3-24-1896

New and Little-Known Species of Indo-Malayan Hymenoptera, with a Key to the Genera on Sphex Flava of Fabricus, and Allied Species

C. T. Bingham

T. H. Frisson

Bingham p. 196

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THE BIRDS OF NORTH CACHAR.

Part V.

By E. C. Stuart Baker, f.z.s., m.b.o.u.

(*With Plate E.*)

(*Continued from page* 12.)

Family *Dicacidae.*

(364) Dicæum cruentum.—The Scarlet-backed Flower-pecker.

Hume, No. 236 ; *Oates, No.* 912.

Rather common throughout Cachar. I have not personally noticed it very high up, but one of my collectors obtained it at Guilang, about 4,000 feet elevation. I have taken some half-dozen nests, and found them to be like the one taken by Oates ("Nests and Eggs," Vol. II, page 270).

I have seen none like that described by Mr. Cripps, and my nests have also averaged somewhat larger, probably about 3·25″ × 2·75″ or a little less.

My eggs average only ·52″ × ·37″.

(365) Dicæum chrysorrheum.—The Orange-bellied Flower-pecker.

Hume, No. 237 ; *Oates, No.* 914.

Perhaps more common than *D. cruentatum*, and certainly ascends higher, for I have myself seen it at Guilang, Chota Ninglo, and other places, over 4,000 feet.

The lower mandible in the live bird is yellowish at the base, not grey, as is shewn in the plate. The irides are orange, orange-red,

orange-brown, or dull crimson, and I cannot make out that the colour refers in any way to sex or age.

The nest of this bird is quite typical of the family, that is to say, it is a small purse made of seed-down, cotton, and other similar soft materials—feathers I have never known the bird make use of—fastened together with fine grasses, fibres, and generally a good many cobwebs. The lining is made of the very softest of *simul* down, and is very neatly matted down into the interior of the nest.

As a rule it is not fastened to anything far from the ground, a slender hanging twig, falling within some four to eight feet, being the height which seems to be preferred.

My eggs average about ·63″ × ·45″, and are of the soft chalky texture common to all the family. They are, of course, pure white.

(366) DICÆUM IGNIPECTUM.—The Fire-breasted Flower-pecker.

Hume, *No.* 241 ; *Oates*, *No.* 915.

I have only seen one pair of these birds. These were shot out of a small flock which were searching for insects in low bushes by a roadway close to Diyungmukh at the extreme north of the district. It must be a very rare bird, as I have not heard of any one else meeting with it, and some Cacharies and Mikirs to whom I shewed the birds had no name for them and did not seem to recognize them at all.*

(367) DICÆUM OLIVACEUM.—The Plain-coloured Flower-pecker.

Hume, *No.* 237 *Ter.*; *Oates*, *No.* 917.

Extremely common everywhere above 1,000 feet up to the very highest peaks ; breeding principally at about 4,000 feet. It is sometimes seen in the plains, but seldom wanders out of the hills.

The nidification differs in no way from that of *D. concolor* ; the nest is a tiny purse of soft down, well matted together and bound with a few fibres and many very fine shreds of grasses.

It is not, however, built in such lofty situations as is that of *D. concolor*, and is, more often than not, placed on twigs not more than six feet from the ground. My eggs average about ·57″ × ·40″, which appears to be a good deal smaller than are the eggs of *D. concolor*.

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* Since writing the above, I have seen a good many more of these birds, and I find they are not uncommon at Hungrum and on the surrounding high peaks, but, when feeding on high trees, as they seem generally to do, it is not easy to tell them from others of the same family. I find them breeding at Hungrum.

(368) DICÆUM ERYTHRORHYNCHUS.—Tickell's Flower-pecker.

Hume, No. 238 ; *Oates, No.* 919.

A very rare bird in Cachar, but is sparsely scattered throughout the whole of it. I have seen a specimen from near the extreme north, and another from Hailakandi in the south.

(369) PIPRISOMA SQUALIDUM.—The Thick-billed Flower-pecker.

Hume, No. 240 ; *Oates, No.* 921.

This *is* the common form in Cachar after all, and not the next bird *P. modestum*, as Oates suggests. I fancy I see ten at least of this bird to every one of *P. modestum*.

(370) PIPRISOMA MODESTUM.—Hume's Flower-pecker.

Hume, No. 240 *Sex* ; *Oates, No.* 922.

The nest of this bird differs in no way from that of *P. squalidum*. The description given by Captain Beavan ("Nests and Eggs," Vol. II, page 278) of the nest of that bird would have stood perfectly well for the two I have seen of this.

One of my eggs, however, is rather peculiar; the ground-colour is of the usual creamy-pink, but the markings are very bold and are almost confined to a broad irregular ring at the larger end. They consist of large blotches of brownish-red, running into and over-laying one another, the colour being, so to speak, doubled in depth where they coalesce, and there are also secondary smaller blotches of lavender and pinky-grey. *Outside* the ring there are only a few small blotches and freckles of both kinds; *inside* they are fairly numerous. The egg is a broad oval, rather inclined to the peg-top shape, but is not very pointed.

It measures ·64″ × ·50″ fully.

Family *Pittidæ*.

(371) PITTA NEPALENSIS.—The Blue-naped Pitta.

Hume, No. 344 ; *Oates, No.* 927.

In a freshly prepared skin the male bird will be seen to have a far brighter pink hue on the lower plumage than is ever shown on that of the female. Moreover, the extent of blue on the nape is far greater in extent in the male than it is in the opposite sex, and it is also much brighter. The general difference is altogether a great deal more distinct than one would imagine from reading Oates's remarks in "The Fauna of British India." I have noted the colour of the soft parts as

follows:—Bill, horny; gape, dull purple; mouth, dark flesh colour; edges of eye-lids, dull flesh colour; irides, vandyke-brown (Jerdon says lightish brown); legs varying from pink flesh-colour to dull reddish-slate colour; soles, paler fleshy-pink; claws, almost white.

The female has the edge of the maxilla and nearly the whole of the mandible flesh-colour or horny flesh-colour, the tip being less pink than the rest.

Hume's "Nests and Eggs" gives such an incomplete description of the eggs of this very common species that I add a few notes about those taken by myself.

The ground-colour of the eggs is, as described, white, sometimes faintly tinged with pink; and the markings range from a pale rufous or reddish to a deep purple or blackish-brown.

In the majority of eggs these markings consist of spots and small irregular blotches, whilst in others the blotches are larger and are more or less intermingled with short broad streaks and straggling lines, and other kinds of marks.

In those eggs in which the markings are of the darker tints there are generally some of dark brown as well, and also a few of very faint grey. In some of my eggs the spots, blotches, etc., are almost entirely absent, and in others they are very numerous over the whole surface. Typically, the markings are rather numerous towards the bigger end, and somewhat scanty elsewhere.

One clutch is minutely speckled all over with pale rufous. Another has only a few spots of pale lavender; a third is densely covered with short scriggly lines of very dark purple-brown mixed with spots and specks of the same colour as well as subordinate ones of grey.

Yet a fourth type is thickly *freckled* with darker colours, and this type is not at all uncommon.

One hundred eggs average 1·14″ × ·90″, and they vary in length between ·89″ and 1·28″ and in breadth between ·79″ and 1·10″.

I have taken three eggs, hard set, from a nest, and have also seen seven in a nest more than once.

(372) PITTA CYANEA.—The Blue Pitta.

Hume, No. 344, *Ter.*; *Oates, No.* 930.

Not a common bird, and seems to be migratory. The young bird has the whole upper plumage with the feathers tipped black, and the

lower plumage the same, though not so distinct. These black tips are not discarded until the second year.

The nest is far more compact than is that of *P. nepalensis*. Hume says the eggs "are broad ovals, not nearly so spherical as those of *P. brachyura*, with a fair amount of gloss, but again by no means so glossy as those of the species just referred to." Now I have taken intensely glossy ones and very spherical ones; in fact, with the exception of one pair of eggs of *P. cucullata*, a clutch of eggs of *P. cyanea* now in my collection are the most glossy ones I have, as also the most spherical.

The eggs vary nearly as much as those of *P. nepalensis*; but, taking them all round, they are decidedly more richly marked, and the markings are certainly both darker and more numerous.

(373) PITTA CUCULLATA.—The Green-breasted Pitta.

Hume, No. 346; *Oates, No.* 935.

Not a common bird anywhere, and very irregularly distributed. Thus there is one little tiny stream in the north where I can always find a few, but there are none in the Diyung into which the Kuta, the small stream in question, runs; nor are there any on several of the other small streams in the immediate vicinity. Their loud musical whistle always denotes their whereabouts, but they are such shy birds and keep so much to fairly thick undergrowth that they are not often seen though often heard.

The spherical pair of eggs above alluded to measure ·95″ × ·92″ and ·92″ × ·91″; so it will be seen that it would not be easy to get any much more spherical than these.

The eggs average in richness of colouring, etc., much the same as those of *P. cyanea*; indeed all the smaller *Pittas* seem to lay eggs more handsomely and more profusely marked than does *P. nepalensis*.

ORDER—EURYLÆMI.

Family *Eurylæmidæ*.

(374) P. SARISOMUS-DALHOUSIÆ.—The Long-tailed Broad-bill.

Hume, No. 138.

This beautiful Broad-bill is by no means uncommon above 2,000 feet, and from that height up to about 4,000 feet; above the latter and below the former it is not common, though I have met with it in the

plains on more than one occasion. I do not think, however, that it often breeds much below 2,000 feet.

The nest is like that described in "Nests and Eggs," Vol. II, page 289, and it is not necessary to add anything about it; but in North Cachar I have found this bird to lay three very distinct types of egg.

The first type is pure white, with numerous, rather large, boldly defined blotches of reddish-brown, with here and there a few secondary marks of pale purple.

The second type has the ground varying from pale to rather dark full cream with large and rather light reddish blotches, the secondary markings being the same as in the first type. In both types the blotches are generally fairly numerous everywhere, but more so towards the larger end, in a few eggs being almost confined to this.

The third type is pure unmarked white, and differs also from the others in being decidedly more glossy.

In shape the egg is normally rather a pointed oval, decidedly smaller at one than at the other end. I think also that the pure white eggs are more pointed than the others, and that the second type is less so than the first.

Twenty-four eggs of the first type average 1·15″ × ·73″ full.

Thirty-two eggs of the second type average 1·1″ × ·72″, and the only nine I have measured of the white ones average 1·12″ × ·73″. Besides these nine, I have a clutch of five eggs, evidently the first clutch laid by the hen, for the smallest egg measures only ·80″ × ·62″, and they gradually increase to 1·20″ to ·80″.

I have found in the stomachs of these birds cockroaches, small beetles, butterflies, grasshoppers, and many other kinds of insects, some amongst them being grubs and larvæ, evidently taken from the rough bark of trees, and this would infer that the birds sometimes feed clinging to the trunks and larger branches. I have seen them capture insects on the wing, and whilst thus engaged their actions reminded me of Drongo-shrikes, but they are heavier and slower.

It has a peculiar habit of settling on the end of some thin pendant bough and thence climbing slowly up, with head and tail close to the branch; and under these circumstances and at a little distance it has a very parrot-like aspect, heightened by the long tail and brilliant colouring.

SCRILOPHUS LUNATUS.—Gould's Broad-bill.

Hume, No. 139 *Bis.*

I am very doubtful about this bird, never having had a typical Burmese S. lunatus *to compare with my skins. At present all I can say is that I have come across some half-dozen birds in these hills which differ from the normal plumage of* S. rubropygius *in that they have the forehead a pale grey, not contrasting with, but shading into, the dark grey of the occiput, and also have the hue of the nape decidedly brownish.*

This, of course, agrees exactly with Sclater's diagnosis of S. lunatus *as given in the British Museum Catalogue, Vol. XIV, page 460 ; but the colouring is so much a matter of degree that, without having a typical skin for purposes of comparison, I do not number this as being, without doubt, a Cachar bird.*

Nearly all the birds I have seen with this plumage have been birds caught on the nest.

Both this and the eggs are exactly like that of the normal S. rubropygius.

(375) SCRILOPHUS RUBROPYGIUS.—Hodgson's Broad-bill.

Hume, No. 139.

This is a very common bird in North Cachar.

The nest of this bird is built on the same plan as that of *Psarisomus dalhousiæ*, but is far neater, smaller, and more compact. It is built of much the same kind of materials, but fewer twigs, sticks, and tendrils are used, and a good deal more grass and similar substances ; moreover, in the inside as lining there are *always* placed a certain number of fresh leaves gathered from some evergreen plant, a lining which *P. dalhousiæ* more seldom goes in for ; but, on the other hand, he invariably masses on the outside of his nest a comparatively vast tangle of small twigs, silk cocoons, excretæ of insects and other useless ornaments which *S. rubropygius* finds he can do without.

The positions chosen as sites for the nests are much the same, and on one occasion I found a nest of each species on the same tree ; but I have never taken two nests of the red-backed bird from one tree.

It breeds from the level of the plains up to about 5,000 feet, perhaps even higher, but the majority below 3,000 feet.

The eggs, in number four to six or even seven, are white with a few black or black-and-purple spots scattered about all over the surface

of the egg, but more numerous towards the larger end. In some eggs the spots are rather paler, a brownish-purple ; and one or two clutches I have seen have the ground-colour a pale delicate pink, with spots of purple-brown and secondary ones of lavender and grey, these latter often surrounding the darker ones as with a nimbus, but *not* making them look as if they had run.

The few specimens of this type in my collection all have the markings almost confined to the larger end, and even there not very numerous.

Taking the whole series I have seen—probably over a hundred—I should say that an equal number of eggs of very few other birds would show as little variation either in size, shape or coloration. Forty eggs average ·96″×·72″, but I have kept no record of the largest and smallest eggs taken.

The shape is a broad oval, rather pointed. The texture is close and fine, shewing a slight gloss.

Far from being the bold bird as it is stated to be by Dr. Helfer (Jerdon), I have found it to be rather wild and shy, and that when frightened it often takes flight to some distance. When, however, it is in one of the deep shady nullahs to which it is so fond of resorting, it is often loathe to leave, and a flock, if followed up in such a place, may be almost exterminated before it will do so.

I have sometimes heard this bird uttering a low warbling note, rather a musical sound, and very different to the harsh "tin-kettly" cry which seems to be that most indulged in by this family.

The Cacharis assert that there is a third species of Broad-bill inhabiting these hills, and they describe a bird which would seem to be *Cymborhnchus macrochnchus*, though that bird is most unlikely to be found here. The Cacharis are, however, such close observers, some of them also such keen naturalists, that I think their report may have some foundation. They brought me a nest and eggs once belonging to this unknown bird, which corresponded in every detail, except as regards size, with the nests and eggs of *Psarisomus*, but they were much smaller.

ON NEW AND LITTLE-KNOWN *LEPIDOPTERA* FROM THE INDO-MALAYAN REGION.

By Lionel de Nicéville, f.e.s., c.m.z.s., &c.

(*With Plates R, S, and T.*)

(*Read before the Bombay Natural History Society on 19th Sept.*, 1895.)

(*Continued from page* 40.)

Suborder RHOPALOCERA.

Family LYCÆNIDÆ.

19. ARRHOPALA AUZEA, n. sp., Pl. S, Figs. 29, ♂; 30, ♀.

Habitat: Preanger, S.-W. Java.

Expanse: ♂, ♀, 2·4 inches.

Description: Male. Upperside, *both wings* shining pale silvery-blue. *Forewing* with the costa as far as the subcostal nervure, the apex widely and the outer margin less widely, of a darker and more purple tint than the rest of the wing; the costa and outer margin very narrowly black. *Hindwing* with the costa somewhat widely fuscous; the abdominal margin, as far as the submedian nervure, whitish; the outer margin broadly but decreasingly to the anal angle of the same purple tint as the costa and outer margin of the forewing; the outer margin with a narrow anteciliary black line as in the forewing, within which, at the anal angle, are two narrow black spots divided by the submedian nervure; tail at the end of the first median nervule long, black, tipped with white; a short tooth-like projection at the termination of the submedian nervure. Underside, *both wings* dull hair-brown; all the spots of a much darker shade of brown, outwardly prominently defined by a white line. *Forewing*, with all the veins more or less defined with white; the inner margin broadly whitish; a large round spot towards the base of the discoidal cell, a still larger one in the middle, a still larger again quadrate one at the end of the cell, its outer edge trifestooned; a large spot posterior to the costal nervure anterior to the middle spot in the cell; two spots beyond this, one above the other, anterior to the spot at the end of the cell and divided by the first subcostal nervule; a large spot at the base of the submedian interspace extending into the sutural area, joined to another large transverse spot placed at the base of the first median

nervule, also extending into the sutural area, a large spot filling the base of the first and a small spot filling the base of the second median interspace; a discal series of eight spots placed four and four, the anterior quartette placed strongly outwardly obliquely, increasing in size to the fourth spot which is the largest, the posterior quartette well removed inwardly from the lowest spot of the anterior quartette, arranged at right angles to the inner margin, the two lowest spots divided by the submedian nervure much smaller than the two spots anterior to them, the lowest spot of all the smallest of all; marginal and submarginal series of obscure oblong fuscous spots, the submarginal series the more prominent. *Hindwing* with a broad subcostal white fascia, outwardly extending a little on both sides of the two subcostal nervules; a large spot at the extreme base of the wing anterior to the costal nervure; four spots extending across the base of the wing, the anterior one posterior to the costal nervure very large; beyond and touching the last-named spot in the same interspace is a still larger spot; an oval spot in the middle of the cell, with a very large triangular one posterior to it in the submedian interspace; a very large triangular spot at the end of the cell, posterior to which is a spot at the base of the first median interspace; the discal series consists of six spots arranged in pairs, and a large hook-shaped marking which reaches from the first median nervule to the internal nervure; a submarginal and marginal series of markings as in the forewing; an oblong black spot on the margin in the first median interspace crowned with pale metallic blue scales; a larger marginal black spot in the submedian interspace sprinkled all over with blue scales; the anal lobe small, black, crowned with blue scales; a black anteciliary thread, defined on both sides with an equally fine white thread, anteriorly obsolete. FEMALE. UPPERSIDE, *both wings* differ from the male in having the black borders very broad. *Forewing* has the costal border reaching to the subcostal nervure, and giving off a black bar at the end of the cell, the area around which is whitish. Otherwise as in the male.

This species belongs to the group of *A. camdeo*, Moore, a North-East Indian species, from which the male is distinguished by the different shade of blue of the upperside without the whitish irroration in the middle of the forewing. The markings of the underside are very

different. It is also allied to *A. anarte*, Hewitson, from Nemotha (Cachar), Myitta (Burma), the Malay Peninsula, Borneo, and Makassar (Celebes), but that species lacks the broad subcostal white fascia on the underside of the hindwing present in *A. auzea*. It is perhaps nearest to "*Amblypodia*" *auxesia*, Hewitson,* but the male differs from that sex in having narrow instead of broad black margins to both wings on the upperside, and has no irrorated white patch in the middle of the forewing ; the female differs in being of a much paler shade, more blue, less purple, with that colour far more extensive on the hindwing ; on the underside the markings are smaller and well separated instead of being run together ; *A. auxesia* is also a smaller insect. "*Amblypodia*" *anthore*, Hewitson,† is somewhat similar on the upperside, but the underside is quite different, having no costal white fascia to the hindwing. This feature is absent also in "*Amblypodia*" *acetes*, Hewitson,‡ and differs also in the hindwing on the upperside having the blue area even smaller than in *A. auxesia*. As far as I am aware, the white costal fascia on the underside of the hindwing is only found in *A. subfasciata*, Moore, from Burma, *A. auxesia*, Hewitson, from Sumatra, *A. auzea*, de Nicéville, from Java, and *A. tephlis*, Hewitson, from Gilolo.

Described from a single pair kindly sent to me by Herr G. Hoppenstedt.

20. ARRHOPALA AZINIS, n. sp., Pl. T, Fig. 31, ♂.

HABITAT : N.-E. Sumatra.

EXPANSE : ♂, 1·55 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* deep shining purple. *Forewing* with the costa narrowly black ; outer margin rather broadly black (rather less than 2 mms.). *Hindwing* with the costa, outer and abdominal margins still more broadly black than in the forewing (about 3 mms.) ; anal lobe very small, black, tipped with white ; tail rather short, black, tipped with white. UNDERSIDE, *both wings* dull hair-brown, almost plumbeous, all the markings very slightly darker than the ground-colour, with very narrow outer whitish margins ;

* Ill. Diurn. Lep., *Lycænidæ*, p. 5, n. 10, pl. i, figs. 2, 3, *male* ; 1, *female* (1863), from Sumatra.

† Cat. *Lycænidæ* B. M., p. 6, n. 25, pl. iii, figs. 21, 22, *male* (1862), from Batchian.

‡ Cat. *Lycænidæ* B. M., p. 5, n. 19, pl. iii, figs. 14, 15, *female* (1862), from Makassar, Celebes.

the usual submarginal fascia straight and rather prominent. *Forewing* with a small round spot towards the base of the discoidal cell, a larger transverse one across its middle, and a still larger one at its end; a small round spot above the latter on the costa; two indistinct ones below the cell divided by the first median nervule; a rather broad even slightly outwardly curved discal band, the uppermost spot of which is the smallest, the two lowermost spots in the submedian interspace darker than the rest, conjoined, forming a figure of 8; the inner margin broadly paler than the rest of the wing. *Hindwing* with the usual four round spots across the base, followed by three others, the middle one in the cell; a large spot closing the cell; an irregular discal band, its two uppermost portions in one straight line, the four following portions also in one straight line, but shifted outwardly towards the margin of the wing, the two posteriormost portions recurved to the abdominal margin; the small anal lobe deep black; a small oval spot on the margin in the first median interspace crowned with metallic green scales; the space between this latter spot and the anal lobe sprinkled with metallic green scales, anterior to which is a sprinkling of black and white scales; a white anteciliary thread prominent at the anal angle, obsolete about the middle of the margin.

