the river bed under projecting rocks and were well concealed, while the third was under a clod in a ploughed field. They were all neatly finished off and well lined. In these parts two would seem to be the usual complement of eggs.

TICKELL'S BLUE FLYCATCHER (*Cyornis tickelli*).—Having found one nest of this little bird last year, I watched it very carefully this and found four nests, though I only obtained eggs out of two. The first was in a hole in a date palm about five feet from the ground, and contained four eggs. Curiously enough no attempt was made at a nest, the eggs being merely deposited in the hole. The second was in a hole in a tamarind tree some 20 feet from the ground; it contained three eggs which I did not take, hoping to get four. However, on returning a day or so later I found the eggs had disappeared. The third nest was placed on the ground amongst Bamboo roots and contained a young bird nearly ready to fly and an addled egg. The fourth was in a hole in a wall from which I obtained three eggs. In the last case the birds had repaired an old nest. In the last three instances the nests were well built and finished off. July seems the best month to search for nests.

THE INDIAN GREY TIT (*Parus atriceps*).—I found about a dozen nests of this little bird this season, some containing eggs, while the rest had young. They nest either in holes, in walls or trees, whichever is handiest. It is really wonderful into what a small hole a Grey Tit can squeeze. The foundation of the nest is usually any rubbish, moss, leaves, rags, snake-skins, coir, etc. On this the nest is placed and lined with hair, fur and any soft material; it is very warm and snug when completed. When building, it is an easy matter to discover the nest by merely watching the bird, but once this operation is over it is excessively difficult: the birds seem to avoid the neighbourhood of the nest, added to which the hen is a very close sitter, no amount of knocking or tapping will induce her to betray her home. Five to six eggs appear to be the complement.

THE SOUTHERN YELLOW TIT (*Macolophus haplonotus*) seems to be rather uncommon, so far as its eggs are concerned. The bird is fairly plentiful round the more wooded parts of Poona. I watched it pretty closely this

year, but was not over-successful in finding its nest. On the 15th July I saw a pair building, the site was a hole, excavated by a Coppersmith, in a Babul tree some 15 feet from the ground. I went on the 26th to take the nest, when I found it had been deserted, which was a disappointment. As "Mr. Coppersmith" was loafing round, I came to the conclusion that he had summarily ejected the Tit. On the 26th August I saw another pair building, this time the nest was in a Mango Tree, in an open grove, some 10 feet from the ground. On the 4th September I obtained 4 fresh eggs from it. On the 28th August I found a nest in a natural hole in a Pipal Tree, 10 feet from the ground, containing young. And on the 21st September I obtained 4, partially incubated eggs, from another nest in a Mango Tree. From the above I conclude that this bird nests a little later than the Grey Tit, but I hope to find out more about it next season. The nest is a *facsimile* of the Grey Tits' as are the eggs, though the latter are a trifle larger.

THE INDIAN WHITE EYE (*Zosterops palpebrosa*) is a common bird round Poona, and its cradle-nest, suspended in the fork of a shrub, is not hard to find. A pair built in my verandah. I watched the up-bringing of the family with great interest. Four eggs were laid and were hatched, but only two lived to leave the nest. I observed that two were much stronger than the others, that they received nearly all the food and attention of the parents accordingly and thrived; while the weaklings went to the wall. Twice a young one, which had been ousted, was replaced in the nest, but the parents, unlike human parents, seemed fonder of the stronger ones, who always shoved the weaker ones aside and got fed. A White Eye's nest is not constructed to hold four young birds. Why, then, should four be the full complement of eggs? The nest in question was bulged out to its full extent with the two strong and two weak birds. No one would have imagined that they belonged to the same brood. When the former were nearly fully fledged and ready to fly, the latter were almost devoid of covering. I have often noticed that birds laying 4 or 5 eggs are rarely followed by more than 2 or 3 young, and believe that the weak nearly always go to the wall, which accounts for it. I should like to know whether others, interested in birds, have noticed this.

THE WHITE-BREASTED KINGFISHER (*Halcyon smyrnensis*) breeds here from May to July, at least those are the best months to search for it. I obtained three nests this year containing 3, 4 and 5 eggs, respectively. The nests were situated in perpendicular banks over a running stream and were some 2 to 3 feet deep. The holes had evidently been excavated by the birds. I obtained eggs from the same nest-hole as I had found young last year. I could get my hand into the hole without enlarging it, so I hope to get another clutch next year.

THE COMMON BEE-EATER (*Merops viridis*) is plentiful and breeds from about the middle of April to the middle of May, that is the best time to look for eggs. They excavate holes to a depth of 2 feet and deposit 4 to 5 round white eggs at the bottom.

THE BLACK-CAPPED BLACKBIRD (*Merula nigripileus*).—I visited Khandalla two or three times during the monsoon and found many nests of this bird. It appears to prefer the open country to the east, which is studded with small trees and bushes to the dense jungle below the crest of the hills. The nest is a massive structure of decayed leaves, roots, etc., in which a good deal of moss and mud are incorporated, while it is finished off very neatly inside, being lined with some black-looking roots, not unlike the stem of maiden-hair fern. The site is usually in some small shrub or tree about 10 feet or so from the ground, a Cactus Bush being a very favourite spot. Three or four eggs are the complement. The native boys are very fond of plundering this bird's nest for the purpose of eating the eggs. The Kartkaris call this bird and the Malabar Whistling Thrush "Gogi" indiscriminately.

THE MALABAR WHISTLING THRUSH (*Myiophonus horsfieldii*), better known as "The Whistling School-boy," and called by the local shikaris "Black Boat," is to be seen and heard at all times at Khandalla during the monsoon. He is a great lover of water. No water-course or pool is without its "School-boy." This bird builds a very massive nest, and usually selects a wet site, but under cover. I found nests in the holes under the Reversing Station Bridge; water was dripping from these, but the interior was dry. I also noticed nests, in course of construction, in the perpendicular cliffs and on projecting ledges in wells. Three or four eggs are the complement.

THE WHITE-THROATED GROUND THRUSH (*Geothlypis cyanonotus*) is also fairly common at Khandalla. In contrast to the Black-capped Blackbird it appears to prefer the heavy jungle. It is a beautiful songster, one of the very best I know of. As its name suggests, it is a ground bird, and is to be seen hopping along, turning over leaves in search of worms. Its nest is a *facsimile* of the Black-capped Blackbird, and the site the same, *viz.*, in the fork of a tree some 10 to 15 feet from the ground. The natives call it "Sutar."

R. M. BETHAM, CAPT.,  
8th Bombay Infantry.

POONA, 24th October, 1900.

### NO. III.—ON A NEW SEROW FROM THE MALAY PENINSULA.

BY A. L. BUTLER, F.Z.S., CURATOR, SELANGOR STATE MUSEUM.

It has hitherto been supposed that the Serow which occurs in the Malay Peninsula is identical with *Nemorhædus sumatrensis* (Shaw). No skin from this region, however, has ever been sent to Europe, and on examining two specimens recently obtained on the Larut Hills, Perak, I am convinced that they belong to a species as yet undescribed.

From the following description it will be seen that the Malayan Serow differs conspicuously from *Nemorhædus sumatrensis* in its jet-black legs, the limbs in that species being always tan or rufous. This uniformity of colouring on body and limbs alone gives the animal an entirely different appearance from the Burmese Serow.

Nor does it agree in any way, as might perhaps have been expected, with Blyth's *N. rubidus* from Arakan. Blyth described the Arakan species (Cat. Mamm. Mus. As. Soc., 1863, p. 174), from a stuffed head, an adult skin and one of a kid, as being "of a red-brown colour with black dorsal list; the hair shorter than that of the others." The Malayan animal is mostly black, the under-colour on the back is greyish-white; the hair is not shorter than in *N. sumatrensis*.

Description of a female specimen in the Perak Museum, shot by Sir Frank Swettenham on the Larut Hills, Perak, early in 1899:—

NEMORHÆDUS SWETTENHAMI, sp. n.

General colour black, the back strongly and the sides slightly grizzled with grey, the bases of the hairs being whitish. Along the lips whitish-grey; the posterior portion of the upper lips, a patch on each side of the lower jaw, and one on the throat, rusty-red. Fars black, grizzled with rusty at the base, and lined and edged with greyish-white hairs. Mane black, mixed with whitish hairs on the fore part of the neck and with reddish hairs towards the withers. Insides of the thighs rusty-red. Remainder of head, neck, chest, belly, and legs black; Tail black.

Height at shoulder  $36\frac{1}{2}$  inches; from nose to root of tail over curves of body 58 inches; tail  $4\frac{1}{2}$  inches. Length of horns 6 inches.

Named after Sir Frank Swettenham, Resident-General of the Federated Malay States, whose specimen appears to be the first ever shot by a European.

Mr. L. Wray, of the Perak Museum, has seen an adult male in the flesh, too decomposed to be preserved, but of which he kept the skeleton. I once had an opportunity of watching one in the jungle for a minute or so not more than fifteen paces distant; and quite recently a kid was captured alive by coolies on the Larut Hills, having strayed into a wired-in tennis court. All these were similar in colour to the one described, which may therefore be taken as a typical specimen of the Malayan species. The kid differed from the adult only in having a very narrow ring of rufous round the top of the hoof. This youngster Mr. Wray and I were particularly anxious to send home alive to the Society's Gardens under the charge of Mr. Keilich, of the Perak Museum, who was shortly proceeding to England, but unfortunately it died after five or six days' captivity. The specimen is now in the Museum along with the adult.

Although this Serow is so little known to Europeans the horns are occasionally obtained from the Sakai tribes of the hills, and I have notes of a dozen pairs as follows:— $8\frac{1}{4}$  inches, 8,  $7\frac{1}{2}$ ,  $7\frac{1}{4}$ ,  $6\frac{3}{4}$ ,  $6\frac{3}{4}$ ,  $6\frac{1}{2}$ ,  $6\frac{3}{8}$ ,  $6\frac{3}{8}$ ,  $6\frac{1}{8}$ , 6, 6. Eight inches appears to be a good head.

The Malay name for this animal is "Kambing grun," i.e., "Cave-goat."

It is found on the mountains of the Peninsula from 2,000 ft. to 4,000 feet altitude, and is said also to occur on various isolated limestone hills of much lower elevation.

The peculiar circumstances under which Sir Frank shot his specimen were narrated in the 'Sketch' of April 26, 1899, p. 22, the article being illustrated with a photo of the mounted animal. Sir Frank was taking a photograph one afternoon when the Serow was noticed on the hill beneath him, apparently quite fascinated by the appearance of the cloth-covered camera on its tripod. It remained motionless, still gazing intently at the camera while a rifle was sent for, when an accurate shot brought it to bag.

(From the *Proceedings of the Zoological Soc. of London*, 19th June, 1900).

No. IV.—NOTES ON *ANOPHELES* OR THE MALARIA MOSQUITO.

In November last year, Colonel Weir suggested that the fever which prevailed in all the houses on the Nepean Mount Road might be attributable to mosquitoes produced in the stream of water which flows down from the reservoir to the sea on the west side of the hill. Accordingly, on the 18th of December, I went out and fished in the pools formed by the stream and found a number of larvæ. I did not at that time know the larva of *Anopheles*, but I reared those which I brought home, and when the mosquitoes came out there was no mistaking them. At Christmas I went up to Matheran, and hearing that there had been a good deal of malarious fever there during the past season, I went with Major Quicke to the lake to see if I could find any larvæ. We found no trace of them in the lake, and, indeed, if I had known as much as I do now, I should never have wasted time looking there. But in the little stream which feeds the lake we found larvæ and pupæ, one of which turned into an unmistakable *Anopheles* the same day. A fortnight later I went up again and found plenty. On the 24th of January I went with Dr. Christy to Chowpatty and examined the grassy puddles formed by the water which trickles down the east face of Malabar Hill below the reservoir. Here we found *Anopheles* larvæ in large numbers, and were not surprised to hear that the occupants of one of the bungalows which stand in that level piece of ground just under the hill were scarcely ever free from fever. I brought home a number and began regularly observing them, but I do not remember that I collected any more till the 26th of March, when I found them swarming in the Frere Fountain in front of Church Gate Street. On the 22nd of April I visited Colonel Weir at Bandora and accompanied him to the slaughter-houses, in the neighbourhood of which he said that fever had been rife. To my astonishment I found *Anopheles* larvæ swarming in a dirty drain filled with rotting straw, which gave the water the colour of beer. In May Colonel Weir sent me two or three bottles of water from other places in Bandora, with *Anopheles* larvæ in them. The breaking of the monsoon, of course, upset the haunts of all mosquitoes for a time, but on the 2nd of July I went out to Chinchpoogly and explored the quarries at the foot of the hill, where Dr. Christy told me he had found larvæ some time before. I found larvæ in many of the pools and

one specimen in a little puddle, not more than four inches deep, which must, I am sure, have been as dry as bone ten days before, for we had a long period of hot, sunny weather, as you will remember, in the middle of June.

On the 20th of July I went again to the place already mentioned, at Chowpatty, and found the pools dried up, but there was a long, narrow ditch, with a little water in it, filled with rotting vegetation and covered with an oily film, and in this I found plenty of *Culex* larvæ and a few *Anopheles*. On the 23rd of July I found *Anopheles* larvæ in the Wellington Fountain, opposite the Sailors' Home. I may mention that, at this time, both the fountains (Frere and Wellington) were nearly empty. They generally contained just an inch or two of water, kept up by occasional showers. The bottom and sides were covered with a green, slimy growth. One of them swarmed for a time with tadpoles, but there was little insect life in them. On the 24th I brought home a large number of *Anopheles* eggs from the Wellington Fountain and tried to rear them. The result will be mentioned afterwards. On the 17th of August I went to Chowpatty again and got a number of *Anopheles* larvæ in a pool which had almost dried up. It contained, in fact, little else than fluid mud, with an iridescent film on the surface. On the 26th of August I found larvæ swarming in the Frere Fountain, which had run almost dry and had been filled again a few days before. On the 14th of September I went with Mr. Leask and Dr. Venis to Malabar Hill and explored the stream below the reservoir. Since I found *Anopheles* here at the beginning of the year, a narrow masonry channel had been made to carry off the water and prevent it forming puddles, but this had not yet been carried right up to the reservoir, so that there was still the upper portion of the stream in its original state, trickling slowly among short grass and forming clear pools at intervals. Even where the masonry channel had been made there were many such pools at the sides of it, formed by water oozing out of the side of the hill. Here we found *Anopheles* larvæ in incredible numbers. I had never found them so abundant before. At the same time they began to swarm in the Wellington Fountain. I took up a hundred or more at one dip of my little net. From that time till now I have never failed to find them in that fountain. It was repaired some time ago and has been kept full ever since, which is decidedly against the mosquito, but the green *Fucus*, which grows on the bottom and sides, often gets detached under the influence of sunlight and floats on the top in masses, and in these the eggs are laid and the larvæ thrive. In the Frere Fountain, which has also been repaired and kept full, I have not found larvæ for some time, but I have not visited it so regularly.

In conclusion, I may mention that I found the larvæ plentiful at Chowpatty on the 23rd of October.

I will now sum up the conclusions at which I have arrived from these notes, and mention a few facts which I have either discovered for myself, or confirmed in the course of my observations.

In the first place, you will note that I have found larvæ in every month of the year, except February, when I did not look for them. But I had plenty in captivity during that month, which I had brought home in January. So it appears that, in a place with a moist climate, in which there is always some water to be found, mosquitoes can survive without hibernation and may be found at all seasons. But as with other insects generally in this Presidency, the time when they are most abundant is the close of the rains. As we all know, this is also the time when malarious fever is most prevalent. It does not follow that mosquitoes cannot tide over a time when there is no water, if they are reduced to that necessity. When I was out with Dr. Venis, we came upon a puddle in which he had found larvæ before, and found it without water, though not very dry. He scraped up some of the moist earth with a pen-knife and took it home and put it into filtered water, and in a few days minute larvæ appeared, showing that there had been eggs in the earth, which had retained their vitality. The eggs I have found have hatched in from one to seven days, but, of course, I did not know when they had been laid, and I have never been able to induce my tame mosquitos to lay in captivity, so I cannot say what is the normal time spent in the egg state. I may mention that the eggs are very like minute carroway seeds and easily recognised even with the naked eye when once you know them. They are laid singly on the surface of the water and not attached to anything.

I was anxious to ascertain next the length of the larva life, but found that it varied indefinitely with the conditions. Given warmth and plenty of food, a larva will come to maturity in eight days, or perhaps less, but I have had one for more than a fortnight, and then it died before becoming a pupa. The time spent in the pupa state in all my specimens was more than 24, but less than 48, hours. So I think we may put down the time which it takes to produce a mosquito at something between ten days and a fortnight from the laying of the egg, and water treated with kerosine oil once a fortnight should be perfectly safe. It is very difficult to ascertain the normal life of the adult mosquito, because we cannot keep them in natural conditions. Some of mine lived for ten days, but, as I have said, they would not lay their eggs, and that alone could not but affect the length of life.

Another matter of great practical importance is to ascertain the exact conditions in which the larva thrives, so that we may reverse those conditions, and also that we may know where *Anopheles* is likely to be found and where we need not look for it. But I have found it much easier to recognise the sort of water that suits them than to describe it, or explain

why it suits them. As far as my experience goes, you will never find them in tubs, flower-pots, buckets, or cisterns, where you will find larvæ of *Culex* in hundreds. Nor will you find them often in tanks, wells, or any deep water; nor in brown, muddy puddles; but in shallow, clear, or greenish pools, fed by running water, you will rarely miss them. I am inclined to think that they cannot live in absolutely stagnant water. It was a surprise to me to find them in the Frere and Wellington Fountains, but I think the explanation is that the water in these was always leaking away more or less and being renewed, either by showers of rain, or when the fountain was allowed to play, as it was occasionally. Since the fountains were repaired and kept full the larvæ have certainly diminished. But the only way of getting to a clear understanding of the conditions which any animal requires is to learn its habits; and the peculiar habits of the larva of *Anopheles* throw some light on the question before us. Its food is both vegetable and animal. The favourite vegetable food is a soft *Fucus*, very like cotton-wool dyed green, which is found in clear running water; or that thick, spongy growth which clothes the sides of fountains in which there are no fishes, and gets detached and floats like a thick, dark green scum. The principal animal food is the cast-off skins and pupa-cases of water larvæ, including those of its own kind, and the remains of dead mosquitoes and other small insects. These often collect in patches on the surface of a pond, and one dip under such a patch will secure hundreds of larvæ after you have searched the rest of the pond in vain. Now the larva of *Anopheles*, unlike that of *Culex*, floats flat on the surface of the water, and it is much more unwilling to go down than *Culex*. If green food is to be had not more than two or three inches deep, it will go down and feed, but it comes up again very soon, and would evidently rather not go down at all. As it floats you will see two little organs on the front of its head incessantly stirring the water. These are the "whorl-organs." They are crowned with little brushes of bristles, and their function is to keep up an eddy, by which every little floating particle which passes by is sucked in towards the insect's mouth. With a lens you can see this quite plainly and observe it seizing the little particles with its jaws, sometime eating them and sometimes throwing them away with an angry toss of its head. I do not think that even living objects, if small enough, are refused, and, in fact, I am almost sure that the larger larvæ sometimes eat the little ones. They are all very ill-natured and bite savagely at each other when they get the chance. This way of feeding explains why *Anopheles* likes a certain amount of motion in the water, for it brings food, and why it must starve in deep water unless there chances to be a great deal of food, animal or vegetable, floating on the surface. The larvæ of *Culex* dive much more freely and are more promiscuous in their diet, and, since they float with their heads down, they do not care much for floating matter.

Hence they dislike any motion. The more stagnant the water is and the more dirty, the better it pleases them. Lastly, *Anopheles* larvæ must have sunlight, though they will hate it more cordially than other mosquitoes when they come to mosquito's estate.

From my experience I should say that, of all larvicides, the most effectual, in the case of *Anopheles*, is little fishes. I have never found larvæ and fishes in the same pool. Once I put a large number of larvæ into two glass vessels and introduced a few gold fish into each. Next morning there was not one larva in either. They have many insect enemies, too, especially the larvæ of dragonflies, but one fish will do more than a hundred of these. Tadpoles do not eat them.

As regards the mature *Anopheles*, the most remarkable fact in my notes is that I have not seen one during these last twelve months, excepting those that I reared. This fact will give the best idea of what an insidious enemy we have to deal with. I lived most of the year at the Bombay Club, within a stone's throw of the Frere Fountain, in which *Anopheles* was being produced by the thousand, but I never saw one, though I was often tormented by *Culex*, the larvæ of which were comparatively scarce. *Anopheles* is a small, slim mosquito, of a pale ashy-grey colour, difficult to see at any time, and it appears to fly only by night, so it is rarely seen. Add to this that its bite appears to be almost painless, and you will see that one may have malaria injected into him night after night while he is sleeping without curtains under the belief that there are no mosquitoes. I say that its bite is almost painless on the authority of my own experiments only. I kept mine in a bottle with thin muslin tied over the mouth, and if I laid my arm on the muslin the females attacked me at once and did not leave off till they were bloated with blood. I sometimes felt a slight prick at the moment when they punctured the skin, but there was little or no irritation afterwards and no swelling. Of course, others might have been affected differently. The males never attempted to suck my blood, but they fed freely, as did the females also, on a slice of apple, fig, mango, or any juicy fruit. In default of fruit I gave them jam, or even sugar and water. After a meal of blood they seemed to feel heavy and indisposed for active exercise, but were quite ready again in 24 hours. It has been stated that *Anopheles* is mute. This is certainly a mistake. It has a very shrill pipe.

All the *Anopheles* that I have reared appear to belong to one species, which is probably *A. rossii*, but Colonel Giles's book makes mention of several other more or less distinct forms in India, and until the subject has been more fully studied it is better not to insist on a name.

E. H. AITKEN.

BOMBAY, December, 1900.

No. V.—ON THE OCCURRENCE OF *COCCYSTES COROMANDUS*  
(THE RED-WINGED CRESTED CUCKOO) IN BOMBAY.

It is not often that we have the opportunity of adding a new species to our list of local birds, but on the morning of 7th November a specimen of the very handsome Red-winged Crested Cuckoo (*C. coromandus*) was caught in the Society's museum, where it had no doubt sought shelter from the unwelcome attention of the crows, which are quicker even than the members of the Natural History Society to notice a stranger in the neighbourhood. That he should have happened to select the Society's rooms for his refuge is curious—not to say thoughtful of the bird,—for this species has only once previously been recorded from any part of this Presidency, *viz.*, a single specimen obtained by Mr. G. W. Vidal at Savantvadi so long ago as January, 1880, which specimen is in the Society's collection.

Mr. Blanford, in the third volume of Birds (*Fauna of British India*), prefaces his remarks on the distribution of the species with "this is a very rare bird in India." Its normal range extends from the base of the Himalayas in Nepal eastwards through Assam and Eastern Bengal, throughout Burma and Pegu to the Malay Peninsula, Southern China, the Philippines, Borneo and Celebes. It also occurs in Ceylon where it is said to be migratory, arriving about October and leaving again in April, and the bird under notice may possibly have been making its way thither.

The fact of its being in perfect adult plumage disposes of the possibility of its having escaped from captivity, for so shy a bird would at once show signs of confinement in a cage by damage to the edges of its long tail.

The skin has been made into an excellent specimen for our collection.

E. COMBER,

BOMBAY, 20th November, 1900.

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No. VI.—BIRDS OF PREY.

Yesterday I happened to be reading in our Journal, Vol. XIII., page 185, the query of Major Rodon with regard to Birds of Prey. Curiously enough, an incident that occurred early that morning furnishes a reply.