This appears to be a very distinct species. On the upperside it is somewhat similar to the common *A. adorea, mihi*,* which occurs in Assam, Burma, the Malay Peninsula, and N.-E. Sumatra, from which it differs in its somewhat smaller size, darker purple coloration, and broader black borders. On the underside it is very near to *A. ace, mihi*,† from the Malay Peninsula, and N.-E. Sumatra, but the ground-colour is not quite so dark, and all the spots are smaller.

Described from a unique example in the collection of Hofrath Dr. L. Martin taken at Bekantschan in March, 1894.

21. ARRHOPALA AZATA, n. sp., Pl. T, Figs. 32, ♂; 33, ♀.

HABITAT: Perak, Malay Peninsula; Battak Mountains, N.-E. Sumatra.

EXPANSE: ♂, 1·9; ♀, 1·8 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* pale violet-blue, very similar in shade to that of *A. anarte* and *A. camdeo* as figured by

* Butt. of India, vol. iii, p. 238, n. 789, pl. Frontispiece, fig. 139, *male* (1890).

† Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 329, n. 6, pl. H, fig. 13, *male* (1892).

Hewitson in Cat. *Lycænidæ* B. M., pl. iii, though somewhat darker. *Forewing* has the costa and outer margin most narrowly black. *Hindwing* has the apex as far as the first subcostal nervule fuscous, the outer margin most narrowly black, the abdominal margin broadly whitish ; the anal lobe small, bearing a deep black spot almost hidden beneath turquoise-blue scales; outer tail from termination of first median nervule rather long, black, tipped with white ; inner tail from termination of submedian nervure very short, tooth-like, black. UNDERSIDE, *both wings* pale shining hair-brown, all the markings of a deeper shade of brown than the ground, outwardly defined with whitish. *Forewing* with a circular spot towards the base of the discoidal cell, a reniform one across its middle, a quadrate one outwardly indented closing the cell, two large spots posterior to the cell divided by the first median nervule ; a discal band of six (seven in Sumatran specimens) well rounded spots, the two (or three) lowermost ones shifted inwardly towards the base of the wing posterior to the third median nervule ; a broad, rather prominent submarginal fascia. *Hindwing* with five round basal spots ; an oval one in the middle of the cell, with one anterior and one posterior to it ; a large spot at the end of the cell, with a small one posterior to it at the base of the first median interspace ; a discal series of spots, the six anterior ones well rounded, placed in pairs, the two posterior ones elongated and recurved to the abdominal margin ; a double series of marginal lunules ; the anal lobe and oval spot on the margin in the first median interspace prominent, deep black, crowned with metallic turquoise-blue scales, the interspace between them also thickly sprinkled with similarly-coloured scales ; an anteciliary black thread defined on both sides with white. FEMALE. UPPERSIDE, *both wings* pale violet-blue. *Forewing* with the costa and outer margin rather broadly (between 2 and 3 mms.) black, the spot closing the discoidal cell on the underside shewing through on the upperside, and defined on both sides with whitish. *Hindwing* with the costa and outer margin broadly black, but this black border is reduced to two narrow black spots towards the anal angle. UNDERSIDE, *both wings* as in the male.

I do not know any near ally to this species. It may be close to *A. vihara*, Felder, described from Malacca interior and recorded from Tenasserim and Nias, but that species appears to have in the male a

black border of uncertain width on the upperside, while *A. azata* cannot be said to have any black border at all. On the underside of the forewing as figured, *A. vihara* has only five spots in the discal band, and the inner margin is almost white, in *A. azata* there are six or seven discal spots, and the inner margin is but slightly paler than the rest of the wing; moreover, this band is even in *A. vihara*, broken in *A. azata*. The pale blue coloration of this species on the upperside in both sexes makes it a very easily recognised one.

Described from a male from Perak and one from Sumatra taken in July in my own collection, and a pair from the latter island taken in March and November in the collection of Hofrath Dr. L. Martin.

22. ARRHOPALA ANILA, n. sp.

Amblypodia agesias, variety *a*, Hewitson, Cat. *Lycænidæ*, B. M., p. 11, n. 49 (1862); id., de Nicéville, Butt. of India, vol. iii, p. 273 (1890).

HABITAT: Perak ; Rawan, Selangor (*December*)—both in the Malay Peninsula ; N.-E. Sumatra ; Borneo.

EXPANSE : ♀, 1·2 to 1·6 inches.

I have ventured to give this form a name. Hewitson described it from a female as a variety of *A. agesias*, Hewitson. I think it highly improbable that it is a variety. I now possess nine specimens of it, and have seen many more, and they are all alike, and agree in having no discal band on the forewing on the underside, while typical *A. agesias*, Hewitson, from Borneo, has the usual band consisting of five round spots as figured, though Hewitson only mentions four. Hewitson describes *A. agesias* and its variety from female specimens. All my specimens look like females, but I am doubtful as to their sex—they may be males. I do not describe the species here, as I have already done so at sufficient length on page 273 of vol. iii of "The Butterflies of India, Burmah and Ceylon."

23. ARRHOPALA AVATHA, n. sp., Pl. T, Fig. 34, ♂.

HABITAT : N.-E. Sumatra.

EXPANSE : ♂, 1·3 to 1·4 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* dark shining purple, with a broad (a little more than 2 mms.) outer black border. *Forewing* with the costa very narrowly black, the outer margin rather more broadly black at the apex. *Hindwing* with the costa and abdominal

margin broadly black. UNDERSIDE, *both wings* dull hair-brown with a slight gloss in some lights ; all the markings very indistinct, of the colour of the ground, outwardly defined by a pale line. *Forewing* with a round spot towards the middle of the discoidal cell ; an oblong spot closing the cell ; a discal almost straight band of five or six rounded spots ; a very obscure submarginal fascia ; the inner margin broadly paler than the rest of the wing. *Hindwing* with the usual four small round basal spots ; a round spot in the middle of the cell, with a spot anterior to it on the costa ; an oblong spot closing the cell ; a large spot posterior to the cell in the submedian interspace ; a somewhat regular discal band, of which the posterior of the two anterior spots is placed midway between the third spot of the discal series and the spot at the end of the cell ; two indistinct marginal fasciæ ; no anal lobe or tail, but at the anal angle there is on the outer margin an elongated narrow black spot anteriorly crowned with metallic turquoise-blue scales.

This species appears to be nearest to *A. davisonii, mihi*,* from Burma, the Malay Peninsula, Sumatra, and Borneo, from which it may instantly be known by the black border on the upperside of the male being quite twice as broad. The markings of the underside are practically the same in both.

Described from five specimens in my collection, which do not differ at all. I would not have ventured to name it had I not found from the examination of perhaps a hundred specimens that *A. davisonii* is constant in the width of the black border on the upperside in the male. It is probably the present species that Mr. H. J. Elwes refers to when he wrote† :—"There seems to be considerable variation in the breadth of the border" of *A. davisonii*.

24. CAMENA CRETHEUS, de Nicéville, Pl. T, Fig. 35, ♀.

C. cretheus, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 294, n. 24, pl. P, fig. 35, *male* (1895).

HABITAT : Battak Mountains, N.-E. Sumatra.

EXPANSE : ♀, 1·4 inches.

DESCRIPTION : FEMALE. UPPERSIDE, *both wings* dull pale blue without any gloss. *Forewing* with the base of the costa whitish ; the

* Butt of India, vol. iii, p. 280, n. 845, pl. Frontispiece, fig. 135, *male* (1890), from Singapore.

† Proc. Zool. Soc. Lond., 1892, p. 633.

apex broadly black, this colour extending decreasingly along the costa till it meets the white area, also decreasingly along the outer margin, ending almost in a point at the anal angle. *Hindwing* with the basal half of the costa broadly white, the apex equally broadly black, the outer margin bearing a fine black anteciliary thread, defined inwardly by an equally fine white thread ; an indistinct marginal round diffused black spot in the first median interspace ; the anal lobe black, bearing anteriorly a small orange spot ; abdominal margin broadly white. UNDERSIDE, *both wings* as in the male, except that the orange spot at the base of the costa of the *forewing* is less prominent than in the male, and the orange subanal area on the *hindwing* is more extensive, extending uninterruptedly to the abdominal margin, and reaching the discal line.

Described from a single example in my collection captured in March.

Genus CREUSA, nov.

MALE. FOREWING, triangular ; *costa* regularly but slightly arched ; *apex* acute ; *outer margin* nearly straight ; *inner angle* rounded ; *inner* margin nearly straight, slightly emarginate in the middle ; *costal nervure* ending opposite to the apex of the discoidal cell ; *first subcostal nervule* arising a little nearer to the apex of the cell than to the base of the wing, close to its base anteriorly bowed forwards, and almost touching the costal nervure for some little distance ; *second* subcostal arising about as far from the first subcostal as from the origin of the upper disco-cellular nervule ; *third* subcostal short, arising much nearer to the apex of the wing than to the apex of the cell ; *subcostal nervure* ending at the apex of the wing ; *upper disco-cellular nervule* (this is actually the base of the upper discoidal nervule) stout, rather long, strongly outwardly oblique; *middle* disco-cellular straight, upright ; *lower* disco-cellular also straight and upright, slightly longer than the middle disco-cellular ; *second median* nervule arising well before the lower end of the cell; *first* median arising nearer the lower end of the cell than to the base of the wing, arising about twice as far from the second as the second does from the third ; *submedian nervure* slightly sinuous ; *secondary sexual character* consists of a large patch of modified deep black scales occupying nearly the outer half of the cell, and extending

slightly beyond it into the discoidal interspaces. HINDWING, *costa* greatly arched at base, thence straight to apex ; *apex* well rounded ; *outer margin* very nearly straight to the anal lobe ; *tails* two, short, the anterior one from the termination of the first median nervule rather longer than the posterior one from the termination of the submedian nervure ; *anal lobe* small ; *abdominal margin* sinuous, excavated anterior to the anal lobe ; *costal nervure* greatly arched at the base, thence straight to the apex of the wing ; *first subcostal nervule* arched throughout its length, arising well before the apex of the cell ; *disco-cellular* nervules of equal length, nearly straight, strongly outwardly oblique ; *second median* nervule arising just before the lower end of the cell ; *first* median arising nearer the lower end of the cell than the base of the wing ; *submedian nervure* straight ; *internal* nervure highly sinuous. *Antennæ* about half the length of the costa of the forewing, with a lengthened rather slender club. *Eyes* naked. *Palpi* naked, porrected forwards, the third joint not rising above the level of the top of the head. *Thorax* small. *Abdomen* not nearly reaching to the anal angle of the hindwing. FEMALE. WINGS somewhat broader than in the male. FOREWING, with no patch of androconia on the upperside. HINDWING, has the outer margin more rounded than in the male. Type, *C. culta*, de Nicéville.

Nearest to the genus *Ops*, de Nicéville,* with which it agrees very closely in outline and neuration, but differs from the three species included therein by its smaller size, and the character of the "male-mark," which in bleached specimens remains unaffected by the bleaching fluid, while in *O. ogyges*, de Nicéville, the type of the genus *Ops*, it entirely disappears when bleached ; it also occupies a different position, as it does not extend anteriorly or posteriorly beyond the cell, being strictly bounded in those directions by the subcostal and median nervures.

25. CREUSA CULTA, n. sp., Pl. T, Figs. 36, ♂ ; 37, ♀.

HABITAT : Khasi Hills.

EXPANSE : ♂, 1·2 to 1·4 ; ♀, 1·3 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* rich shining deep blue as in *Tajuria longinus*, Fabricius ; *cilia* fuscous. *Forewing* with

* Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 296 (1895).

the costa as far as the subcostal nervure, the apex widely, the outer margin decreasingly black ; a large oval plush-like jet-black patch of androconia at the end of the discoidal cell, outwardly extending just beyond it. *Hindwing* with the costa and apex broadly fuscous, the abdominal margin broadly pale fuscous, the outer margin with an anteciliary black thread ; the anal lobe fuscous, with faint traces of a few ochreous and blue scales at the middle ; tails fuscous, tipped with white. UNDERSIDE, *both wings* drab or pale slate colour, the disc crossed by a deeper drab narrow line outwardly faintly defined with whitish. *Forewing*, the inner margin broadly paler than the rest of the wing ; the discal line is nearly straight, commences close to the costa and ends on the submedian nervure ; there is a faint trace of a submarginal dark fascia. *Hindwing*, the discal line somewhat irregular, posteriorly zigzag and recurved to the abdominal margin ; a rather small ochreous spot close to the margin in the first median interspace, and a similar one on the anal lobe, the latter bears outwardly a small patch of black and metallic turquoise-blue scales ; the space between the two ochreous spots is faintly irrorated with black and white scales. *Thorax* above blue. *Abdomen* above fuscous, beneath drab. *Antennæ* black, very slightly annulated with white, the club beneath ferruginous, at the tip wholly ferruginous. FEMALE. UPPERSIDE, *both wings* much paler blue with less gloss than in the male. *Forewing* with the base of the costa whitish, no androconal black patch, the apex less broadly black than in the male. Otherwise as in the male.

On the upperside the male at once reminds one of Hewitson's figure of the male of "*Iolaus*" *isæus*, Hewitson,* which I identify with *Britomartis cleoboides*, Elwes,† but the blue coloration in that species is of a far paler and duller shade, and the apex of the hindwing is not broadly black. Mr. Hampson, however, informs me that the blue colour shewn in Hewitson's figure is incorrect, it should be darker, as in *Tajuria longinus*, Fabricius. It cannot, however, represent *C. culta*, as that species has three subcostal nervules to the forewing, while "*I.*" *isæus* has only two. On the upperside the female

* Ill. Diurn. Lep., *Lycænidæ*, Supplement p. 10, Supplement pl. iv, figs. 35, 36, *male* (1869).

† Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 306, n. 1 (1895).

at once reminds one of Hewitson's figure of "*Iolaus*" *isæus*, Hewitson,* which name stands for the species, but the underside differs considerably, as it has a very large ochreous area at the anal angle of the hindwing, which area in *C. culta* is reduced to two small spots.

I am indebted to the Rev. Walter A. Hamilton for the gift of five males and one female of this interesting little species.

Genus CREON, nov.

MALE. FOREWING, triangular, broad ; *costa* arched at base, straight in the middle, deflected posteriorly at the apex ; *apex* acute ; *outer margin* strongly convex ; *inner angle* rather acute ; *inner margin* much bowed posteriorly in the middle, to the edge of this bowed portion are attached two pencils of hairs, the interior one is narrow, long, deep black, directed obliquely outwardly, under and forwards, and extends a little beyond the submedian fold ; the exterior one is broad, short, and pale ochreous ; *costal nervure* ending opposite to the apex of the discoidal cell ; *first subcostal nervule* arising nearer to the apex of the cell than to the base of the wing, well separated from the costal nervure ; *second* subcostal arising twice as far from the upper disco-cellular as from the first subcostal nervule ; *third* subcostal short, arising much nearer to the apex of the wing than to the apex of the cell ; *subcostal nervure* ending at the apex of the wing ; *upper disco-cellular nervule* (this is actually the base of the upper discoidal nervule) stout, rather long, strongly outwardly oblique ; *middle* disco-cellular very slightly concave, upright ; *lower* disco-cellular straight, in the same straight line with and rather longer than the middle disco-cellular ; *second median* nervule arising well before the lower end of the cell ; *first* median arising nearer the lower end of the cell than to the base of the wing, arising about twice as far from the second as the second does from the third ; *submedian nervure* slightly sinuous. HINDWING, *costa* greatly arched at base, thence to apex forming a very obtuse angle, the two sides forming this angle of nearly equal length, each side almost straight ; *apex* well rounded ; *outer margin* at first slightly concave, produced from the apex of the second median nervule to the anal lobe ; *tails* two, short, the anterior one from the termination of the first median nervule rather longer than the posterior one

* Ill. Diurn. Lep., *Lycænidæ*, p. 44, n. 15, pl. xix, figs. 13, 14, *male* (1865).

from the termination of the submedian nervure; *anal lobe* rather small; *abdominal margin* excavated anterior to the anal lobe, then greatly convex to the base of the wing ; *costal nervure* short, much arched at base, arched again in the middle; a small round deep black patch of *androconia* on the upperside in the middle of the subcostal interspace, well separated from the veins on either side of it, placed in a line with the base of the upper disco-cellular nervule ; *first subcostal nervule* arched throughout its length, ending at the apex of the wing, arising well before the apex of the cell ; *upper disco-cellular* nervule nearly straight, strongly outwardly oblique ; *lower* disco-cellular also straight, not so strongly outwardly oblique as the upper disco-cellular, of the same length ; *third median* nervule much arched throughout its length ; *second* median arising immediately before the lower end of the cell ; *first* median arising nearer the lower end of the cell than the base of the wing, arising about twice as far from the second as the second does from the third ; *submedian nervure* straight ; *internal* nervure short, bowed outwardly close to its base. *Antennæ* about half the length of the costa of the forewing, with a lengthened rather slender club. *Eyes* naked. *Palpi* naked, porrected forwards, the third joint not rising above the level of the top of the head. *Thorax* small. *Abdomen* not nearly reaching to the anal angle of the hindwing. FEMALE. WINGS, broader than in the male. FOREWING, *inner margin* instead of being bowed out as in the male is emarginate in the middle, and has no tufts of hair attached to its edge and turned under and forwards as in the male. HINDWING, costa regularly and evenly arched throughout its length ; *costal nervure* long, ending at the apex of the wing, in the male it is short, and the first subcostal nervule ends at the apex ; no androconal patch of modified scales in the subcostal interspace. Otherwise as in the male. Type, *C. cleobis*, Godart.

This genus is allied to *Camena*, Hewitson, but differs in its male secondary sexual characters. In the forewing it has two (instead of one) tufts of hair attached to the inner margin, which is a unique feature in the *Lycænidæ* as far as I am aware ; and the androconal patch on the hindwing is very much smaller, being confined to the middle of one interspace, instead of extending into several interspaces as in *C. ctesia*, Hewitson (the type of *Camena*), and *C. deva*, Moore (the type of

Pratapa, Moore). The hindwing is also more bowed forwards in the middle, forming there an obtuse angle, and is more produced in the anal region from the lobe to the second median nervule than in those species.

(1) CREON CLEOBIS, Godart.

Polyommatus cleobis, Godart, Enc. Méth., vol. ix, p. 634, n. 61 (1823); *Iolaus cleobis*, Hewitson, Ill. Diurn. Lep., p. 43, n. 12, pl. xviii, figs. 8, 9, *male*; 10, *female* (1865); *Pratapa cleobis*, de Nicéville, Journ. A. S. B., vol. liv, pt. 2, p. 49, n. 91 (1885); id., Hampson, Journ. A. S. B., vol. lvii, pt. 2, p. 360, n. 145 (1888); *Camena cleobis*, de Nicéville, Butt. of India, vol. iii, p. 343, n. 899 (1890); *Amblypodia hypatada*, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 45, n. 72 (1857); *Dipsas biocellatus*, Grose, MS., Cat. Lep. Mus. E. I. C., vol. i, pl. xii, fig. 2, *larva*; 2*a*, *pupa* (1857).

HABITAT: Masuri in the Western Himalayas, Bholahât in the Malda district, Dinajpur, Jalpaiguri, Western Duars, Calcutta, Sibsagar in Upper Assam, Chin Lushai Hills, Ruby Mines in Upper Burma, Nilgiri Hills.

26. TAJURIA THRIA, n. sp., Pl. T, Figs. 38, ♂; 39, ♀.

HABITAT: Daunat Range, Middle Tenasserim, Burma; Battak Mountains, N.-E. Sumatra.

EXPANSE: ♂, 1·25 to 1·35; ♀, 1·20 inches.

DESCRIPTION: MALE. UPPERSIDE, *forewing* black, with a slight gloss in some lights. *Hindwing* with the costa as far as the costal nervure whitish; the apex and outer margin narrowly and decreasingly black, towards the anal angle this black margin is reduced to an anteciliary thread, posteriorly inwardly defined by an equally fine white thread; the abdominal margin as far as the submedian nervure broadly whitish, outwardly becoming blackish; the rest of the wing glittering azure; anal lobe black, bearing anteriorly a few blue scales; tails black with white tips, the outer one from the termination of the first median nervule the longer, the inner one from the termination of the submedian nervure inwardly ciliated with white. UNDERSIDE, *both wings* dull chrome-yellow; with a discal narrow darker line outwardly defined with whitish. *Forewing* has the discoidal cell closed by a pair of darker lines; the discal line is outwardly bowed, it commences at the costa and ends on the submedian nervure; there is a very obscure submarginal fascia; the inner margin broadly pale. *Hindwing* has the discal band from the costa to the second median nervule straight, then zigzagged to the abdominal margin; the outer margin

far as the discal line and from the anal angle to the third median nervule, anterior to which but not quite reaching the apex of the wing it is continued in a narrow submarginal fascia, white sprinkled with black scales, inwardly bearing a narrow lunular black line ; the anal lobe bears a large round deep black spot anteriorly with a few metallic pale green scales ; a large oval deep black spot in the first median interspace near the margin ; a fine black anteciliary thread, defined on both sides with an equally fine white thread. *Cilia* cinereous throughout. FEMALE. UPPERSIDE, *forewing* black ; with a broad pale blue area from the inner margin to the median nervure, extending slightly into the first median interspace, but not nearly reaching the outer margin. *Hindwing* with the costa and apex broadly black, the outer margin rapidly decreasingly black; the rest of the wing pale blue. Otherwise as in the male.