On a jhil in Mataundh, Banda District, yesterday morning, I shot a teal, which fell in some grass on the shore. I had to make a detour to reach it, and in the meantime a large hawk, that the *shikari* called *lāgār*, swooped down on the teal. When we reached the spot the hawk flew to a hillock, a few yards off, leaving only feathers where it had been eating on the shore. I said to the *shikari* that the hawk must have carried off the fragments in its beak. I fired and wounded the hawk, having no shot large enough to hit it, and it flew away, carrying nothing in its beak. But on the hillock

we found about half of the mangled teal. The rest the hawk must have eaten on the shore, whence it carried off the remainder only because we came up. I think it would be natural for birds of prey to carry away and eat their victims at a little distance from the plucked-out feathers, lest they should stick to the carcase and get in their beaks as they eat; but this hawk may have been in a hurry, as we were approaching.

AGNES S. BELL.

CAMP BANDA (N.-W. P.), 7th December, 1900.

NO. VII.—NOTES ON TRIPS TO PERAK AND SINGAPORE.

1. TRIP TO PERAK.—19th March to 18th April.—During this trip I devoted myself principally to making a large and representative collection of the reptiles and batrachians of the Larut Hills. The result was highly successful, 351 specimens of 56 species being obtained. The majority of these were of great rarity and interest. Ten species, new to science, were discovered and have been described by Mr. Boulenger of the British Museum in the *Annals and Magazine of Natural History*. They include five new frogs: *Microhyla annectens*, *Microhyla butleri*, *Ixalus larutensis*, *Ixalus vermiculatus* and *Leptobrachium heteropus*. Two flying lizards: *Draco formosus* and *Draco punctatus*. Three lizards: *Lygosoma stellatum*, *Lygosoma presigne* and *Gehyra larutensis*.

Four species not previously known to inhabit the Peninsula were obtained: *Calamaria vermiformis*, *Typhlops albiceps*, *Lygosoma bamfylldii* and *Draco microlepis*. Among other valuable captures were: *Lygosoma larutense*, *Lygosoma malayanum*, *Gehyra butleri*, *Draco blanfordii*, *Mezalophrys longipes*, *Phrynella pollicaris*, *Rana latopalmeta*, *Ixalus pictus* (found by Mr. Hale), *Rana hascheana*, *Microphyla leucostigma*, *Icthyophis monochrous*, *Lycodon butleri*, *Amblycephalus vertebralis*, *Macrocalamus lateralis*, etc. Many of these have only been obtained once or twice before; all are of great rarity. I was able to present to the British Museum an important collection of duplicates; other specimens were exchanged with the Raffles Museum, Singapore, and many more are still available for exchanges.

The British Museum authorities congratulated me on the success of this trip.

Mr. Hale, who was spending a month's leave on the hills at the same time, devoted his leisure to collecting land-shells, and procured 103 specimens of apparently 18 species. Many of these are rare and valuable, but I am unable to give a complete list of them until a collection, sent to Europe for identification and comparison with types, is returned to me. It is curious that on his expedition to Kina Balu, British North Borneo (1899), Dr. Hanitsch also procured 18 species of land shells, and the *Asian*, in noticing the result of his expedition, observed that anyone who had collected these mollusca would appreciate the difficulty of obtaining so many species from any one locality

at a high elevation." Little was done in the way of mammals and birds, the Perak Government declining to allow shooting on the hills. Spirit specimens were obtained of a rat (*Mus surifer*) recently described by American naturalists from specimens obtained by Dr. W. L. Abbott, at Trong, Lower Siam, and a small black shrew (*Crocidura fuliginosa*). I had an opportunity of examining a young serow (*Nemorhædus*) caught alive by some coolies near the cottage, and the similarity of this young specimen to the adults I have seen confirms me in my opinion that the serow of these hills is not, as has hitherto been supposed, *Nemorhadus sumatrensis*, but a distinct and new species.

Six species of scorpions were collected and sent home to be worked out. A small collection of Millepedes was also made.

Thirty-one species of butterflies were collected. A list of these has been published already in the *Gazette* (18th May).

2. VISIT TO SINGAPORE.—24th June to 1st July.—On this visit to the Raffles Museum I obtained a knowledge of their desiderata and of their duplicates available for exchange, and was able to arrange a system of exchanges which will, I hope, in future be of mutual advantage. I brought back some valuable specimens, including the following reptiles, new to our collection: *Lygosoma bowringii*, *Befo quadriporcatus*, *Hipsirhina boccourti*, *Microhyla achantna*, *Microhyla ornata*, *Hemidactylus platyurus*, *Jpalura nigrilabris*, *Tachydromus seelincetus*, *Gonatodes offinis*, &c., and a specimen of the rare and beautiful crested falcon (*Baza lophotes*). One day was devoted to an excursion to Bukit Timah, with Mr. Ridley, to hunt for a very rare—but very small—toad (*Nectophrine quentheri*) which was known to occur in that locality. One specimen was procured just before we gave up the search in the evening. I also brought back half a dozen tortoises of three species, kindly given me by Mr. Ridley: *Geoemyda spinosa*, *Cyclemys platynota* and *Cyclemys amboinensis*. I spent two days in examining the reptile collections in the Raffles Museum, and obtained many notes for a paper on the Reptiles and Batrachians of the Peninsula, on which I have been working for two years and which I hope shortly to publish.

A. L. BUTLER,  
Curator.

(From the *Silangor Government Gazette*.)

#### No. VIII.—ON THE LONGEVITY OF THE PERSIAN BULBUL.

Trustworthy evidence as to the longevity of birds being always difficult to obtain, I venture to think that the following facts are worthy of record:—

In 1891, nine years ago, I purchased a Persian Bulbul (*Molpastes leucotis*) from one of the nurses at the Cama Hospital, Bombay, whose brother-in-law, Captain Jourdain, had brought it, four or five years before, when it was quite young, from the Persian Gulf. It soon became perfectly tame and lead a life of liberty and happiness. It was only confined in a cage at night, and

spent the day hopping about in the children's ward, where it naturally became a great favourite. We kept the bird's wings slightly clipped for fear of losing it, but it never showed any desire to leave us. I frequently went through the compound with the bird perched on my hand or shoulder, when it would answer the calls of the wild Madras Bulbuls without making any attempt to join them. It had four distinct notes :—One of happiness,—used especially when in the sun or in the open air ; the warning note of danger—a low cry of greeting or thanks which it gave whenever I stroked it or brought it anything to eat ; and lastly, a low twittering or “ conversation ” which it carried on with itself, especially when observing its own reflection in a looking-glass.

As time went on my bird became more and more affectionate and tame. His happiest moments were when he was perched on the hand or on the lap, being stroked ; he loved it as much or even more than a cat does. His preference for the country over town life was very marked : in London he was dull and quiet, in the country, happy and joyous, calling and answering to the wild birds in the gardens. In England, however, he did not have quite as much liberty as in India, but still a great deal ; and only on one occasion did he take advantage of it to leave us for a short time. This was in a garden near Droitwich ; I had him on my hand when he suddenly took flight into some big elm trees near, and there he stayed for about two hours, very happy at first, as his notes of joy testified, but after a while finding nothing that suited him to eat in the branches, his song changed to that of discontent, and he came down into an apple tree and allowed himself to be taken in the hand.

As regards his food in England, not being able to supply him with enough grasshoppers, we found meal-worms made a good substitute, and those he continued to eat, combined with fruit of all kinds, and bread and milk till a few months before he died, when he renounced meat diet entirely. The bird, which has lived in captivity for about 14 years, died this year.

IDA CHINNERY.

TEDDINGTON, 10th December, 1900.

#### No. IX.—MUSK RAT ATTACKING A TOAD.

While sitting in the verandah of the Baroda Residency, soon after dark, one evening, recently, we were startled by the cry of a frog, or as it eventually proved to be, a toad. I suggested that the reptile was being attacked by a snake, which remark, as the noise proceeded from a spot apparently close to our chairs, caused a sudden cessation in the game of bridge that was in progress at the moment. After some difficulty we localised the noise under the platform placed opposite the central door for the convenience of visitors alighting from their carriages. Lights and sticks were procured and the platform was removed *in loco*.

We then saw a toad of the kind very common at Baroda with a musk-rat hanging on to his head : he had caught the toad between the eyes and hung

on like a bull-terrier. We knocked him off with a stick, but after running around once or twice he again fixed on the toad and was again beaten off. The space under the platform shewed the remains of many toads, so it was apparently a habit of this musk-rat to attack and kill toads. I noticed, however, that the most edible parts of the toads, at least those parts where the meat was, such as the thighs and legs, remained uneaten. Is it possible that the musk-rat caught and killed the toad so that he might get for his own use the insects that the toad had caught?

S. E. PRALL, MAJOR, I.M.S.

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No. X.—SQUIRRELS AND SATBHAIS.

In front of the house at Baroda, I often observed that the Squirrels, who made a wholesome respect for my terriers, used to come down from the trees with greater confidence and in greater numbers to feed when there was a family of Satbhais feeding on the ground. They seemed to think that there was a certain degree of safety from the wiles of the dogs afforded them by the watchfulness of the birds. The two dogs used to apply themselves to squirrel-hunting for the greater part of their day and must have been a very real danger to the squirrel population.

S. E. PRALL, MAJOR, I.M.S.

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No. XI.—SNARING OWLS IN NOOSES.

In the beginning of the month a female Brown Hawk Owl (*N. scutulata*) was brought me. It had been caught in a noose set near a chaur for ducks. Again, on the 27th, a female Short-eared Owl (*A. accipitrinus*) was brought me : it had also been snared at the same place in the same fashion. It seems surprising that nocturnal birds like owls should be caught in this way at night, one would have thought that they would steer clear of any snare.

CHAS. M. INGLIS,

BAGHOWNIE FTY., DURBHANGA, 27th January, 1901.

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No. XII.—OCCURRENCE OF BONELLI'S EAGLE AND THE GOLDEN-EYE DUCK AT MYINGYAN.

On the 25th January last I shot an eagle here off its nest and took three eggs.

Col. Bingham has since kindly identified the skin as that of a Bonelli's Eagle (*Hieraëtus fasciatus*).

The nest was on a large tree, and two of the eggs are faintly spotted, while one is spotless.

In December last, I shot a Golden-eye Duck, identified by Major Russell, I.M.S., and myself, but unfortunately the bird was stolen from my kit coming in. This bird was in a jheel and by itself, not with the other birds.

K. C. MACDONALD.

MYINGYAN, BURMA, February, 1901.

No. XIII.—THE LIFE-HISTORY OF *MYCALESIS (CALYSISME)*  
*SUBDITA*, MOORE.

A female, of the wet-season form, was captured April 24th, 1900, and put in a large French plum bottle with some of the food plant (guinea-grass).

Weather showery, sometimes heavy rain. Forty eggs laid on the 26th-27th, and began hatching May 2nd. Some of the eggs were laid on the food plant, others on the side of the bottle. Eggs pale green, very small, translucent, almost circular; the larvæ generally eat the egg-shell on emergence. Young larvæ light green from ingested food, head large in proportion to the body and very black.

May 5th—The larvæ have grown considerably, the largest  $\frac{3}{8}$ " , pale green with two black spines on the head and tail.

May 11th—The largest larvæ are now an inch long, pale green with darker green dorsal line deepening at head and tail to purplish-black; there is also an indication of a pale spiracular line; larvæ somewhat spindle-shaped.

May 14th—The larvæ change their skins every four days, and their appearance now is very different from that described above. Length  $1\frac{1}{4}$ " , somewhat pale pinkish-brown with darker brown dorsal line more pronounced towards the tail; ill-defined paler spiracular and darker supra-spiracular line; shorter and darker diagonal lines passing forwards and backwards and touching these longitudinal lines give a reticulated appearance. Head, dark pinkish-brown; spines, the same; both legs and prolegs same colour as the body.

May 16th—Larva when full fed nearly two inches in length, dull dirty-brown with disappearance of nearly all markings and lines.

May 17th—Pupa attached to grass by the tail suspended head downwards; the larva remains suspended for nearly twenty-four hours before the final ecdysis, and then turns to bright apple-green and remains this colour before changing finally to dull brown two days before emergence.

The first insect hatched May 24th. There were twelve males and twenty-eight females out of the batch of eggs. A considerable number were placed under mosquito netting over growing patches of the food plant; but unfortunately they did not breed. All the insects were of the rain-season form showing no variation. The weather during this time was as follows:—

April 25—Showery.

„ 29—Very heavy rain.

„ 30—Rain.

May 1—Showery.

„ 2—Very hot and sultry, rain in the evening.

„ 3-13—Fine and very hot.

(During this time the food-plant was kept in water, and consequently the atmosphere inside the plum jar was probably saturated with vapour, as the

mouth of the bottle was closed. After the 14th the stopper and water were removed and the food renewed daily.)

May 14-16—Dry and very hot.

„ 17—Thunderstorm.

„ 18-19—Fine and very hot.

„ 21—Heavy rain for a short time.

„ 22-23—Fine and dry.

„ 24-25—Rain in afternoon.

„ 26-27—Hot and dry.

„ 28—Tremendous downpour from 5 p.m. to 7-30 p.m.

*M. subdita* is a scarce insect at Trincomalie, and, so far, I have only met with the rain-season form, which is curious, as this is an exceptionally dry climate, except in November and December.

N. MANDERS, F.E.S., MAJOR, R.A.M.C.

TRINCOMALIE, CEYLON, 9th February, 1901.

#### NO. XIV.—A VISIT TO THE NULL AFTER THE FAMINE.

It may be of interest to our members to hear how various aquatic birds, our winter visitors, have absented themselves from the Null this year. First as to the Null itself. This is a large inland lake between Gujerat and Kathiawar, extending for about fifteen miles, and being about four miles across. It is of no great depth, and the water contains quantities of weeds on which wild fowl feed. There are large tracts of rushes in it, and the shores around and the numerous islands are covered in a great part with high rushes. It is the winter home of countless numbers of ducks, geese, snipe, flamingoes, pelicans, coots, and other waterfowl. Snipe are generally there in large wisps, and, strange to say, are always wild there. Duck, too, are also very wild, and a large bag is seldom made there although they are so numerous. Last year (the famine year) the Null was absolutely dry and, of course, no wildfowl stayed there. I was curious to know what would happen this year and whether the duck, etc., would return to their old haunts. Although the rainfall was deficient around the Null this year, the Null had quite the average amount of water in it. The water runs into it from various small streams, and I believe that the river at Wadhwan flows into it. There is no outlet. Some of my friends reported to me that they had their Christmas camps at the Null, but there were no duck or snipe there. I have been there at Christmas time about ten times. This year I was not in India at Christmas, but on the 16th February I arrived on the Null and spent a few days on it. My local *shikaries* reported there had been no snipe whatever there, but that lately a fair amount of duck had arrived. I found there were a fair amount of duck at one end of the Null, but no snipe, a few pelicans and flamingoes. Geese I heard in the night. There were not the usual amount of coots, and, strange to say, I did not see a single purple coot. There were no quail about

either. Although the Null was quite dry last year there were plenty of fish in it this year, and my men caught one of 3-lb. weight. Where do these come from?

Large herds of buffaloes with their attendants go to the Null, usually in the cold weather. The buffaloes find good food in the rushes, and large quantities of ghee are produced here. It was lamentable to find that all these had died with the exception of one small herd on one island. The villages around presented a sad appearance—the greater number of the houses in ruins, and from half to two-third of the people dead. A mild famine exists again this year, as they had again a scanty rainfall, and few of the fields were tilled. Strange to say, I saw more bullocks than I expected. From all over the Bombay Presidency I hear duck, snipe and wildfowl have not visited us this year. I suppose there can be no question that this is because last year they came as usual and found no water. Having learnt that lesson they thought it was useless to come again; but can birds think, that is another question.

REG. GILBERT.

BOMBAY, 26th February, 1901.

#### No. XV.—THE FAUNA OF AMOY.

Amoy is a small island on the coast of China, 325 miles E. N. E. of Canton direct. It measures nine miles by seven miles, and has a population of under half a million souls. It is a treaty port, or rather the town of Amoy on the island of that name, is. My friend, Mr. Eth. F. Skertchly, has just visited it on a trip in search of health, and sends me the following amusing account of his natural history observations on the fauna of the island, where he spent ten days. He writes:—"During the time I was there not only did I work out the flora and fauna of the island of Kulangou, but I took a census of the animal and insect-life there. The mammals were represented by an old rat with a barren wife who inhabited my bedroom and talked of the good old days before the plague; and a cat whose morals would not have been above reproach but for the absence of all female society. There were some dogs and pigs, to be sure, but they, being Chinese, were unnatural and unhistorical, and therefore unworthy of inclusion in my catalogue. The birds were best represented. A pair of magpies had been consigned to penal servitude at the last criminal sessions held on the mainland, and spent their time in trying to pervert the morals of Kulangou. Seven sparrows, six males and a female, dragged out a fairly joyous existence by an inordinate indulgence in scandal and the divorce court. Nine kites spent the day perching on the main-top-mast stay of H.M.S. *Argonaut* and kept a couple of ordinary seamen busy with a swab removing from the deck the evidences of their insanitary up-bringing. A couple of mynahs ran the local paper, evidently a most scurrilous print. Of insects, the butterflies were represented by one forlorn *Papilio polytes*, Linnaeus, a damaged *Papilio*

*clytia*, Linnæus, two *Terias hecabe*, Linnæus, and a *Neptis eurynome*, Westwood, that had only half a wing left. There used to be a mosquito of the genus *Anopheles*, but the local doctor kept it in a cage in his backyard till it died, for fear that it should inoculate the people with malaria, so the race is now extinct. Altogether the naturalist in search of novelties would find but little to interest him in the island."

LIONEL DE NICÉVILLE.

INDIAN MUSEUM, CALCUTTA, 23rd February, 1901.

No. XVI.—NIDIFICATION OF THE SPOTTED SAND-GROUSE  
(*PTEROCLES SENEGALLUS*).

I think it is worth recording the fact that I have recently obtained the eggs of the Spotted Sand-Grouse (*Pterocles senegallus*).

Mr. Fletcher, of the Salt Preventive Frontier Force, living fourteen miles north of this, shot some of these birds on the 19th instant, and from three of them one egg each was obtained. Two of these eggs are now in my collection, the third having the shell too soft to blow. The two eggs I have are pure white with the shell smooth and glossy.

On reference to my books on Birds, I find that Blanford records having obtained one egg "from a female shot west of Shikarpur on March 20th, 1875." This egg was apparently sent to Mr. Hume, who refers to it in his Book "Nests and Eggs of Indian Birds," as follows:—

"In shape and size the egg is similar to that of *P. exustus*, but the markings are much more sparse than in any egg of that species that I have ever seen. The egg is, of course, cylindro-ovoidal, the ground-colour is a pale yellowish-stone colour, and the markings, which are thinly distributed over the surface of the egg, consist of olive-brown spots and tiny blotches with a few crooked and hooked lines: besides these a few pale lilac-purplish or inky-grey spots, streaks and smears, having a sub-surface appearance, are scattered irregularly about the surface of the egg. Having been extracted from the body of the bird, the egg has of course but little gloss."

Barnes, in his "Hand-book to the Birds of the Bombay Presidency," refers to this bird in the following terms:—"Within our limits the Spotted Sand-grouse is only common in Sind, but stragglers occasionally find their way into portions of Gujarat and even Rajputana. A few apparently remain to breed in Sind, but most of them are mere cold weather visitants."

My experience of the Spotted Sand-grouse is that they are to be found *in numbers* all along the Runn, 100 miles north of this, during the cold weather, and a fair number of them remain throughout the year, as I have seen them in the hot weather and during the monsoon.

The fact of the two eggs I have being white is, I think, attributable to their having been taken from the birds perhaps a day before they would ordinarily have been laid, for it is a fact that the eggs of some birds develop their

colour after being laid and coming into contact with the light. I have taken eggs from Rain Quail which were pure white, whereas the eggs of this bird, when ordinarily found in the nest, are profusely spotted and sometimes boldly blotched with dark purple, the ground-colour of the egg being yellowish. In the same way I have taken an egg from a Florikan that was a very pale blue and without any gloss, whereas the ordinary colour of this bird's egg is dark sap-green, and the egg has a fine gloss over it. It is somewhat curious that the egg referred to by Blanford and Hume should be coloured and yet with little gloss, whereas my two eggs are pure white but decidedly glossy.

HARRINGTON BULKLEY.

KHARAGHORA, 27th February, 1901.

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In continuation of my letter *re* the nidification of *Pterocles senegallus*, I write to say that I have this morning received from Mr. Fletcher another egg of the same species taken from a bird after it had been shot.

This egg, unlike the other two, has the colouring well developed with a fair amount of gloss, and is thus similar to the one obtained by Blanford and sent to Mr. Hume. Unfortunately the egg was broken when the bird fell shot.

HARRINGTON BULKLEY.

KHARAGHORA, 2nd March, 1901.

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#### NO. XVII.—THE SHOVELLER AS AN ARTICLE OF FOOD.

The Shoveller, though one of the rankest of ducks, in the old days was not the despised bird it is now. Sir William Jardine, Bart., in his "Naturalists' Library," published in 1845, Vol. XIV., part 4, says:—"In America it is much esteemed for the table, and Audobon remarks that "no one should pass a shoveller to shoot a canvas-back." . . . . In the poetry of Howard, Earl of Surrey, the second course for His Grace the Duke of Norfolk is made to contain, among other fowl, four seapeys, two shovellers, &c." Fancy anybody shooting a shoveller for the table when he can get a canvas-back!

CHAS. M. INGLIS.

BAGHOWNIE FTY., DURBHANGA,  
28th February, 1901.

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#### NO. XVIII.—OCCURRENCE OF *MACRORHAMPHUS SEMIPALMATUS* IN ASSAM.

Mr. Macdonald, of the Titadimru Tea Estate in Lakhimpore, Upper Assam, shot a specimen of the Snipe-billed Godwit when out snipe-shooting on the

23rd December, 1899. This is the first recorded instance of its occurrence in Assam and interesting, also, taken in conjunction with its re-occurrence, for the second time, in South Malaya, Butler having this year recorded it there.

The bird was sent in to me for identification.

E. L. STUART BAKER, F.Z.S.

DIBRUGARH, ASSAM, 25th February, 1901.

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NO. XIX.—THE NIDIFICATION OF *RIMATOR MALACOPTILUS*.

The last number of this journal contained two accounts of the nidification of the Long-billed Babbler, which are so conflicting that I feel it necessary to write a few more remarks upon the subject. Mr. de Nicéville has, also, very kindly sent me two letters received by him from Mr. W. P. Masson from which he says I can quote freely.

As regards my own note I have little to add. The bird was brought to me by a Naga who had done a great deal of nesting for me and whom I had always found to be reliable. It had been noosed on the nest itself, and the remains of this noose were still on the bird and the nest when brought to me.

Now, to quote what Mr. Masson says regarding the taking of his nest and eggs. He writes: "Had I not taken the nest myself and got the parent birds it might have been said that I had been misled by my collector, but I watched the bird for several days before the hen bird laid and then when she laid three eggs, I secured both birds with the nest and eggs."

This would, of course, appear to be much stronger evidence than any I can bring, my nest and eggs having been brought to me and *not* taken by myself. On the other hand I refer to Mr. Masson's description of the nest and eggs. He says, "I am positive the eggs of *Rimator malacoptilus* are bluish and nearly quite round. The nest being deep cup-shaped, something like the nest of '*Leucocerca fulcoventrics*' but without the spider's webs round the outside—simply grass—and fixed in the fork of a shrub about 18 inches from the ground."

It will be seen, therefore that the description of the nest and eggs (the size of these latter is not definitely given) would apply well to those of a *Zosterops*, but are not in the least such as one would have *expected* to find belonging to *Rimator*.

Now I must quote the weak spot in Mr. Masson's letters under reference. He says "All who have collected Birds' eggs largely must know that most of the Thrushes' and Babblers' eggs are blue." From this it would seem that Mr. Masson thinks that the Thrushes and Babblers are closely allied and, if this is so, it shows that his knowledge of ornithology is very meagre; perhaps, however, he only alludes to the birds known popularly as Laughing-thrushes,

and these are of course really in the same family as all the other Babblers. As regards his assertion, however, that most of the Babblers lay blue eggs there can be no dispute, but that he is labouring under rather a serious mistake. The family *Crateropodidae* is divided into six sub-families, the *Crateropodinae*, *Timeliinae*, *Brachypteryginae*, *Sibiinae*, *Liotrichinae*, and *Brachypodinae*. Of these the first named sub-family is the only one containing many species which lay unspotted blue eggs, and even here these number only about 27 as compared with over 40, which lay white or spotted eggs. The third, fourth and fifth sub-families contain each one genus only, *viz.*, *Larvivora*, *Zosterops* and *Cephalopyrus*, which lay pure blue eggs, and the sixth and seventh sub-families have no single species laying such. *Rimator* is a genus of the second sub-family, *Timeliinae*, and its position in it is one beyond all doubt, whilst its nearest allies would seem to be the birds of the genus *Corythocichla*. It seems therefore very strange that such a bird should lay eggs and build a nest so absolutely unlike those of its nearest relations.

Again, Mr. Masson says, "*R. malacoptilus* is a small bird, not quite 5 inches in length and lays small eggs". Now *R. malacoptilus* is a short bird with a very short tail, but is in proportion to its length, a stout, bulky bird far larger than the little *Rhipidura* (*Leucocerca* as Mr. Masson calls it) to the size of whose eggs the eggs of *Rimator* are likened. *Corythocichla brevicaudata* is a smaller, less heavy, bird than *Rimator*, yet I should estimate that the cubic contents of an egg of *C. brevicaudata* are nearly twice the cubic contents of an egg of *R. albicollis*, and the presumption, therefore, would be that the egg of *Rimator* would be at least as big as that of *C. brevicaudata* if not bigger.

Taking every thing into consideration I cannot help still thinking that Mr. Masson must have made a mistake, and that the birds he shot (if *Rimator*) though haunting the bush in which the nest was found were yet not the owners of it.

I am, I regret to say, no longer in a district where I can hope to either confirm or contradict my impressions as there are no hills high enough and *Rimator* is not to be found, but I sincerely trust that Mr. Masson will, this year, again find *Rimator* breeding and will succeed in getting the nest and eggs. I trust too that he will manage either to shoot the bird as it leaves the nest or, better still, succeed in trapping it on the nest itself.

E. C. STUART BAKER, F. Z. S.

DIBRUGARH, ASSAM.

25th February, 1901.

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No. XX.—NOTES ON BIRDS COLLECTED IN SOUTH SYLHET.

Amongst other birds lately collected here I have managed to secure a pair of *Scæorhynchus ruficeps*, the Red-headed Crow Tit, also specimens of *Caprimulgus monticola*, Franklin's Night-jar, which I found to be rare in Cachar, though

it is common here and evidently breeds, as in the oviduct of a female shot 20th February, 1901, was a shelled egg (unfortunately broken) of a salmon colour thinly spotted with brownish-red.

I have besides shot the following birds which I have either never come across, or found to be exceedingly rare, in the adjoining district of Cachar.

*Falco chiquera*, rather uncommon; *Pandion haliaëtus*, common; *Scops spilocephalus*, ♀, caught on nest with 2 young; *Micropus melanocephalus*, uncommon; *Cinnyris asiatica*, plentiful; *Cinnyris hasselti*, plentiful; *Tiga javanensis*, not rare; *Crocopus phanicopterus*, perhaps the commonest green pigeon here; *Columba intermedia*, exceedingly common; *Halcyon pileata*, observed closely but not having a gun with me, I was unable to secure the bird.

A. M. PRIMROSE.

RENA T. E., S. SYLHET.

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NO. XXI.—ON THE OCCURRENCE OF THE DESERT FINCH  
(*RHODOSPIZA OBSOLETA*) AT CHAMAN, BALUCHISTAN.

The Society has lately received several specimens of the Desert Finch (*Rhodospiza obsoleta*) from Lieut. John W. Watson, I.M.S., which he has collected at Chaman, and as this species is not included by Mr. Oates in the Fauna of British India, Birds, Vol. II., on the grounds that no instance of its occurrence had up to the time of publication been recorded from within the limits of British India and its dependencies, the present instance is worthy of record. This, however, is not the first occasion of the species being obtained within our limits, for two specimens from the Tochi Valley are mentioned in the Journal of the Asiatic Society, Bengal (Vol. LXIX, part 2, page 101), and Mr. Oates' note as to the probability of the species being eventually found within our boundaries has thereby been justified.

Regarding the species Lieut. J. W. Watson writes: "It is very common in Chaman in August and September, going about in large flocks in the latter month, eating the seeds of sunflowers, &c. in our compounds, and of grasses, &c., by the roads. They are fond of sitting in lines on telegraph wires and wire railings."

E. COMBER.

BOMBAY, March, 1901.

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NO. XXII.—NIDIFICATION OF *RIMATOR MALACOPTILUS*, BLYTH.

With reference to Mr. de Nicéville's note on page 531 of the present Volume of our Journal there seems to be some doubt as to my finding the nest and eggs of *Rimator malacoptilus*.

I watched the birds for several days building, and after laying I took the hen bird *on the nest*. I am quite positive the eggs were bluish, nearly round, the nest being cup-shaped and fixed in the fork of a shrub about 18 inches from the ground. The eggs were three in number. Now, as I got the hen bird on the nest and watched both birds for several days, I do not see how there can be any doubt in the matter. I hope to get another nest and eggs this year, when all doubts will be set at rest.

It is known that the Drongo or Fork-tailed Cuckoo, *Surniculus dicruroides*, lays its egg which is blue in the nest of *Notodola leucura*. I have also found it in the nest of *Pericrocotus elegans*.

W. P. MASSON.

DARJEELING, 8th March, 1901.

#### No. XXIII.—INDIAN SHEEP DOGS.

Sheep dogs in England are wonderfully trained, and their intelligence in picking out, and driving sheep, is almost incredible; but clever as they are they cannot hold a candle to the Indian sheep dogs I have seen in the province of Berar. These dogs are not trained by man at all, but, their masters, who belong to the Shepherd, or Dungen, caste—for every trade or vocation has its caste in India—have discovered what the dog will instinctively do under certain circumstances, and arrange that those circumstances shall occur. The following story will show how I came to find out about these sheep dogs, and the value the shepherds place upon them, which is entirely owing to their training, as they belong to no particular breed.

About the year 1863, the G. I. P. Railway was being made through Berar, and one of the contractor's staff, a platelayer or inspector, I forget which, lived in a tent about a mile and a half outside the town of Akola, where I was. A big masonry bridge had to be built across the Morna river, which passes through Akola, and to reach this bridge from his tent, the inspector, as we will call him, had every day to pass a thorn inclosure, in which was kept a large flock of sheep. Outside the door of the inclosure, when the sheep were there, were always several large and very fierce dogs, which invariably came out at the man, until at last, to give them a lesson, he took his gun with him, and the next time the dogs attacked him he shot two of them. This, though almost in self-defence, led to serious trouble, and the inspector for one, and I for another, did not understand why so much importance was attached to the death of the dogs, as to all appearance they were very ordinary mongrels, though large and long in the leg. The case came up before the Deputy Commissioner, when it was discovered that the statements of the inspector and of the shepherd who owned the dogs, were practically identical. That is, the complaint was the defence.

The inspector, a Scotchman, gave a large sum of money to the owner of the dogs, when their value was explained to him, and it was then that I first

learned how an Indian shepherd protects his sheep from wolves and other wild animals when feeding in the jungle by day, and from thieves at night, with the assistance of these large and fierce dogs, that in the performance of their duty, will go at a man as willingly as they would at a wolf or any other wild beast, though, strange to say, away from the flock they become cowards at once.

At first I thought the sum of money given by the inspector to the shepherd excessively large, but afterwards I understood how it was almost impossible that money could make good to the man the loss he had sustained. In talking to him, I got him to explain to me how these dogs were trained, and why they were so very brave and fierce. He said that the custom of the shepherds was, when they wanted to train a dog, to take a male pup from the litter as soon as it could see, while they were careful that the father and mother were of as large and heavy a breed as possible. This puppy would be given to some ewe who had lost her little one, and was suckled by her. At first she had to be held down for the purpose, but in about three weeks' time she would become accustomed to being the dog's wet nurse, and would take to the little animal. As soon as the puppy could run about properly, it would be allowed to run alongside its foster-mother to the jungle, where she would go daily with the flock.

Care was taken that the ewe in question should remain, owing to her peculiar duties, an unusually long time in milk, so the puppy was well nurtured in its infancy, and invariably turned out a larger and heavier animal than its parents, this being also partly due to the fact that he was castrated when about a month and a half old. From always going out with the flock, life among the sheep became the dog's second nature, and when it no longer got milk from its foster mother, the shepherd would feed it well with milk from the other sheep, and bread broken into the milk. And when from any accidental cause a sheep died, its carcase would be divided among the dogs of the flock. Finally, the puppy being full grown, would be turned out of the flock at night time, and would sleep outside the door of the thorn enclosure with the other dogs, generally round a fire made of dried sheep's droppings.

A large flock of sheep generally requires six, seven, or eight dogs, all educated in the way I have described. Every day after the sun has well risen and dried the dew off the grass, the flock is taken into the jungle to graze. As they start, one dog goes to each of the four corners of the flock, and remains about sixty or eighty yards from it. The rest of the dogs follow with the shepherd. Should a wolf appear, the dog at the corner nearest to him gives a bark, on which the dogs with the shepherd, who is always behind the flock, rush towards the warning voice to assist in repelling the intruder, but the other three sentinel dogs remain still at their posts. What is going on elsewhere is no business of theirs. They have only to give the alarm

where they are, and the wonderful thing is that the shepherd does not tell the dogs to go to the corners, but the weaker ones invariably by their own instinct take this post, while the stronger and heavier dogs remain with the shepherd, on the alert, to rush at once to any spot to which they are called. As I have already said, dogs so brought up, when with their flock, are utterly fearless of man or beast; but if they leave the flock, be it only to walk with their master down a village street, they are the veriest cowards possible.

The shepherd told me that the daily routine of the dogs with the flock was due to no teaching of his. He said that it was instinct, and was quite unable to tell me where or when the system had been introduced. He only knew that from time immemorial it had existed. When I asked him if his dogs would really have bitten the inspector, he answered, "Of course they would," and added, "that no wise man would ever go near a sheep inclosure." And when I pointed out the fact that the inspector had been going along a public footpath, he replied "that his inclosure had been there before the footpath, which had been made by the workmen going to and coming from the railway bridge." The shepherd did not do so badly after all with the compensation he got for the loss of his dogs, as the increase of population and of cultivation had driven off the wild animals to a great extent from about Akola, so that he could manage to get along without those that had been shot; but I found afterwards that what he had said was quite true, he could not have replaced them under two years.

This account will show how cleverly the instinct of the dog has been utilised for the protection of his flock by the shepherd in Berar, and for all I know, also in other parts of India, and to me it is all the more wonderful, as from the circumstances of the training this cannot be an inherited instinct.

J. F. G.

[The custom of rearing dogs for the protection of the flocks, amongst the sheep themselves goes back many hundreds of years. Darwin says that when staying in Banda Oriental he was amused with what he "saw and heard of the shepherd dogs of the country . . . Their method of education consists in separating the puppy when very young from his bitch and in accustoming it to its future companions. The ewe is held three or four times a day for the little thing to suck, and a nest of wool is made for it in the sheep pen. At no time is it allowed to associate with other dogs or with the children of the family. The puppy is also castrated in order that it can have no common feeling with the rest of its kind. From this education it has no wish to leave the flock, and just as another dog will defend its master—man, so will these the sheep. It is amusing to observe when approaching a flock how the dog immediately advances barking and the sheep all close in his rear, as if round the oldest ram."—ED.]

(The above appeared in the *Field* on 16th February, 1901).

No. XXIV.—EARLY BREEDING OF THE COMMON IORA  
*ÆGITHINA TIPHIA*.

Yesterday (13th March) I found a nest of *Ægithina tiphia* in my garden containing 2 fresh eggs. I have searched all the books at my command and cannot find any note on the breeding of this bird before the month of May. Jerdon mentions that it breeds twice a year, but other authorities seem to doubt this. This does not appear to be an isolated case, as I have several other pairs in the garden all of whom appear to be breeding. Does this not, in a way, go to prove that Jerdon was right?

The nest was placed in an upright fork of a Mango tree about 20 feet from the ground; it was very well concealed, and was only discovered after a minute search. It was the constant trilling note of the cock that made me suspect the hen was sitting.

The eggs are typical Iora's being creamy white longitudinally streaked with purplish and reddish-brown.

E. E. TOOTH.

DUM-DUM, 14th March, 1901.

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No. XXV.—THE FLOWERING HABITS OF THE VIOLET.

I was recently asked to explain the reason for the flowers of the violet concealing themselves among the leaves. I explained as follows:—

It is a notorious fact that although a number of flowers of the violet are fully exposed, yet many are to be found hidden away among the leaves, and there is every reason to believe that the habit of the plant is in great part to conceal its flowers. Yet from the fact of some of the flowers being exposed this habit does not seem to be a confirmed one.

Next the method of fertilisation must be considered.

The normal flower is adapted to insect fertilisation and seems to be perfect for this purpose. But it is known that violets bear very small inconspicuous and closed flowers that are technically called "cleistogamous." These flowers are for purposes of self-fertilisation and economise pollen which is produced in very much greater abundance in the ordinary flower. It is not necessary to state here the advantages and disadvantages of the two methods of fertilisation. It is necessary only to note that while normal flowers are borne as a rule, yet cleistogamous flowers are sometimes to be found along with them.

Thus we find a somewhat unsettled habit in conjunction with a somewhat unsettled method of fertilisation.

Treating, then, the cleistogamous flower of the violet in the same manner as a rudiment is treated by a zoologist, it might be reasonably supposed that the cleistogamous flower of the violet represents an ancient normal condition

of the flower of the violet in particular, and perhaps of the *Violaceæ* in general when as yet the competing members of the Order had not developed into genera, and which later by adopting the showy insect-fertilised flower, as in the near relative of the violet, the *Viola tricolor*, forced the violet either to adopt the same method of fertilisation or else to become extinct. For, with some exceptions, cross-fertilisation is more advantageous than self-fertilisation.

In this former condition there would be no necessity for the flower to be conspicuous.

Thus both the habit referred to and the cleistogamous flower are relics of the past, and one explains the other.

I should be much obliged if I could receive any light on this subject.

ST. C. THOMPSON.

THE RETREAT, FORSYTH ROAD,  
LAL BAGH,  
LUCKNOW, 15th March, 1901.

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No. XXVI.—NESTING OF THE BLACK-HEADED ORIOLE,  
*ORIOIUS MELANOCEPHALUS*.

On page 360, Vol. I, of "Hume's Nests and Eggs of Indian Birds," 2nd Edition, Oates, I find a note, by a Mr. Buchanan Hamilton, on the breeding of the Black-headed Oriole, *Oriolus melanocephalus* in Bengal, in which he describes a nest as containing young unfledged in March. Mr. Hume says, with reference to this, that he believes it to be a mistake, as he never found the bird breeding in March in Bengal.

I have had the same experience as Mr. Hamilton, as I found a nest a few days ago containing two eggs, and left them in order to get, as I thought, the full clutch. Judge my astonishment when my *chokra* on reaching the nest last evening cried, "Doo butcha."

I was very disappointed, as I have not got the eggs of this bird, but had to console myself with the knowledge of a pair of the same birds building in another small tope in my garden.

Mr. Hamilton describes the nest as *rude*, but Mr. Hume takes objection to the word. I therefore leave it at that, as I think it all depends upon a person's conception of the word.

E. E. TOOTH.

DUM-DUM, 20th March, 1901.

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No. XXVII.—NESTING DIFFICULTIES OF THE COPPERSMITH.

A pair of Coppersmiths (*Xantholæma hæmatocephala*) are breeding in a tree in my garden, and towards sunset every evening a Blue-throated Barbet (*Cyanops asiatica*) comes and turns its smaller relatives out, taking possession

of their nest for the night, but gives it up in the morning, leaving them in undisturbed possession until the following evening.

His method of eviction is unique. As soon as he arrives the Coppersmith retires and shows fight, but after a couple of rounds is ignominiously dragged out by the back of the neck. Nor is this the only bird that takes advantage of the Coppersmith's weakness or good nature, whichever it may be, for a Bulbul (*Molpastes bengalensis*) waits about, and as the male Coppersmith comes with pieces of fruit for his mate, the Bulbul exacts toll from him before he has time to enter the nest, and the Coppersmith never tries to get away from the Bulbul, but actually feeds it. I should like to know whether any such incident has been recorded before.

E. E. TOOTH,

DUM-DUM, 28th March, 1901.

## PROCEEDINGS

OF THE MEETING HELD ON 12TH MARCH, 1901.

A meeting of the members of the Bombay Natural History Society took place at the Society's Rooms on Tuesday, 12th March, 1901, Mr. E. H. Aitken presiding.

## NEW MEMBERS.

The election of the following new members was announced:—Mr. Charles A. Fuller (Cawnpore), Mr. B. R. Pritchard (Lakhimpur), Mr. W. B. Wright (Lakhimpur), Mr. G. M. Prichard (Ramtek), Mr. F. E. Fletcher (Calicut), and Mr. W. P. Masson (Darjeeling).

## CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary acknowledged the following contributions to the Society's Collections since the last meeting:—

|                                                                   |                                      |                                 |
|-------------------------------------------------------------------|--------------------------------------|---------------------------------|
| 1 pair of Indian Wolves, juv. (alive).                            | <i>Canis pallipes</i> .....          | Mr. W. A. Heyland.              |
| 1 Bonelli's Eagle .....                                           | <i>Hieræetus fasciatus</i> .....     | Capt. W. A. Payne.              |
| 1 Crested Serpent Eagle. ...                                      | <i>Spilornis cheela</i> .....        | Do.                             |
| 1 Crested Honey Buzzard ...                                       | <i>Pernis cristatus</i> .....        | Do.                             |
| 1 Pale Harrier .....                                              | <i>Circus macrurus</i> .....         | Do.                             |
| 1 Greenshank .....                                                | <i>Totanus glottis</i> .....         | Do.                             |
| 1 Gull-billed Tern .....                                          | <i>Sterna anglica</i> .....          | Do.                             |
| 1 Red-breasted Fly-catcher...                                     | <i>Siphia parva</i> .....            | Do.                             |
| 2 Jungle Cats (alive) .....                                       | <i>Felis chaus</i> .....             | Mr. P. A. Collins.              |
| 1 Fossil Tusk of a Mastodon                                       | .....                                | Mr. E. Goff.                    |
| Head of Indian Rhinoceros...                                      | <i>Rhinoceros unicornis</i> .....    | Sir Henry Tichborne, Bart.      |
| 1 Sarus' egg .....                                                | <i>Grus antigone</i> .....           | Mr. D. A. Macmillan.            |
| 2 Earth Snakes (alive) .....                                      | <i>Eryx johnii</i> .....             | Mr. O. Merrony.                 |
| 1 Bunch of plantains (red and yellow varieties on the one stalk). | .....                                | Cap. S. Goodridge, R.N., C.I.E. |
| 7 Bats (in spirits) .....                                         | .....                                | Mr. T. B. Fry, I.F.S.           |
| 3 Bats (skinned) .....                                            | .....                                | Mr. E. Comber.                  |
| 241 birds' skins .....                                            | .....                                | Indian Museum.                  |
| Reed Bunting .....                                                | <i>Emberiza schoeniclus</i> .....    | Lieut. J. W. Watson, I. M.S.    |
| Tree Sparrow .....                                                | <i>Passer montanus</i> .....         | Do.                             |
| Rose Finch .....                                                  | <i>Rhodospiza obsoleta</i> .....     | Do.                             |
| Eversman's Redstart .....                                         | <i>Ruticilla erythronota</i> .....   | Do.                             |
| Barnes's Chat .....                                               | <i>Saxicola barnesi</i> .....        | Do.                             |
| Red-tailed Chat.....                                              | <i>Saxicola chrysopygia</i> .....    | Do.                             |
| Masked Wagtail.....                                               | <i>Motacilla personata</i> .....     | Do.                             |
| Water-pipit.....                                                  | <i>Anthus spinoletta</i> .....       | Do.                             |
| Central Asian Starling .....                                      | <i>Sturnus porphyronotus</i> .....   | Do.                             |
| Allied Grey Shrike .....                                          | <i>Lanius assimilis</i> .....        | Do.                             |
| Sparrow-hawk .....                                                | <i>Accipiter nisus</i> .....         | Do.                             |
| Jerdon's Accentor .....                                           | <i>Tharrhaleus jerdoni</i> .....     | Do.                             |
| 4 Pheasant Skins.....                                             | <i>Gennæus</i> sp. ....              | Capt. W. G. Nisbett.            |
| 1 Imperial Pigeon .....                                           | <i>Ducula griseicapilla</i> .....    | Do.                             |
| 1 Civet Cat (alive).....                                          | <i>Viverricula malaccensis</i> ..... | Mr. W. Murray.                  |
| 7 Bats' Skins.....                                                | .....                                | Mr. A. M. Primrose.             |
| 1 Batrachian .....                                                | <i>Ichthyophis glutinosus</i> .....  | Mr. E. Ernest Green.            |
| 2 Lizards .....                                                   | <i>Ceratophora tennentii</i> .....   | Do.                             |
| 2 Toads .....                                                     | <i>Nannophrys ceylonensis</i> .....  | Do.                             |

CONTRIBUTIONS TO THE LIBRARY.

The Wild Disease of Cotton and its Control; The Canadian Entomologist, Vol. XXXIII, No. 2; The Distribution of Vertebrate Animals in India, Ceylon, and Burmah, by W. T. Blanford, LL. D., F.R.S.; Annals of the Queensland Museum, No. 5; Anales del Museo Nacional de Montevideo, La Faune du Congo, Poissons Nouveau, Boulenger; Illustrations de la Flore du Congo.

The Honorary Secretary drew the special attention of the members to the valuable contribution consisting of 241 specimens of birds' skins, representing over 200 species, which had been received in exchange from the Deputy Superintendent of the Indian Museum, Calcutta. A detailed list of birds will appear in the Journal.

The curious "sport" sent by Captain Goodridge, R. N., of the red and yellow varieties of plantains growing together in one bunch excited considerable attention, and an excellent sketch of the same by Miss M. Thacker was much admired.

A special vote of thanks was passed to Sir Henry Tichborne, Bart., for his handsome contribution of a head of the Indian rhinoceros (*Rhinoceros unicornis*) mounted by Rowland Ward & Co. of London.

ACCOUNTS FOR 1900.

Mr. N. C. Macleod, the Honorary Treasurer, laid before the meeting a statement of accounts for the year ended the 31st December, 1900, showing a credit balance of Rs. 2,159-13-8 in cash, and Rs. 4,800 invested in Government Paper.

It was resolved that the accounts be passed, subject to the usual audit.

ELECTION OF COMMITTEE.

The President, Vice-Presidents, and Members of the Managing Committee for the present year were duly elected as follows:—

President.—H. E. the Right Hon'ble Lord Northcote.

Vice-Presidents.—Mr. J. D. Inverarity and Dr. D. MacDonald.