This interesting little butterfly belongs to a small but distinct group which hitherto has comprised three Northern Indian species, its geographical range extending from Masuri in the Western Himalayas to Assam, *viz.*:—*T. megistia*, Hewitson, *T. yajna*, Doherty, and *T. istroidea*, de Nicéville. From all of these *T. thria* may be known in the male in the hindwing being almost entirely cerulean blue, the others having this colour confined to a more or less wide anterior patch. In the same way the female may be known by the blue area in the hindwing on the upperside being of much greater extent, and almost reaching the outer margin, which is not the case in the three above-named species. The coloration of the underside of *T. thria* agrees with that of *T. megistia*, being orange or dull chrome-yellow.

Described from several males in the collection of Hofrath Dr. L. Martin and my own, taken in March and May, and a solitary female in Dr. Martin's collection, taken in July, 1894, all from the Battak Mountains, and from five males from the Daunat Range, Middle Tenasserim, Burma, in my own collection. The type specimens are from Sumatra.

27. RAPALA RHŒCUS, de Nicéville, Pl. T, Fig. 40, ♀.

R. rhœcus, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 319, n. 35, pl. P, fig. 47, *male* (1895).

HABITAT : N.-E. Sumatra.

EXPANSE : ♀, 1·5 to 1·6 inches.

DESCRIPTION : FEMALE. UPPERSIDE, *both wings* fuscous, with a distinctly reddish-coppery gloss in some lights which is particularly

prominent on the veins. *Cilia* reddish-coppery. *Forewing* with the basal half iridescent dark ultramarine-blue visible in all lights, but much brighter in some lights than in others, anteriorly bounded by the subcostal nervure, posteriorly by the inner margin, outwardly reaching beyond the discoidal cell, and approaching the outer margin at the anal angle. *Hindwing* with the discal two-thirds blue as in the forewing, leaving the costa, outer and abdominal margins about equally broadly fuscous ; anal lobe black, anteriorly bearing a few turquoise-blue scales, inwardly with a small reddish patch. UNDERSIDE, *both wings* as in the male, except that the discal fuscous band is outwardly defined by a whitish thread.

I possess examples of this sex taken in the Battak Mountains in March and July, and at Bekantschan in March.

28. RAPALA RHODOPIS, n. sp., Pl. T, Figs. 41, ♂ ; 42, ♀.

HABITAT : Battak Mountains, N.-E. Sumatra.

EXPANSE : ♂, 1·3 to 1·4 ; ♀, 1·3 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* shining fuscous. *Forewing* with the posterior outer end of the discoidal cell, the base of the second and first median, and all except a small portion exteriorly of the submedian and internal interspaces shining deep brownish-ferruginous of a very unusual shade ; the bases of the three median nervules and that portion of the median nervure between the origins of the first and third median nervules defined with black, that is to say, the wing-membrane at these points is free from brownish-ferruginous scales. *Hindwing* with the costa widely as far as the discoidal nervule, and the outer margin somewhat narrowly of the black ground-colour, the abdominal margin pale fuscous, all the rest of the wing shining deep brownish-ferruginous ; tail black, tipped with white ; anal lobe black, anteriorly ochreous, with a narrow outer white line. UNDERSIDE, *both wings* pale brown distinctly glossed with dull yellow ; the disco-cellular nervules defined by a narrow whitish and dark brown double line ; a discal narrow dark brown line outwardly defined with whitish. *Forewing* has the discal line very straight and even, being only very slightly outwardly bowed, commencing at the subcostal nervure and ending on the submedian nervure ; the tuft of hairs attached to the inner margin towards the base of the wing and turned under and forwards large and deep black. *Hindwing* has the discal line nearly

straight from the costa to the first median nervule, thence zigzagged to the abdominal margin, this latter portion is ochreous, and bears on each side a very fine black and an outer white line; the usual round black spot in the first median interspace faintly crowned with orange; the submedian interspace between the discal line and the margin irrorated with turquoise-blue scales; the anal lobe deep black crowned by a silvery-blue spot; anterior to the lobe is a short silvery-blue fascia. *Cilia* black, with an anteciliary white line on the anal half of the wing. FEMALE. UPPERSIDE, *both wings* shining dark hair-brown somewhat tinted with ochreous. *Forewing* with the costa widely extending well into the discoidal cell and the outer margin less widely fuscous. *Hindwing* has the anal lobe deep black inwardly bearing a small ochreous spot, outwardly defined by a narrow white line, which line is continued along the outer margin as far as the discoidal nervule, and is inwardly defined by a very thin black and then a white line; tail black, tipped with white. *Cilia* of the hindwing anally black, anteriorly and in the forewing dull ochreous. UNDERSIDE, *both wings* as in the male, except that the ground-colour is paler, being of a distinctly greenish-ochreous shade.

I do not know any species, except *R. rhoda*, de Nicéville, next described, to which the present species isallied, the coloration of the upperside of the male being quite unique. On the underside of both sexes the coloration and markings are very similar to those of *R. xenophon*, Fabricius, which is also found in N.-E. Sumatra.

Described from several males in Hofrath Dr. L. Martin's collection and my own taken in the Battak Mountains in March, May, July, August, September, and December, and a single female in Dr. Martin's collection, without date; also one male from Selesseh.

29. RAPALA RHODA, n. sp., Pl. T, Figs. 43, ♂; 44, ♀.

HABITAT: Battak Mountains, N.-E. Sumatra.

EXPANSE: ♂, ♀, 1·4 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* shining fuscous. *Forewing* with two longitudinal shining deep brownish-ferruginous streaks of a slightly darker shade than in *R. rhodopis*, de Nicéville, described above, commencing at the base of the wing, not quite reaching the outer margin; the anterior one posterior to but lying against the median nervure, occupying the whole basal portion of the

first median interspace, and extending slightly into the interspaces exterior and posterior to it ; the posterior one lying along both sides of the submedian nervure. *Hindwing* with the costa, outer and abdominal margins alone fuscous, the rest of the wing shining deep brownish-ferruginous ; the anal lobe ferruginous ; the tail black, tipped with white. UNDERSIDE, *both wings* dull fuscous ; two rather widely separated narrow whitish lines at the end of the discoidal cells ; a somewhat broad catenulated discal band of a slightly darker shade than the ground, outwardly defined on both sides by a very fine white line. *Forewing* has the discal band straight, commencing close to the costa, ending on the submedian nervure ; the tuft of hairs attached to the inner margin towards the base of the wing and turned under and forwards small and pale fuscous. *Hindwing* has the discal band very irregular, posteriorly recurved to the abdominal margin ; the usual round deep black spot slightly crowned with ferruginous in the first median interspace ; the submedian interspace between the discal band and the outer margin slightly irrorated with black and white scales ; the anal lobe deep black crowned with ferruginous and white ; anterior to the lobe is a short outwardly ferruginous, then black, and then white fascia ; the usual fine black anteciliary line inwardly defined by a fine white line from the anal angle to about the middle of the wing. FEMALE. UPPERSIDE, *both wings* shining fuliginous. *Hindwing* with the anal lobe as in the male. UNDERSIDE, *both wings* whitey-brown, the disco-cellular markings and discal band as in the male but more prominent ; an indistinct submarginal lunulated fascia.

Nearest to *R. rhodopis*, de Nicéville, described above, but differing greatly in details, though superficially very similar.

Described from a single pair in the collection of Hofrath Dr. L. Martin taken in the Battak Mountains in February, 1894.

30. RITRA AUREA, Druce, Pl. T, Fig. 45, ♀.

Sithon aurea, Druce, Proc. Zool. Soc. Lond., 1873, p. 352, n. 12, pl. xxxiii, fig. 1, *male*.
Ritra aurea, de Nicéville, Butt. of India, vol. iii, p. 411 (1890).

HABITAT : Borneo (*Druce*); Perak (*de Nicéville*) ; N.-E. Sumatra.

EXPANSE : ♀, 1·7 inches.

DESCRIPTION : FEMALE. UPPERSIDE, *forewing* dull dark ferruginous; the base dusted with fuscous ; the apex widely and the outer margin decreasingly fuscous. *Hindwing* fuscous, the middle of the wing

obscurely ferruginous, of a duller shade than in the forewing; three outer discal pure white spots, the one in the submedian interspace square, the one in the first median interspace lunular, the one in the second median interspace elongated and the smallest of all; these three spots have beyond them close to the margin three other elongated white spots, with a fourth anteriorly on the excavation above the anal angle; the anal lobe black, bearing a few turquoise-blue metallic scales; the tails black broadly ciliated with white. *Cilia* of the forewing cinereous, of the hindwing broad and pure white. UNDERSIDE, *both wings* as in the male, except that the ground-colour is somewhat paler.

The coloration of the specimen above described reminds one of the female of "*Myrina*" *orpheus*, Felder, the male of which is figured by Hewitson as "*Myrina*" *massiva*,* a species from the Philippines, but the female of *R. aurea* differs from the same sex of that species on the upperside of the hindwing in having seven white spots in all instead of four only.

I possess two males of this interesting species from Sumatra, one taken at Selesseh on 14th April, 1894. The female here described from Sumatra is unique in the collection of Hofrath Dr. L. Martin.

Family PAPILIONIDÆ.

Subfamily PAPILIONINÆ.

31. PAPILIO (*Dalchina*) SARPEDON, Linnæus, Pl. T, Fig. 46, ♂.

P. sarpedon, Linnæus, Syst. Nat. Ins., ed. x, p. 461, n. 14 (1758); *P. sarpedon*, var., Leech, Trans. Ent. Soc. Lond., 1889, p. 115, n. 69, pl. vii, fig. 2, *male*; *P.* (*Dalchina*) *sarpedon*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 54, n. 14, pl. L, fig. 11, *male* (1893); *P. sarpedon*, var. *semifasciatus*, Honrath, Ent. Nach., vol. xiv, p. 161 (1888).

I have already (l. c.) figured and described a very remarkable aberration or "sport" of *P. sarpedon* from the Battak mountains of N.-E. Sumatra, in which the normal discal blue-green band of both wings has entirely disappeared, except the anterior spot of the forewing which alone remains, and two of the normal number of six submarginal blue-green lunules (one from either end of the series) of the hindwing are also wanting. Mr. J. H. Leech (l. c.) has figured and described another remarkable form, which he says is the common one there, from Kiukiang in Central China, in which the normal discal blue-green band is wanting in the hindwing (the whitish spot in continuation thereof

* Ill. Diurn. Lep., p. 30, n. 8, pl. xvi, fig. 45, *female*; pl. xii, figs. 10, 11, *male* (1863).

anterior to the subcostal nervure is, however, present), and the posteriormost of the submarginal blue-green lunules of the hindwing is also absent. Herr E. G. Honrath (l. c.) has described this form from Kiukiang in Central China as *P. semifasciatus*. Lastly, to complete the series, I have here figured a male example from Sikkim in my collection, in which the blue-green band of the forewing on the upperside is reduced to the anteriormost and posteriormost spots, the latter, instead of being large, quadrate, and filling the interspace from the submedian nervure to the inner margin, is represented by an irregular small irrorated patch of blue scales heavily oversprinkled with black scales. On the underside of the forewing the discal band is faintly indicated by an indistinct bluish-white fascia in the normal position, which shows through on the upperside faintly by transparency, the anteriormost and posteriormost spots being present as on the upperside; on the hindwing this fascia is much paler than usual, and ends anteriorly on the subcostal nervure instead of extending broadly up to the costa. In other respects this specimen is normal.

Family HESPERIIDÆ.

32. TAGIADES TOBA, n. sp., Pl. T, Fig. 47, ♂.

HABITAT : Selesseh and the Battak Mountains, N.-E. Sumatra.

EXPANSE : ♂, 1·35 to 1·40 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* deep black. *Forewing* with the following transparent white dots :—Two placed outwardly obliquely towards the outer end of the discoidal cell, the lower one sometimes missing; a costal one placed between the costal nervure and first subcostal nervule in a straight line with the dots in the cell ; one in the second median interspace ; and five subapical forming a perfect S-shaped figure. *Cilia* fuscous. *Hindwing* with the anal angle broadly, as far as the second median nervule, pure white, bearing a large round black spot on the margin in the submedian interspace, and a small one in the first median interspace ; a fine black anteciliary line in the white area. *Cilia* anteriorly fuscous, posteriorly and along the abdominal margin pure white ; very long at the anal angle. UNDERSIDE, *both wings* dull black. *Forewing* with the dots as on the upperside ; a pale suffused indistinct twinned spot towards the outer angle in the submedian interspace. *Hindwing* almost entirely white, the costa and apex broadly and a narrow

anteciliary line alone being of the dull black ground-colour ; the posterior edge of the blackish area bearing four rounded deep black spots ; the two black spots on the outer margin as on the upperside. *Palpi* above, *thorax* and *abdomen* above black, but the latter tipped with white. Palpi beneath, thorax, *legs*, and abdomen beneath pure white.

Near to *T. lavata*, Butler, from Malacca (*Butler*), and Perak (*Distant*), known to me by figures and descriptions only, from which *T. toba* differs in having two or three discal as well as the subapical dots in the forewing ; the hindwing differs in the white area on both upper- and undersides being spotted with black, in *T. lavata* it is immaculate; the hindwing also appears to be conspicuously narrower and produced anally. It is also near to *T. gracilentus*, Weymer,* from New Britain (*Weymer*), but that species has the white area on the upperside of the hindwing at least twice as large as in *T. toba*, and the anteciliary line is developed into a broad band which includes the two black marginal spots of *T. toba*. The shape of the wings will also distinguish *T. toba* from the common and widely-distributed *T. atticus*, Fabricius, the hindwing in especial being much longer and narrower.

Described from several examples in the collection of Hofrath Dr. L. Martin and my own taken in March, April, and October.

33. KORUTHAIALOS KERALA, n. sp., Pl. T, Fig. 48, ♂.

HABITAT : Perak, Malay Peninsula ; Battak Mountains, N.-E. Sumatra.

EXPANSE : ♂, 1·75 to 1·90 ; ♀, 1·75 to 2·15 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* shining fuscous. *Forewing* with a broad oblique discal orange fascia exactly as in *Kerana armatus*, Druce, that is to say, the band is about twice as long as it is broad, and it does not quite reach the costa, the outer margin at the anal angle, or the inner margin; but it differs slightly in form from the band in that species as its inner edge anteriorly is obliquely cut off instead of being continued straight to the costa. *Hindwing* unmarked. UNDERSIDE, *both wings* paler than on the upperside, of a more sooty brown. *Forewing* has the discal band rather broader than on the upperside, reaching the inner margin ; it is paler moreover throughout, especially so posteriorly. *Hindwing* immaculate. *Cilia* fuscous throughout. *Antennæ* black, the apex of the club paler beneath.

* Stet. Ent. Zeit., vol. xlviii, p. 14, n. 12, pl. ii, fig. 7, *male* (1887).

Palpi fuscous, blunt, the third joint hidden beneath the second. *Body* and *legs* entirely fuscous. FEMALE, exactly like the male.

On the upperside this species has a strong superficial resemblance to *Celænorrhinus ladana*, Butler, from Borneo (*Butler*), and Perak (*Elwes*), but on the underside that species has the hindwing spotted instead of immaculate. It is also very similar to *Kerana armatus*, Druce, from Borneo (*Druce*), Malacca and Singapore (*Distant*), Perak and Sumatra (*coll. de Nicéville*), but that species has the hindwing much broader (nearly circular), being as broad as it is long, while in *K. kerala* it is longer than broad; besides which *K. armatus* has in the male on the upperside of the hindwing "a patch of appressed scales occupying the entire discoidal cell, and giving it a velvety appearance," and on the underside of the forewing (Capt. Watson in Proc. Zool. Soc. Lond., 1893, p. 115, inadvertently says on the hindwing) "a similar ill-defined patch towards the base," these male secondary sexual characters being absent in *K. kerala*, that species possessing instead a pencil of stiff hairs on the base of the costa of the hindwing, correlated with a hairy groove at the base of the discoidal cell of the forewing on the underside within which the pencil of hairs appears to lie. It is probably nearest of all to "*Astictopterus*" *xanites*, Butler, described from Borneo, but that species is smaller (Watson says it expands 41 mms. = 1·6 inches), nor are the published figures of it by Butler and Distant at all like the present species, but it is almost certain that these figures were not taken from or are conspecific with the type.

Described from a female from Perak, and four males and two females from Sumatra, one taken in May, in my collection. Hofrath Dr. L. Martin possesses other specimens from Sumatra in his collection. The specimen figured is from Sumatra.

34. KORUTHAIALOS KOPHENE, n. sp., Pl. T, Figs. 49, ♂; 50, ♀.

HABITAT: N.-E. Sumatra; Central and Western Java.

EXPANSE: ♂, 1·6; ♀, 1·8 and 2·1 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *both wings* sooty-brown. *Forewing* with a broad oblique discal orange fascia (not as broad as in *Celænorrhinus ladana*, Butler, *Kerana armatus*, Druce, and *Koruthaialos kerala*, de Nicéville) commencing near the costa, ending near the submedian nervure, its edges irregular, crossed by the dark brown

veins, bearing a dark brown line which defines the disco-cellular nervules. *Hindwing* unmarked. UNDERSIDE, *both wings* rather paler than above. *Forewing* with the discal band broader and paler, especially posteriorly, than on the upperside, the disco-cellular dark line narrower and more prominent ; the inner margin as far as the submedian nervure pale ochreous. *Hindwing* unmarked. *Antennæ* black, the apex of the club beneath paler. *Palpi* blunt, the third joint hidden beneath the second. *Body* and *legs* sooty-brown. MALE. Similar to the female but smaller, the orange fascia on both sides of the forewing rather more obscure and narrower. It has the same secondary sexual characters as in *K. kerala*, de Nicéville, described above.

Unfortunately I possess only four examples of this species. The type female is from Central Java, 1,500 feet, taken in 1891 by Herr H. Frushtorfer, and I have another female from Sukabumi, 2,000 feet, Western Java, captured by the same gentleman in 1893. They are larger than my other female specimen from N.-E. Sumatra, and have the discal band somewhat broader and less interrupted by the veins, but are obviously the same species. There are other specimens from Sumatra in Hofrath Dr. L. Martin's collection and the type male in my own collection. At first I believed this species to be the female of *K. kerala*, but subsequently I received both sexes of both species, which enables me to describe it. The female specimen figured is from Central Java, the male from Sumatra.

35. AMPITTIA MAROIDES, n. sp., Pl. T, Fig. 51, ♂.

HABITAT : Daunat Range, Tenasserim.

EXPANSE : ♂, 1·0 inch.

DESCRIPTION : MALE. UPPERSIDE, *both wings* glossy fuscous, with rich chrome-yellow markings. *Forewing* with a broad basal fascia occupying the whole of the discoidal cell and divided from the costa only by a fine thread of the ground-colour ; two well separated discal quadrate patches, the anterior one crossed by the terminal portion of the subcostal nervure (the fifth subcostal nervule of some writers), and the fourth subcostal nervule, the posterior one crossed by the second median nervule, with a minute dot placed posteriorly against the middle of the lower of these two last-named spots in the submedian interspace ; a streak of large highly deciduous chrome-yellow scales from the

base to about the middle of the submedian interspace, and a slightly longer similar one in the sutural area. *Hindwing* with a large chrome-yellow patch in the middle of the disc ; the base with long chrome-yellow setæ. *Cilia* of the hindwing almost entirely chrome-yellow, of the forewing chrome-yellow of a duller shade mixed with black. UNDERSIDE, *forewing* black ; a costal chrome-yellow streak, which is joined to a wide similar streak occupying the outer two-thirds of the cell, both joined to the anterior discal patch of the upperside ; the lower discal patch as on the upperside, but composed of two portions only, with no third minute portion in the submedian interspace ; the apex of the wing more or less chrome-yellow ; a fine anteciliary chrome-yellow line. *Hindwing* chrome-yellow, with numerous small black spots scattered evenly over the surface ; a fine black anteciliary thread. *Antennæ* above black, beneath chrome-yellow. *Thorax* and *abdomen* above black, beneath and *legs* chrome-yellow.

Very near to *Ampittia maro*, Fabricius = *Cyclopides camertes*, Hewitson = *Thymelicus palemonides*, Snellen,* from Indian and Ceylonese specimens of which of the same sex it differs on both sides of the forewing in lacking the chrome-yellow spot in the *middle* of the submedian interspace, and on the underside in the ground-colour of the forewing being much deeper black, and all the spots of the hindwing being deep black, and consequently much more prominent. The cilia of the hindwing is also almost entirely chrome-yellow, instead of prominently spotted with fuscous at the termination of all the veins. It is but distantly allied to *Taractrocera atropunctata*, Watson, MS. from Upper Burma, the type specimens of which are before me as I write, and which has in the male all the chrome-yellow markings of the upperside very greatly reduced in size. In this species the knob to the antennæ is large and spatulate with no terminal crook, in *A. maro* the knob is smaller and elongated with a very small crook, in *A. maroides* the crook is distinctly longer.

Described from three examples in my collection.

Suborder HETEROCERA.

Family PYRALIDÆ.

Subfamily CHRYSAUGINÆ.

Genus TERATOMORPHA, nov.

* Reise en Midden-Sumatra, vol. iv, pt. 4, p. 28, n. 1 (1884).

PALPI upturned, the second joint reaching vertex of head and moderately scaled in front, the third short and naked. MAXILLARY PALPI absent. FRONS rounded. ANTENNÆ almost simple. LEGS, tibiæ with the outer spurs about two-thirds the length of inner. FOREWING, with the *costa* arched at base and excised beyond middle ; the *apex* bent upwards, arched and falcate ; the *outer margin* excised below apex, produced and hooked at middle, then excised to outer angle ; the *inner* margin lobed. MALE with large costal glandular swelling clothed with long hair at base on underside. Vein 3 from before angle of cell ; 4 and 5 from angle ; 6 from upper angle ; 7, 8, 9 stalked and curved ; 10, 11 free. HINDWING, with the *outer margin* somewhat excised below apex and angled at vein 2 ; vein 3 from near angle of cell ; 4, 5 from angle ; 6, 7 from upper angle, 7 anastomosing slightly with 8.

This very distinct genus is the fourth belonging to the *Chrysauginæ* known from the Oriental region (*Banepa*, Moore, *Omphalolomia*, Swinhoe, and *Macna*, Walker= *Goossensia*, Rogonot). The true habitat of *Hypocosmia definitalis*, Rogonot, described from Ceylon, being Venezuela. Of the other genera of the subfamily, one is Australian, whilst the numerous remaining genera are all from the Neotropical and the warmer parts of the Nearctic regions.

36. TERATOMORPHA HAMPSONII, n. sp., Pl. T, Figs. 52, ♂ ; 52*a*, neuration ; 52*b*, head, showing palpi and antennæ ×2.

HABITAT : Daunat Range, Tenasserim.

EXPANSE : 32 mms. Type in B.M.

DESCRIPTION : MALE. Head dark vinous-red ; thorax and abdomen fuscous. *Forewing* dark sap-green ; the base and costal area dark vinous-red ; a large vinous-red disco-cellular reniform spot conjoined to the red costal area, extending below vein 2 and enclosing a green spot at its upper exterior edge ; the outer area suffused with vinous-red-brown scales. *Hindwing* fuscous-brown ; the inner area smoky-black ; the cilia reddish. UNDERSIDE, *both wings* fuscous-brown. *Forewing* with the outer area vinous-red. *Hindwing* with indistinct pale sinuous submarginal line.

It gives me great pleasure to name this interesting moth after my friend Mr. G. F. Hampson of the British Museum, whose important work on "The Moths of India" in the Fauna of British India series should be in the hands of every one interested in the *Heterocera*.

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NEW AND LITTLE-KNOWN SPECIES OF INDO-MALAYAN *HYMENOPTERA*, WITH A KEY TO THE GENERA OF INDIAN *POMPILIDÆ*, AND A NOTE ON *SPHEX FLAVA* OF FABRICIUS, AND ALLIED SPECIES.

By Colonel C. T. Bingham, f.z.s., Forest Department, Burma.

(*With Plates I and II.*)

(*Read before the Bombay Natural History Society, on 2nd April*, 1895.)

After most careful comparison I have been unable to identify with any known species any of the eleven hymenopterous insects below described and contained in my collection, and I believe them to be hitherto undescribed.

Family *APIDÆ*, Leach.

1.—ANTHOPHORA VEGETA, n. sp., Pl. I, Fig. 1, ♀.

Habitat: Deli, Sumatra.

Female: Length 12 m.m., expanse 22 m.m.

Male: Unknown.

Description.—♀. Head, thorax, and abdomen black with fulvous pubescence, dark on the thorax, paler on the outside of the tibiæ and tarsi of the legs and on the abdomen. Mandibles yellow, castaneous-brown at the tips; clypeus yellow with two large square black maculæ at the base; antennæ piceous, a short yellow streak on the scape in front; the front of the face, the vertex and the cheeks behind the eyes black with fulvous pubescence, that on the cheeks inclining to hoary; ocelli black placed in a triangle on the vertex, between the eyes and the lateral ocelli on each side the top of the head is sunk and furrowed. Thorax black and finely punctured, covered with a dark fulvous pubescence, tufted and long on the metathorax; wings yellowish hyaline, the tegulæ and nervures testaceous; legs black, with pale fulvous pubescence on the outside of the tibiæ and tarsi, the tibial calcaria and claws black. Abdomen black, densely and finely punctured, the posterior margins of the segments with broad bands of golden fulvous pubescence; below the abdomen is black, the margin of the segments narrowly testaceous.

2.—ANTHOPHORA AMYMONE, n. sp., Pl. I, Fig. 2, ♀.

HABITAT : Deli, Sumatra.

FEMALE : Length 17 m. m., expanse 30 m.m.

MALE : Unknown.

DESCRIPTION.— ♀. Head, thorax, and abdomen black with fuscous black pubescence, behind the eyes and on the sides of the clypeus it is hoary, on the outside of the tibiæ and tarsi of the legs, and on the two last segments of the abdomen bright ferruginous. The mandibles testaceous, darker at the tips, the clypeus is higher than broad, punctured with a pale testaceous mark down the centre ; the pubescence on it black and thinly scattered, on the sides of the face and below it is dense and hoary-gray, and on the front between the antennæ fuscous-black ; the antennæ are piceous, the scape in front black and shining ; the vertex is bare, finely punctured and marked with three short longitudinally impressed lines leading from the ocelli forward to as far as the base of the antennæ ; the ocelli are of a deep ruby-red placed in a curve on the vertex. Thorax black with fuscous-black pubescence ; the centre of the metathorax above and the scutellum bare and finely punctured ; wings brownish-hyaline, the tegulæ testaceous, the nervures dark brown ; legs testaceous-brown, the tibiæ and tarsi with bright ferruginous pubescence on the outside ; claws dark castaneous-brown. Abdomen black, finely and closely punctured ; the posterior margins of the 1st, 2nd, 3rd, and 4th segments thickly fringed with fuscous-black pubescence, that on the terminal segments bright ferruginous ; below the abdomen is piceous-black, with the margins of the segments testaceous.

The above two species were collected at Deli in Sumatra by Hofrath Dr. L. Martin, by whom they were kindly sent to me.

3.—BOMBUS RUFO-FASCIATUS, Smith, Pl. I, Fig. 3, ♀.

BOMBUS RUFO-FASCIATUS, Smith, Trans. Ent. Soc., Lond. New Ser., II, (1852-53), p. 48, ♀.

HABITAT : Sikkim Himalayas, above 12,000 ft.

FEMALE : Length 25 m.m., expanse 46 m.m.

DESCRIPTION.— ♀. Black with long black and hoary-gray pubescence ; the 2nd segment of the abdomen with a bright vermillion-red band above. Head black, narrow and long ; the mandibles, clypeus, face

and cheeks behind the eyes shining jet-black, the clypeus finely pitted, the antennæ black, the front of the face and the vertex with black pubescence, the ocelli in a straight line sunk in shallow depressions; thorax black with black pubescence, a hoary-gray band on the prothorax anteriorly not reaching the pectus, which latter is finely pitted and clothed with only scattered black hairs; the dorsal surface of the mesothorax bare and finely pitted; the metathorax with a fringe of fuscous hairs turning to hoary-gray; wings hyaline with a light brown tint, the tegulæ and nervures dark brown; legs black with stiff black pubescence turning to dark reddish-brown on the tibiæ and yellowish-brown on the tarsi; claws black. Abdomen black, the base of the 1st segment and posterior margins of the 3rd, 4th, and 5th segments with hoary-gray pubescence, the 2nd segment with a band of brilliant vermillion-red pubescence above, the anal segment testaceous, below the abdomen is piceous-black, thinly pubescent and finely pitted.

This beautiful species was not uncommon in May around and above Gnatong, the military post on the Sikkim-Thibetan frontier. I found it frequenting the wild *Auriculas* which were flowering in great abundance on the bare slopes of the moraine of the ancient glacier on which the military post has been erected. When disturbed, this *Bombus*, unlike any other species known to me, has a habit of suddenly rising perpendicularly till it disappears from sight. It does not seem, at any rate in summer, to descend below 12,000 ft. I did not meet with it on the road from Sedonchen until I got to the side slopes of Lintu, the high peak behind Gnatong.

4.—BOMBUS MÖLLERII, n. sp., Pl. I, Fig. 4, ♀.

HABITAT: Kumaon, Sikkim, over 8,000 ft.

FEMALE: Length 28 m.m., expanse 58 m.m.

DESCRIPTION.—♀. Black with brownish-black pubescence; the mesothorax above, the scutellum and postscutellum and the penultimate segment of the abdomen clothed with dense silvery-gray pubescence. Head long and somewhat narrow, the mandibles, clypeus, sides of the face and the cheeks shining black, the antennæ piceous, the front of the face, vertex and back of the head with dense dark brown pubescence. Thorax broad, the pro- and metathorax, the sides of the body under the wings and the pectus with black pubescence; the

mesothorax scutellum and postscutellum above silvery-gray ; the wings smoky-hyaline, the tegulæ and nervures testaceous-brown; the legs black, the anterior and intermediate legs and the coxæ and trochanters of the posterior pair with reddish-brown pubescence getting paler on the tarsi, the outside of the femora and tibiæ of the posterior legs black and shining, the inside clothed with a dense short ferruginous-brown pile. The abdomen black with long black pubescence, the penultimate segment with a silvery-gray band above, the apical segment ferruginous-brown ; below the abdomen is destitute of pubescence, piceous-black and finely pitted.

This species was first sent to me from Kumaon. Subsequently I found it sparingly distributed above 8,000 ft. in Sikkim on Senchal and Tiger Hill near Darjeeling, and at Guntok and Sedonchen in Native Sikkim. Named after my friend Mr. F. Möller, who has done so much for the entomology of Sikkim.

5.—MEGACHILE STELOIDES, n. sp., Pl. I, Fig. 5, ♀.

HABITAT : Sikkim.

FEMALE : Length 13 m.m., expanse 28 m.m.

MALE : Unknown.

DESCRIPTION : ♀. Black, the two apical segments of the abdomen and the tibiæ and tarsi of the legs testaceous-yellow ; the scutellum projecting backwards and completely overhanging the metathorax as in *Stelis*. Head as broad as the thorax, shining, very finely pitted ; mandibles black quadridented, very broad at the tips ; clypeus large, oval, slightly convex, its anterior margin bisinuate; antennæ piceous; the back of the head flat, the ocelli placed in a broad triangle on the vertex. Thorax very densely and coarsely pitted, the mesanotum bearing three short longitudinally impressed lines not reaching to its posterior margin, the scutellum in shape like that of the species of *Stelis* projecting backwards and overhanging the metathorax, its posterior margin rounded and notched in the middle ; wings hyaline, the apical margins broadly but lightly infuscated, tegulæ and nervures dark brown; legs black, the outer margins of the femora, the tibiæ and tarsi rich ferruginous-brown. Abdomen black and shining, finely pitted, the two apical segments and the pollen-brush bright ferruginous.

This remarkable bee, which probably deserves generic separation, I found frequenting flowers and the wet sand along the banks of the Runjit river in Sikkim in May. In habits it is a true leaf-cutter bee.

6.—MEGACHILE MINIATA, n. sp., Pl. I, Fig. 6, ♀.

HABITAT : Deli, North-East Sumatra.

FEMALE : Length 23 m.m., expanse 38 m.m.

MALE : Unknown.

DESCRIPTION.— ♀. Black with sordid white pubescence on the metanotum posteriorly and on the two apical segments of the abdomen above, the pollen-brush rich cinnabar-red. Mandibles broad, longitudinally striated, clypeus abruptly truncated in front, the anterior margin waved and narrowly smooth and shining, the rest of the head densely and finely pitted, the antennæ opaque. Thorax broad, densely and finely pitted, the scutellum prominent, the metanotum fringed posteriorly above and below with sordid white tufted hairs, mixed with fuscous-black ; wings clear hyaline-yellow, slightly iridescent, the apex somewhat broadly but lightly infuscated ; legs black, the posterior tarsi with cinnabar-red pubescence on the inside. Abdomen black, the margins of the segments sparsely pitted and fringed with black pubescence, the two apical segments above clothed with a dense fine sordid white pile, the pollen-brush and a spot on either side of the 2nd segment a rich cinnabar-red.

Described from eight specimens collected in the North-East of Sumatra and kindly sent to me by Hofrath Dr. L. Martin. This species is closely allied to *Megachile luctuosa*, Smith, from Singapore, but it is considerably larger, differs in the colour of the pollen-brush, and has no white pubescence on the 2nd, 3rd, and 4th segments of the abdomen. It still more closely resembles *Megachile terminalis*, Smith, from the Celebes, from which it differs in the colour of the wings and pollen-brush.

Family *POMPILIDÆ*, Leach.

Priocnemis Group.

7.—SALIUS NICEVILLEI, n. sp., Pl. I, Fig. 7, ♀.

HABITAT : Sikkim, Tenasserim.

FEMALE : Length 24-30 m.m., expanse 46-52 m.m.

MALE : Length 23-25 m.m., expanse 40-43 m.m.

DESCRIPTION.— ♀. Head, thorax and abdomen dark brownish-red, the two former clothed with a short dense pile, which in certain lights

has a golden lustre ; the posterior margins of the segments of the latter broadly black. Head as broad as the thorax, eyes distinctly converging above, below reaching up to the base of the mandibles, ocelli in an equilateral triangle on the vertex ; forehead slightly concave, bearing a short vertically impressed line above the base of the antennæ, these latter rather slender, convolute, destitute of pubescence and of a somewhat lighter colour than the rest of the head, with the tips from the apex of the penultimate joint darkening into dusky black ; clypeus broadly oval, twice as broad as high, convex ; mandibles castaneous, their tips black. Thorax, the pronotum anteriorly almost transverse, its posterior margin obtusely angled, mesonotum slightly convex, scutellum and postscutellum raised and prominent, metanotum gently rounded, posteriorly declivous, transversely striated, on either side it bears a broad shallow sulcation which, however, does not reach to its apex, the side tubercles and stigmata well marked and prominent; wings hyaline, of a light ferruginous-yellow, the lower portion of the hind-and the apical margin of the forewing infuscated, the tegulæ and nervures ferruginous-yellow ; in the forewing the transverse cubital nervure rises well before the apex of the submedial cell, and the 1st recurrent nervure is received in the apical 3rd of the 2nd cubital cell, in the hindwing the cubital nervure rises immediately after (almost at) the apex of the anal cell ; legs long, of a light ferruginous-red, the tibiæ of the intermediate and posterior legs grooved, serrated and spined, the claws castaneous-brown, one-toothed at their base below. Abdomen subpetiolate, ferruginous-red, the posterior margins of the first four segments broadly black, of the two apical segments only slightly blackish at the sides ; on the ventral side the 1st segment is wholly black, the 2nd to the 5th red at base with broad black margins, the apical segment ferruginous, studded with a few stiff hairs of the same colour. The 2nd segment (♀) bears a well-marked furrow at its base below.

♂. Closely resembles the ♀, but is of a lighter and more testaceous-red, and the wings are darker and more dusky than yellow. It is, of course, considerably smaller in size.

The nearest ally of this insect is *Salius audax*, Smith, which however is structurally different, belonging to the *Hemipepsis* group

of the genus *Salius*. In colour *S. audax* is a much deeper richer red than *S. nicevillei*, and this difference holds good through a series of six specimens of *S. audax* and eight of *S. nicevillei*. Sikkim specimens of this latter insect vary very much, being considerably smaller with conspicuously more dusky wings.

8.—SALIUS ZELOTYPUS, n. sp., Pl. I, Fig. 8, ♂.

HABITAT : Tenasserim.

MALE : Length 20-24 m.m., expanse 48-51 m.m.

FEMALE : Unknown.

DESCRIPTION.— ♂. Head, thorax and abdomen black with ferruginous-brown markings. Mandibles ferruginous, darkening to brownish-black at the tips, clypeus lighter brown, oval, boldly convex and covered with a fine thin ferruginous pile, the face below the antennæ on the inside of the eyes yellow, scape of antennæ ferruginous, flagellum black, forehead, vertex, and cheeks black and shining, sparsely studded with black hairs, ocelli placed in a broad triangle on the vertex. Thorax, the prothorax light ferruginous-brown darkening to fuscous-black below, anteriorly it is rounded, its posterior margin arched or widely angled ; rest of the thorax, pectus and pleuræ dark fuscous-black, the scutellum and postscutellum marked with light ferruginous-red ; the metanotum long, gently rounded, posteriorly declivous with transverse striations and rather long thinly scattered black pubescence, a ferruginous stain on either side on the posterior angles ; wings dark fuscous-brown with a purple effulgence, the tegulæ and nervures dark brown ; an irregular hyaline yellow stain occupies part of the 1st and 2nd discoidal, the 1st cubital and the 2nd submedial cells in the forewing. This hyaline patch varies in different specimens, in some extending more or less into the radial and 2nd cubital cells in the forewing and even into the radial and medial cells of the hindwing. In the forewing the transverse-medial nervure rises well before the apex of the 1st submedial cell, and the 1st recurrent nervure is received in the apical third of the 2nd cubital cell ; in the hindwing the cubital nervure is interstitial, rising at the apex of the anal cell ; legs ferruginous-brown, the coxæ and trochanters and the apical joints of the intermediate and posterior tarsi and the claws black, the tibiæ and tarsi of the intermediate and posterior legs thickly spined

and slightly grooved, the tibial calcaria half the length of the metatarsus. Abdomen subpetiolate, dark ferruginous-brown, thinly covered with scattered and somewhat decumbent black pubescence, the posterior margins of the 1st and 2nd segments black, of the 3rd, 4th, and 5th dusky brownish, the apical segment ferruginous-red; the abdomen below has the 1st segment black, the base of the 2nd light ferruginous-brown marked with a conspicuous transverse impressed line, beyond which the rest of the ventral segments are dusky brownish, the apical segment studded with a few still black hairs.

This species is not uncommon along the foot of the Daunat range in Tenasserim at about 500 ft. elevation. It frequents low herbage and bushes, and I have taken one occasionally sucking up the moisture from the wet sand by the side of hill streams in the Daunat. The female has not yet been procured.

9.—SALIUS EXILIPES, n. sp., Pl. I, Fig. 9, ♀.

HABITAT: Sikkim.

FEMALE: Length 19 m.m., expanse 36 m.m.

MALE: Unknown.

DESCRIPTION.—♀. Head, thorax, and abdomen light yellowish-brown with golden pubescence. Mandibles dark brown, almost black at the tips; clypeus convex, broader than high, covered with thick golden pile; its anterior margin bare, shining and recurved; antennæ dark brown, the scape and the base of the 1st joint of the flagellum with golden pile, the face, forehead, vertex, back of the head and cheeks covered with golden pubescence; eyes parallel reaching up to the base of the mandibles, ocelli small, placed in an equilateral triangle on the vertex. Thorax brown, covered with golden pubescence, the metathorax with a longitudinally impressed line or furrow down the centre not reaching its apex; posteriorly the metanotum is abruptly declivous, its apex funnel-shaped and truncated, with the margin recurved; wings light brown, hyaline, somewhat iridescent, tegulæ and nervures testaceous, the former covered with golden pile, a hyaline spot in the internal angle of the 1st discoidal cell of the forewing, the transverse medial nervure rises well before the apex of the 1st submedial cell, the 1st recurrent nervure is received about the middle of the 2nd cubital cell; in the hindwing the cubital nervure is interstitial, rising at the apex of the anal cell; legs very long, light

yellowish-brown, the coxæ and trochanters covered with golden pile and some long golden hairs, the intermediate and posterior tibiæ serrated, grooved and thickly spined ; the claws long and slender, bearing one conspicuous tooth on their inferior edges, the tibial calcaria short, stout, reaching only to about one-third the length of the metatarsus. Abdomen subpetiolate, of a light yellow-brown, covered with golden pile, the 1st segment dusky at base, the abdomen below dark brown, the posterior margins of the segments testaceous, the 2nd ventral segment with an impressed line or furrow at its base.

The type specimen of this was procured at Darjeeling by Mr. T. A. Hauxwell, Deputy Conservator of Forests, who kindly gave it to me. The insect belongs to the *Priocnemis* section of the *Salius* group, distinguished by the remarkable length of their legs. It resembles *Salius* (*Priocnemis*) *crinitus*, *mihi*, from Ceylon.

10.—SALIUS MOMUS, n. sp.

HABITAT : Tenasserim.

FEMALE : Length 13 m.m., expanse 20 m.m.

MALE : Unknown.

DESCRIPTION.— ♀. Black, the abdominal segments with gray pile on their posterior margins. Mandibles black, clypeus very low and broad, anteriorly emarginate, covered with a fine silvery pile which extends on to the front and face and coxæ, antennæ black convolute, head broad, posteriorly concave. Thorax short and broad, the pronotum gibbous laterally, its posterior margin widely angled, the metanotum convex above, posteriorly declivous and marked with transverse striæ ; wings hyaline, the apex of the forewing and an obsolete cloud occupying the 2nd cubital and the upper portion of the 2nd discoidal cells fuscous, the tegulæ and nervures black ; in the front wing the transverse-medial nervure rises before the apex of the 1st submedial cell, and in the hindwing the cubital nervure after he apex of the anal cell ; legs black, the intermediate and posterior tibiæ very strongly spined, grooved and serrated, claws with one tooth on their inferior edges. Abdomen black, the bases of the segments above broadly plumbeous-gray, the apical segment with a thick tuft of reddish-brown hairs, and the 2nd segment below with an impressed line or furrow at its base.