Managing Committee.—Mr. E. C. Stuart-Baker, Dr. D. MacDonald; Mr. E. H. Aitken; the Rev. Father Dreckman, S.J.; Lieut.-Col. K. R. Kir-tikar, I.M.S.; Mr. J. D. Inverarity; Lieut.-Col. H. D. Olivier, R.E.; Messrs. E. Ernest Green, F. O. Gadsden, L. de Nicéville, W. S. Millard, A. Abercrombie, E. L. Barton, R. Gilbert, E. Comber, R. C. Wroughton, I.F.S.; T. R. D. Bell, I.F.S.; Capt. A. Newnham, and Vety.-Capt. G. H. Evans.

Honorary Treasurer.—Mr. N. C. Macleod.

Honorary Secretary.—Mr. H. M. Phipson.

PAPERS READ.

The following papers were read and discussed:—

- (1) The Poison Gland of the King Cobra (*Naja bungarus*), with demonstrations by Major S. Prall, I.M.S.

- (2) A Visit to the Null after the Famine, by Mr. Regd. Gilbert.
- (3) The Fauna of Amoy, by Mr. L. de Nicéville.
- (4) The life-history of *Mycalasis (Calysisme) subdita*, Moore, by Major N. Manders, R.A.M.C.
- (5) On the Occurrence of Bonelli's Eagle and the Golden-Eye Duck at Myingyan, Burmah, by Mr. K. C. Macdonald.
- (6) On the Occurrence of the Desert Finch (*Rhodospiza obsoleta*) at Chaman, Baluchistan, by Mr. E. Comber.

PROCEEDINGS

OF THE MEETING HELD ON 6TH FEBRUARY, 1901.

A meeting of the members of the Bombay Natural History Society took place on Wednesday, 6th February, 1901, at the Society's Rooms, Dr. D. MacDonald presiding.

NEW MEMBERS.

The election of the following new members was announced :—Mr. F. W. Robertson, I.C.S. (Madras), the Mess President, 34th Battalion, R.F.A. (Ahmedabad); Major Arthur C. Daniell, R.A. (Ahmedabad); Mr. J. E. B. Hotson, I. C. S. (Ahmedabad); Mr. Charles St. C. W. Thompson (Lucknow); Captain E. W. Harris, 3rd M. I. (Hongkong); Lieutenant W. C. Nicholson, 3rd M. I. (Hongkong); Lieutenant W. V. Coppinger, I. M. S. (Dibrugarh); Mr. Jack Needham, (Dibrugarh); Mr. W. Morley, C. E. (Dibrugarh); Mr. F. Thorburn (Assam); the Mess President, 10th Bombay Light Infantry, Ahmedabad (life member); Major A. E. Aitken (Chaman); Lieutenant Victor Coates (Bombay); Mr. V. M. Griffiths (Nasik); Mr. O. C. G. Hayter (Sukkur, Sind); Mr. S. Armstrong (Poona); and Mr. C. B. Antram (Cachar).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's collections:—

| Contribution.                           | Description.                           | Contributor.                |
|-----------------------------------------|----------------------------------------|-----------------------------|
| 1 Snake, from Aden.                     | <i>Zamenis ventrimaculatus</i> .       | Mr. C. Baglehole.           |
| 2 Purple Honeysuckers.                  | <i>Arachnechthra zeylonica</i> .       | Mr. Pottinger.              |
| 1 Whimbrel.....                         | <i>Numenius phaeopus</i> .....         | Mr. J. D. Inverarity.       |
| 1 Chestnut Bittern.....                 | <i>Ardetta cinnamomea</i> .....        | Do.                         |
| 1 Pallas' Squirrel .....                | <i>Sciurus erythraeus var-sadani</i> . | Capt. E. C. Townsend.       |
| 1 Sind Pied Woodpecker.                 | <i>Dendrocopos sirdianus</i> ,         | Lt. J. Watson, I.M.S.       |
| 1 Desert Chat.....                      | <i>Saxicola deserti</i> .....          | Do.                         |
| 1 Rose Finch .....                      | <i>Rhodospiza obsoleta</i> .....       | Do.                         |
| 1 Snake (alive) .....                   | <i>Silybura macrolepis</i> .....       | Mr. C. G. Wright.           |
| 1 Stiff-tailed Duck ...                 | <i>Erasmatura leucocephalus</i> ,      | Lt. R. E. Salkeld.          |
| A number of Tiger-beetles.              | <i>Cicendela</i> sp.                   | Mrs. Townsend.              |
| 1 Small Green Barbet                    | <i>Thereicerya vividis</i> .....       | Lieut. W. A. Payne.         |
| 7 Pairs of Black Buck<br>Horns.         | <i>Antilope cervicapra</i> .....       | Mr. W. Webb.                |
| 1 Pair Chinkara Horns.                  | <i>Gazella bennetti</i> .....          | Do.                         |
| A number of Bats, Frogs<br>and Spiders. | .....                                  | Col. R. R. Kirtikar, I.M.S. |
| 1 Snake .....                           | <i>Dendrophis pictus</i> .....         | Mr. J. E. Chico.            |

| Contribution.                     | Description.                        | Contributor.                        |
|-----------------------------------|-------------------------------------|-------------------------------------|
| 2 Otters' Skins and Skulls.       | <i>Lutra ellioti</i> .....          | Mr. W. E. Shipp.                    |
| 1 Red-whiskered Bulbul (alive).   | <i>Otocompa fuscicaudata</i> ....   | Miss Butcher.                       |
| 2 Geckos .....                    | <i>Hemidactylus maculatus</i> ...   | Mr. E. Comber.                      |
| A collection of Ferns.            | .....                               | Lieut. W. A. Light.                 |
| 1 Rock Horned Owl.                | <i>Bubo bengalensis</i> .....       | Major A. E. Aitken.                 |
| 1 White-checked Hill Partridge.   | <i>Arboricola atrigularis</i> ..... | Capt. E. Townsend.                  |
| 1 Green-legged Hill Partridge.    | <i>Tropicoperdix chloropus</i> .... | Do.                                 |
| Head and claws of Imperial Eagle. | <i>Aquila heliaca</i> .....         | Gen. W. Osborn.                     |
| 1 Stuffed Python .....            | <i>Python reticulatus</i> .....     | H. H. the Maharajah of Cooch Behar. |
| A collection of Birds' Eggs       | .....                               | Mr. W. E. Shipp.                    |

## CONTRIBUTIONS TO THE SOCIETY'S LIBRARY.

"Notes on the Nidification of some Indian Birds" not mentioned in "Hume's Nests and Eggs," by E. C. Stuart Baker, from the Author. "Indian Museum Notes," Vol. V., No. 2, in exchange. "The Common Birds of Bombay," by E. H. Aitken, from the Author. "Memoirs of the Geological Survey of India," Vol. XXX., Part 2. "Peach Leaf Curl, its Nature and Treatment," by Newton Price. "Fauna of British India (Arachnida)" purchased. "The Great and Small Game of India, Burmah, and Tibet (Lydekker)" deposited.

## MINOR CONTRIBUTIONS FROM

Mr. J. P. Watson, Mr. F. G. Hutchinson, Mr. E. W. Trotter, and Mr. C. C. James, C. E.

## LARGE PYTHON.

Special attention was drawn to the contribution received from H. H. the Maharajah of Cooch Behar of a large specimen of *Python reticulatus* which had been mounted by Rowland Ward & Co., London. The snake when shot by His Highness in Assam weighed about 200 lbs. and measured 19 feet 2 inches in length. A special vote of thanks was passed to His Highness the Maharajah for his contribution to the Society's Museum.

## PAPERS READ.

The following papers were read and discussed:—

1. Burmese Snakes, by Captain F. Wall, I.M.S., and Veterinary-Captain G. H. Evans, A.V.D.
2. New Species of Indian *Hymenoptera*, by Major C. G. Nurse, 13th Bombay Infantry.
3. "Kills" by Carnivorous Animals, by W. A. Wallinger, I.F.S.
4. An appeal for assistance in collecting Gadflies, Bot-flies, and Warble-flies in India, by Colonel J. W. Yerbury, R. A.
5. Bird's Nesting in the vicinity of Poona, by Captain R. M. Betham, 8th Bombay Infantry.
6. Hints to beginners on collecting and preserving Natural History Specimens, by E. Comber.
7. Longevity of the Persian Bulbul, by Miss Ida Chinnery.
8. A Musk Rat attacking a Toad, by Major S. E. Prall, I.M.S.
9. Squirrels and Satbhais, by Major S. E. Prall, I.M.S.
10. On the use of the Beaks of Pelicans and Flamingoes, by E. H. Aitken.

PROCEEDINGS

OF THE MEETING HELD ON 11<sup>TH</sup> DECEMBER, 1900.

A meeting of the members took place at the Society's Rooms on Tuesday last, the 11th instant, Mr. E. H. Aitken presiding.

NEW MEMBERS.

The election of the following new members was announced:—Lieutenant R. H. Brudenell Bruce (Bombay); Lieutenant E. E. C. Dalgliesh (Bombay); Mr. W. W. Coen (Hubli); Mr. L. E. P. Gaskin, I.C.S. (Mandla, C. P.); Mr. W. Erskine Crum (Bombay); Mr. Edmund Scott (Ceylon); Major G. A. Leslie, R. E. (Chitral); Lieutenant W. H. Evans, R.E. (Chitral); Mr. S. L. Whympcr (Jeolikote, N.-W. P.); Mr. S. Tomkins (Bombay); Mr. George E. Bright (Bombay); Mess President, 55th Battery, R.A. (Saugor); Captain F. F. Major (Jalna); Mr. A. Rodgers, I.F.S. (Thayetmyo, Burma); Mr. Herbert Druce (London); Rev. H. Howard Campbell (Gooty); Lieutenant W. H. Lane (Burma); Mr. C. L. Burns (Bombay); Mrs. H. J. Bell (Banda, C.P.).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum:—

|                                             |                                    |                                |
|---------------------------------------------|------------------------------------|--------------------------------|
| 2 Green Tree-vipers (alive.)                | <i>Trimeresurus gramineus.</i>     | Mr. Paul Gerhardt.             |
| 3 Brown Tree-snakes (alive.)                | <i>Dipsas trigonata</i> .....      | Do.                            |
| 2 Phursas (alive).....                      | <i>Echis carinata</i> .....        | Do.                            |
| 1 Head of Siamese Deer.                     | <i>Cervus schombergi</i> .....     | Mr. A. J. A. Jardine.          |
| 1 Bison's Head.....                         | <i>Bos banting</i> .....           | Do.                            |
| 1 Lizard (alive).....                       | <i>Hemidactylus maculatus.</i>     | Mr. F. G. Hutchinson.          |
| 6 Eggs of the Indian Red Munia.             | <i>Sporæginthus amandava.</i>      | Capt. R. M. Betham.            |
| 3 Eggs of the small Minivet.                | <i>Pericrocotus peregrinus.</i>    | Do.                            |
| Nest and 4 Eggs of the large Pied Wagtail.  | <i>Motacilla maderaspatensis.</i>  | Do.                            |
| Nest of the Common Wood Shrike.             | <i>Tephrodornis pondiceriana.</i>  | Do.                            |
| 1 Snake .....                               | <i>Tropidonotus plumbicolor.</i>   | Mr. F. A. Hill.                |
| 1 Screech Owl with five young ones (alive). | <i>Strix javanica</i> .....        | Mr. Ameerudin Tyabjee.         |
| 1 Wild Dog (alive).....                     | <i>Cyon dukhunensis</i> .....      | Capt. W. Leslie.               |
| 1 Red-winged Cuckoo (alive).                | <i>Coccyzus coromandus</i> .....   | Caught in the Society's Rooms. |
| 2 Stiff-tailed Ducks.....                   | <i>Erasmatura leucocephala.</i>    | Lieut. L. Swinton-Browne.      |
| 2 Houbara (alive).....                      | <i>Houbara macqueeni</i> .....     | Capt. F. W. Townsend.          |
| 1 Water-Cock (alive).                       | <i>Gallinæa cinerea</i> .....      | Mr. F. O. Gadsden.             |
| 2 Malabar Whistling Thrushes (alive).       | <i>Myiophonus horsfieldi.</i>      | Mr. G. P. de Soane.            |
| 1 Koel (alive).....                         | <i>Eudynamis honorata</i> .....    | Mr. H. Hemming.                |
| 1 Dusky Striped Squirrel                    | <i>Sciurus sublineatus</i> .....   | Mr. Chas. Gray.                |
| 2 Palm Civets (alive)                       | <i>Paradoxurus niger</i> .....     | Mr. Chas. Merrony.             |
| Skull of large Panther.                     | <i>Felis pardus</i> .....          | Capt. E. S. Hill.              |
| 1 Egg of Sarus Crane.                       | <i>Grus antigone</i> .....         | General W. Osborn.             |
| 1 Snake (alive).....                        | <i>Gongylaphis conicus</i> .....   | Mr. F. Hutchinson.             |
| 2 Snakes (alive).....                       | <i>Tropidonotus piscator</i> ..... | Dr. Dhargalkar.                |
| 1 Muntjat's head.....                       | <i>Cervus muntjac</i> .....        | Lieut. H. E. Bartlett.         |

MINOR CONTRIBUTIONS FROM

Mr. F. G. Hutchinson, Mr. T. D. Moore, Captain C. J. R. Milne, I.M.S., Mr. A. L. Dupuis, and Mr. D. Lindsay.

CONTRIBUTIONS TO THE LIBRARY.

On the birds collected and observed in the Southern Shan States and Upper Burmah, by Colonel C. T. Bingham, I.F.S., from the Author; Catalogue of Moths, Vol. II, Text and Plates, from British Museum; Guide to the Zoological Collections of the Indian Museum (F. Finn), from the Author; Parasitic Invasion of Eggs of the Common Cockroach, by Dr. N. F. Surveyor; Two Diseases of the Red Cedar, caused by *Polyporus Juniperinus*, n. sp. and *Polyporus carneus*, Nees (H. Von Schrenk); Progress in the Treatment of Plant Diseases in the United States (B. T. Galloway); Progress of Commercial Growing of Plants under Glass (B. T. Galloway); Stigmonose, a Disease of Carnations and other Pinks (A. F. Woods); Progress of Plant-breeding in the United States (H. J. Webber and E. A. Bessey); Xenia, or the Immediate Effect of Pollen in Maize (H. J. Webber); Food of the Bobolink, Blackbirds and Grackles (F. E. L. Beal); The Indian Forester, Vol. XXVI, No. 9, in exchange; North American Fauna, Nos. 18-19 (W. Oswood); Annales du Musée du Congo, Botanique, Series II.; Annales du Muséo Nacional de Montevideo, Tomo II. Annuaire du Musée Zoologique, St. Petersburg, 1900; Vol. II. Nos. 1-2, Journal, Asiatic Society of Bengal; Vol. LXIX. No. 2., Annals of the South African Museum.

MOSQUITOES.

Colonel G. M. Giles, I.M.S., exhibited a specimen of Insect Collecting Box, fitted up with camphor, pins, card discs, cork carpet, &c., complete with printed instructions on the top, and offered to supply similar boxes to any one who was willing to take up the subject and assist him in making a complete collection of the different species of mosquitoes (*Culicidae*) in this country. A small collection of mosquitoes presented to the Society by Colonel Giles was exhibited and admired.

OUR BOMBAY GARDENS.

Mr. Phipson exhibited a number of beautifully coloured plates of tropical flowering plants which were not, as far as he knew, to be found in any of our Bombay Gardens. His object in drawing attention to these plates was to stimulate the introduction of new flowering plants into Bombay, as very little had been done of late years in that direction, especially since the departure of Mr. Birdwood.

THE DESTRUCTION OF BIRDS.

The honorary secretary read a letter received from Mr. William Jesse, of La Martinière College, Lucknow, stating that the Government of India is desirous of making a further inquiry into the question of the destruction of the bird-life of this country. It is probable that, if a proper case be made out, further restrictions will be placed on the indiscriminate slaughter of

birds for their plumage—a policy which has had such disastrous effects in other countries. The Government has requested that a report on this matter be compiled as soon as possible, and, in order that such may bear due weight, it has been determined to obtain the opinion of as many of the leading ornithologists in this country as possible.

Mr. Jesse had prepared a list of the points on which he required information, and asked for the assistance of the members of the Society in the matter.

The honorary secretary stated that a copy of Mr. Jesse's circular would be sent to any one who would be willing to help in this important movement.

#### VICTORIA GARDENS.

The honorary secretary read a letter from the Superintendent of the Municipal Gardens, drawing the attention of the members to the seven new enclosures for deer which had recently been erected in the Victoria Gardens. Now that the animals would have room for exercise, and would be thoroughly protected from dogs, &c., he hoped the members would assist him in stocking the enclosures. He particularly wanted the following:—Hog Deer, females, Spotted Deer or Chetal, females; Nilgai males; and Sambar, males.

#### PAPERS READ.

The following papers were read and discussed:—

1. The distinguishing characteristics between poisonous and non-poisonous snakes, by Captain F. Wall, I.M.S.

2. A plea for the collective investigation of Indian *Culicidæ*, with suggestions as to the moot points for inquiry and a prodromus of species known to the author, by Lieutenant-Colonel G. M. Giles, I.M.S.

3. Description of new genera and species of *Hymenoptera*, collected by Captain C. G. Nurse, at Deesa, Simla, and Ferozepore, by P. Cameron.

4. Notes on some Kalij pheasants from the Kachin Hills in the possession of the Bombay Natural History Society, by Captain W. G. Nisbet and F. Finn, Deputy Superintendent of the Indian Museum.

Miscellaneous Notes:—

(a) Birds nesting in the Tons Valley, by B. B. Osmaston, I.F.S.

(b) On the occurrence of the Red-winged Crested Cuckoo in Bombay, by E. Comber.

(c) Notes on *Anopheles*, or the malaria mosquito, by E. H. Aitken.

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W. S. MILLARD.

VOL. XIII, No. 5.

*Containing Title Page, Contents, List of Contributors, List of  
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| Coode, J. M.                                                                                       | ... | ... | ... | Jabalpur, C. P.     |
| Cursetji, Khan Bahadoor C. M.                                                                      | ... | ... | ... | Bombay.             |
| Cutch, H. H. the Rao Saheb of                                                                      | ... | ... | ... | Cutch.              |
| Dawson, W. H. (I.C.S.)                                                                             | ... | ... | ... | <i>Europe.</i>      |
| Drake-Brockman, Major H. E. (I.M.S.)                                                               | ... | ... | ... | Bhurtpur.           |
| Dwarkadas, Naranji                                                                                 | ... | ... | ... | Bombay.             |
| Goculdas, Nurrotum Morarji                                                                         | ... | ... | ... | Bombay.             |
| Habibuddin, S. (H.C.S.)                                                                            | ... | ... | ... | Khamamet.           |
| Hide, P.                                                                                           | ... | ... | ... | Karachi.            |
| Hyam, Judah                                                                                        | ... | ... | ... | Poona.              |
| Ichalkaranji, The Hon'ble Meherban Narayenrao<br>Govind, <i>alias</i> Babasaheb Ghorpade, Chief of | ... | ... | ... | Kolhapur.           |
| Inverarity, J. D. (B.A., LL.B.)                                                                    | ... | ... | ... | Bombay.             |
| Janjira, H. H. Sir Sidi Ahmed Khan, Nawab of                                                       | ... | ... | ... | Janjira.            |
| Kolhapur, H. H. the Maharaja of                                                                    | ... | ... | ... | Kolhapur.           |
| Kotah, H. H. the Maharaja of                                                                       | ... | ... | ... | Kotah.              |
| Lamb, R. A. (I.C.S.)                                                                               | ... | ... | ... | <i>Europe.</i>      |
| Long, G. R. (I.F.S.)                                                                               | ... | ... | ... | Moulmein.           |
| MacDonald, Dr. D.                                                                                  | ... | ... | ... | Bombay.             |
| Manders, Major N. (R.A.M.C.)                                                                       | ... | ... | ... | Diyatalawa, Ceylon. |
| Mandlik, Narayan Vishvanath                                                                        | ... | ... | ... | Bombay.             |
| Martin, Lieut.-Col. Gerald                                                                         | ... | ... | ... | <i>Europe.</i>      |
| Mess President 10th Bombay Light Infantry                                                          | ... | ... | ... | Ahmedabad.          |
| Miraj, Shrimant Gungadharrao Ganesh, <i>alias</i> Babasaheb Patwardhan, Chief of                   | ... | ... | ... | Miraj.              |
| Navanagar, H. H. Maharaja Jam Sahib of                                                             | ... | ... | ... | Rajkote.            |
| Olivier, Lieut.-Col. H. D. (R.E., F.Z.S.)                                                          | ... | ... | ... | Bombay.             |

|                                        |                                 |
|----------------------------------------|---------------------------------|
| Partridge, Henry ... ..                | ... Pyinmana, Burma.            |
| Pestonji Jivanji ... ..                | ... Karemnnagar.                |
| Petit, The Hon'ble Mr. Bomanji Dinshaw | ... Bombay.                     |
| Petit, Jehangir Bomanji ... ..         | ... Bombay.                     |
| Phipson, H. M. (C.M.Z.S.) ... ..       | ... Bombay.                     |
| Poncins, Baron Edmond de ... ..        | ... Europe.                     |
| Ravenshaw, Lieut.-Col. C. W. ... ..    | ... Europe.                     |
| Scindia, H. H. the Maharaja... ..      | ... Gwalior.                    |
| Spooner, T. J. (C.E.) ... ..           | ... Mtotowa, Udi, E.<br>Africa. |
| Standen, B. (I.C.S.) ... ..            | ... Betul, C. P.                |
| Swayne, Herbert C. ... ..              | ... Ceylon.                     |
| Tata, Dorabji J. ... ..                | ... Bombay.                     |
| Tejpal, Goverdhundas Goculdas          | ... Bombay.                     |
| Tilly, T. H. ... ..                    | ... Mingin, Burma.              |
| Travancore, H. H. the Maharaja of      | ... Trivandrum.                 |
| Ulwar, H. H. the Maharaja Jey Singh of | ... Ulwar.                      |
| Unwalla, J. N. ... ..                  | ... Bhownnagar.                 |
| Viccaji, Framji R. ... ..              | ... Bombay.                     |
| Whitworth, G. C. (I.C.S.) ... ..       | ... Satara.                     |
| Yerbury, Col. J. W. ... ..             | ... Europe.                     |

## HONORARY CORRESPONDING MEMBERS.

|                                     |               |
|-------------------------------------|---------------|
| Forel, Professeur Auguste ... ..    | ... Europe.   |
| Heeckerenez, Le Baron Von ... ..    | ... Java.     |
| Kerkhoven, E. J. ... ..             | ... Java.     |
| Maries, Chas. ... ..                | ... Europe.   |
| Nicéville, L. de (F.E.S., C.M.Z.S.) | ... Calcutta. |
| Oates, E. W. ... ..                 | ... Europe.   |