This species closely resembles some of the black and gray species of *Pompilus* and *Pseudagenia*. It is, however, a true *Salius* in structure, having the intermediate and posterior tibiæ strongly serrated and spined. It is not uncommon in bamboo jungle in August and September, and I once watched a female fighting with a large hairy spider which she finally paralyzed and carried off, but she flew so swiftly that I lost sight of her in the thick undergrowth and so failed to find the nest.

Hemipepsis Group.

11.—SALIUS MARTINII, n. sp., Pl. I, Fig. 10, ♀; 11, ♂.

HABITAT : Deli, North-East Sumatra.

FEMALE : Length 30 m.m., expanse 58 m.m.

MALE : Length 21 m.m., expanse 44 m.m.

DESCRIPTION.— ♀. Head, thorax and abdomen jet-black, smooth and shining, a fine silky silvery-white pile on the posterior portion of the thorax above ; wing fusco-hyaline, legs reddish-yellow. Head broad, eyes distinctly converging above, below reaching well up to the base of the mandibles ; mandibles narrow, shining black with a reddish testaceous tinge at the tips, clypeus broad, convex, slightly porrect, finely pitted and clothed with stiff decumbent hairs ; its anterior margin arched upwards and stained with testaceous-red ; a streak on the inside of the eyes and another short streak behind starting from near the vertex reddish-yellow, front of the face, vertex, and back of the head black with scattered black hairs ; antennæ dusky yellow-fuscous at apex ; the scape and flagellum below brighter yellow, the ocelli small, in an equilateral triangle on the vertex, a shallow furrow from the anterior ocellus down the forehead to between the base of the antennæ. Thorax black, very closely and finely pitted ; the pronotum short, widely arched posteriorly, the mesonotum convex, scutellum and postscutellum prominent, the metanotum sharply declivous posteriorly, its apex funnel-shaped with recurved edges, the mesothorax, scutellum, postscutellum and metathorax above clothed with a beautiful fine silvery pile, which in the type specimen is much abraded, but from the traces left evidently covered the whole of the after part of the thorax ; the metathorax transversely striate above, the side tubercles and stigmata well marked ; wings dark fuscous with a purplish effulgence, tegulæ and nervures dark brown, a large prominent wing spot in the 1st discoidal cell, opaque anteriorly, clear hyaline

towards the inner angle, with a central small round opaque spot; in the forewing the tranverse medial nervure rises well before the apex of the 1st submedial cell, and the 1st recurrent nervure is interstitial with the 2nd transverse cubital nervure, which latter is curved outwards; in the hindwing the cubital nervure rises with an abrupt curve inwards well before the apex of the anal cell; legs reddish-yellow, the coxæ, trochanters, and basal half of the femora black and shining, the intermediate and posterior tibiæ thickly spined, serrated and grooved, the tibial calcaria short and stout, the claws dusky black with two teeth on their inferior edges. Abdomen black and shining, subpetiolate, the apical segment thickly pubescent above, and studded with stiff black hairs, the 2nd segment with a well marked transverse furrow at its base below.

♂. Differs from the ♀ in the clypeus and the face in front, a band on the posterior margin of the prothorax and the top of the mesothorax and scutellum, with the coxæ, trochanters, and femora of the legs being yellow instead of black, and in the specimen under observation, the complete absence of any silvery pile on the thorax above.

Two specimens of this well marked and distinct species I owe to the kindness of Hofrath Dr. L. Martin, who procured them in the North-East of Sumatra. I may note that I had some hesitation in assigning the ♂ specimen figured and described to this species; but after a very careful comparison with the known males of other allied species, I have come to the conclusion, with some doubt still, that the two specimens described above are the ♂ and ♀ of one species.

12.—PSEUDAGENIA DANAE, n. sp., Pl. I, Fig. 12, ♀.

HABITAT: Sikkim, Assam, Tenasserim.

FEMALE: Length 21—25 m.m., expanse 36—40 m.m.

MALE: Length 13 m.m., expanse 32 m.m.

DESCRIPTION.—♀. Head, thorax and abdomen black, with golden pubescence on the head and thorax, antennæ and legs pale reddish; the entire head, the front and sides of the pro- and mesothorax, the sides and dorsal surface of the metathorax, and the outside of the coxæ and trochanters of the legs clothed with fine short glistening golden pile. The mandibles pale reddish, their tips black, the clypeus convex,

transverse, twice as broad as high, the antennæ inserted low down just above the clypeus, the scape and the first three joints of the flagellum pale reddish, the apical joints dusky black ; the eyes distinctly converging above, the ocelli placed in an equilateral triangle on the vertex, a shallow short impressed line runs vertically down from the anterior ocellus to between the antennæ. Thorax, the prothorax very short, its anterior margin convex, the mesothorax broad, slightly convex and rounded above, indications of golden pile on the sides of the scutellum and postscutellum, the metathorax long, gibbous, posteriorly rounded, with a broad shallow central longitudinal sulcation and well marked transverse striæ ; wings hyaline yellow, the front wing from beyond the middle of the 1st discoidal cell, and the hindwing at the apex dusky purplish, slightly iridescent ; the transverse medial nervure of the forewing rises before the apex of the 1st submedial cell and the cubital nervure of the hindwing after the apex of the anal cell, the tegulæ and nervures dusky red ; legs with the base of the coxæ black, the apex and outer side, and the trochanter with golden pile, the femora, tibiæ and tarsi pale dusky red, the last joint of the tarsi and the claws black, the latter with one tooth on their inferior edges, the tibiæ and tarsi of the intermediate and posterior legs studded with minute spines, the inner tibial spur of the posterior legs not more than half the length of the metatarsus. Abdomen black-pruinose distinctly petiolated, the apex studded with ferruginous hairs.

♂. Differs from the ♀ in the pubescence, being silvery instead of golden, the antennæ fuscous, the forewings darker throughout, and the first three segments of the abdomen reddish.

This very handsome pompilid I procured first on some sandy banks on the Ataran in Tenasserim. Subsequently I met with it in the Runjit valley near Darjeeling, and there is a specimen in the Indian Museum, Calcutta, collected by Mr. Doherty at Margherita in Assam.

It is with much diffidence I submit the following tentative key to the genera of Indian *Pompilidæ* ; for though I have spent much time and thought over its construction, and have carefully examined

hundreds of specimens, and in most cases series of many species of each genus, still I have had only the materials afforded by my own collection to judge from. My collection is fairly extensive, but the data drawn from it alone may hereafter, with more material at command, prove to be faulty. This, however, is certain that, though I have been collecting steadily for ten years in Burma and Tenasserim, and have had, moreover, large collections sent to me from various parts of India, Ceylon, the Straits Settlements and Sumatra, following the keys given below, I have had no difficulty in assigning every pompilid insect I have so far come across to what I consider its proper genus.

The classification followed is that of Kohl. in "Die Gattungen der Pompiliden," Verh. der K. K. Zool. Bot. Ges. Wien, 1884.

Key to the Indian Genera of Pompilidæ.

A. Forewing with three complete cubital cells.

a. Femora not serrated below. Intermediate and posterior tibiæ furnished with spines.

a^1. Posterior tibiæ cylindrical ; spines minute.

a^2. In the forewing the cubital nervure stopping short of, and the discoidal nervure reaching up to, the margin of the wing.

I. Pseudagenia, Kohl.

b^2. In the forewing both cubital and discoidal nervures reaching up to the margin of the wing.

II. Ceropales, Latreille.

c^2. In the forewing both cubital and discoidal nervures stopping short of the margin of the wing.

III. Pompilus, Fabricius.
(Group *Ferreola*, Latreille.)

b^1. Posterior tibiæ cylindrical; spines long, scattered, and irregular.

III. Pompilus, Fabricius.
(Excluding *Ferreola* and *Aporus*.)

c^1. Posterior tibiæ angular, grooved above and serrated with spines, short, stout, in double row.

d^2. The 1st recurrent nervure received at the extreme apex of the second cubital cell, the 2nd transverse-cubital nervure bent outwards.

IV. Salius, Fabricius.

(Group *Hemipepsis*, Dahlbom.)

e^2. The 1st recurrent nervure received before the apex of the second cubital cell, the 2nd transverse-cubital nervure oblique, not bent.

IV. Salius, Fabricius.

(Group *Priocnemis*, Schioedte.)

b. Femora serrated below. Intermediate and posterior tibiæ entirely destitute of spines or hairs.

(*V. Macromeris*,* Lepelletier.)

B. Forewing with only two complete cubital cells.

a. Head flattened above.

VI. Planiceps, Latreille.

b. Head rounded above.

VII. Pompilus, Fabricius.

(Group *Aporus*, Spinola.)

NOTE ON *Sphex flava*, FABRICIUS, AND ITS ALLIES.

Working out the fossorial wasps belonging to the family *Pompilidæ* in my collection, I have been greatly puzzled to make out what the *Sphex flava* of Fabricius is. The insect I identify as such is figured on pl. II, fig. 1. It has the head, the thorax above as far as the postscutellum, the wings except at the apex, the legs in part, and the three apical segments of the abdomen ferruginous, the pectus, sides, metathorax, the coxæ trochanters and base of the femora, and the basal segments of the abdomen jet-black ; the apex of the forewing beyond the radical cell is fuscous-brown with a purple effulgence.

Fabricius in the "Entomologia Systematica," vol. ii, p. 217, thus describes *Sphex flava* :—

"80. S. Atra, dorso anoque ferrugineo, alis apice fuscis.

* Smith (Jour. Linn. Soc., vol. ii, p. 97) has described a species, *Macromeris argentifrons*, from Borneo, Malacca, Singapore and Java as having "the tibiæ slightly spinose," a character not in accordance with Lepelletier St. Fargeau's original diagnosis of the genus. I think it probable Smith's species, when the types are carefully examined, will prove to be not a *Macromeris* at all.

"Habitat in India Orientali.

"Statura S. cyaneæ. Antennæ convolutæ ferrugineæ. Caput et thorax obscure ferrugineo, pectore atro. Abdomen atrum ano sive ultimo segmento ferrugineo. Alæ flavæ apice fuscæ.

"Variat segmentis abdominis aliquot basi flavis."

In the "Systema Piezatorum," p. 197, Fabricius quotes the short diagnosis given in the "Entomologia Systematica" and places the insect under his genus *Pompilus*.

At page xviii of the introduction to his "Hymenoptera Europea," vol. i, Dahlbom gives a catalogue by Professor Behn of the Fabrician collection of *Hymenoptera* in the Museum at Kiel, and at page xx notes that *Pompilus flavus*, Fabricius=*Priocnemis flavus* in his work. At page 457 in the "Tabula Examinationis Synoptica Specierum Pompilidarum," *Priocnemis flavus* is described briefly as follows :—

"*Divis.* 1. Abdomen nigrum (ano rarissime fulvo)."

* * * * * *

* * * * * *

"*Subdivis.* 3. Alæ lutæ aut fulvæ, apice fumatæ. Vena cubitalis a marginæ alæ anticæ apicali sat remota.

"A. Alæ luteo-hyalinæ. Alæ posticæ cellula analis ante originem venæ cubitalis terminata. Caput, thorax antice, anus, pedes antennæque fulva. Clypeus margine apicali subtruncatus. Corpus mediocre...6. *Priocn. flavus*, Fabr. ♂, ♀.

India Oriental, Fabr. Egyptia, *Hedenborg*."

Lepelletier St. Fargeau in his great work on the *Hymenoptera*, vol. iii, p. 430, describes *Pompilus flavus*, thus :—

"Antennæ caputque luteo-testacea ; thorace concolori, inferius tamen fusciori. Abdomen fuscum, segmentorum primi secundique basi plus minusve testaceo-ferruginæ. Anus uteo-testaceus. Pedes ferrugineo-testacei: coxis, trochanteribus et femorum quatuor posticorum basi interna cum tarsorum apice fuscis. Alæ ferrugineo-tastaceæ, apice nigro-violacio marginato: hæc ala um fascia à radealis apice ad alæ apicem extenditur, et eundo fit latior. Prothorax angustus, postice subacute emarginatus. Metathorax mediocris, convexus, postice

declivis. Cubitalis tertia ad radialem parum angustata, secundæ fere æqualis. *Femina.*"

Note that Dahlbom says distinctly "thorax antice" and not the whole of the thorax "fulva." The species I take to be *flava* agrees with the description in this and also with Fabricius' and Lepelletier's descriptions, even to there being varieties which have the base of the 1st and 2nd segments of the abdomen stained with testaceous-yellow; but then the whole of the series of over twenty specimens I have have the *three* apical segments and not the anus alone ferruginous.

Dahlbom again—and here comes the confusion at page 123 of the work quoted above—describes an insect under the name *Hemipepsis flava* thus :—"26. Genus HEMIPEPSIS, Dlbm. "(1) *flava*, ♂, ♀; media (subsemi-pollicaris et ultra) atra, oculis brunneis; capite cum antennis-pro- et mesonotis, genubus, tibiis, tarsis alesque subaureo-fulvis, his apice nigro-violascenti-fumatis, ano nonnunquam brunescente;" and the gives as synonyms "*Sphex flava*, Fabr. E. S. 2, 217, 80; *Pompilus flavus*, Fabr. Piez. 197, 52; anne *Pompilus luteipennis*, Fabr. Piez. 198, 54; and *Pompilus fulvipennis*, Fabr. Piez. 198, 57, huic referendi."

Now as Dahlbom instituted the genus *Hemipepsis* and considered it differed from *Priocnemis*, and as he specially notes (introduction to "Hymenoptera Europea," vol. i, p. xx referred to above) that his *Priocnemis flavus* = *Pompilus flavus*, Fabr., it seems to me clear that there is some mistake in his putting the synonyme above-quoted under *Hemipepsis flava*, which insect, in my opinion, is quite distinct from *Pompilus flavus* of Fabricius. I am the more inclined to think so, because further on at p. 462 in the "Tabula Examinationis Synoptica Specierum Pompilidarum," Dahlbom allows *luteipennis* and *fulvipennis* of Fabricius to stand as distinct, and gives *Hemipepsis flava* apparently as his own species. I note later on what I take this insect, *Hemipepsis flava*, Dahlbom, to be.

In the Catalogue of Hymenopterous insects in the British Museum, Pt. iii, by Mr. F. Smith, at page 182, the following are enumerated :—

"1. MYGNIMIA SEVERA.

"Sphex severus, *Drury, Ill. Exot. Ins.* iii., t. 42, p. 4.

"*Hab :* India. (Coll. W. W. Saunders, Esq.)

"2. MYGNIMIA FLAVA. B. M.

" Sphex flava, *Fabr. Ent. Syst.* ii, 217, 80 ; Pompilus flavus, *Fabr. Syst. Piez.*, p. 197, 52 ; *St. Farg. Hym.* iii, 430, 21 ; Hemipepsis flava, *Dahlb. Hym. Europ.* i, 123, 1."

Here Smith identifies the *Sphex flava* of Fabricius with the *Hemipepsis flava* of Dahlbom, but keeps the *Sphex severa* of Drury distinct. Later on in his Catalogue of the Aculeate *Hymenoptera* and *Ichneumonidæ* of India and the Eastern Archipalego, published in 1867 in the Journal of the Linnean Society, vol. xi, at page 357, he has

" Gen. MYGNIMIA, Schuck.

" 1. MYGNIMIA (SPHEX) FLAVA, *Drury, Ill. Exot. Ins.* iii, tab. 42, fig. 4, ♀ ; *Smith, Cat. Hym. Ins.* iii, 182, 2 ; *Proc. Linn. Soc.* 11, 1.

Pompilus flavus, *Fabr. Syst. Piez.*, p. 197, 52 ; *St. Farg. Hym.*, iii, 430, 21.

" Hemipepsis flavus, *Dahlb.*

Hym. Eur. i, 123.

" *Hab :* India, Borneo, Singapore, Gilolo, Sumatra."

Here evidently two species, *Sphex severa*, Drury, and *Sphex flava*, Fabricius, are confused together. The reference, fig. 4, pl. 42 of Drury's work, represents *severa*, a fairly common species in Burma, of which I give a figure, Pl. II, fig. 1. This species is also very constant in form and colour. I have only one specimen, and that is from Sumatra, which varies in being a dusky black all over and having the basal half of both wings fuscous shot with purple.

Cameron (Mem. and Proc. Manch. Lit. and Phil. Soc., 4th series, vol. iv, Pt. iii., pp. 443-445) and I (Journ. Bom. Nat. Hist. Soc., vol. v, p. 371), following Smith, have fallen into the same error in giving the synonyme of the two species.

In the Ann. and Mag. Nat. Hist, Series iv, vol. xii (1873), p. 257, Smith describes a large *Salius* under the name *Mygnimia intermedia* as follows :—

" *Female.* Length 16 lines. Black, the head, pro- and mesothorax, and the legs, except the coxæ, trochanters, and base of the femora reddish-yellow. The antennæ yellow ; tips of the mandibles black. The anterior margin of the pro- and mesothorax blackish ; the metathorax black, truncate posteriorly and transversely striated ; the wings flavo-hyaline. Abdomen smooth and shining.

" *Hab. :* N. India, Ceylon."

A species answering exactly to this description is not uncommon in Tenasserim, and comparing it with Dahlbom's brief description of his *Hemipepsis flava* (Hym. Eur., i, pp. 123 and 462), it seems to me very close to, if not identical with, that insect, which, I may again note, is in my opinion *not* the *Pompilus* (*Sphex*) *flavus* of Fabricius. If my conjecture is right, and *Hemipepsis flava*, Dahlbom=*Mygnimia intermedia*, Smith, then Smith's name must stand for the insect, as under the classification of the *Pompilidæ* proposed by Kohl (Gattungen der Pompiliden in Verh. der K. K. Zool. Bot. Ges. Wien, 1884), and accepted by our greatest living English Hymenopterist, Cameron, the genera *Hemipepsis*, Dahlbom, and *Priocnemis*, Schioedte, are both placed as groups only of the genus *Salius*, Fabricius.

In the Annali del Mus. Civ. di Storia Naturale di Genoa, 2nd series, vol. i (1884), at page 349, Gribodo mentions having received from Burma three specimens of a pompilid which he identifies as *Priocnemis flavus*, Fabr. (*apud* Dahlbom), and describes another species which he names *Hemipepsis sycophanta* as new.

With reference to the former, I give a translation of his remarks as they bear on the difficulty of identifying the *Sphex flava* of Fabricius :—

"20. PRIOCNEMIS FLAVUS, Fabr.

"Sphex flava, *Fabr. Ent. Syst.* ii, p. 217, n. 80.

"Pompilus flavus, *Fabr. Syst. Piez.*, p. 197, n. 52.

"Priocnemis flavus, *Dhlb. Hym. Eur.* i, p. 457, n. 6.

"Three females sent by Signor Comotto correspond well with the description (of *Priocnemis flavus*) given by Dahlbom in his Hymenoptera Europea.

"It is necessary to note, however, that in the same work he mentions a *Hemipepsis flava* which would appear to be referable to *Pompilus flavus* of Fabricius. These two species (*i. e.*, *Hemipepsis flava* and *Priocnemis* [*Pompilus*] *flavus*) would appear to differ not only in generic characters, such as the number of teeth on the tarsal claws and the neuration of the wing, but also in the colour of the extremity of the abdomen. I know not how to explain this confusion by the learned and accurate author. It may be that it arose from his having found among Fabricius' types allied but distinct species labelled under the same name, a mistake often made by the earlier Entomologists whose

superficial observation and want of minute accuracy often led to the confusion of species which were not unfrequently generically distinct. I can, however, affirm that the specimens sent from Burma belong without doubt to the genus *Priocnemis*."

Of *Hemipepsis* (?) *sycophanta*, he says:—

"This species was collected by Captain Comotto at Minhla. The type is in my collection, and was sent to me from the English possessions in India, having been probably collected in the neighbourhood of Colombo in Ceylon. It is difficult to classify this insect. First, it is as well to note that it cannot be considered a true *Hemipepsis*, because the posterior tibiæ are not serrated nor even strongly spinose, the elevated longitudinal folding or grooving (repiegatura) of the tibiæ which in true *Hemipepsis* has the edges deeply indented in the manner of a saw is in this species, on the contrary, hardly even lightly wavy, and almost continued in a perfectly straight line. It cannot, however, be placed in the genus *Pompilus* (vera), because it has not only the claws strongly bidentate, but bears a transverse impressed line or furrow on the 2nd ventral segment."

Three other allied species may be noted here. *Priocnemis gigas*, Taschenberg, described in the Zeitschrifft für die Gesammten Naturwissenschaften, xxxiv, (1869), p. 40, 16, as follows:—

"16. *Pr. gigas*: *Niger, alis, capite cum antennis, thorace pro partibus; pubescentia, pedibus anoque fulvis. Long.* 42 *Mill*, ♀ ... Java.

"It is unfortunate that the only specimen has the apex of the wing much torn, and the pubescence on the body considerably abraded, for which reason its real appearance cannot be ascertained. The head and antennæ are light reddish-yellow, the front of the face and the forehead with thick decumbent orange-yellow pubescence. The clypeus has its outer margin short, smoothly arched, inwardly transverse, its anterior angle obtuse and well rounded, wide at its arched base, which is at the same height as the base of the antennæ, which latter are placed in somewhat small depressions. The posterior margin of the prothorax is very obtusely angled, emarginate, also rather flatter than the rest, and where the pubescence has been rubbed, red in colour. The meso- and metathorax are black covered

with a very fine light yellow pubescence ; the metathorax posteriorly gently arched and declivous, transversely striate, with conspicuous obliquely placed stigmata. The pubescence on the abdomen has a greyish appearance, the apical segment on its dorsal and partly on its ventral side also clothed with decumbent bristly yellow hairs. The legs by reason of the pubescence are of a reddish-yellow, the coxæ chiefly on account of the same appear of a like tint. The posterior tibiæ are strongly spinous, and, having regard to their size, but feebly serrated, while the pubescence is prolonged into a like-coloured silky stripe. The claws have in their middle a short rather strong tooth. The wings at the base through their pubesecnce are likewise of a dusky yellow without a trace of a blackish tint, but towards the posterior margin they become lighter, at least in the only example obtained, the apex of the hindwing is whitish. The submedial cell of the forewing has its outer margin oblique, and the 1st recurrent nervure is received close to the outer angle of the 2nd cubital cell, which, bounded outwardly by the 2nd transverse cubital nervure, has this latter angled and imperfect. The anal cell of the hindwing extends beyond the origin of the cubital nervure."