## MEMBERS.

|                                      |                                  |
|--------------------------------------|----------------------------------|
| Abdy, Major A. J. (R.A.) ... ..      | ... South Africa Field<br>Force. |
| Abercrombie, A. ... ..               | ... Bombay.                      |
| Acworth, E. C. B. ... ..             | ... Bombay.                      |
| Adam, James (C.E.)... ..             | ... Bombay.                      |
| Aga Khan, His Highness (Life Member) | ... Bombay.                      |
| Aga Shaha Rookh Shaha, H. H. ... ..  | ... Poona.                       |
| Ainslie, Lieut. H. P. ... ..         | ... China Field Force.           |
| Ainsworth, Capt. H. (I.M.S.) ... ..  | ... Bombay.                      |
| Aitken, Major A. E... ..             | ... Chaman.                      |
| Aitken, E. H. ... ..                 | ... Bombay.                      |
| Alcock, J. B. (I.C.S.) ... ..        | ... Ahmedabad.                   |
| Alderson, M. J. ... ..               | ... Kandy, Ceylon.               |
| Allan, C. W. (I.F.S.) ... ..         | ... Pegu.                        |
| Allen, G. B. ... ..                  | ... Cawnpore.                    |
| Allen, P. R. ... ..                  | ... Hyderabad, Deccan.           |
| Allum, E. F. ... ..                  | ... Bombay.                      |

|                                                                 |     |     |     |                            |
|-----------------------------------------------------------------|-----|-----|-----|----------------------------|
| Almon, W.                                                       | ... | ... | ... | Bombay.                    |
| Ameerudin Tyabjee                                               | ... | ... | ... | Bombay.                    |
| Anderson, Major A. V. (I.M.S.)                                  | ... | ... | ... | Nasik.                     |
| Anderson, Capt. H. R. F.                                        | ... | ... | ... | Bombay.                    |
| Anderson, J. C.                                                 | ... | ... | ... | <i>Europe</i> .            |
| Andersonn, M.                                                   | ... | ... | ... | Calcutta.                  |
| Anthony, H. B. (I.F.S.)                                         | ... | ... | ... | Rangoon.                   |
| Antram, C. B.                                                   | ... | ... | ... | Cachar.                    |
| Aquino, Dr. T. H.                                               | ... | ... | ... | Sukkur, Sind.              |
| Armstrong, S.                                                   | ... | ... | ... | Poona.                     |
| Arthur, Mrs. S. R.                                              | ... | ... | ... | <i>Europe</i> .            |
| Atlay, F.                                                       | ... | ... | ... | Mogok, U. Burma.           |
| Austria, H. I. H. the Archduke Franz Ferdinand<br>(Life Member) | ... | ... | ... | <i>Europe</i> .            |
| Babajee Gopal                                                   | ... | ... | ... | Bombay.                    |
| Baddeley, Col. P. F. M.                                         | ... | ... | ... | Cawnpore.                  |
| Bagley, F. (C. E.)                                              | ... | ... | ... | Maymyo, Burma.             |
| Bailward, Lt.-Col. A. C. (R.A.)                                 | ... | ... | ... | <i>Europe</i> .            |
| Bainbridge, Surgeon-Genl. G. (I.M.S.)                           | ... | ... | ... | Poona.                     |
| Baker, E. C. Stuart (Life Member) (F.Z.S.)                      | ... | ... | ... | Dibrugarh.                 |
| Baldrey, Vet.-Lt. F. S. H.                                      | ... | ... | ... | Bombay.                    |
| Balfour, John A.                                                | ... | ... | ... | Bombay.                    |
| Bamford, C. F.                                                  | ... | ... | ... | Shillong, Assam.           |
| Banks, Lieut.-Col. S. (I.M.S.)                                  | ... | ... | ... | Kamptee.                   |
| Baput, Risaldar S. K.                                           | ... | ... | ... | Dhulia.                    |
| Barker, Lieut.-Col. F. C. (I.M.S.)                              | ... | ... | ... | <i>Europe</i> .            |
| Barker, P. W.                                                   | ... | ... | ... | Neschindipur, E. B.<br>Ry. |
| Barnard, Lieut. A. E.                                           | ... | ... | ... | <i>Europe</i> .            |
| Barnes, Lieut. E.                                               | ... | ... | ... | Indore.                    |
| Baroda, The Curator, Baroda State Museum (Life<br>Member)       | ... | ... | ... | Baroda.                    |
| Baroda, H. H. the Maharaja Gaekwar of (Life<br>Member)          | ... | ... | ... | Baroda.                    |
| Barrow, Col. H. J. W. (R.A.M.C.)                                | ... | ... | ... | Kasauli.                   |
| Bartlett, Major C. R. (R.A.M.C., F.Z.S.)                        | ... | ... | ... | Muttra.                    |
| Barton, E. L. (Life Member)                                     | ... | ... | ... | Bombay.                    |
| Barton, Major F. J. H.                                          | ... | ... | ... | Mardan.                    |
| Bassett-Smith, Dr. P. W. (R.N.)                                 | ... | ... | ... | <i>Europe</i> .            |
| Batchelor, S. L. (I.C.S.)                                       | ... | ... | ... | Ahmedabad.                 |
| Bates, S. B. (F.Z.S.) (Life Member)                             | ... | ... | ... | Banmauk, Upper<br>Burma.   |
| Batten, Capt. F. G.                                             | ... | ... | ... | Belgaum.                   |
| Battie, J. S.                                                   | ... | ... | ... | Kurnool.                   |
| Baumbach, R.                                                    | ... | ... | ... | Bombay.                    |
| Bayley, V. B. F.                                                | ... | ... | ... | Bombay.                    |
| Beadon, Lieut. W.                                               | ... | ... | ... | <i>Europe</i> .            |
| Beale, H. F. (Life Member)                                      | ... | ... | ... | Poona.                     |

LIST OF MEMBERS.

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|------------------------------------------------------------------|-----|-----|-----|--------------------|
| Beaumont, T. L. F.                                               | ... | ... | ... | Karachi.           |
| Beechey, A. St. V. (I.F.S.)                                      | ... | ... | ... | Khandwa, C. P.     |
| Beg, Mirza Nazir                                                 | ... | ... | ... | Hyderabad, Deccan. |
| Bell, Mrs. H. J.                                                 | ... | ... | ... | Banda, N.-W. P.    |
| Bell, Capt. R. C.                                                | ... | ... | ... | Agar.              |
| Bell, T. R. D. (I.F.S.)                                          | ... | ... | ... | Kanara.            |
| Bell, W. M.                                                      | ... | ... | ... | Bombay.            |
| Benjamin, Isaac                                                  | ... | ... | ... | Bombay.            |
| Bennett, Douglas                                                 | ... | ... | ... | Bombay.            |
| Benson, Miss A. M. (M.D.)                                        | ... | ... | ... | Bombay.            |
| Benson, J. J. B. (C.E.)                                          | ... | ... | ... | Porebunder.        |
| Benson, W. A. (C.E.)                                             | ... | ... | ... | Chalisgaon.        |
| Benwell, G. L.                                                   | ... | ... | ... | Europe.            |
| Bergerson, S. H.                                                 | ... | ... | ... | Silchar, Cachar.   |
| Berry, R. (C.E.)                                                 | ... | ... | ... | Arsikere.          |
| Betham, J. A.                                                    | ... | ... | ... | Chittagong.        |
| Betham, Major R. M.                                              | ... | ... | ... | Poona.             |
| Betham, W. G. (I.F.S.)                                           | ... | ... | ... | Karachi.           |
| Beveridge, E. W. (C.E.)                                          | ... | ... | ... | Nadiad, Kaira.     |
| Bhatavadekar, Sir Bhalchandra Krishna                            | ... | ... | ... | Bombay.            |
| Bhownagar, H. H. the Maharaja Bhaosingji of<br>(Life Member)     | ... | ... | ... | Bhownagar.         |
| Bhurie Singh, Mean Sahab (C.I.E.) (Life Member)                  | ... | ... | ... | Chamba.            |
| Bickel, F. W.                                                    | ... | ... | ... | Bombay.            |
| Bicknell, H.                                                     | ... | ... | ... | Bombay.            |
| Biggs, Major H. V. (R.E.)                                        | ... | ... | ... | Rawal Pindi.       |
| Bignell, R.                                                      | ... | ... | ... | Calcutta.          |
| Bikaneer, H. H. the Maharaja of (Life Member)                    | ... | ... | ... | Bikanir.           |
| Bingham, Col. C. T. (F.Z.S.)                                     | ... | ... | ... | Europe.            |
| Birdwood, H. M. (C.S.I.)                                         | ... | ... | ... | Europe.            |
| Birkinshaw, A. H. (C.E.)                                         | ... | ... | ... | Calcutta.          |
| Biscoe, W. Fraser                                                | ... | ... | ... | Secunderabad.      |
| Bisset, Sir W. S. (R.E., C.I.E.)                                 | ... | ... | ... | Europe.            |
| Blackwell, H. F.                                                 | ... | ... | ... | Bombay.            |
| Blanford, W. T. (F.R.S.)                                         | ... | ... | ... | Europe.            |
| Blathwayt, C. H. (I.C.S.)                                        | ... | ... | ... | Dharwar.           |
| Bogle, Lt. J. S.                                                 | ... | ... | ... | Mardan.            |
| Bomanji, K. R. (I.C.S.)                                          | ... | ... | ... | Ratnagiri.         |
| Bombay Government, The Chief Secretary, Sepa-<br>rate Department | ... | ... | ... | Bombay.            |
| Bourdillon, Hon'ble Mr. J. A. (I.C.S., C.S.I.)                   | ... | ... | ... | Calcutta.          |
| Bourdillon, T. F. (I.F.S., F.L.S.)                               | ... | ... | ... | Europe.            |
| Bourke, Lt.-Col. G. D. (R.A.M.C.)                                | ... | ... | ... | Rawal Pindi.       |
| Bowen, J. C. G.                                                  | ... | ... | ... | Bombay.            |
| Bower, Geo. (I.C.S.)                                             | ... | ... | ... | Bijnor.            |
| Bowles, L. O. (C.E.)                                             | ... | ... | ... | Shillong.          |
| Bowles, Major L. T.                                              | ... | ... | ... | Chaubattia.        |
| Brand, J.                                                        | ... | ... | ... | Kalyan.            |
| Branson, R. M.                                                   | ... | ... | ... | Bombay.            |

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|----------------------------------------------|-----|-----|------------------------|
| Brendon, B. A. (I.C.S.)                      | ... | ... | ... Ahmednagar.        |
| Brendon, C. R.                               | ... | ... | ... <i>Europe</i> .    |
| Bright, Geo. E.                              | ... | ... | ... Bombay.            |
| Brodie, N. S. (I.C.S.)                       | ... | ... | ... Bombay.            |
| Brook-Fox, E. (C.E.)                         | ... | ... | ... Bankipur.          |
| Broughton, Lt. T. D. (R.E.)                  | ... | ... | ... Bangalore.         |
| Brown, Capt. H. R. (I.M.S.)                  | ... | ... | ... Kowloon, China.    |
| Browne, Major C. A. R. (R.E.)                | ... | ... | ... Lahore.            |
| Browne, Rev. E.                              | ... | ... | ... <i>Europe</i> .    |
| Bruce, Chas. W. A. (I.F.S.)                  | ... | ... | ... Pyinmana, Burma.   |
| Bruce, Lieut. H. R. Brudenell                | ... | ... | ... Dum Dum.           |
| Brunton, R. P.                               | ... | ... | ... Bombay.            |
| Buchanan, J. G.                              | ... | ... | ... Calcutta.          |
| Buchanan, Capt. K. J.                        | ... | ... | ... Abbottabad.        |
| Buck, Sir Edward (K.C.S.I.)                  | ... | ... | ... <i>Europe</i> .    |
| Bulkley, H.                                  | ... | ... | ... Kharaghora.        |
| Burder, H. C. (Life Member)                  | ... | ... | ... <i>Europe</i> .    |
| Burn-Murdoch, Lieut.-Col. J. (R.E.)          | ... | ... | ... Dharwar.           |
| Burness, T.                                  | ... | ... | ... Dibrugarh, Assam.  |
| Burnett, Capt. S. H. (I.M.S.)                | ... | ... | ... Bombay.            |
| Burns, C. L.                                 | ... | ... | ... Bombay.            |
| Burrard, Capt. C.                            | ... | ... | ... Bombay.            |
| Burton, Capt. R. G.                          | ... | ... | ... Jalna.             |
| Burton, Lieut. Richard W.                    | ... | ... | ... Secundbd., Deccan. |
| Butler, A. L.                                | ... | ... | ... Egypt.             |
| Butler, Lt. H. M.                            | ... | ... | ... Mhow.              |
| Bythell, Major W. J. (R.E.)                  | ... | ... | ... <i>Europe</i> .    |
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| Caccia, A. M. (I.F.S.) (Life Member)         | ... | ... | ... DehraDun, N.-W.P.  |
| Cadell, P. R. (I.C.S.)                       | ... | ... | ... Godhra.            |
| Caine, L. S.                                 | ... | ... | ... Mombasa.           |
| Calcutta, Hon. Secretary, Zoological Gardens | ... | ... | ... Calcutta.          |
| Cama, K. R. (Life Member)                    | ... | ... | ... Bombay.            |
| Cama, Dr. Maneckjee D. (Life Member)         | ... | ... | ... Bombay.            |
| Cameron, W. L. (C.E.)                        | ... | ... | ... Belgaum.           |
| Campbell, Lieut. D. (Life Member)            | ... | ... | ... Kamptee.           |
| Campbell, John (C.E.)                        | ... | ... | ... Bombay.            |
| Campbell, Capt. Malcolm (R.A.)               | ... | ... | ... Quetta.            |
| Campbell, Revd. W. H.                        | ... | ... | ... Gooty.             |
| Cappel, E. L. (I.C.S.)                       | ... | ... | ... Poona.             |
| Cappel, S. F. L. (I.F.S.)                    | ... | ... | ... Taungoo, Burma.    |
| Capper, Lieut. A. S.                         | ... | ... | ... Goona.             |
| Carr, S. (I.F.S.)                            | ... | ... | ... <i>Europe</i> .    |
| Carroll, E. B. (C.E.)                        | ... | ... | ... <i>Europe</i> .    |
| Carter, Capt. J. R. B. G.                    | ... | ... | ... Sadra.             |
| Cassels, Mrs. Herbert                        | ... | ... | ... Calcutta.          |
| Cayley, Dr. C. H. (M.A., M.B.)               | ... | ... | ... Bombay.            |
| Chaldecott, Lt. W. H. (R.E.)                 | ... | ... | ... Kirkee.            |
| Chalmers, Allan M.                           | ... | ... | ... Cachar.            |

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|-----------------------------------------------|-----|-----|-----|-----|-------------------|
| Chalmers, H.                                  | ... | ... | ... | ... | Bombay.           |
| Chambers, Chas.                               | ... | ... | ... | ... | Mozambique.       |
| Channer, Lieut.-Col. O. H. (I.M.S.)           | ... | ... | ... | ... | Europe.           |
| Chappel, H. E.                                | ... | ... | ... | ... | Calcutta.         |
| Charles, F. L. (I.C.S.)                       | ... | ... | ... | ... | Europe.           |
| Chichgar, Hormusjee M.                        | ... | ... | ... | ... | Bombay.           |
| Chico, J. R. (C.E.)                           | ... | ... | ... | ... | Baroda.           |
| Chitty, C. W.                                 | ... | ... | ... | ... | Europe.           |
| Cholmondeley, E. C.                           | ... | ... | ... | ... | Indore, C. J.     |
| Christy, Dr. C.                               | ... | ... | ... | ... | Satara.           |
| Clark, J. (I.C.S.)                            | ... | ... | ... | ... | Rangpur.          |
| Clark, W. H.                                  | ... | ... | ... | ... | Kamptee, C. P.    |
| Clarke, Robt. L. H. (I.C.S.)                  | ... | ... | ... | ... | Gonda, Oudh.      |
| Clarkson, Lt.-Col. J. W. (I.M.S.)             | ... | ... | ... | ... | Poona.            |
| Clements, E. (I.C.S.)                         | ... | ... | ... | ... | Karachi.          |
| Cleveland, Capt. H. F. (I.M.S.)               | ... | ... | ... | ... | Bombay.           |
| Clifton, C. N. (C.E.)                         | ... | ... | ... | ... | Poona.            |
| Close, E. P.                                  | ... | ... | ... | ... | Kharaghora.       |
| Clutterbuck, P. H. (I.F.S., F.Z.S.)           | ... | ... | ... | ... | Chakrata.         |
| Coates, Lt. Victor                            | ... | ... | ... | ... | Bombay.           |
| Coen, W. W.                                   | ... | ... | ... | ... | Hubli.            |
| Coggan, R. T.                                 | ... | ... | ... | ... | Haflong.          |
| Collie, Major M. A. T. (I.M.S.)               | ... | ... | ... | ... | Europe.           |
| Collie, R. A.                                 | ... | ... | ... | ... | Dibrugarh, Assam. |
| Collister, J. G. H.                           | ... | ... | ... | ... | Jhansi, N.-W.P.   |
| Colombo, The Librarian, Colombo Museum        | ... | ... | ... | ... | Colombo.          |
| Coltart, Dr. H. N.                            | ... | ... | ... | ... | Dibrugarh.        |
| Comber, Edward (F.Z.S.)                       | ... | ... | ... | ... | Bombay.           |
| Conley, Andrew                                | ... | ... | ... | ... | Calcutta.         |
| Constable, F. A.                              | ... | ... | ... | ... | New York, U.S.A.  |
| Cooch Behar, H. H. the Maharaja (Life Member) | ... | ... | ... | ... | Cooch Behar.      |
| Coode, J. M. (Life Member)                    | ... | ... | ... | ... | Jabalpur, C. P.   |
| Cooke, Lieut. A. St. John                     | ... | ... | ... | ... | South Africa.     |
| Cooke, Dr. E. H.                              | ... | ... | ... | ... | Lanouli.          |
| Cooke, J. V.                                  | ... | ... | ... | ... | Surat.            |
| Copleston, W. E. (I.F.S.)                     | ... | ... | ... | ... | Belgaum.          |
| Coppinger, W. V. (I.M.S.)                     | ... | ... | ... | ... | Dibrugarh, Assam. |
| Corbett, P. J. (C.E.)                         | ... | ... | ... | ... | Karachi, Sind.    |
| Corbett, Capt. W. F.                          | ... | ... | ... | ... | Lucknow.          |
| Cory, Rev. C. P.                              | ... | ... | ... | ... | Europe.           |
| Cosserat, L. (C.E.)                           | ... | ... | ... | ... | Broach.           |
| Counsell, J. G.                               | ... | ... | ... | ... | Bombay.           |
| Coventry, B. O. (I.F.S.)                      | ... | ... | ... | ... | Lahore.           |
| Coventry, E. M. (I.F.S.)                      | ... | ... | ... | ... | Jhelum.           |
| Covernton, Professor A. L.                    | ... | ... | ... | ... | Bombay.           |
| Covernton, J. G.                              | ... | ... | ... | ... | Ahmedabad.        |
| Cox, Capt. P. Z. (F.Z.S., F.R.G.S.)           | ... | ... | ... | ... | Muscat.           |
| Cox, S. (I.F.S.)                              | ... | ... | ... | ... | Madras.           |

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|---------------------------------------------|-----|-----|-----|------------------------------------------|
| Craddock, W. H. (I.F.S.)                    | ... | ... | ... | Bampon Taunggyi,<br>Shan States.         |
| Crawford, Leslie                            | ... | ... | ... | Bombay.                                  |
| Crawford, W. M. (I.C.S.)                    | ... | ... | ... | Khandwa, C. P.                           |
| Crofton, Chas. S. F. (I.C.S.)               | ... | ... | ... | Nasik.                                   |
| Crofts, Major A. M. (I.M.S.)                | ... | ... | ... | Gwalior, C. I.                           |
| Croly, Lt.-Col. A. E. J. (R.A.M.C.)         | ... | ... | ... | Poona.                                   |
| Crommelin, C. A. R.                         | ... | ... | ... | Bombay.                                  |
| Cruddas, Lieut. H. W.                       | ... | ... | ... | Ferozepur.                               |
| Crum, W. E.                                 | ... | ... | ... | Bombay.                                  |
| Crump, H. A.                                | ... | ... | ... | Nagpur, C. P.                            |
| Crump, L. C. (I.C.S.)                       | ... | ... | ... | Europe.                                  |
| Cuffe, T. W.                                | ... | ... | ... | Bombay.                                  |
| Cumming, W. D.                              | ... | ... | ... | Bushire.                                 |
| Curreembhoy Ebrahim                         | ... | ... | ... | Bombay.                                  |
| Currey, E. S.                               | ... | ... | ... | Europe.                                  |
| Currie, R. G.                               | ... | ... | ... | Europe.                                  |
| Cursetji, Khan Bahadur C. M. (Life Member)  | ... | ... | ... | Bombay.                                  |
| Curtis, J. H.                               | ... | ... | ... | Rangoon.                                 |
| Cutch, H. H. the Rao Saheb of (Life Member) | ... | ... | ... | Bhuj, Cutch.                             |
|                                             |     |     |     |                                          |
| Dadarkar, Dr. Bhawanishankar B.             | ... | ... | ... | Dadar.                                   |
| Daintrey, W. M.                             | ... | ... | ... | New York.                                |
| Dalby, Lt. J. (R.A.)                        | ... | ... | ... | Europe.                                  |
| Dalgado, Dr. D. G.                          | ... | ... | ... | Sawantwady.                              |
| Dalgliesh, Lt. E. E. C.                     | ... | ... | ... | Bolarum.                                 |
| Dallaporta, J. N.                           | ... | ... | ... | Bombay.                                  |
| Daly, W. Mahon                              | ... | ... | ... | Pitsunalok, <i>via</i><br>Bangkok, Siam. |
| Damania, Major P. J. (I.M.S.)               | ... | ... | ... | Europe.                                  |
| Daniell, Major A. C. (R.A.)                 | ... | ... | ... | Ahmedabad.                               |
| Danson, J. W. W.                            | ... | ... | ... | Rangoon.                                 |
| Davidson, J. (I.C.S.)                       | ... | ... | ... | Europe.                                  |
| Davidson, Norman                            | ... | ... | ... | Shenkotah P. O.                          |
| Davies, H. S. (C.E.)                        | ... | ... | ... | Europe.                                  |
| Dawn, W. A. W.                              | ... | ... | ... | Moulmein.                                |
| Dawson, G. B.                               | ... | ... | ... | Rangoon.                                 |
| Dawson, W. H. (I.C.S.) (Life Member)        | ... | ... | ... | Europe.                                  |
| Deane, Dr. A. H.                            | ... | ... | ... | Bombay.                                  |
| Deane, H. H. (C.E.)                         | ... | ... | ... | Nandurbar, Khan-<br>deish.               |
| Delmé-Radcliffe, Lt. A.                     | ... | ... | ... | Saugor, C. P.                            |
| Delmé-Radcliffe, Capt. H.                   | ... | ... | ... | Europe.                                  |
| Delme-Radcliffe, Lieut. S.                  | ... | ... | ... | Quetta.                                  |
| Dempster, F. E. (C.I.E.)                    | ... | ... | ... | Umballa.                                 |
| Dharampur, H. H. Maharana Baldeoji of       | ... | ... | ... | Dharampur.                               |
| Dhargalkar, Dr. Luxumon                     | ... | ... | ... | Bombay.                                  |
| Dick, Capt. A. R.                           | ... | ... | ... | China Field Force.                       |
| Dickinson, W. L.                            | ... | ... | ... | Sibsagar, Assam.                         |

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|---------------------------------------------------|-----|-----|--------------------------|
| Dimmock, Lt.-Col. H. P. (M.D., I.M.S.)            | ... | ... | Bombay.                  |
| Dixon, R. M.                                      | ... | ... | Bombay.                  |
| Dodgson, James (J.F.S.)                           | ... | ... | Europe.                  |
| Donald, C. H.                                     | ... | ... | Kotkhai P. O.            |
| Donovan, Capt. C. (I.M.S.)                        | ... | ... | Europe.                  |
| Douglas, D.                                       | ... | ... | Dibrugarh, Assam.        |
| Drake-Brockman, C. B.                             | ... | ... | Fort Lungleh.            |
| Drake-Brockman, Capt. D. H.                       | ... | ... | China Field Force.       |
| Drake-Brockman, Maj. H. E. (I.M.S.) (Life Member) | ... | ... | Bhurtpur.                |
| Dreckmann, Rev. F. (S.J.)                         | ... | ... | Bombay.                  |
| Druce, Herbert                                    | ... | ... | Europe.                  |
| Drury, Major M. O'C. (I.M.S.)                     | ... | ... | Khandeish.               |
| DuBoulay, J. H. (I.C.S.)                          | ... | ... | Europe.                  |
| Dudgeon, G. C. (F.E.S.)                           | ... | ... | Palanpur, Punjab.        |
| Duke, Lt.-Col. J. (I.M.S.)                        | ... | ... | Kashmir.                 |
| Dumayne, F. G.                                    | ... | ... | Calcutta.                |
| Dunbar-Brander A. (I.F.S.)                        | ... | ... | Jabalpur.                |
| Duncan, P. (M.I.C.E.)                             | ... | ... | Ongole, Madras.          |
| Dunsterville, Major K. S. (R.A.)                  | ... | ... | Poona.                   |
| Dunsterville, Capt. L. C.                         | ... | ... | China Field Force.       |
| Dupuis, A. L.                                     | ... | ... | Ceylon.                  |
| Duthie, J. F. (F.L.S.)                            | ... | ... | Saharanpur.              |
| Duxbury, G. R. (I.F.S.)                           | ... | ... | Europe.                  |
| Dwane, E. H.                                      | ... | ... | Secunderabad.            |
| Dyson, Major T. E. (I.M.S.)                       | ... | ... | Europe.                  |
|                                                   |     |     |                          |
| Eardley-Wilmot, S. (I.F.S.)                       | ... | ... | Rangoon.                 |
| Earle, A. A.                                      | ... | ... | Europe.                  |
| Ebden, E. J. (I.C.S.)                             | ... | ... | Europe.                  |
| Ede, F. J. (A.M.I.C.E.)                           | ... | ... | Silchar, Cachar.         |
| Edgelow, Miss G.                                  | ... | ... | Europe.                  |
| Eddie, A. G. (I.F.S.)                             | ... | ... | Dhulia.                  |
| Edmiston, W. L.                                   | ... | ... | Kotagiri.                |
| Edulji Nusserwanji, Dr.                           | ... | ... | Bombay.                  |
| Egerton, C. F.                                    | ... | ... | Europe.                  |
| Elliot, Capt. W. H. W. (F.L.S., I.M.S.)           | ... | ... | South Africa.            |
| Elliot, A.                                        | ... | ... | Amraoti Camp,<br>Berars. |
| Elliott, Dr. A. M.                                | ... | ... | Sholapur.                |
| Elliott, C. F. (I.F.S.)                           | ... | ... | Lahore.                  |
| Elmes, F. W.                                      | ... | ... | Dibrugarh, Assam.        |
| Elsworthy, E. H.                                  | ... | ... | Bombay.                  |
| Elwes, H. J. (F.R.S.)                             | ... | ... | Europe.                  |
| English, A. E. (I.C.S.)                           | ... | ... | Mogaung, Burma.          |
| Enthoven, R. E. (I.C.S.)                          | ... | ... | Poona.                   |
| Evans, Vety.-Capt. G. H.                          | ... | ... | Rangoon.                 |
| Evans, Lt. W. H. (R.E.)                           | ... | ... | Drosh, Chitral.          |
| Evatt, C. B.                                      | ... | ... | Europe.                  |

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|-------------------------------------------------|-----|-----|-----|---------------------|
| Fagan, H. R.                                    | ... | ... | ... | Rangoon.            |
| Fairclough, J.                                  | ... | ... | ... | Bombay.             |
| Farrington, H. A. (I.F.S.)                      | ..  | ... | ... | Jalpaiguri, Bengal. |
| Fawcett, C. H. (I.C.S.)                         | ... | ... | ... | Poona.              |
| Fenton, Lt.-Col. L. L.                          | ... | ... | ... | Rajkote.            |
| Ferguson, H. S. (F.Z.S., F.L.S.)                | ... | ... | ... | Trivandrum.         |
| Fernandez, T. R.                                | ... | ... | ... | Europe.             |
| Ferrand, Lt.-Col. E. (I.M.S.)                   | ... | ... | ... | Jhansi, N.-W. P.    |
| Ferreira, Miss C. (L.M. & S.)                   | ... | ... | ... | Bombay.             |
| Ferris, Lt.-Col. W. B.                          | ... | ... | ... | Bombay.             |
| Few, H. W.                                      | ... | ... | ... | Pakokku, U. Burma.  |
| Finny, Capt. T. G. R.                           | ... | ... | ... | Europe.             |
| Fischer, C. E. C. (I.F.S.)                      | ... | ... | ... | Chatrapur.          |
| Fisher, W. F. D. (I.F.S.)                       | ... | ... | ... | Europe.             |
| Fitz-Hugh Lance, Lieut. F.                      | ... | ... | ... | South Africa.       |
| Fleming, W. N.                                  | ... | ... | ... | Europe.             |
| Fletcher, F. E.                                 | ... | ... | ... | Calicut.            |
| Flower, Lieut. S. S.                            | ... | ... | ... | Cairo, Egypt.       |
| Foote, R. Bruce                                 | ... | ... | ... | Bangalore.          |
| Forbes, C. H. B.                                | ... | ... | ... | Bombay.             |
| Forbes, Capt. G. F. R.                          | ... | ... | ... | Europe.             |
| Forbes, J. D.                                   | ... | ... | ... | Europe.             |
| Forbes-Sempill, The Hon'ble R. A.               | ... | ... | ... | Moulmein.           |
| Forel, Monsieur Auguste (Hon. Corresp. Member). | ... | ... | ... | Europe.             |
| Forsyth, Dr. W.                                 | ... | ... | ... | Europe.             |
| Forteach, H. H. (I.F.S.)                        | ... | ... | ... | Europe.             |
| Foster, Capt. L. M.                             | ... | ... | ... | Kirkee.             |
| Foulkes, George F. F. (I.F.S.)                  | ... | ... | ... | Nellore.            |
| Foulkes, Capt. H. D.                            | ... | ... | ... | Ferozepur.          |
| Fountouklis, E.                                 | ... | ... | ... | Ahmednagar.         |
| Fox, Col. H. C.                                 | ... | ... | ... | Dharwar.            |
| Fraser, Major A.                                | ... | ... | ... | Mooltan.            |
| Fraser, Capt. H. A. D. (R.E.)                   | ... | ... | ... | Bangalore.          |
| Fraser, S. M. (I.C.S.)                          | ... | ... | ... | Bangalore.          |
| French, Major G. B. (I.M.S.)                    | ... | ... | ... | Azambarh.           |
| Frenchman, Major E. P. (I.M.S.)                 | ... | ... | ... | Bassein, Burma.     |
| Friedlander and Sohn, Messrs. R.                | ... | ... | ... | Europe.             |
| Fry, T. B. (I.F.S.)                             | ... | ... | ... | Europe.             |
| Fuller, Dr. Chas. A.                            | ... | ... | ... | Cawnpore.           |
| Fulton, Hon'ble Mr. Justice E. M. (I.C.S.)      | ... | ... | ... | Bombay.             |
| Fulton, Lt.-Col. R.                             | ... | ... | ... | Dharamsala.         |
| Furdoonji Jamsetji                              | ... | ... | ... | Bombay.             |
| Gadsden, F. O. (R.I.M.)                         | ... | ... | ... | Bombay.             |
| Gahagan, E. G. (C.E.)                           | ... | ... | ... | Malegaon.           |
| Gama, Dr. J. A. Da                              | ... | ... | ... | Bombay.             |
| Gamble, J. S. (F.L.S.)                          | ... | ... | ... | Europe.             |
| Gaskin, L. E. P. (I.C.S.)                       | ... | ... | ... | Mundla, C. P.       |
| Gaye, W. C.                                     | ... | ... | ... | Secunderabad.       |

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|------------------------------------------------|-----|-----|-----|-----------------------------|
| Gebbie, E. St. J., Mailang Division, B.-N. Ry. | ... | ... | ... | N. Cachar.                  |
| Geddes, Mrs. J. G.                             | ... | ... | ... | <i>Europe</i> .             |
| Gell, H. G.                                    | ... | ... | ... | Bombay.                     |
| George, C. P.                                  | ... | ... | ... | Secunderabad.               |
| Gerhardt, Paul                                 | ... | ... | ... | Karli, Deccan.              |
| Ghosal, J. (I.C.S.)                            | ... | ... | ... | Alibag.                     |
| Gibbett, E. (C.E.)                             | ... | ... | ... | Rangoon.                    |
| Gibbs, H. M.                                   | ... | ... | ... | <i>Europe</i> .             |
| Gibbs, R. T.                                   | ... | ... | ... | Dacca.                      |
| Gilbert, C. F. (M.I.C.E.)                      | ... | ... | ... | Bhamo, Burma.               |
| Gilbert, Reg.                                  | ... | ... | ... | Bombay.                     |
| Gilbert-Cooper, W. J. (I.F.S.)                 | ... | ... | ... | Moulmein.                   |
| Giles, R.                                      | ... | ... | ... | Karachi.                    |
| Gill, H.                                       | ... | ... | ... | Bombay.                     |
| Gillum, S. J.                                  | ... | ... | ... | Bombay.                     |
| Gimlette, Lt.-Col. G. H. S. (I.M.S.)           | ... | ... | ... | Hyderabad, Deccan.          |
| Giro, C. G.                                    | ... | ... | ... | Calcutta.                   |
| Gleadow, F. (F.R.M.S., I.F.S.)                 | ... | ... | ... | Dehra Dun.                  |
| Godwin-Austin, H.                              | ... | ... | ... | <i>Europe</i> .             |
| Goldsmid, F. L.                                | ... | ... | ... | Sholapur.                   |
| Goldthorpe, Lieut. F. H.                       | ... | ... | ... | Kohat.                      |
| Gonsalves, Dr. J. F.                           | ... | ... | ... | Bandra.                     |
| Gordon, D. M.                                  | ... | ... | ... | Mone, Burma.                |
| Gore, Col. St. G. C. (R.E.)                    | ... | ... | ... | Calcutta.                   |
| Gracias, Dr. C. F. X.                          | ... | ... | ... | Silvassa, <i>viâ</i> Daman. |
| Graham, Lt. B. C.                              | ... | ... | ... | Drosh, Chitral.             |
| Graham, J. A.                                  | ... | ... | ... | Coorg.                      |
| Graham, W. D.                                  | ... | ... | ... | Hongkong.                   |
| Gray, Chas.                                    | ... | ... | ... | Coonoor.                    |
| Gray, H.                                       | ... | ... | ... | Rangoon.                    |
| Greany, Lieut.-Col. J. P.                      | ... | ... | ... | <i>Europe</i> .             |
| Greatheed, C.                                  | ... | ... | ... | <i>Europe</i> .             |
| Greaves, John                                  | ... | ... | ... | Bombay.                     |
| Greaves, S. E.                                 | ... | ... | ... | Bombay.                     |
| Green, E. Ernest (F.E.S.)                      | ... | ... | ... | Peradeniya, Ceylon.         |
| Green, Major J. S. (R.A.M.C.)                  | ... | ... | ... | South Africa.               |
| Green, W. M. (I.F.S.)                          | ... | ... | ... | <i>Europe</i> .             |
| Gregerson, Dr. J. D.                           | ... | ... | ... | Dibrugarh, Assam.           |
| Greig, Joseph                                  | ... | ... | ... | Cachar.                     |
| Griffiths, V. M.                               | ... | ... | ... | Nasik.                      |
| Grubbe, Major E. A.                            | ... | ... | ... | Nasirabad.                  |
| Guinness, Major E. (R.A.)                      | ... | ... | ... | <i>Europe</i> .             |
| Guy, G. Filmer                                 | ... | ... | ... | Bombay.                     |
| Gwyn, Capt. A.                                 | ... | ... | ... | <i>Europe</i> .             |
| Habibuddin, S. (C.S.)                          | ... | ... | ... | Kazipet.                    |
| Haig, Lt.-Col. P. de H. (I.M.S.)               | ... | ... | ... | <i>Europe</i> .             |
| Haines, H. H. (I.F.S.)                         | ... | ... | ... | <i>Europe</i> .             |

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|-------------------------------------------------|-----|-----|-----|-----|--------------------------|
| Hale, A.                                        | ... | ... | ... | ... | Selangor.                |
| Hall, Mitchell                                  | ... | ... | ... | ... | South Africa.            |
| Hampson, Sir George F. (Bart.) (F.L.S., F.E.S.) | ... | ... | ... | ... | Europe.                  |
| Hankin, A. C. (C.I.E.)                          | ... | ... | ... | ... | Secunderabad.            |
| Hannington, W. O.                               | ... | ... | ... | ... | Toungdwingyee,<br>Burma. |
| Hanson, C. O. (I.F.S.)                          | ... | ... | ... | ... | Seoni, Chapara.          |
| Hanson, R. W.                                   | ... | ... | ... | ... | Bombay.                  |
| Hardinge, D.                                    | ... | ... | ... | ... | Maubin, Burma.           |
| Harington, Lieut. E. C.                         | ... | ... | ... | ... | Europe.                  |
| Harington, Capt. H. H.                          | ... | ... | ... | ... | Rangoon.                 |
| Harington, Lt.-Col. V. (I.M.S.)                 | ... | ... | ... | ... | Ajmir.                   |
| Harper, E. W. (F.Z.S.)                          | ... | ... | ... | ... | Calcutta.                |
| Harris, Capt. E. W.                             | ... | ... | ... | ... | Hongkong.                |
| Harris, L. T.                                   | ... | ... | ... | ... | Vizagapatam.             |
| Harrison, A. J.                                 | ... | ... | ... | ... | Tippuk, Assam.           |
| Harter, R. W.                                   | ... | ... | ... | ... | Bombay.                  |
| Harvey, W. L. (I.C.S.)                          | ... | ... | ... | ... | Europe.                  |
| Haslope, Rev. L. M.                             | ... | ... | ... | ... | Poona.                   |
| Hasted, H. R. G.                                | ... | ... | ... | ... | Russel Konda.            |
| Hasted, W. A.                                   | ... | ... | ... | ... | Waltair, Madras.         |
| Hatch, Capt. A. E.                              | ... | ... | ... | ... | Poona.                   |
| Hatch, G. W. (I.C.S.)                           | ... | ... | ... | ... | Ratnagiri.               |
| Hatch, Lt.-Col. W. K. (I.M.S.)                  | ... | ... | ... | ... | Bombay.                  |
| Hatchell, D. G.                                 | ... | ... | ... | ... | Vizianagram.             |
| Hate, Vinayek N.                                | ... | ... | ... | ... | Bombay.                  |
| Haughton, Samuel (C.C.S.)                       | ... | ... | ... | ... | Colombo, Ceylon.         |
| Hauxwell, T. A. (I.F.S.)                        | ... | ... | ... | ... | Rangoon.                 |
| Hawks, Lieut. G. A.                             | ... | ... | ... | ... | Meerut.                  |
| Hayter, O. C. G.                                | ... | ... | ... | ... | Sukkur, Sind.            |
| Hearsey, T. N. (I.F.S.)                         | ... | ... | ... | ... | Pollibetta, S. Coorg.    |
| Heath, R. H. (C.E.)                             | ... | ... | ... | ... | Bombay.                  |
| Heeckerenz, Le Baron Von (Hon. Corrug. Member). | ... | ... | ... | ... | Java.                    |
| Henderson, Lt. R. R.                            | ... | ... | ... | ... | Lucknow.                 |
| Henderson, Lieut.-Col. W. G. H. (I.M.S.)        | ... | ... | ... | ... | Poona.                   |
| Herbert, Major H. (I.M.S.)                      | ... | ... | ... | ... | Bombay.                  |
| Hickman, R. St. J.                              | ... | ... | ... | ... | Cachar.                  |
| Hide, P. (Life Member.)                         | ... | ... | ... | ... | Karachi.                 |
| Hill, Claude H. (I.C.S.)                        | ... | ... | ... | ... | Poona.                   |
| Hill, F. J. A.                                  | ... | ... | ... | ... | Uran.                    |
| Hill, H. Charles                                | ... | ... | ... | ... | Calcutta.                |
| Hla, Maung Po                                   | ... | ... | ... | ... | Mingin, Burma.           |
| Hodges, Capt. H.                                | ... | ... | ... | ... | Europe.                  |
| Hodgson, C. M. (I.F.S.)                         | ... | ... | ... | ... | Kendat, Burma.           |
| Hojel, Major J. G. (I.M.S.)                     | ... | ... | ... | ... | Bombay.                  |
| Hole, H. A.                                     | ... | ... | ... | ... | Europe.                  |
| Hole, R. S. (I.F.S.)                            | ... | ... | ... | ... | Jabalpur, C.P.           |
| Holland, W. J.                                  | ... | ... | ... | ... | Europe.                  |
| Hollis, T.                                      | ... | ... | ... | ... | Bombay.                  |

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|------------------------------------------------------------|-----|-----|-----|-----------------------|
| Holmes, Capt. G. V.                                        | ... | ... | ... | Sirdarpur, C. I.      |
| Holyoak, Bernard                                           | ... | ... | ... | Bombay.               |
| Hooton, Capt. A. (I.M.S.)                                  | ... | ... | ... | Poona.                |
| Hope, C. W.                                                | ... | ... | ... | Europe.               |
| Hope, G. A. (R.A.)                                         | ... | ... | ... | Ellichpur.            |
| Hornidge, S. (C.E., I.F.S.)                                | ... | ... | ... | Ahmednagar.           |
| Hoskyn, Lt. J. C. M.                                       | ... | ... | ... | Poona.                |
| Hotson, J. E. B. (I.C.S.)                                  | ... | ... | ... | Ahmedabad.            |
| Howlett, Col. A. (I.S.C.)                                  | ... | ... | ... | Bhamo, Burma.         |
| Hudson, Capt. C. T. (I.M.S.)                               | ... | ... | ... | Europe.               |
| Hudson, C. W. M. (I.C.S.)                                  | ... | ... | ... | Europe.               |
| Hunt, C. B. Holman                                         | ... | ... | ... | Ceylon.               |
| Hunt, E. R.                                                | ... | ... | ... | Sylhet.               |
| Hunter, Lt. W. J. H.                                       | ... | ... | ... | Poona.                |
| Hutchinson, Lt. C. G.                                      | ... | ... | ... | Europe.               |
| Hutchinson, F. G.                                          | ... | ... | ... | Bhaynder.             |
| Hutchinson, F. T.                                          | ... | ... | ... | Bombay.               |
| Hyam, Judah (Life Member)                                  | ... | ... | ... | Poona.                |
| Hyde-Wilcox, F.                                            | ... | ... | ... | Calcutta.             |
| Ichalkaranji, The Hon'ble Narayenrao Govind, <i>alias</i>  |     |     |     |                       |
| Babasaheb Ghorpade, Chief of (Life Member)                 |     |     | ... | Kolhapur.             |
| Ilbert, L. G.                                              | ... | ... | ... | Sibsagar, Assam.      |
| Imray, Robt. S.                                            | ... | ... | ... | Peermaad, Travancore. |
| Indore, H. H. the Maharaja Holkar of ...                   |     |     |     |                       |
| Inglis, Chas. M.                                           | ... | ... | ... | Indore.               |
| Inverarity, J. D. (B.A., LL.B.) (Life Member)              | ... | ... | ... | Hatauri, P. O.        |
| Ittensohn, C.                                              | ... | ... | ... | Bombay.               |
| Ittensohn, C.                                              | ... | ... | ... | Bombay.               |
| Jackson, A. B. (I.F.S.)                                    | ... | ... | ... | Coimbatore.           |
| Jackson, Col. F. H.                                        | ... | ... | ... | Europe.               |
| Jacob, Mrs. Arthur                                         | ... | ... | ... | Europe.               |
| Jacob, G. (I.C.S.)                                         | ... | ... | ... | Europe.               |
| Jamrach, W.                                                | ... | ... | ... | Europe.               |
| Jamsetji, M., Doctor                                       | ... | ... | ... | Bombay.               |
| Janjira, H. H. Sir Sidi Ahmed Khan, Nawab of (Life Member) | ... | ... | ... | Janjira.              |
| Jardine, A. J. A.                                          | ... | ... | ... | Bangkok, Siam.        |
| Jardine, E. R.                                             | ... | ... | ... | Rangoon.              |
| Jardine, M. R.                                             | ... | ... | ... | Bombay.               |
| Jardine, W. F.                                             | ... | ... | ... | Ratnagiri.            |
| Jayakar, Lt.-Col. A. S. G. (I.M.S.)                        | ... | ... | ... | Bandora.              |
| Jeffrey, J. A.                                             | ... | ... | ... | Bombay.               |
| Jellet, H. H.                                              | ... | ... | ... | Seoni, Chapara.       |
| Jermyn, Capt. T.                                           | ... | ... | ... | Peshawar.             |
| Jesse, William                                             | ... | ... | ... | Lucknow.              |
| John, H. C. (C.E.)                                         | ... | ... | ... | Satara.               |
| John, H. E.                                                | ... | ... | ... | Bombay.               |

|                                               |     |     |     |                      |
|-----------------------------------------------|-----|-----|-----|----------------------|
| Johnson, S. M.                                | ... | ... | ... | Cawnpore.            |
| Johnson, W. P.                                | ... | ... | ... | Bombay.              |
| Johnston, J. C. R.                            | ... | ... | ... | Bombay.              |
| Johnstone, J. W. D.                           | ... | ... | ... | Gwalior, C. I.       |
| Jones, Major F. W. C. (R.A.M.C.)              | ... | ... | ... | Kandia, Crete.       |
| Jones, Major J. Lloyd (I.M.S.)                | ... | ... | ... | Bombay.              |
| Jones, Lt.-Col. J. M. (R.A.M.C.)              | ... | ... | ... | Sabathu, Punjab.     |
| Jones, Capt. M. D. Goring                     | ... | ... | ... | Nagpur, C. P.        |
| Jowitt, John F.                               | ... | ... | ... | Bandarwella, Ceylon. |
| Jugmohundas V. Bhaisett                       | ... | ... | ... | Bombay.              |
|                                               |     |     |     |                      |
| Kearns, A. S.                                 | ... | ... | ... | Bangalore.           |
| Keary, Lt.-Col. H. D.                         | ... | ... | ... | Moiktilla, Burma.    |
| Keene, Lt. C. W.                              | ... | ... | ... | Edwardsabad.         |
| Kellie, Col. R. H.                            | ... | ... | ... | Deolali.             |
| Kelsall, Capt. H. J. (R.A.)                   | ... | ... | ... | Europe.              |
| Kemball, H. V. (C.E.)                         | ... | ... | ... | Bombay.              |
| Kemp, N. W.                                   | ... | ... | ... | Bombay.              |
| Kendall, Capt. C. J. (R.I.M.)                 | ... | ... | ... | Bombay.              |
| Kennedy, R. M. (I.C.S.)                       | ... | ... | ... | Europe.              |
| Kenny, S. D. (I.F.S.)                         | ... | ... | ... | Chikalda, Berar.     |
| Kenyon, James                                 | ... | ... | ... | Karachi.             |
| Ker, L. B.                                    | ... | ... | ... | Bombay.              |
| Kerkhoven, E. J. (Hon. Correspg. Member)      | ... | ... | ... | Java.                |
| Keys, H. W. (I.F.S.)                          | ... | ... | ... | Satara.              |
| Khan, Muncherji Framji                        | ... | ... | ... | Bombay.              |
| Khareghat, M. P. (I.C.S.)                     | ... | ... | ... | Shikarpur.           |
| Kinloch, A. M.                                | ... | ... | ... | Kotagiri.            |
| Kirtikar, Lt.-Col. K. R. (I.M.S.)             | ... | ... | ... | Ratnagiri.           |
| Kolhapur, H. H. the Maharaja of (Life Member) | ... | ... | ... | Kolhapur.            |
| Kotah, H. H. the Maharaja (Life Member)       | ... | ... | ... | Kotah.               |
| Kunwar Kushal Pal Singh                       | ... | ... | ... | Narki, Agra Dist.    |
|                                               |     |     |     |                      |
| Lace, John H. (I.F.S., F.L.S.)                | ... | ... | ... | Calcutta.            |
| Laird-MacGregor, E. G. L. (I.C.S.)            | ... | ... | ... | Karwar.              |
| Lamb, Capt. Geo. (I.M.S.)                     | ... | ... | ... | Bombay.              |
| Lamb, R. A. (I.C.S.) (Life Member)            | ... | ... | ... | Europe.              |
| Lambert, J. S.                                | ... | ... | ... | Munmar.              |
| Land Records and Agriculture, The Director of | ... | ... | ... | Poona.               |
| Lane, Lt. W. H.                               | ... | ... | ... | Bombay.              |
| Lang, Walter                                  | ... | ... | ... | Bombay.              |
| Langley, Brig.-Surg. E. H.                    | ... | ... | ... | Europe.              |
| Lawrence, Mrs. E.                             | ... | ... | ... | Europe.              |
| Leask, J.                                     | ... | ... | ... | Bombay.              |
| Lee, Lieut. A. W. H.                          | ... | ... | ... | Sima, Upper Burma.   |
| Lee, P. Henry K.                              | ... | ... | ... | Bangalore.           |
| Leighton, D. E. W.                            | ... | ... | ... | Madras.              |
| Lely, Hon'ble Mr. F. S. P. (I.C.S.)           | ... | ... | ... | Ahmedabad.           |
| Lennox, Lt. G. M.                             | ... | ... | ... | Poona.               |

LIST OF MEMBERS.