In the Journal of the Bombay Natural History Society, vol. viii, p. 372, I described a large *Salius* under the name *elizabethæ*. At that time I was certain it was previously undescribed, as I had compared it with the descriptions of all nearly allied species, including *Priocnemis gigas* of Taschenberg. However, after further careful comparison, I am not happy about *Salius elizabethæ*, and I think it is very probably identical with *Salius* (*Priocnemis*) *gigas*, Taschenberg.

Finally, there is my *Salius* (*Hemipepsis*) *convexus*, described in Journal Bombay Natural History Society, vol. v, p. 237, which in a way resembles *Salius* (*Hemipepsis*) *intermedius*, but is very considerably smaller, and differs in the colouring of the wings and abdomen.

To sum up. I believe the following closely allied species of the genus *Salius* exist, all having the yellow and black type of colouring.

Priocnemis Group.

1.—SALIUS FLAVUS, Fabricius, Pl. II, Fig. 1, ♀.

Sphex flava, *Fabr. Ent. Syst.* ii, p. 217, 80.

Pompilus flavus, *Fabr. Syst. Piez*, p. 197, 52 ; *Lepel. Hym.* iii, p. 430, 21.

Priocnemis flavus, *Dahlb. Hym. Eur.* i, p. 457, 6; *Gribado, Ann. d. Mus. Civ. di Genova*, 2nd series, vol i (xxi), p. 349, 20.

Mygnimia flava, *Smith, Cat. Hym. Ins. Brit. Mus.* Pt. iii, p. 182, 2; *Jour. Linn. Soc.* xi, p. 357, 1.

Salius flavus, *Cam. Hym. Orient. Mem. & Proc. Manchester Lit. and Phil. Soc.*, 4th series, vol. iv, Pt. iii, p. 443, 11; *Bingh. Jour. Bomb. Nat. Hist. Soc.*, vol. vii, p. 371, 9.

Habitat. India. Burma.

Hemipepsis Group.

2.—SALIUS SEVERUS, Drury, Pl. II, Fig. 2, ♀.

Sphex severa, *Drury, Ill. Exot. Ins.* iii, t. 42, fig. 4.

Mygnimia severa, *Smith, Cat. Hym. Ins. Brit. Mus.* iii, p. 182, 1.

Salius severus, *Cameron, Hym. Orient. Mem. and Proc. Manchester Lit. and Phil. Soc.*, 4th series, vol. iv, Pt. iii, p. 445, 29; *Bingh., Jour. Bomb. Nat. Hist. Soc.*, vol. viii, p. 371, 10.

Habitat: India, Burma, Sumatra.

3.—SALIUS INTERMEDIUS, Smith, Pl. II, Fig. 3, ♀.

Hemipepsis flava, *Dhlbm.* (*non Fabr.*) *Hym. Eur.* i, p. 123, 1, and p. 462, 3.

Mygnimia intermedia, *Smith, Ann. and Mag. Nat. Hist.*, 4th series, vol. xii, p. 257.

Salius intermedius, *Cam., Hym. Orient. Mem. and Proc. Manchester Li. and Phil. Soc.*, 4th series, vol. iv, Pt. iii, p. 444, 18; *Bingh., Jour. Bomb. Nat. Hist. Soc.*, vol. viii, p. 372, 11.

Habitat: N. India, Ceylon, Burma.

4.—SALIUS CONVEXUS, Bingh., Pl. II, Fig. 4, ♀.

Priocnemis convexus, *Bingh., Jour. Bomb. Nat. Hist. Soc.*, vol. v, p. 237, 6.

Salius convexus, *Cam., Hym. Orient. Mem. and Proc. Manchester Lit. and Phil. Soc.*, 4th series., vol. iv, Pt. iii, p. 451, 33; *Bingh., Jour. Bomb. Nat. Hist. Soc.*, vol. viii, p. 375, 18.

Habitat: Ceylon, Tenasserim.

5.—SALIUS GIGAS, Taschenberg.

Priocnemis gigas, *Tasch., Zeits. f. d. Ges. Naturwiss.* Bd. xxxiv. (1869), p. 40, 16.

Salius gigas, *Cam.*, *Hym. Orient. Mem. and Proc. Manchester Lit. and Phil Soc.*, 4th series, vol. iv, Pt. iii, p. 451, 37.

? Salius elizabethæ, *Bingh. Jour. Bomb. Nat. Hist. Soc.*, vol. viii, p. 372, 14.

Habitat : Java, Tenasserim.

I have doubtfully joined *S. elizabethæ* with this species, but the former differs from Taschenberg's description of *gigas* in several points, notably in the colour of the apical segment of the abdomen, which in a long series of *S. elizabethæ* is always black, never yellow.

From Taschenberg's description it is evident that *S. gigas* has the typical *Hemipepsis* wing. I have therefore placed it under the *Hemipepsis* section of the genus *Saluis*.

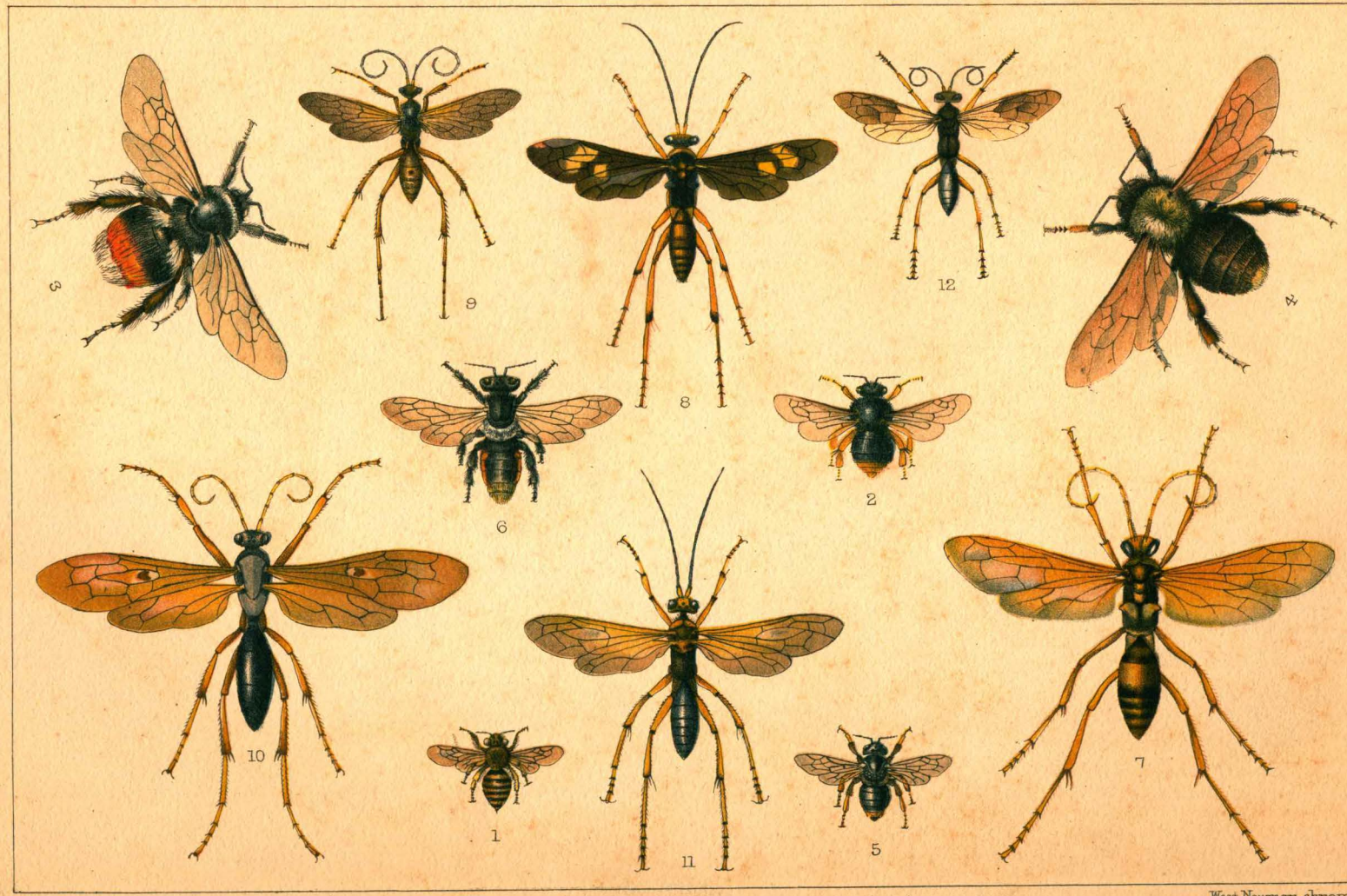
DESCRIPTION OF PLATES.

Plate I.

Fig. 1.	*Anthophora vegeta*, n. sp.	...	...	...	♀, p. 195
„ 2.	*Anthophora amymone*, n. sp.		...	...	♀, p. 196
„ 3.	*Bombus rufo-fasciatus*, Smith		...	...	♀, p. 196
„ 4.	*Bombus möllerii*, n. sp.	...	...	...	♀, p. 197
„ 5.	*Megachile steloides*, n. sp.	...	...	...	♀, p. 198
„ 6.	*Megachile miniata*, n. sp.	...	...	...	♀, p. 199
„ 7.	*Salius nicevillei*, n. sp.	...	...	...	♀, p. 199
„ 8.	*Salius zelotypus*, n. sp.	...	...	...	♂, p. 201
„ 9.	*Salius exilipes*, n. sp.	...	...	...	♀, p. 202
„ 10.	*Salius martinii*, n. sp.	...	...	...	♀, p. 204
„ 11.	„ „ n. sp.	...	...	...	♂, p. 204
„ 12.	*Pseudagenia danae*, n. sp.	...	...	...	♀, p. 205

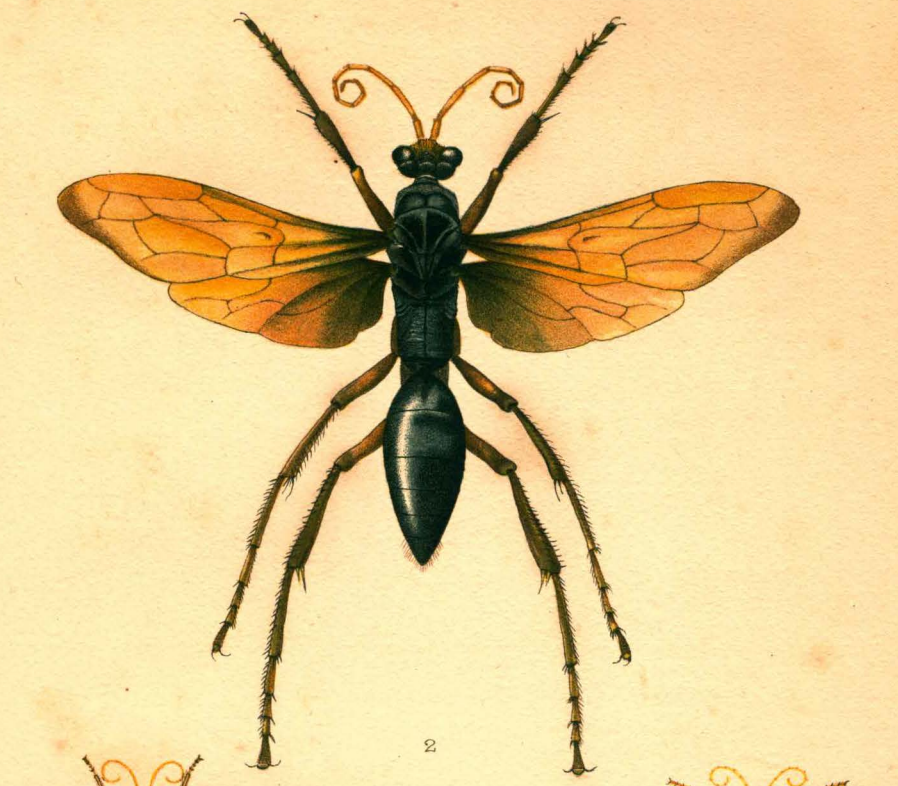
Plate II.

Fig. 1.	*Salius flavus*, Fabr.	...	...	...	♀, p. 214
„ 2.	*Salius severus*, Drury	...	...	...	♀, p. 215
„ 3.	*Salius intermedius*, Smith		...	...	♀, p. 215
„ 4.	*Salius convexus*, Bingh.	...	...	...	♀, p. 215



G. Cory del.

West, Newman chromo.



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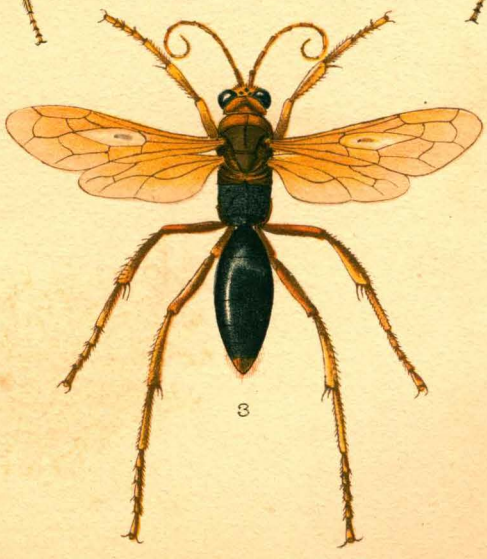

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G. Cory del.

West, Newman chromo

LIST OF SHELLS COLLECTED AT ADEN IN 1892—95, CLASSIFIED IN ACCORDANCE WITH THE PAETEL CATALOGUE.

By Commander E. R. Shopland, R.I.M.

(*Read before the Bombay Natural History Society, 14th January*, 1896.)

G. and S. Names.	Author.	Habitat.	Remarks.
Argonauta tuberculosa.	Lk.	Aden.	Drifted on shore off Sk. Othman. Rare
Ianthina fragilis ...	,,	,,	Do. do. Plentiful
Murex anguliferus ...	,,	,,	Plentiful at low water on mud flats.
,, carboneri ...	Jouss.	,,	Dredged in 5 fathoms in harbour. Adult large specimens rare.
,, clavus... ...	Kein.	,,	Wn. Shore, Sk. Othman, among coral brought for lime. Very rare
,, cyclostomia ...	Sowb.	,,	
,, fenestrata ...	Chem.	,,	Only 2 small specimens, Isthmus mud flats.
,, haustellum ...	L.	,,	Dredged in 5 fathoms and on mud flats.
,, ramosus ...	,,	,,	On mud flats of Maala. Plentiful
,, rota	Sowb.	,,	Among coral, Sk. Othman. Very rare
,, secundum ...	Lk.	,,	Only one dead specimen, south coast.
,, ternispina ...	,,	,,	Common in all sandy bays.
,, varicosus ...	Sowb.	,,	Mud flats, Isthmus. Rare
Pyrula ficus	L.	,,	L.W.S.T. Plentiful in sandy bays.
,, ficoides ...	Lk.	,,	Cast up dead on S. E. sands.
,, melongina-paradisiaca.	,,	,,	Plentiful everywhere at low water.
Pisania crosseanus ...	Sowb.	,,	Sk. Othman, coral blocks. R
,, ignea	Gmel.	,,	Do. do. P
Pollia contracta ...	Rve.	,,	Dredged in harbour and on rocks, south coast. P

G. and S. Names.	Author.	Habitat.	Remarks.
Pollia tritonidea-marmorata.	Rve.	Aden.	Dredged in harbour and among coral, Sk. Othman. M
,, ,, rubiginea.	,,	,,	Do. do. do. M
,, undosa	L.	,,	Plentiful everywhere at ½ tide
Fusus forceps... ...	Berry.	,,	Dredged off Tarshyne. Very rare
Pleurotoma albifuniculata.	Reese.	,,	Sifted from Sappers Bay sand
,, Baynhami.	Smith.	,,	Dredged off Tarshyne MP
,, catena ...	Rve.	,,	Dredged off Tarshyne. Large specimens very rare
,, Cecchi ...	Jouss.	,,	Dredged off Tarshyne MP
,, cingulifera.	Lk.	,,	Dredged in harbour. Rare
,, jousseaumi.	Melvill.	,,	Do. do. Do.
,, latissimata.	Smith.	,,	Only 1 dead specimen coral, Sk. Othman.
,, makemonas	Jouss.	,,	Do. do. specimen.
,, pouloensis.	,,	,,	Dredged in harbour 5 to 7 fathoms. P
,, tuberculata	Gray.	,,	Dredged 5 to 7 fathoms, Bunder Fookum Bay. P
,, tigrina ...	Lk.	,,	Bunder Fookum Bay, L.S.T. Rare
,, unifasciata.	Desh.	,,	Do. do. Do.
,, vidua ...	Roe.	,,	Do. do. good specimens rare.
,, violacea ...	Hinds.	,,	Dredged in harbour 5 to 7 fathoms. P
Daphnella citharella ...	Lk.	,,	Telegraph Bay, sifted from sand. Scarce
,, crebriplicata	Rve.	,,	Dredged 5 fathoms, one specimen.
,, Cummingii.	Powis.	,,	Telegraph Bay, sifted from sand. Scarce
,, cylindrica...	Rve.	,,	Do. do. Do.
Triton cancellinus ...		,,	Rocks east shore of Isthmus position. R
,, clandestinus ...	Lk.	,,	Rocks east shore of Isthmus One dead specimen
,, clancellinus, var. decipiens.	Rve.	,,	Rocks east shore of Isthmus. R

G. and S. Names.	Author.	Habitat.	Remarks.
Triton epidronus antiquatus.	Hinds.	Aden.	Dredged 5 fathoms in harbour Very rare
„ epidronus-bracteatus ...	„	„	L.W.S.T. Bunder Fookum Bay. P
„ epidronus-maculosus.	Chem.	„	Coral. Sk. Othman. Scarce
„ equatilis ...	Rve.	„	Rocks between Steamer Point and Maala. Scarce
„ labiosus ..	Wood.	„	Maala mud flats. P
„ pilearis ...	L.	„	Do. do. and rocks. P
„ Rauzani ...	Bianc.	„	Socotra.
„ retusus ...	Lk.	„	Coral for lime-burning, Sk. Othman. R
„ rubecula ...	L.	„	Rocky places all round coast. MP
„ trilineatus ...	Rve.	„	Dredged 5 to 7 fathoms and sea face, A.L.S.R.
„ vespaceus ...	Lk.	„	Maala mud flats. P
Persona adicus ...	Jouss.	„	Rocks by Isthmus position, L. W.S.T.
„ Shoplandi ...	Do.	„	Do. do. do.
Ranella anceps ...	Lk.	„	In coral at Sk. Othman and Telegraph Bay. P
„ concinna ...	Dunker.	„	Rocks, Telegraph Bay, low water.
„ granifera ..	Lk.	„	Plentiful everywhere.
„ livida ...	Rve.	„	Do. do.
„ spinosa ...	Lk.	„	Sandy beach, sea face, Sk. Othman. MP
Bullia lineolatum ...	Wood.	„	Telegraph Bay. Large specimens rare
„ mauritiana ...	Gray.	„	Telegraph and all bays. P
„ Tahitiensis ...	Lk.	„	Dredged near Anadyr wreck. R
Phos roseatus... ...	Hinds.	„	Sk. Othman, coral. Scarce
Cyllene Grayii ...	Rve.	„	Dredged in 5 to 7 fathoms off Tarshyne. MR
Nassa Adamsoni ...	Desh.	„	All sandy bays near rocks. R
„ albescens, var. fenestrata.	Dkr.	„	Do. do. P
„ arcularia ...	Lk.	„	Do. do. R
„ coronata ...	L.	„	All sandy bays near rocks and mud flats. P