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|------------------------------------------------|--------|--------|--------|--------------------|
| Leslie, A. K. ... ..                           | ... .. | ... .. | ... .. | Bombay.            |
| Leslie, Major G. A., (R.E.) ... ..             | ... .. | ... .. | ... .. | Drosh, Chitral.    |
| Lester, Capt. C. D. ... ..                     | ... .. | ... .. | ... .. | Europe.            |
| Lewis, Fred. (F.L.S.) ... ..                   | ... .. | ... .. | ... .. | Colombo, Ceylon.   |
| Light, Lt.-Col. R. H. ... ..                   | ... .. | ... .. | ... .. | Europe.            |
| Light, Lieut. W. A. ... ..                     | ... .. | ... .. | ... .. | Saugor, C. P.      |
| Lightfoot, S. St. C. ... ..                    | ... .. | ... .. | ... .. | Mimbu, U. Burma.   |
| Lindesay, Major E. ... ..                      | ... .. | ... .. | ... .. | Mhow, C. I.        |
| Linnell, Fred. ... ..                          | ... .. | ... .. | ... .. | Rangoon.           |
| Little, F. A. ... ..                           | ... .. | ... .. | ... .. | Europe.            |
| Littledale, Professor H. ... ..                | ... .. | ... .. | ... .. | Europe.            |
| Lloyd, Col. R. O. (R.E.) ... ..                | ... .. | ... .. | ... .. | Poona.             |
| Loam, Mathew ... ..                            | ... .. | ... .. | ... .. | Europe.            |
| Lech, Capt. F. R. E. (I.S.C.) ... ..           | ... .. | ... .. | ... .. | Europe.            |
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| Lowrie, A. E. (I.F.S.) ... ..                  | ... .. | ... .. | ... .. | Coorg.             |
| Luard, E. S. ... ..                            | ... .. | ... .. | ... .. | Europe.            |
| Lucknow, The Curator & Sec., Provincial Museum |        |        |        | Lucknow.           |
| Lumley, Major F. D. ... ..                     | ... .. | ... .. | ... .. | Trimulgherry.      |
| Lye, Rev. S. L. ... ..                         | ... .. | ... .. | ... .. | Europe.            |
| Lynch, C. B. ... ..                            | ... .. | ... .. | ... .. | Bombay.            |
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| Lyons, Major R. W. S. (I.M.S.) ... ..          | ... .. | ... .. | ... .. | Bombay.            |
| Macaulay, L. A. ... ..                         | ... .. | ... .. | ... .. | Thana.             |
| Macaulay, R. H. ... ..                         | ... .. | ... .. | ... .. | Europe.            |
| MacDonald, Dr. D. (Life Member) ... ..         | ... .. | ... .. | ... .. | Bombay.            |
| MacDonald, J. ... ..                           | ... .. | ... .. | ... .. | Bombay.            |
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| Macpherson, Col. T. R. M. ... ..               | ... .. | ... .. | ... .. | Europe.            |
| Mactaggart, H. B. ... ..                       | ... .. | ... .. | ... .. | Negapatam.         |
| Macwood, F. M. ... ..                          | ... .. | ... .. | ... .. | Colombo.           |
| Madras, The Principal Presidency College       |        |        |        | Madras.            |
| Madras, The Supdt., Govt. Central Museum       |        |        |        | Madras.            |
| Mahaluxmiwalla, K. D. ... ..                   | ... .. | ... .. | ... .. | Bombay.            |

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| Mair, A.                                                                                       | ... | ... | ... | Calcutta.                               |
| Maitland, Major C. B. (I.M.S.)                                                                 | ... | ... | ... | Europe.                                 |
| Major, Capt. F. F.                                                                             | ... | ... | ... | Jalna, Deccan.                          |
| Mallins, Major C. (I.M.S.)                                                                     | ... | ... | ... | Europe.                                 |
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| Manson, C. E. F.                                                                               | ... | ... | ... | Pyinmana, Burma.                        |
| Manson, F. B. (I.F.S.)                                                                         | ... | ... | ... | Europe.                                 |
| Mant, R. N.                                                                                    | ... | ... | ... | Europe.                                 |
| Maries, Chas. (Hon. Correspg. Member)                                                          | ... | ... | ... | Europe.                                 |
| Marjoribanks, Lt. J. L. (I.M.S.)                                                               | ... | ... | ... | Bombay.                                 |
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| Marston, G. D. (C.E.)                                                                          | ... | ... | ... | Bombay.                                 |
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| Martin, Lieut.-Col. Gerald (Life Member)                                                       | ... | ... | ... | Europe.                                 |
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| Maxwell, F. D.                                                                                 | ... | ... | ... | Maubin, Burma.                          |
| McArthur, Vet.-Surgn. G. W.                                                                    | ... | ... | ... | Rangoon.                                |
| McClelland, W. S. (M.I.C.E.)                                                                   | ... | ... | ... | Europe.                                 |
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| McKay, Lt.-Col. H. K. (I.M.S.)                                                                 | ... | ... | ... | Jabalpur, C. P.                         |
| McKenzie, Alex.                                                                                | ... | ... | ... | Bombay.                                 |
| McLaughlin, Lt. H. D.                                                                          | ... | ... | ... | Sirdarpur.                              |
| McMahon, Major A. H. (C.I.E., C.S.I.)                                                          | ... | ... | ... | Quetta.                                 |
| McMullen, Dr. G. C.                                                                            | ... | ... | ... | Kotri, Sind.                            |
| McNeil, J. (I.C.S.)                                                                            | ... | ... | ... | Europe.                                 |
| Mead, Capt. H. R.                                                                              | ... | ... | ... | Europe.                                 |
| Mead, P. J. (I.C.S.)                                                                           | ... | ... | ... | Bombay.                                 |
| Meinertzhagen, Lieut. R.                                                                       | ... | ... | ... | Mandalay.                               |
| Merrony, Chas.                                                                                 | ... | ... | ... | Godhra.                                 |
| Merwanji Pallonji Talati                                                                       | ... | ... | ... | Bombay.                                 |
| Mess President, 34th Battery, R. F. A.                                                         | ... | ... | ... | Ahmedabad.                              |
| Mess President, 10th Bo. L. Infantry (Life Member)                                             | ... | ... | ... | Ahmedabad.                              |
| Mess President, South Wales Borderers                                                          | ... | ... | ... | Chakrata.                               |
| Mess President, Q. O. Corps of Guides                                                          | ... | ... | ... | Mardan.                                 |
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| Meyer, O.                                                                                      | ... | ... | ... | Bombay.                                 |
| Millard, W. S.                                                                                 | ... | ... | ... | Bombay.                                 |
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| Milne, Capt. C. J. (I.M.S.)                                                                    | ... | ... | ... | Calcutta.                               |
| Minniken, G. G. (I.F.S.)                                                                       | ... | ... | ... | Simla.                                  |
| Miraj, Shrimant Gungadharrao Ganesh, <i>alias</i> Babasaheb Patwardhan, Chief of (Life Member) | ... | ... | ... | Miraj.                                  |

|                                                             |     |     |                        |
|-------------------------------------------------------------|-----|-----|------------------------|
| Mitchell, Dr. W. ...                                        | ... | ... | ... <i>Europe.</i>     |
| Modi, Bomanji Edulji ...                                    | ... | ... | ... Kaira.             |
| Monte, Dr. D. A. dé ...                                     | ... | ... | ... Bandora            |
| Morgan, A. ...                                              | ... | ... | ... Kotagiri.          |
| Morgan, Lt. E. J. (I.M.S.) ...                              | ... | ... | ... Bombay.            |
| Morison, A. E. F. ...                                       | ... | ... | ... Kotagiri.          |
| Morison, W. T. (I.C.S.) ...                                 | ... | ... | ... <i>Europe.</i>     |
| Morley, G. S. ...                                           | ... | ... | ... Nagpur, C. P.      |
| Morris, Capt. D. O. ...                                     | ... | ... | ... Amraoti, Berar.    |
| Morris, G. C. ...                                           | ... | ... | ... Ceylon.            |
| Morris, Lt. G. M. ...                                       | ... | ... | ... <i>Europe.</i>     |
| Morrison, Dr. W. ...                                        | ... | ... | ... Bombay.            |
| Morton, Lieut. J. P. (I.M.S.) ...                           | ... | ... | ... Madras.            |
| Moscardi, E. H. (I.C.S.) ...                                | ... | ... | ... Surat.             |
| Moss, Capt. C. ...                                          | ... | ... | ... <i>Europe.</i>     |
| Mosse, Lt. A. H. E. (I.S.C.) ...                            | ... | ... | ... Dehra Ismail Khan. |
| Moulvi Syed Ali Belgram ...                                 | ... | ... | ... Hyderabad, Deccan. |
| Mowbray, Lt. J. L. ...                                      | ... | ... | ... Nasirabad.         |
| Moylan, W. ...                                              | ... | ... | ... Calcutta.          |
| Muir, Col. H. S. (I.M.S.) ...                               | ... | ... | ... <i>Europe.</i>     |
| Muller, Professor O. V. ...                                 | ... | ... | ... Bombay.            |
| Mumford, E. G. ...                                          | ... | ... | ... Maubin, Burma.     |
| Mumford, J. ...                                             | ... | ... | ... Bombay.            |
| Munna Lâl, Dr. ...                                          | ... | ... | ... Orai, N.-W.P.      |
| Mure, J. S. ...                                             | ... | ... | ... Rawal Pindi.       |
| Mysore, The Superintendent, Mysore Government<br>Museum ... | ... | ... | ... Bangalore.         |
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| Nagpur, The Curator, Central Museum...                      | ... | ... | ... Nagpur.            |
| Nangle, Lieut. K. E. ...                                    | ... | ... | ... Aurungabad.        |
| Nangle, Lt. M. C. ...                                       | ... | ... | ... Mandalay.          |
| Naranji Dwarkadas (Life Member) ...                         | ... | ... | ... Bombay.            |
| Narrotumdas Morarji Goculdass (Life Member) ...             | ... | ... | ... Bombay.            |
| Navanagar, H. H. Maharaja Jam Saheb of (Life<br>Member) ... | ... | ... | ... Rajkote.           |
| Needham, J. ...                                             | ... | ... | ... Dibrugarh.         |
| Newland, Major A. G. E. (I.M.S.) ...                        | ... | ... | ... <i>Europe.</i>     |
| Newnham, Major A. (F.Z.S.) ...                              | ... | ... | ... Lucknow.           |
| Nicéville, L. de (F.E.S.) (Hon. Corresp. Member)...         | ... | ... | ... Calcutta.          |
| Nicholson, E. F. ...                                        | ... | ... | ... Bombay.            |
| Nicholson, Major R. H. (R.A.M.C.) ...                       | ... | ... | ... <i>Europe.</i>     |
| Nicholson, Capt. W. C. ...                                  | ... | ... | ... Hongkong.          |
| Nigel Jones, M.E. ...                                       | ... | ... | ... Dibrugarh, Assam.  |
| Nisbett, Capt. W. G. ...                                    | ... | ... | ... Sadon, Burma.      |
| Northcote, H. E., Lord ...                                  | ... | ... | ... Poona.             |
| Norvill, Dr. F. H. ...                                      | ... | ... | ... Lakhimpur.         |
| Nurse, Major C. G. (F.R.G.S., F.E.S.) ...                   | ... | ... | ... Deesa.             |
| Nurse, Capt. H. H. ...                                      | ... | ... | ... China Field Force  |

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|------------------------------------------------------|-----|-----|-----|--------------------------------------|
| Oakden, R. (I.C.S.)                                  | ... | ... | ... | Meerut.                              |
| Oakes, George                                        | ... | ... | ... | Ootacamund.                          |
| Oates, E. W. (Hon. Corresp. Member)                  | ... | ... | ... | Europe.                              |
| O'Brien, Edward                                      | ... | ... | ... | Amreli, Kathiawar.                   |
| O'Brien, Hon'ble W. T.                               | ... | ... | ... | Europe.                              |
| O'Connor, J. E. (C.I.E.)                             | ... | ... | ... | Calcutta.                            |
| O'Leary, J. L. McCarthy (I.F.S.)                     | ... | ... | ... | Kurnool.                             |
| Ogilvie, Capt. E. C. (R.E.)                          | ... | ... | ... | Quetta.                              |
| Oldham, Capt. F. T. (R.A.)                           | ... | ... | ... | Mean Mir.                            |
| Oliver, A. K.                                        | ... | ... | ... | Bombay.                              |
| Oliver, J. W. (I.F.S.)                               | ... | ... | ... | Dehra Dun.                           |
| Olivier, Lt.-Col. H. D. (R.E., F.Z.S.) (Life Member) | ... | ... | ... | Bombay.                              |
| Ollivant, Hon'ble Sir E. C. K. (I.C.S., K.C.S.I.)    | ... | ... | ... | Bombay.                              |
| Opiumwalla, Dorab E.                                 | ... | ... | ... | Bombay.                              |
| Orr, J. P. (I.C.S.)                                  | ... | ... | ... | Thana.                               |
| Osborn, Lt.-Genl. W. (I.S.C.)                        | ... | ... | ... | Hoshiarpur.                          |
| Osmaston, B. B. (I.F.S.)                             | ... | ... | ... | Europe.                              |
| Osmaston, L. S. (I.F.S.)                             | ... | ... | ... | Poona.                               |
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| Palliser, H. G. (C.E.)                               | ... | ... | ... | Karachi.                             |
| Parker, Lt.-Col. J. (I.M.S.)                         | ... | ... | ... | Europe.                              |
| Parsons, H. J.                                       | ... | ... | ... | Europe.                              |
| Partridge, Henry (Life Member)                       | ... | ... | ... | Pyinmana, Burma.                     |
| Pawalla, Jamsetji C.                                 | ... | ... | ... | Bombay.                              |
| Payn, Capt. W. A.                                    | ... | ... | ... | South Africa.                        |
| Pearless, S. H.                                      | ... | ... | ... | Ceylon.                              |
| Pearson, R. S. (I.F.S.)                              | ... | ... | ... | Dhulia.                              |
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| Peiniger, W. G.                                      | ... | ... | ... | Chiengmai, viâ<br>Moulmein.          |
|                                                      |     |     |     |                                      |
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| Pigott, R. E.                                        | ... | ... | ... | Arkonam.                             |
| Pilcher, Capt. A. J. (R.E.)                          | ... | ... | ... | Europe.                              |
| Pilcher, Col. J. G. (I.M.S.)                         | ... | ... | ... | Europe.                              |
| Pilkington, H. S. H.                                 | ... | ... | ... | Bombay.                              |
| Pinhey, Capt. A. F.                                  | ... | ... | ... | Oodeypur.                            |

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| Pink, H. F. L.                          | ... | ... | ... | Dehra Dun.                            |
| Plinston, G. C.                         | ... | ... | ... | Bombay.                               |
| Pollen, Dr. John (I.C.S.)               | ... | ... | ... | Bombay.                               |
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| Polwhele, A. C. (C.E.)                  | ... | ... | ... | Naini Tal.                            |
| Poncins, Baron Edmond de (Life Member)  | ... | ... | ... | Europe.                               |
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| Prall, Major S. E. (I.M.S.)             | ... | ... | ... | Aden.                                 |
| Pratt, F. G. (I.C.S.)                   | ... | ... | ... | Kaira.                                |
| Prentis, Capt. W. S.                    | ... | ... | ... | China Field Force.                    |
| Prescott, Lieut. C. W.                  | ... | ... | ... | Poona.                                |
| Preston, F. J.                          | ... | ... | ... | Sholapur.                             |
| Price, Capt. R. H. (I.M.S.)             | ... | ... | ... | Chind Field Force.                    |
| Prichard, G. M.                         | ... | ... | ... | Ramtek, C. P.                         |
| Priestley, Capt. C. E. N.               | ... | ... | ... | Rangoon.                              |
| Primrose, Alex. M.                      | ... | ... | ... | Chandpur Bagan P.O.,<br>South Sylhet. |
| Prior, Major W.                         | ... | ... | ... | Europe.                               |
| Pritchard, B. R.                        | ... | ... | ... | Lakhimpur.                            |
| Proctor, H. E.                          | ... | ... | ... | Europe.                               |
| Pundit Jwala Prasad (I.C.S.)            | ... | ... | ... | Orai, N.-W. P.                        |
| Quicke, Major W. H. (I.M.S.)            | ... | ... | ... | Bombay.                               |
| Rahimtoola Khairaz                      | ... | ... | ... | Bombay.                               |
| Raikes, E. B.                           | ... | ... | ... | Bombay.                               |
| Rambant, B. R. R. (R.A.)                | ... | ... | ... | Europe.                               |
| Ranger, G. O.                           | ... | ... | ... | Calcutta.                             |
| Rattray, Lieut. H. B.                   | ... | ... | ... | Mombasa.                              |
| Rattray, Lt.-Col. R. H.                 | ... | ... | ... | Rawal Pindi.                          |
| Ravenshaw, Lt.-Col. C. W. (Life Member) | ... | ... | ... | Europe.                               |
| Rayment, Vet.-Major G. J.               | ... | ... | ... | Rawal Pindi.                          |
| Readymoney, N. J.                       | ... | ... | ... | Bombay.                               |
| Rees, J. C. (C.E.)                      | ... | ... | ... | Pegu, Burma.                          |
| Rees, W. E.                             | ... | ... | ... | Gaya, Bengal.                         |
| Reeve, R.                               | ... | ... | ... | Bombay.                               |
| Reid, Major L. H.                       | ... | ... | ... | Rangoon.                              |
| Reid, M. F.                             | ... | ... | ... | Bombay.                               |
| Reid, W. J. (I.C.S.)                    | ... | ... | ... | Dibrugarh, Assam.                     |
| Renton, Capt. C. C.                     | ... | ... | ... | Hingoli, Deccan.                      |
| Reynolds, L. W. (I.C.S.)                | ... | ... | ... | Allahabad.                            |
| Reynolds, P. (C.E.)                     | ... | ... | ... | Bombay.                               |
| Rhé-Philippe, G. W. de                  | ... | ... | ... | Lucknow.                              |
| Rhodes, T. M.                           | ... | ... | ... | Haflong, Cachar.                      |
| Rice, Lieut. B. A.                      | ... | ... | ... | Killa Drosh.                          |
| Richardson, Cecil                       | ... | ... | ... | Ahmedabad.                            |
| Richardson, Miss E. E.                  | ... | ... | ... | Bombay.                               |
| Richardson, Major W. St. John           | ... | ... | ... | Poona.                                |

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|-------------------------------------------|-----|-----|-----|--------------------------------------|
| Rivett-Carnac, L.                         | ... | ... | ... | Bombay.                              |
| Roberts, R.                               | ... | ... | ... | <i>Europe.</i>                       |
| Robertson, B. (I.C.S.)                    | ... | ... | ... | Jabalpur, C. P.                      |
| Robertson, The Hon'ble Col. D. (C.S.I.)   | ... | ... | ... | <i>Europe.</i>                       |
| Robertson, F. W. (I.C.S.)                 | ... | ... | ... | Waltair, Madras.                     |
| Robertson, J. H. (I.C.S.)                 | ... | ... | ... | Madanapalle.                         |
| Robinson, Capt. G. T.                     | ... | ... | ... | Rangoon.                             |
| Rodger, A. (I.F.S.)                       | ... | ... | ... | Toungoo, Burma.                      |
| Rodon, Major G. S.                        | ... | ... | ... | Dharwar.                             |
| Roffey, T. H.                             | ... | ... | ... | Sibsagar, Assam.                     |
| Rogers, C. G. (I.F.S.)                    | ... | ... | ... | Darjeeling.                          |
| Rogers, Henry (M.R.C.V.S.)                | ... | ... | ... | Bombay.                              |
| Rogers, Rev. K. St. A.                    | ... | ... | ... | Mombasa.                             |
| Rogers, Capt. P. H.                       | ... | ... | ... | Bombay.                              |
| Rogers, Thos.                             | ... | ... | ... | Bombay.                              |
| Rome, F. J.                               | ... | ... | ... | Bombay.                              |
| Roome, Capt. R. E.                        | ... | ... | ... | Fort Sandeman.                       |
| Roosmale Cocq, Lt. Chas. H.               | ... | ... | ... | China Field Force.                   |
| Rose, C.                                  | ... | ... | ... | Dibrugarh, Assam.                    |
| Routh, R. S.                              | ... | ... | ... | Haflong, Cachar.                     |
| Rundle, Major C. S. (I.M.S.)              | ... | ... | ... | <i>Europe.</i>                       |
| Rushton, Kenneth C.                       | ... | ... | ... | Bhusawal.                            |
| Russell, Hon'ble Mr. Justice L. P.        | ... | ... | ... | Bombay.                              |
| Rutherford, D.                            | ... | ... | ... | <i>Europe.</i>                       |
| Ryan, G. M. (I.F.S.)                      | ... | ... | ... | Thana.                               |
| Ryder, Major W. J.                        | ... | ... | ... | Dharamsala.                          |
| Ryves, A. E.                              | ... | ... | ... | Allahabad.                           |
|                                           |     |     |     |                                      |
| Sale, Edward L. (I.C.S.)                  | ... | ... | ... | Bombay.                              |
| Salkeld, Lt. R. E.                        | ... | ... | ... | Perozepore.                          |
| Sanjeli, H. H. Kumar Shri Ranjit Singh of | ... | ... | ... | Dhulia.                              |
| Saone, G. Prier De                        | ... | ... | ... | Bombay.                              |
| Sassoon, Mrs. S. D.                       | ... | ... | ... | Bombay.                              |
| Saunders, Lt. F. W. (R.E.)                | ... | ... | ... | Bangalore.                           |
| Savile, P. B.                             | ... | ... | ... | <i>Europe.</i>                       |
| Scindia, H. H. the Maharaja (Life Member) | ... | ... | ... | Gwalior.                             |
| Scott, J. S. (I.F.S.)                     | ... | ... | ... | Madanapalle, Cud-<br>dapah District. |
| Scott, Edmund                             | ... | ... | ... | Ceylon.                              |
| Scott, Venerable Archdeacon W. E.         | ... | ... | ... | Bombay.                              |
| Seal, Dr. C. E. B.                        | ... | ... | ... | Darjeeling.                          |
| Sealy, Lieut. A. E.                       | ... | ... | ... | Bakloh, Punjab.                      |
| Seervai, Rustom F.                        | ... | ... | ... | Bombay.                              |
| Sewell, Major J. H.                       | ... | ... | ... | Myittha, Burma.                      |
| Sewell, Lieut. R. A. D.                   | ... | ... | ... | Jalna, Deccan.                       |
| Sharp, Professor W. H.                    | ... | ... | ... | Bombay.                              |
| Sharpe, Genl. C. F.                       | ... | ... | ... | British Columbia,<br>Canada.         |
| Shaw, F. W.                               | ... | ... | ... | Bombay.                              |

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|-------------------------------------|-----|-----|-----|------------------------------|
| Sheppard, W. D. (I.C.S.)            | ... | ... | ... | Bombay.                      |
| Shipp, W. E.                        | ... | ... | ... | Bombay.                      |
| Shoubridge, H. O. B. (C.E.)         | ... | ... | ... | Dharwar.                     |
| Shuttleworth, Lt. A. R. B.          | ... | ... | ... | Europe.                      |
| Silcock, H. F. (I.C.S.)             | ... | ... | ... | Europe.                      |
| Simeox, A. H. A. (I.C.S.)           | ... | ... | ... | Satara.                      |
| Simpson, J. Hope (I.C.S.)           | ... | ... | ... | Jhansi, N.-W. P.             |
| Sims, E. Proctor                    | ... | ... | ... | Bhavnagar.                   |
| Sitwell, N. S. H. (R.A.)            | ... | ... | ... | Bombay.                      |
| Skey, Capt. F. E. G. (R.E.)         | ... | ... | ... | Europe.                      |
| Slade, H. (I.F.S.)                  | ... | ... | ... | Bangkok, Siam.               |
| Sladen, J. (I.C.S.)                 | ... | ... | ... | Europe.                      |
| Slater, E. M.                       | ... | ... | ... | Bombay.                      |
| Slater, J. Sanders                  | ... | ... | ... | Bombay.                      |
| Sly, F. G. (I.C.S.)                 | ... | ... | ... | Calcutta.                    |
| Smales, Chas. B. (I.F.S.)           | ... | ... | ... | Shwebo, Burma.               |
| Smith, Capt. F. A. (I.M.S.)         | ... | ... | ... | Muscat.                      |
| Smith, Major Stanley (R.A.)         | ... | ... | ... | Bombay.                      |
| Smythies, Arthur (I.F.S.)           | ... | ... | ... | Nagpur, C. P.                |
| Span, Lt. H. J. B.                  | ... | ... | ... | Satara.                      |
| Spence, L. H.                       | ... | ... | ... | Ahmednagar.                  |
| Spencer, F. A.                      | ... | ... | ... | Europe.                      |
| Spooner, T. J. (C.E.) (Life Member) | ... | ... | ... | Mtotowa Udi,<br>East Africa. |
| Sprague, Capt. W. C. (I.M.S.)       | ... | ... | ... | Europe.                      |
| Stables, Major Alex. (R.A.M.C.)     | ... | ... | ... | Poona.                       |
| Standage, Lt. R. F. (I.M.S.)        | ... | ... | ... | Bangalore.                   |
| Standen, B. (I.C.S.)                | ... | ... | ... | Betul, C. P.                 |
| Stansfeld, Lt. H. G.                | ... | ... | ... | Rangoon.                     |
| Stanton, W. C.                      | ... | ... | ... | Rangoon.                     |
| Stebbing, E. P. (I.F.S.)            | ... | ... | ... | Lashio, N. Shan<br>States.   |
| Stevens, P. W.                      | ... | ... | ... | Gaya.                        |
| Stewart, Lt. I.                     | ... | ... | ... | Lucknow.                     |
| Stewart, Lt. J. Johnston            | ... | ... | ... | Mauritius.                   |
| Stewart, R. B. (I.C.S.)             | ... | ... | ... | Europe.                      |
| Stigand, Lieut. C. H.               | ... | ... | ... | Berbera.                     |
| Stirling, G. C. B.                  | ... | ... | ... | Lashio, N. Shan<br>States.   |
| Stiven, J.                          | ... | ... | ... | Europe.                      |
| St. John, Lt. J. H. (R.I.M.)        | ... | ... | ... | Rangoon.                     |
| Stone, S. J.                        | ... | ... | ... | Mussoorie, N.-W.P.           |
| Storey, Thos. H.                    | ... | ... | ... | Oodeypur.                    |
| Storr, Henry                        | ... | ... | ... | Europe.                      |
| Stuart, Capt. A. G. (A.D.C.)        | ... | ... | ... | Rangoon.                     |
| Stuart, C. J.                       | ... | ... | ... | Europe.                      |
| Sturrock, Capt. G. C. (R.A.)        | ... | ... | ... | Balasure.                    |
| Sullivan, Col. G. D. F.             | ... | ... | ... | Bombay.                      |
| Summers, Thos. (C.E.)               | ... | ... | ... | Europe.                      |

|                                                                      |     |     |     |                   |
|----------------------------------------------------------------------|-----|-----|-----|-------------------|
| Sutherland, J. (C.E.)                                                | ... | ... | ... | Lahore.           |
| Sutherland, W.                                                       | ... | ... | ... | Jabalpur, C. P.   |
| Sutton, F. H.                                                        | ... | ... | ... | Europe.           |
| Swan, H. H.                                                          | ..  | ... | ... | Europe.           |
| Swayne, Herbert (Life Member)                                        | ... | ... | ... | Ceylon.           |
| Swinhoe, Col. C.                                                     | ... | ... | ... | Europe.           |
| Swinton, Capt. F. E. (I.M.S.)                                        | ... | ... | ... | Poona.            |
| Sykes, C. M. (C.E.)                                                  | ... | ... | ... | Jamnagar.         |
| Symington, J. H.                                                     | ... | ... | ... | Bombay.           |
| Symonds, W. P. (I.C.S.)                                              | ... | ... | ... | Europe.           |
| Symons, H. S.                                                        | ... | ... | ... | Europe.           |
| Symons, J. L.                                                        | ... | ... | ... | Europe.           |
|                                                                      |     |     |     |                   |
| Talbot, W. A. (I.F.S.)                                               | ... | ... | ... | Belgaum.          |
| Tanner, Capt. C. O. O.                                               | ... | ... | ... | Malakand.         |
| Tata, Dorabji J. (Life Member)                                       | ... | ... | ... | Bombay.           |
| Tata, Jamsetji N.                                                    | ... | ... | ... | Bombay.           |
| Taylor, James H.                                                     | ... | ... | ... | Khorda, Orissa.   |
| Taylor, M. D.                                                        | ... | ... | ... | Kumargram.        |
| Taylor, S. B.                                                        | ... | ... | ... | Karachi.          |
| Tejpal, Goverdhundas Gceuldas (Life Member)                          | ... | ... | ... | Bombay.           |
| Temulji B. Nariman, Dr.                                              | ... | ... | ... | Bombay.           |
| Tenasserim Agri-Horticultural Society, The Honorary Secretary of the | ... | ... | ... | Moulmein.         |
| Thacker, E. B.                                                       | ... | ... | ... | Daman.            |
| Thacker, W.                                                          | ... | ... | ... | Bombay.           |
| Thesiger, Hon'ble P.                                                 | ... | ... | ... | Bombay.           |
| Thomas, J. C.                                                        | ... | ... | ... | Mandalay.         |
| Thomas, R. E. S.                                                     | ... | ... | ... | Europe.           |
| Thompson, H. N. (F.Z.S., I.F.S.)                                     | ... | ... | ... | Taunggyi, Burma.  |
| Thompson, R. H. E. (I.F.S.)                                          | ... | ... | ... | Dehra Dun.        |
| Thompson, R. M. (C.E.)                                               | ... | ... | ... | Europe.           |
| Thompson, St. C.                                                     | ... | ... | ... | Lucknow.          |
| Thomson, D. A. (I.F.S.)                                              | ... | ... | ... | Alibag.           |
| Thomson, Capt. D. B.                                                 | ... | ... | ... | Poona.            |
| Thorburn, F. Seymour                                                 | ... | ... | ... | Lakhimpur.        |
| Thornhill, Capt. J.                                                  | ... | ... | ... | Jhansi.           |
| Tieborne, Sir Henry (Bart.)                                          | ... | ... | ... | Europe.           |
| Tighe, Capt. M. J.                                                   | ... | ... | ... | Europe.           |
| Tilly, T. H. (Life Member)                                           | ... | ... | ... | Mingin, Burma.    |
| Tod, Alex. M.                                                        | ... | ... | ... | Bombay.           |
| Tomkins, Capt. E. (R.A.)                                             | ... | ... | ... | Bombay.           |
| Tomkins, S.                                                          | ... | ... | ... | Bombay.           |
| Tooth, E. E.                                                         | ... | ... | ... | Calcutta.         |
| Topham, F. D.                                                        | ... | ... | ... | Hubli, S. M. Ry.  |
| Tottenham, W. F. L. (I.F.S.)                                         | ... | ... | ... | Europe.           |
| Townsend, Capt. E. C. (I.S.C.)                                       | ... | ... | ... | Myitkyina, Burma. |
| Traill, W. H.                                                        | ... | ... | ... | Jhansi, N.-W. P.  |
| Travancore, H. H. The Maharaja of (Life Member)                      | ... | ... | ... | Trivandrum.       |

|                                                                |     |     |     |                             |
|----------------------------------------------------------------|-----|-----|-----|-----------------------------|
| Travers, G. H.                                                 | ... | ... | ... | Chingleput.                 |
| Trevithick, R. L. (A.M.I.C.E.)                                 | ... | ... | ... | Europe.                     |
| Trewby, Miss Lilian (M.D.)                                     | ... | ... | ... | Amraoti.                    |
| Trivandrum, Hon. Sec., Government Museum and<br>Public Gardens | ... | ... | ... | Trivandrum.                 |
| Trotter, E. W.                                                 | ... | ... | ... | Pyapon, L. Burma.           |
| Trotter, W.                                                    | ... | ... | ... | Jalpaiguri.                 |
| Troup, N. F. T.                                                | ... | ... | ... | Kousanie P. O.,<br>Almora.  |
| Truning, L.                                                    | ... | ... | ... | Calcutta.                   |
| Trydell, Vet.-Lt. A. S.                                        | ... | ... | ... | Rawal Pindi.                |
| Tudball, W. (I.C.S.)                                           | ... | ... | ... | Gorakhpur.                  |
| Turner, Hon'ble Mr. M. C.                                      | ... | ... | ... | Calcutta.                   |
| Twopenny, C. D.                                                | ... | ... | ... | Europe.                     |
| Tydd, F. A.                                                    | ... | ... | ... | Cachar.                     |
| Tyler, Major-General T. B. (R.A.)                              | ... | ... | ... | Simla.                      |
| Tyler, Capt. H. C.                                             | ... | ... | ... | Dinapur.                    |
| Ulwar, H. H. Maharaja Jey Singh of (Life Member)               |     |     |     | Ulwar.                      |
| Unwalla, J. N. (Life Member)                                   | ... | ... | ... | Bhavnagar.                  |
| Vanderzee, Capt. H. F. (R.A.)                                  | ... | ... | ... | Fort St. George,<br>Madras. |
| Varley, F. J. (I.C.S.)                                         | ... | ... | ... | Dhulia.                     |
| Vaughan, J. P. (I.C.S.)                                        | ... | ... | ... | Karachi.                    |
| Velinker, Shrikrishna, G.                                      | ... | ... | ... | Bombay.                     |
| Vicaji Framji R. (Life Member)                                 | ... | ... | ... | Bombay.                     |
| Vick, F. H.                                                    | ... | ... | ... | Silchar, Cachar.            |
| Vidal, G. W. (I.C.S.)                                          | ... | ... | ... | Europe.                     |
| Vincent, W. H. H. (I.C.S.)                                     | ... | ... | ... | Burdwan.                    |
| Vithuldas Damodhar Thakersey                                   | ... | ... | ... | Bombay.                     |
| Waddington, C. W.                                              | ... | ... | ... | Rajkote.                    |
| Wadia, Sorab P. N.                                             | ... | ... | ... | Bombay.                     |
| Walker, A. C.                                                  | ... | ... | ... | Europe.                     |
| Walker, G. K.                                                  | ... | ... | ... | Muktesar, N.-W.P.           |
| Wall, Capt. E. W.                                              | ... | ... | ... | Mean Mir.                   |
| Wall, Capt. F. (I.M.S.)                                        | ... | ... | ... | China Field Force.          |
| Wallace, John (C.E.)                                           | ... | ... | ... | Bombay.                     |
| Wallace, W. V. (I.C.S.)                                        | ... | ... | ... | Taungoo, Burma.             |
| Wallinger, W. A. (I.F.S.)                                      | ... | ... | ... | Dharwar.                    |
| Walton, Lt. H. J. (I.M.S.)                                     | ... | ... | ... | Bombay.                     |
| Ward, Lieut. C. H.                                             | ... | ... | ... | Agra.                       |
| Ward, Rowland                                                  | ... | ... | ... | Europe.                     |
| Wasey, G. K.                                                   | ... | ... | ... | Marmagoa, Goa.              |
| Watson, H. W. A. (I.F.S.)                                      | ... | ... | ... | Taungoo, Burma.             |
| Watson, Lt.-Col. J. (R.A.M.C.)                                 | ... | ... | ... | Darjeeling.                 |
| Watson, Capt. John C.                                          | ... | ... | ... | Europe.                     |
| Watson, Lt. J. W. (I.M.S.)                                     | ... | ... | ... | Poona.                      |

|                                            |     |     |     |     |                     |
|--------------------------------------------|-----|-----|-----|-----|---------------------|
| Watson, L. P.                              | ... | ... | ... | ... | Cawnpore.           |
| Watts, Lieut. G. A. R.                     | ... | ... | ... | ... | Kohat, Punjab.      |
| Weir, Lieut.-Col. T. S. (I.M.S.)           | ... | ... | ... | ... | Quetta.             |
| Wells-Cole, Capt. H.                       | ... | ... | ... | ... | Mauritius.          |
| Wells-Witham, Dr. E. (M.D.)                | ... | ... | ... | ... | Dibrugarh, Assam.   |
| Wenden, H. (C.E.)                          | ... | ... | ... | ... | Bombay.             |
| Westmacott, Genl. Sir R. (K.C.B., D.S.O.)  | ... | ... | ... | ... | Poona.              |
| Westropp, A. S. A. (I.C.S.)                | ... | ... | ... | ... | Bombay.             |
| Wetherall, Lieut. E. R.                    | ... | ... | ... | ... | Jalna.              |
| Whately, Richard                           | ... | ... | ... | ... | Broach.             |
| Whiffin, F. D.                             | ... | ... | ... | ... | Rourkela, B.-N. Ry. |
| Whitecombe, Capt. E. G. R. (I.M.S.)        | ... | ... | ... | ... | Poona.              |
| White, G. H.                               | ... | ... | ... | ... | Nasik.              |
| Whitehouse, Langford                       | ... | ... | ... | ... | Pakokku, Burma.     |
| Whiting, J. E. (C.E.)                      | ... | ... | ... | ... | Bombay.             |
| Whitley, A. W.                             | ... | ... | ... | ... | Europe.             |
| Whittall, Major F. V.                      | ... | ... | ... | ... | Jalna.              |
| Whittle, A. T.                             | ... | ... | ... | ... | Wadhwan.            |
| Whitworth, G. C. (I.C.S.) (Life Member)    | ... | ... | ... | ... | Satara.             |
| Whymper, S. L.                             | ... | ... | ... | ... | Jeolikote, N.-W. P. |
| Whyte, Major C. W. F.                      | ... | ... | ... | ... | Europe.             |
| Whyte, Dr. Fredk.                          | ... | ... | ... | ... | Europe.             |
| Wickham, P. F.                             | ... | ... | ... | ... | Shwebo, Burma.      |
| Wileman, A. E.                             | ... | ... | ... | ... | Hakodate, Japan.    |
| Wilkie, Lt.-Col. C. B. (R.E.)              | ... | ... | ... | ... | Bangalore.          |
| Wilkins, A. V.                             | ... | ... | ... | ... | Jalpaiguri.         |
| Wilkinson, Capt. E. (I.M.S.)               | ... | ... | ... | ... | Bombay.             |
| Williams, Capt. C. E. (I.M.S.)             | ... | ... | ... | ... | Taunggyi.           |
| Williams, Major F. T.                      | ... | ... | ... | ... | Mandalay.           |
| Willis, R. A.                              | ... | ... | ... | ... | Bombay.             |
| Wilson, A. R.                              | ... | ... | ... | ... | Binsur, Almora.     |
| Wilson, Major C. L. (R.A.)                 | ... | ... | ... | ... | Europe.             |
| Wilson, Lt. H. A.                          | ... | ... | ... | ... | Jhansi, N.-W. P.    |
| Wilson, Lt. N. F. T. (R.I.M.)              | ... | ... | ... | ... | Mandalay.           |
| Wilson, V. S. Fellowes                     | ... | ... | ... | ... | Trichinopoly.       |
| Wilson, W. G.                              | ... | ... | ... | ... | Bombay.             |
| Winsloe, Lt. H. E. (R.E.)                  | ... | ... | ... | ... | Bangalore.          |
| Winter, E. L. (I.C.S.)                     | ... | ... | ... | ... | Europe.             |
| Witt, D. O. (I.F.S.)                       | ... | ... | ... | ... | Saugor.             |
| Wodehouse, Lt. F. W.                       | ... | ... | ... | ... | Rajkote.            |
| Wolf-Murray, F. D. O. (I.C.S.)             | ... | ... | ... | ... | Madras.             |
| Wolseley, Major-Genl. Sir Geo. B. (K.C.B.) | ... | ... | ... | ... | Europe.             |
| Wolseley-Smith, F.                         | ... | ... | ... | ... | Bangalore.          |
| Wood, A. (I.C.S.)                          | ... | ... | ... | ... | Godhra.             |
| Wood, C. W. (C.E.)                         | ... | ... | ... | ... | Pollachi, Madras.   |
| Wood, Lt. H. (R.E.)                        | ... | ... | ... | ... | Mussoorie, N.-W.P.  |
| Wood, H. F. A.                             | ... | ... | ... | ... | Cuddapah, Madras.   |
| Woodburn, A. F. (I.C.S.)                   | ... | ... | ... | ... | Europe.             |
| Woodhouse, Lt. C.                          | ... | ... | ... | ... | Loralai.            |

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|------------------------------------------|-----|-----|-----|--------------------------------|
| Woodrow, G. Marshall                     | ... | ... | ... | <i>Europe.</i>                 |
| Woodrow, W. R. (I.F.S.)                  | ... | ... | ... | <i>Europe.</i>                 |
| Woods, M. V. (C.E.)                      | ... | ... | ... | Haflong, N. Cachar.            |
| Wormold, Percy                           | ... | ... | ... | <i>Europe.</i>                 |
| Wright, Fred                             | ... | ... | ... | Secunderabad.                  |
| Wright, F. A. (C.E.)                     | ... | ... | ... | Howrah, Bengal.                |
| Wright, H. C.                            | ... | ... | ... | Bombay.                        |
| Wright, Major R. W. (R.A.M.C.)           | ... | ... | ... | Jhansi, N.-W. P.               |
| Write, Dr. W. B.                         | ... | ... | ... | Lakhimpur, Assam.              |
| Wroughton, R. C. (I.F.S., C.M.Z.S.)      | ... | ... | ... | Poona.                         |
|                                          |     |     |     |                                |
| Yeld, Col. J. H.                         | ... | ... | ... | <i>Europe.</i>                 |
| Yeo, Edwin, W.                           | ... | ... | ... | Bombay.                        |
| Yerbury, Col. J. W. (R.A.) (Life Member) | ... | ... | ... | <i>Europe.</i>                 |
| Young, E. H.                             | ... | ... | ... | Rutlam.                        |
| Young, Lt. G. G. (I.M.S)                 | ... | ... | ... | Baroda.                        |
| Young, H. G.                             | ... | ... | ... | Waltair, Madras<br>Presidency. |
| Young, John                              | ... | ... | ... | Rangoon, Burma.                |
| Young, W. E.                             | ... | ... | ... | Karachi, Sind.                 |
| Yule, Col. J. H.                         | ... | ... | ... | <i>Europe.</i>                 |

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# BOMBAY NATURAL HISTORY SOCIETY.

## STATEMENT of ACCOUNT from 1st January, 1900 to 31st December, 1900.

| RECEIPTS.                                                 | Rs.     | a.  | p.  | EXPENDITURE.                                                                       | Rs.       | a. | p. |
|-----------------------------------------------------------|---------|-----|-----|------------------------------------------------------------------------------------|-----------|----|----|
| Balance in Bank on 1st January, 1900 ... ..               | Rs. 764 | 12  | 3   | Rent of the Rooms from 1st December, 1899 to 30th November, 1900 ... ..            | 1,500     | 0  | 0  |
| Cash in hand on 1st January, 1900 ... ..                  | 71      | 4   | 0   | Salaries from 1st December, 1899, to 30th November, 1900 ... ..                    | 1,650     | 0  | 0  |
| Petty Cash balance on 1st January, 1900 ... ..            | 14      | 12  | 9   | Library Account ... ..                                                             | 27        | 0  | 0  |
| Subscriptions for 1898 (in arrears) ... ..                | ...     | ... | ... | Furniture Account ... ..                                                           | 237       | 0  | 0  |
| Do. for 1899 ( do. ) ... ..                               | ...     | ... | ... | Printing and Stationery, &c. ... ..                                                | 307       | 13 | 0  |
| Do. for 1900 ... ..                                       | 8,771   | 0   | 0   | Journal Account, cost of printing Journals and coloured plates from England ... .. | 6,338     | 7  | 0  |
| Do. for 1901 (in advance) ... ..                          | 440     | 0   | 0   | General Expenses ... ..                                                            | 1,453     | 10 | 8  |
| Do. for Journal from Members residing out of India ... .. | 306     | 12  | 3   | Balance in Bank on 31st December, 1900 ... ..                                      | Rs. 1,996 | 2  | 0  |
| Do. for Life Membership ... ..                            | 300     | 0   | 0   | Cash in hand on 31st December, 1900 ... ..                                         | 126       | 0  | 0  |
| Entrance Fees ... ..                                      | 880     | 0   | 0   | Petty Cash balance on 31st December, 1900... ..                                    | 37        | 11 | 8  |
| Sale of Back Journals, &c. ... ..                         | 1,435   | 13  | 3   |                                                                                    |           |    |    |
| Interest on Government Paper... ..                        | 159     | 2   | 10  |                                                                                    |           |    |    |
| Total ... Rs.                                             | 13,673  | 12  | 4   | Total ... Rs.                                                                      | 13,673    | 12 | 4  |

Examined and found correct.  
R. SPENCE.

N. C. MACLEOD,  
*Hon'y. Treasurer.*

BOMBAY, 1st January, 1901.

# BOMBAY NATURAL HISTORY SOCIETY.

## *Investment Account.*

|                                                                                                             | Rs. a. p. | Rs. a. p. |
|-------------------------------------------------------------------------------------------------------------|-----------|-----------|
| Balance of Rs. 4,800, 3½% Government Paper, deposited with the Bank of Bombay on 1st January, 1900 ... ..   | 4,800 0 0 | 4,800 0 0 |
| Balance of Rs. 4,800, 3½% Government Paper, deposited with the Bank of Bombay on 31st December, 1900 ... .. |           | Rs. ...   |
|                                                                                                             | 4,800 0 0 | Rs. ...   |

Examined and found correct.

R. SPENCE.

Bombay, 1st January, 1901.

N. C. MACLEOD,

*Hon'y. Treasurer.*

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