G. and S. Names.	Author.	Habitat.	Remarks.
Nassa dermestina ...	Gould.	Aden.	Telegraph Bay, sifted from sand. P
,, erythræa ...	Issœ.	,,	All sandy bays. MP
,, festiva (?) ...	Rve.	,,	The rocks beyond Gold Mohur Bay. Scarce
,, fiscelabris ...	Ad.	,,	All sandy bays. Do.
,, gemmulata ...	Lk.	,,	Do. Do.
,, lentiginosa ...	A. Ad.	,,	Mud flats at Maala. P
,, marrati... ...	E. Smith.	,,	Do. do. P
,, nodifera ...	Powis.	,,	Do. do. P
,, papilosa ...	L.	,,	Do. do. P
,, persica	Mart.	,,	Do. and rocks everywhere. P
,, pullus	L.	,,	Do. do. do. P
,, variegata ...	Rve.	,,	Mud flats at Maala. Scarce
,, verrucosa ...	Kien.	,,	Dredged 5 to 7 fathoms in harbour. P
,, Obockensis, Jouss. = zailansis.	Sowb.	,,	Bunder Fookum Bay, L.S.T.
Eburna Borneoensis ...	Sowb.	,,	Dredged 5 fathoms young P adult. R
,, valentiana ...	Swain.	,,	Beach east of Isthmus washed up. P
Purpura fasciata ...	Dkr.	,,	Rocks all round P
,, hippocastamum	Lk.	,,	Do. P
,, mancinella ...	L.	,,	Do. MP
,, sacellum ...	Lk.	,,	Do. MP
,, persica ...	L.	,,	Do. P
,, Rondolphi ...	Chem.	,,	Do. P
Ricinula arachnoides, var. ricinus.	L.	Aden	Rocks all round. P
,, chrysostoma.	Desh.	,,	Do. in harbour. P
,, elatum ...	Blain.	,,	Do. do. Scarce
,, fiscellum ...	Chem.	,,	Do. do. P
,, lobatus ...	Blain.	,,	Dredged dead and coral at SK Othman. R
,, marginatum-altigona.	Jouss.	,,	Rocks all round. P
,, tuberculata..	Blain.	,,	Do. P
Rapana bulbosa ...	Sol.	,,	Maala mud flats, L.W.P.
Coralliophila costularis.	Lk.	,,	Dredged 5 to 7 fms. Scarce
,, violacea...	Kein.	,,	Sk. Othman, coral. Do.
Leptoconchus serratus.	Rupell.	,,	Sk. Othman. coral. R

G. and S. Names.	Author.	Habitat.	Remarks.
Magilus antiguus ...	Mft.	Aden.	Buried in blocks of coral.
Oliva bulbosa... ...	Jouss.	,,	Scarce Berbera, L.W.S.T. Sandy bays near rocks. P
,, inflata	Lk.	,,	Do. do. do. VP
Ancillaria albisculata...	Sowb.	,,	Maala mud flats. MP
,, castanea ...	,,	,,	Only one specimen, Maala mud flats.
,, exigus ...	,,	,,	Outer sea-shore all round. MP
,, fulva ...	Swain.	,,	Maala mud flats. P
Fasciolaria trapezium...	L.	,,	Rocks on sea face. P
Latirus Forskælli ...	Canafri.	,,	Rocks sea face everywhere. P
,, Pauluciæ ...	,,	,,	Sk. Othman, coral. Scarce
,, polygonus ...	Gmel.	,,	Rocks sea face everywhere. P
,, turritus ...	,,	,,	Sk. Othman, coral.
Turbinella cornifera ...	Lk.	,,	Rocks east of Isthmus. P
Mitra affinis	Rve.	,,	Sk. Othman, coral. R
,, armilata ...	,,	,,	Sifted from sand below Marbat. P
,, aureolata ...	,,	,,	Sk. Othman, coral. R
,, bella	A. Ad.	,,	Do. do. R
,, Bovei	Kein.	,,	Do. do. R
,, circulata ...	,,	,,	Dredged 5 to 10 fathoms P
,, cœligena ...	Rve.	,,	Rocks, L.W.S.T. MP
,, coniacea ...	,,	,,	Do. do. MP
,, episcopalis ...	L.	,,	Dead specimens only.
,, ferruginea ...	Lk.	,,	Sk. Othman, coral. Scarce
,, fissurata ...	,,	,,	Do. do. R
,, foviolata ...	Dkr.	,,	Do. do. R
,, fulvescens ...	Sowb.	,,	Do. do. P
,, innesi	Jouss.	,,	Dredged 5 to 7 fathoms P
,, interlirata ...	Rve.	,,	Do. do. R
,, literata	Lk.	,,	Rocks Little Aden, L.W.S.T. P
,, lubeus	Rve.	,,	Sk. Othman, coral R
,, marginata ...	Sowb.	,,	Do. do. R
,, nebias	Melvill.	,,	Do. do. R
,, Pharaonis ...	Ad.	,,	Do. do. R
,, pretiosa-antoniæ.	H. Ad.	,,	Dredged outside Tarshyne 7 to 10 fathoms. P
,, rotundelirata ...	Rve.	,,	Sk. Othman, coral. R
,, rufescens ...	A. Ad.	,,	Dredged outside Tarshyne 7 to 10 fathoms. P
,, Scabriuscula ...	Gray.	,,	

G. and S. Names.	Author.	Habitat.	Remarks.
Mitra Shoplandi ...	Melvill.	Aden.	Coral at Sk. Othman. VR
,, turgida... ...	Rve.	,,	Do. do. R
,, variegata ...	,,	,,	Do. do. P
,, vexillum ...	,,	,,	Do. do. MP
,, valpecula ...	Lk.	,,	Do. do. R
,, ustulata ...	Rve.	,,	Coral at Sk. Othman R
,, xerampelina ...	Melvill.	,,	Do. do. R
Marguiella gibbosa ...	Jouss.	,,	Bunder, Fookum Bay, L.W. S.T. P
,, obscura ...	Rve.	,,	All outer bays.
,, obtusa ...	Sowb.	,,	Dredged 5 fathoms in harbour and Berbera, L.W.S.T. P
,, scripta ...	Hinds.	,,	Dredged 5 fathoms in harbour, only one specimen.
,, terveriana .	Petit.	,,	All outer bays. P
,, verdensis .	Smith.	,,	Do. P
Columbella albina ...	Kein.	,,	Sk. Othman, coral. Scarce.
,, albinodulosa.	Gask.	,,	Rocks in all bays. P
,, aspersa ...	Sowb.	,,	Sk. Othman, coral. R
,, astricta ...	Rve.	,,	Do. do. R
,, alveolata ...	Kein.	,,	Telegraph Bay sifted from sand. R
,, conspersa ...	A. Ad.	,,	Sk. Othman, coral. R
,, cribraria ...	Lk.	,,	Rocks in all bays. P
,, fabula ...	Rve.	,,	Sappers Bay, one dead specimen.
,, flava ...	Brug.	,,	Rocks LittleAden,L.W.S.T.P
,, Hanleyi ...	Dsh.	,,	Sappers Bay, one dead specimen.
,, ligula ...	Dull.	,,	Sifted from sand, Steamer Point to Maala near rocks. P
,, lyrata ...	Sowb.	,,	Do. do. Scarce
,, mendicaria .	L.	,,	Rocks everywhere, L.W. P
,, mercatoria..	L.	,,	Sk. Othman, coral, only one dead specimen.
,, misera ...	Sowb.	,,	Rocks everywhere, L.W. P
,, propinqua ...	Smith.	,,	Rocks LittleAden,L.W.S.T. P
,, zonata ...	Rve.	,,	Little Aden and most rocky bays. P
Harpa ventricosa ...	...	,,	Isthmus mud flats. R
Cassis fauroti ...	...	,,	Isthmus mud flats, one specimen. R
,, pila	Rve.	,,	

G. and S. Names.	Author.	Habitat.	Remarks.
Cassis rufa	L.	Aden.	Little Aden reefs. R
„ vibex	„	„	Do. R
Dolium quemanju ...	...	„	Sk. Othman, coral, only one dead specimen.
Natica cernica ...	Jouss.	„	Rocks on islands in harbour, L.W.S.T. P
„ chinensis ...	Lk.	„	Dredged 5 to 7 fathoms in harbour. R
„ Colliei ...	Recluz.	„	Do. do. do. R
„ didyma ...	Bolt.	„	Do. do. Adult specimens scarce.
„ Forskalli ...	Chem.	„	Rocks on island in harbour. R
„ maculosa ...	L.	„	Dredged 5 fathoms and Maala mud flats. R
„ mamilla ...	L.	„	Mud flats steamer to Maala P
„ marocana ...	Chem.	„	Do. do. P
„ melanostoma ...	Sk.	„	Sk. Othman, coral. R
„ plicatula ...	Nutt.	„	Rocks on islands in harbour. P
„ pulicaria ...	Philipi.	„	Dredged in 5 fathoms harbour adult specimens scarce.
„ simiæ	Chem.	„	Little Aden. R
„ tæniata ...	Nunke.	„	Telegraph and Gold Mohur Bays. Scarce.
Natacina papilla ...	Gmel.	„	Dredged 5 to 7 fathoms in harbour. R
Sigaretus planulatus ...	Recluz.	„	Isthmus sea face. Scarce.
Sealaria clathrus ...	L.	„	Rocks Gold Mohur Bay, one adult specimen.
„ decussata ...	Lk.	„	Isthmus sea face, two dead specimens.
Terebra albomarginata.	Desh.	„	Dredged 5 to 7 fathoms in harbour. R
„ Babylonica ...	„	„	Do. do. do. and mud flats, L.W.S.T., Scarce
„ cœrulescens ...	Lk.	„	Telegraph Bay. P
„ consobrina ...	Desh.	„	Maala mud flats, one dead specimen.
„ gotoensis ...	Smith.	„	Dredged 5 to 8 fathoms off Tarshyne. R
„ Lamarckii ...	Kien.	„	All mud flats, L.W.S.T. P
„ nassoides ...	Hinds.	„	Dredged off Tarshyne, Scarce
„ Souleyeti ...	Desh.	„	Do. R

G. and S. Names.	Author.	Habitat.	Remarks.
Terebra straminea, var. serotina.	Ad.&Rve.	Aden.	Dredged off Tarshyne and in Berbera. P
„ tessellata ...	Gray.	„	Dredged 5 to 7 fathoms harbour and Steamer Point to Maala. S
Pyramidella mitralis ...	A. Ad.	„	Dredged off Tarshyne. R
„ Pratii ...	Born.	„	Do. R
„ variegata.	A. Ad.	„	Do. R
Obeliscus dolabratus ...	L.	„	Do. Scarce
Eulima arenata ...	Sowb.	„	Do. Do.
„ brevis ...	„	„	Do. R
Solarium cylindraceum	Chem.	Aden.	Dredged 5 to 7 fathoms in harbour. R
„ dorsuorum ...	Hinds.	„	Do. do. Scarce
„ (Philippia) hybridum.	L.	„	Do. do. Do.
„ lævigatum ...	Lk.	„	Dredged off Tarshyne. Large specimens scarce
„ perspectivum	L.	„	Mud flats, Isthmus. P
„ perspectivincula.	Chem.	„	Steamer Point to Maala. P
„ regium ...	Hanley.	„	Isthmus mud flats. R
„ variegatum...	Gmel.	„	Steamer Point to Isthmus, L.W.S.T. Scarce
Conus acuminatus ...	Hwass.	„	Maala mud flats. P
„ adenensis ...	Smith.	„	Isthmus sea face, 4 dead specimens only.
„ adansoni ...	Lk.	„	Rocks outer sea face. MP
„ arenatus ...	Hwass.	„	Steamer Point to Maala. P
„ betulinus ...	L.	„	Telegraph Bay and Little Aden. L.W.S.T. P
„ bullatus ...	„	„	Berbera. R
„ catus ...	Hwass.	„	Rock on islands in harbour. P
„ cæpitaneus ...	L.	„	Dead specimens only, Isthmus sea face. R
„ cuvieri ...	Crosse.	„	Islands in harbour, Steamer Point. P
„ erythræensis ...	Beck.	„	Steamer Point to Maala, L. W. P
„ var. adustus ...	Sowb.	„	SteamerPoint to Maala. Scarce
„ flavidus ...	Lk.	„	Holkart's Bay. P
„ fumigatus ...	Hwass.	„	Dredged in harbour. Good specimens scarce

G. and S. Names.	Author.	Habitat.	Remarks.
Conus generalis ...	L.	Aden.	Dredged off Tarshyne. R
,, geographus ...	,,	,,	Sk. Othman, coral. R
,, gemmulatus ...	Sowb.	,,	Bulhar, only one specimen.
,, inscriptus ...	...	,,	Maala mud flats and var. Gold Mohur Bay, L.W.S.T.
,, lividus ...	Chem.	,,	Holkart's Bay, L.W.S.T. P
,, lineatus ...	...	,,	Off M.M. coal depot. Scarce
,, luctificus ...	...	,,	Bunder Fookum Bay reefs L.W.S.T. Scarce
,, miles ...	L.	,,	Dead specimens, Isthmus sea-face. R
,, minimus ...	,,	,,	Rocks everywhere. VP
,, nussatella ...	,,	,,	Maala mud flats. Scarce
,, nemocamus ...	Hwass.	,,	Do. P
,, pusillus ...	Chem.	,,	Rocks outer sea face, L.W.V.P
,, quercinus ...	Hwass.	,,	Steamer Point to Maala, L. W.S.T. P
,, quadratomaculatus.	Sowb.	,,	Bulhar dredged 10 fathoms R
,, splendidulus ...	,,	,,	Bunder Fookum reefs. R
,, striatus ...	L.	,,	Little Aden. R
,, Sumatrensis ...	Lk.	,,	Rocks outer sea face all parts, L.W. P
,, tæniatus ...	Hwass.	,,	Do. do. do. VP
,, tesselatus ...	Born.	,,	Off Tawai, L.W.S.T. Scarce
,, textile ...	L.	,,	Rocks outer sea face. P
,, Thomasi ...	...	,,	Do. do. P
,, traversianus ...	Smith.	,,	Dredged off Tarshyne, good specimen. VR
Strombus cylindricus ..	Swain.	,,	Steamer Point to Maala, L.W. P
,, dentalus ...	L.	,,	Do. do. R
,, floridus ...	Lk.	,,	Do. do. P
,, fusiformis ...	Sowb.	,,	Steamer Point to Maala, L.W.S.T. Scarce
,, gibberulus ...	L.	,,	Steamer Point to Maala, L.W. P
,, lineatus ...	Lk.	,,	Perim, 2 specimens only dredged in harbour.
,, mauritiana ...	Lk.	,,	Gold Mohur Bay, young specimen only. R
,, plicatus ...	Lk.	,,	Steamer Point to Maala. P
,, Roupelli ...	Rve.	,,	Do. do. P

G. and S. Names.	Author.	Habitat.	Remarks.
Strombus tricornis ...	Lk.	Aden.	Mud flats at Maala, L.W.S.T. P
,, variabilis ...	Swain.	,,	Mud flats at Maala and Isthmus, L.W.S.T. P
,, urceus ...	L.	,,	Do. do. R
Rostellaria curta ...	Sowb.	,,	Maala mud flats. R
,, curvirostris.	Lk.	,,	Do. P
Cypræa annulus ...	L.	,,	Rocks outer sea face, L.W. P
,, Arabica ...	,,	,,	Do. everywhere, L.W. VP
,, cameoleopardalis -melanostoma.	...	,,	Isthmus, dead specimen.
,, caurica ...	L.	,,	Rocks round islands, L.W. P
,, carneola ...	Mart.	,,	Do. everywhere, L.W.
,, clandestina ...	L.	,,	Sk. Othman, coral. P
,, crucuta ...	Gmel.	,,	Islands in harbour, L.W.S.T. P
,, var. coloba ...	Melvill.	,,	Do. do. R
,, erosa ...	L.	,,	Rocks everywhere, L.W. VP
,, erythræensis ...	Beck.	,,	Sk. Othman, coral. Scarce
,, exusta ...	Sowb.	,,	Do. R
,, felina Gray- fabula.	Kein.	,,	Rocks all round, L.W.S.T. P
,, fimbriata ...	Gmel.	,,	Do. do. VP
,, var. macula ...	Adams.	,,	Do. do. P
,, gangrenosa ...	Sol.	,,	Do. do. Scarce
,, helvola ...	L.	,,	Do. do. R
,, histrio ...	Gmel.	,,	Do. do. P
,, isabella ...	L.	,,	Do. do. R
,, lentiginosa ...	Gray.	,,	Dredged 5 fathoms, 2 specimens harbour.
,, Listeri ...	Gray.	,,	Island in harbour, 2 specimens only.
,, lynx ...	L.	,,	Island in harbour and Maala, L.W.S.T. P
,, Lienardi ...	Jouss.	,,	Sk. Othman, coral. P
,, mauritiana ...	L.	,,	Perim Rocks and outer sea-face MP
,, moneta ...	,,	,,	Do. do. MP
,, nucleus ...	,,	,,	Sk. Othman, coral. Scarce
,, ocellata ...	,,	Berbra	One specimen only, L.W.S.T.
,, pantherina ...	Sol.	Aden	Fisherman's Bay, L.W.S.T. P
,, pulchra ...	Swain.	,,	Do. do. P
,, punctata ...	L.	,,	Sk. Othman, coral. R

G. and S. Names.	Author.	Habitat.	Remarks.
Cypræa staphylea ...	L	Aden.	Sk. Othman, coral. R
,, talpa ...	,,	,,	Do. do. R
,, tigris ...	,,	,,	Fisherman's Bay, L. W. S. T. R
,, turdus ...	Lk.	,,	Everywhere at L. W. S. T. VP
,, Turneri ...	Jouss.	,,	Sk. Othman, coral. MP
,, undata ...	Lk.	,,	Do. do. R
,, vitellus ...	L.	,,	Do. do. R
,, zigzac ...	,,	,,	Steamer Point to Maala under Rocks, L.W.S.T. R
Ovulum lacteum ...	Lk.	,,	Sk. Othman coral. R
,, (birostia) spelta	L.	,,	Do. R
Cancellaria elegans ...	Sowb.	,,	Dredged 5 to 7 fathoms harbour. R
,, hystrix ...	Rve.	,,	Do. do. MP
,, melanostoma..	Sowb.	,,	Bunder Fookum Bay. R
,, scalarina ...	Lk.	,,	Dredged in harbour 5 to 7 fathoms. MP
Cerethium asper ...	L.	,,	Sk. Othman. R
,, bifasciatum ...	Sowb.	,,	Bunder Fookum Bay, L.W. S.T. R
,, clypemorus ...	Jouss.	,,	Steamer Point, harbour shore L.W. P
,, cæruleum ...	Sowb.	,,	All sandy beaches near rocks, L.W.S.T. R
,, columna ...	,,	,,	All sandy beaches near rocks, L.W.S.T. P
,, contractum ...	,,	,,	Bunder Fookum Bay, L.W. S.T.
,, echinatum ...	Lk.	,,	Do. do R
,, fasciatum ...	Mart.	,,	Sappers' Bay and dredged in 5 fathoms harbour. P
,, fluviatilis ...	Pd. Mich	,,	Mud flats, Little Aden. P
,, kochii ...	Phil.	,,	Dredged in 5 to 7 fathoms in harbour. P
,, lacteum ...	Kien.	,,	Do. do. P
,, vertagus-fasciatus	Brug.	,,	Little Aden, L.W.S.T. R
,, ,, obeliscus...	,,	,,	All parts, L. W. VP
,, var. cedo-nulli...	Sowb.	,,	Do. do. VP
,, pingue ...	A. Ad.	,,	Bunder Fookum Bay, L.W. S.T. R

G. and S. Names.	Author.	Habitat.	Remarks.
Cerethium recurvum.	Sowb.	Aden.	Sandy bays all round L.W. P
„ Roupelli ...	...	„	Do. do. L.W. P
„ tuberculatum.	L.	„	All sandy beaches L.W.S.T. VP
„ yerburyi ...	Smith.	„	Do. do. do. VP
Littorina ahenea ...	Rve.	„	Berbera.
„ granocostata .	„	„	Bunder Fookum Bay, L.W. VP
„ natalensis ...	Kraus.	„	Do. do. VP
Modulus candidus ...	Petit.	„	Dredged in harbour 5 to 7 fathoms, only 2 dead specimens.
„ textum ...	Gmel.	„	Dredged in harbour 5 to 7 fathoms, only 2 dead specimens. R
Planaxis breviculus ...	Desh.	„	All rocks on sea face. VP
„ Savignyi ...	„	„	Do. do. VP
Rissoina clathrata ...	A. Ad.	„	Sifted from sand, Sappers' Bay.
„ cocinna ad- „ emporides.	Recluz.	„	Do. do. Scarce
„ sidmondiana.	Issol.	„	Do. do. Do.
„ spirata ...	Sowb.	„	Do. do. P
„ tridentata=curta	„	„	Do. do. R
Turritella columnaris .	Kien.	„	Dredged off Tarshyne, 6 fathoms. V P
„ maculata ...	Rve.	„	Dredged off from Tarshyne to Maala, L.W.S.T. P
Phorus			
Calyptræa æquestris ...	L.	„	Maala and Isthmus Rocks, L.W. Scarce
„ cicatrosa ...	Rve.	„	Do. do. Do.
Narica cancellata ...	Chem.	„	Isthmus Rocks, both sides. R
Nerita chrysostoma ...	Richy.	„	Little Aden, L.W.S.T. P
„ plexa	Chem.	„	Do. do. Scarce
„ polita	L.	„	Rocks everywhere, L.W. VP
„ Rumphii var ...	Recluz.	„	Do. do. VP
Phasianella lineolatus ..	Wood.	„	Bunder Fookum Bay, L.W. S.T. R
„ nivosa ...	Rve.	„	Do. do. R
Turbo coronatum, var. granulatum ...	Gmel.	„	Rocks everywhere, L.W. VP
„ elegans ...	Phil.	„	Do. do. P

G. and S. Names.	Author.	Habitat.	Remarks.
Turbo pethiolatus ...	L.	Aden	Rocks Isthmus sea face. R
„ pustulata ...	Broedii.	„	Do. do. Scarce,
„ radiata ...	Gmel.	„	Do. everywhere. P
Leptothyra læta ...	Montr.	„	
Trochus cardinalis virgata	Gmel.	„	Sk. Othman, coral. R
„ infundibulum, var. erythræus ...	Brochi.	„	Rocks everywhere, L.W. P
Clanculus Pharaonis ...	L.	„	Do. do. P
Monodonta dama ..	Phil.	„	Sappers' Bay Rocks, L.W.S.T. P
„ obscurus ...	Wood.	„	Sappers' Bay sand. P
Eucellus bicinctus ...	Phil.	„	Sifted Sappers' Bay sand, L.W.S.T. P
„ delpretei ...	Caram.	„	Do. do. P
„ proximus ...	A. Ad.	„	Rocks Steamer Point to Maala, L.W. P
Zizhyphinus scobinatus	A. Ad.	„	Dredged 5 to 7 fathoms in harbour. P
Gibbula doriæ ...	Caram.	„	Sifted from sand, Sappers' Bay. P
Minolia caifassei ...	Caram.	„	Do. do. P
Margarita variabilis ...	A. Ad.	„	Do. do. R
Haliotis	...	„	Rocks Isthmus sea face. R
Fissurella kuppelli ...	Sowb.	„	Rocks everywhere, L.W. P
Parmophorus unguis ...	L.	„	Gold Mohur Bay R
Dentalium Shoplandi...	Jouss.	„	Dredged 670 fathoms by Tel. Str. Amber 50 miles E. Aden.
Patella plumbea ..	Lk.	„	Rocks outer sea face P
„ radians ...	Gmel.	„	Do. do. P
Somatella solidula ...	L.	„	Berbera and Perim dredged 5 to 7 fathoms P
Bulla ampulla ...	L.	„	Steamer Point to Maala, L.W.S.T. P
„ physis ...	Lk.	„	Isthmus mud flats. P
„ vexillum ...	...		Do. R
Atys cylindracea ...	Helb.	„	Dredged 5 to 7 fathoms in harbour. P
„ naucum ...	L.	„	Do. do. P
Umbrella Indica ...	Lk.	„	Near M.M. Coal Depot R

G. and S. Names.	Author.	Habitat.	Remarks.
		BIVALVES.	
Martesia striata ...	L.	Aden.	Mud flats at Maala in soft rock. P
Solen corneus ...	Lk.	,,	Isthmus sea face, L.W. P
,, d ...			.....
,, Gouldii ...	Conrad.	,,	Do. do. P
,, truncatus ...	Wood.	,,	Do. do. P
Machæra polita, Wood, var. japonica ...	Dkr.	,,	Do. do. VP
Tugonia nobilis ...	A. Ad.	,,	Do. do. alive. R
Corbula Leahitriensis...	Lk.	,,	Rocks near Isthmus. P
Anatina hispidula ...	Val.	,,	Dredged 5 to 7 fathoms in harbour. Scarce
Thracia Australica ...	Rve.	,,	Dredged 5 to 7 fathoms, only one specimen.
Pandora ...	...		.....
Mactra achatina ...	Chem.	,,	Dredged Bunder Fookum Bay. VR
,, crista ...	Jouss.	,,	Isthmus sea face, L.W.S.T. R
,, decora ...	Desh.	,,	Do. do. Scarce
,, fauroti, var.alba	Jouss.	...	Do. do.
,, famoh ...	,,	,,	Do. do.
Lutraria cultellus ...	L.	,,	Isthmus sea face, dead specimen. R
,, intermedia ...	Desh.	,,	Do. do.
Standella Egyptica ...	Chem.	,,	Maala mud flats. R
,, solandri ...	Gray.	,,	Do. R
Ræta abercrombiei ...	Melvill.	,,	Isthmus sea face, odd valves only. P
Cæcilla zebuensis ...	Desh.	,,	All sandy bays, L.W. P
Asaphis deflorata ...	L.	,,	Sappers' Bay L.W. P
Psamobia elegans ...	Desh.	,,	Little Aden. R
,, marmorea ...	,,	,,	Do. R
,, occidens ...	Chem.	,,	Do. R
,, pallida ...	Desh.	,,	Do. R
,, Weinkauffi...	Crosse.	,,	Gold Mohur Bay cast up dead. R
Soletellina adamsi ...	Desh.	,,	Maala mud flats, L.W. R
Tellina Adenensis ...	Smith.	,,	Isthmus sea face. MP
,, concentrica ...	Gould.	,,	Steamer Point, harbour shore L.W.S.T. Scarce.

G. and S. Names.	Author.	Habitat.	Remarks.
Tellina coxa	Jouss.	Aden.	Steamer Point, harbour shore L.W.S.T. Scarce.
,, dubia	Desh.	,,	Do. do. R
,, edentula ...	Spengl.	,,	Isthmus sea face. L.W.S.T.
,, foliacea ...	L.	,,	Isthmus sea face.
,, lacumniosa ...	Chem.	,,	Steamer Point to Maala, L.W.S.T., dead only. P
,, ostracea ...	Lk.	,,	Isthmus sea face R
,, Pharaonis ...	Hanley	,,	Do. do. R
,, rubella ...	Desh.	,,	Dredged 5 fathoms inner harbour. P
,, rugosa ...	Bom.	,,	Maala mud flats, L.W.S.T. R
,, scobinata ...	L	,,	Do. Scarce.
,, staurella ...	Lk.	,,	Isthmus sea face. R
,, subpallida ...	Smith.	,,	Do. Scarce.
,, sulcata ...	Wood.	,,	Steamer Point to Maala L.W.S.T. MP
,, perplexa ...	Hanley.	,,	Sk. Othman, coral. R
Donax erythræa ...	Bertram.	,,	Sands Bunder Fookum Bay L.W.S.T. P
,, scalpellum ...	Gray.	,,	Sands Little Aden, L.W.S.T. Scarce.
,, clathrata ...	Reese.	,,	Isthmus sea face, L.W.S.T. P
Scrobicularia vaillanti.	Jouss.	,,	Do. do. R
Semele chinensis ...	A. Ad.	,,	Rocks Isthmus, L.W.S.T. P
,, cruenta ...	Ad&Ang.	,,	Dredged 5 fms. harbour R
,, lamellosa ...	Sowb.	,,	Do. do. R
Paphia glabrata ...	Desh.	,,	Isthmns sea face. R
Tivela ponderosa ...	Koch.	,,	Do. R
Meretrix lusoria ...	Chem.	,,	Do. R
Callista costata ...	,,	,,	.....
,, erycina ...	L.	,,	Berbera Isthmus mud flats, L.W.S.T. R
,, florida ...	Lk.	,,	.....
,, umbonella ...	,,	,,	Maala and Isthmus mud flatr. L.W.S.T. P
,, lilacina ...	Lk.	,,	Do. do. P
Caryatis varians ...	Hanley.	,,	.....
Lioconcha hebrœa ...	Lk.	,,	Dredged off Tarshyne, 5 to 7 fathoms R
,, tigrina ...	,,	,,	Do. do. do. R
Circe Arabica... ...	Chem.	,,	.....
,, callypiga ...	Bom.	,,	All mud flats, L.W.S.T. P

G. and S. Names.	Author.	Habitat.	Remarks.
Circe corrugata ...	Chem.	Aden.	Dredged in harbour, 5 to 7 fathoms Scarce.
„ intermedia ...	Rve.	„	Steamer Point to Isthmus mud flats, L.W.S. T. M P
„ leutiginosa ...	Chem.	Aden	Maala mud flats, L. W. S. T. P
„ pectinata ...	L.	„	Do. do. P
„ scripta ...	„	„	Dredged off Tarshyne 5 to 10 fathoms. P
„ do. var. fulgurata	Rve.	„	Do. do. R
Sunetta contempta ...	Smith.	„	Gold Mohur Bay. R
„ intermedia ...	.....	„	Do. R
Tapes deshayesi ...	Hanley.	„	Bunder Fookum Bay, dredged 6 fathoms. VR
„ florida var. ...	Lk.	„	Dredged off Flint Island. P
„ litterata ...	L.	„	
„ malabaricus ...	Chem.	„	Steamer Point to Isthmus mud flats, L.W. P
„ obscurata ...	Desh	„	Dredged 5 fathoms harbour. R
„ pinguis ...	Chem.	„	All mud flats, L.W.S.T. VP
„ radiata ...	Gmel.	„	Do. do. P
„ sulcosa ...	Lk.	„	Sk. Othman. R
„ textrix ...	Chem.	„	Dredged in harbour 5 to 7 fathoms. P
Anaitis foliacea ...	Philippi.	„	Do. do. P
Chione crispata ...	Desh.	„	Do. do. R
„ Lamarckii ...	Gray.	„	Do. do. R
„ lamellosa ...	Chem.	„	Do. do. R
Dosinia alta ...	Dkr.	„	Isthmus sea face, L.W.S.T. P
„ hepatica ...	Lk.	„	Do. do. P
„ histrio ...	Gmel.	„	Do. do. P
„ pubescens ...	Phil.	„	Do. do. VP
Venerupis macrophylla.	Desh.	„	Isthmus mud flats, L.W.S.T., near rocks. P
„ claudiconitra madreporica.	Jouss.	„	Do. do. P
Cypricardia coralliophaga.	Lk.	„	Sk. Othman, coral. P
Coralliophaga coralliophagus.	Jouss.	„	Do. do. P
Petricola hemprichii...	Issol.	„	Do. do. P
Choristodon lapicidium.	Chem.	„	Sk. Othman, coral. Scarce

G. and S. Names.	Author.	Habitat.	Remarks.
Cardium assimile ...	Rve.	„	Steamer Point harbour shore, L.W.S. T. Scarce
„ australi Sowb.= pulchrum.	„	„	Dredged 5 to 7 fathoms in harbour. P
„ latum=cetosum.	Redfield.	„	Steamer Point to Maala. Scarce
„ pseudolima ...	Lk.	„	Dredged 5 fathoms harbour. VR
„ rugosum ...	„	„	Off Post Office, L.W.S.T. P
„ rubicundum var.	...	„	Do. do. R
Chama fragum ...	Rve.	„	Dredged off Tarshyne 6 fathoms. P
„ gryphoides ...	L.	„	Do. do. P
Tridacna crocea var. ...	Lk.	„	Sk. Othman coral. R
Lucina dentifera ...	Jouss.	„	Maala mud flats. Scarce
„ exasperata ...	Rve.	„	Do. Do.
„ semiporiana ...	Issel.	„	Sappers' Bay Sand. P
Diplodonta rotundata.	Turton.	„	Isthmus sea face, L.W.S.T. P
Scintilla obockensis ...	Jouss.	„	Do. do. R
„ faba	Desh.	„	Do. do. P
Crassatella radiata ...	Sowb.	„	Dredged off Tarshyne, 5 to 7 fathoms. P
Cardita antiquata ...	Poli.	„	Steamer Point to Maala. Good specimens scarce
„ semi-orbiculata.	L	„	Isthmus sea face, L.W.S.T. P
„ sulcata ...	Lk.	„	Steamer Point to Maala mud flats. P
„ variegata ...	Brug.	„	Do. do. do. P
Mytilicardia gubernaculum.	Rve.	„	Rocks at Isthmus sea face, L.W. P
Mytellus pictus ...	Bom.	„	Off buoys and vessels in harbour. P
Crenella cummingii ...	Drk.	„	Isthmus sea face. R
Modiola auriculata ...	Kraus.	„	Do. R
„ Sirhœnsis ...	Jouss.	„	Do. R
Lithodomus erythræensis.	„	„	Sk. Othman, coral. P
„ lithophagus.	Lk.	„	Do. do. P
„ cinnamoneanus var.	„	„	Do. do. P

G. and S. Names.	Author.	Habitat.	Remarks.
Septifer excisus ...	Weigh-man.	„	Rocks all round, L.W.S.T. P
Avicula marmorata ...	Rve.	„	Off vessels and buoys. Good specimens rare.
Maleagrina margaritafera.	L.	„	Flint Island, L.W.S.T. Large specimens scarce
Maleus albieus ...	Jouss.	„	Dredged in 5 to 7 fathoms off Tarshyne.
Crenatula picta ...	Gmel.	„	Isthmus sea face, only one specimen
Pinna altor	Sowb.	„	Islands in L.W.S.T. Scarce
„ bicolor ...	Chem.	„	Do. do. MP
„ nigra ?	...		Military Pier to Tawai-Tides only. MP
Arca clathrata ...	Rve.	„	All mud flats. P
„ domingensis ...	Lk.	„	Rocks everywhere, L.W.S.T. P
„ imbricata ...	Brug.	„	Do. do. P
„ natalensis ...	Kraus.	„	Do. do. P
„ navicularis ...	Brug.	„	Sk. Othman, coral. R
„ obliquata ...	Wood.	„	Rocks, Maala and Isthmus, L.W.S.T. P
„ tortuosa ...	L.	„	Dredged 5 to 7 fathoms in harbour. P
„ scapha ...			
Cuculea concamerata...	Martini.	„	Sk. Othman, coral. R
Pectunculus pectiniformis.	Lk.	„	Maala mud flats near rocks. Scarce
Pectunculina multistricta.	Sowb.	„	Dredged off Tarshyne and at Bulhar, 7 to 12 fathoms
Pecten flabeloides ...	Rve.	„	Isthmus mud flats, L.W.S.T. VR
„ layardi, var. ...	Rve.	„	Marbat to P.O. Pier. L.W.S.T. R
„ luculentus, var..	„	„	Do. do. R
„ plica ...	L.	„	Isthmus mud flats, L.W.S.T. R
„ sanguinolentus .	Gmel.	„	Sk. Othman coral, only two specimens.

G. and S. Names.	Anthor.	Habitat.	Remarks.
Pecten senatorius ...	Gmel.	„	Steamer Point to Maala, attached to rocks and piers, L.W. P
„ squamosus, var. lividus.	Lk.	„	Steamer Point to Maala attached to rocks and piers, L.W. P
„ Townsendi ...	Sowb.	„	Bunder Fookum Bay and African Coast, L.W.S.T. R
„ Tranquebaricus..	Gmel.	„	Rocks and islands in harbour, L.W.S.T. R
Lima paucicostata ...	Sowb.	„	Sk. Othman, coral. R
„ scabra ...	Born.	„	Do. do. R
Plicatula imbricata ...	Menke.	„	Rocks on islands in harbour.
Pedum spondyloidum...	Lk.	„	Rocks on mud flats. R
Anomia achæus ...	Gray.	„	Attached to other shells. P
Placuna placentis ...	L.	„	Maala and Isthmus mud flats, L.W.S.T. R
Vulsella linguafelis ...	Roe.	„	Steamer Point to Maala in sponge. P
Ostrea crista galli ...	L.	„	In Cave in Islands Bunder Fookum Bay. M.P
„ hyotis ...	„	„	Reef, Bunder Fookum Bay, L.W.S.T. P
„ Sueli ...	„	„	Do. do. P
Lingula anatina ...	Lk.	„	Dug out of sand, L.W.S.T., Isthmus. P

DESCRIPTION OF A NEW EARTH-SNAKE FROM TRAVANCORE (*RHINOPHIS FERGUSONIANUS*).

By G. A. Boulenger, F.R.S.

(*With a Plate.*)

(*Read before the Bombay Natural History Society, 14th January*, 1896.)

The genus *Rhinophis*, of which five Ceylonese species are known, was for many years believed to be represented in Southern India by two species, *viz.*, *R. melanogaster*, Gray, and *R. sanguineus*, Beddome. In 1886 Colonel Beddome pointed out that the former had no right to remain in that genus and correctly transferred it to the genus *Silybura*, to which the bulk of Indian Uropelts belong. Therefore, when in 1890 I revised the list of Indian Snakes, the genus *Rhinophis* was reduced to one continental species, *R. sanguineus*. But shortly after I had the pleasure of adding a second, described in this Journal in 1893, *R. travancoricus*,* of which a specimen from Trivandrum had been sent to me by Mr. H. S. Ferguson. Thanks to the same gentleman, I am now able to describe a third species, nearest allied to the Ceylonese *R. trevelianus*, with which I am happy to connect the name of Mr. Ferguson, to whose exertions we owe several interesting additions to the herpetological fauna of Travancore.

Rhinophis fergusonianus, n. sp.

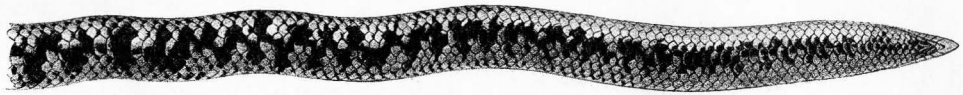
Snout acutely pointed; rostral very obtusely keeled above, two-fifths the length of the shielded part of the head; frontal a little longer than broad, shorter than the paritals; eye very small, not half as long as the ocular shield, in contact with the third labial. Diameter of body, 40 times in the total length; 17 scales round the middle of the body, 19 behind the head; ventrals only a little larger than the adjacent scales, 184; subcaudals 4, caudal disk a little longer than the shielded part of the head, scarcely visible from below; longitudinally striated, blackish above; sides white, dotted and spotted with black; belly white, with black dots and two series of large black spots partially confluent into a zigzag band; caudal disk black, edged all round with yellow.

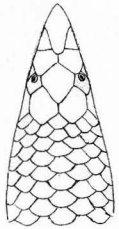
Total length, 320 millim.

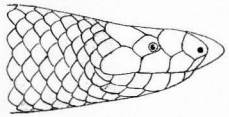
A single specimen from the Cardamom hills, collected by Mr. J. S. Sealy.

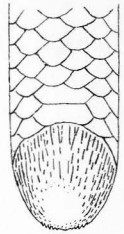
Differs from *R. trevelianus* in the more slender body, and the longer caudal disk, which does not extend on the lower surface of the tail, and is striated instead of granulate.

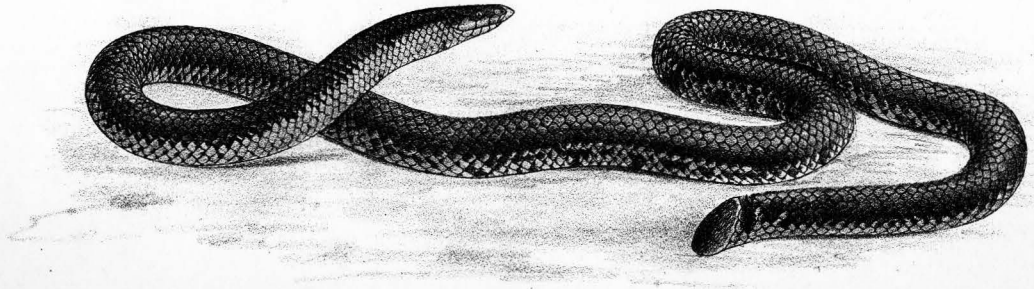
* See Vol. VII, page 318.











RHINOPHIS FERGUSONIANUS.

(A new Earth-Snake from Travancore.)

Mintern Bros. del et lith. London.

THE BUTTERFLIES OF THE NORTH CANARA DISTRICT OF THE BOMBAY PRESIDENCY.

By J. Davidson, T. R. Bell, and E. H. Aitken.

Part I.

(*With Plates I, II, III.*)

(*Read before the Bombay Natural History Society on* 14*th January*, 1896.)

In the Journal of the Bombay Natural History Society, vol. V (1890), pp. 260, 349, two of us published a paper on some of the larvæ and pupæ of the butterflies of the Bombay Presidency, in which we described 94 species which we had ourselves reared. In the next two years, Mr. Bell having in the meantime joined us in our investigations, we had added so largely to this number that we began to meditate a supplementary paper. For various reasons, however, this did not get itself done, as Carlyle would have said, and now the number of butterflies, of which the transformations remain to be discovered, has become so small that it seems invidious to leave them out, and we have decided that our paper should take the form of a list of the butterflies which we have met with in the district, with such information as we can give regarding their habits and transformations. We will not repeat descriptions published in our former paper, but we will supplement or correct these where it appears to be necessary, and in some instances give figures of larvæ which were only described before.

As regards the time of the year at which each species is on the wing, our notes are not so satisfactory as we could have wished. One reason for this is that we are all district officers, spending the monsoon at Karwar and the dry-season on tour through the district, many parts of which are quite different from Karwar in the character of their vegetation and other conditions which influence the butterfly population. So it happens that our observations of particular species are interrupted for months at a time. Collectors in other parts of India often write of the number of broods in the year in terms which imply more regularity than we have observed in this moist and equable climate. We are not inclined to think that the majority of species here have any fixed number of broods in the year. One generation succeeds

another as fast as conditions permit. It would be difficult to name any month in the year when many common species, such as *Euplœa core*, Cramer, may not be seen laying their eggs. They are undoubtedly much more plentiful in some months than others, but this is because the largest number of larvæ come to maturity at those times when succulent young leaves are most plentiful and enemies least active. Many species, however, pass through a certain portion of the year, which is unfavourable to them, in a state analogous to hibernation. For example, the smaller *Lycœnidœ*, such as *Zizera*, are not to be seen from June to August, when the heavy rain would beat down such feeble butterflies and drown their larvæ. They appear in September and swarm for some months after. The same is true of *Hypolimnas misippus*, Linnæus, perhaps because it feeds on ground weed, and the larva is liable to be drowned by heavy rain. On the other hand, *H. bolina*, Linnæus, and the majority of the *Nymphalinœ* and also the *Papilioninœ* are much more abundant during the monsoon than at any other season. By the end of the year some of them have become very scarce, if they have not disappeared altogether, and it is evident that those which feed on deciduous plants cannot be in the larva state from December to March or later. The *Pierinœ*, excepting *Nepheronia*, are less abundant during the rains than in the cold season, and *Atella phalantha*, Drury, may be called a dry-season butterfly. Its period of inactivity is the monsoon. How each species tides over the particular time which is unfavourable to it is an interesting question on which our knowledge is very limited. We have proved that *Papilio nomius*, Esper, regularly remains in the pupa state from August till the following March or May ; but this is a peculiar case. In *P. clytia*, Linnæus = *dissimilis*, Linnæus, the pupa state is often prolonged for weeks or months without regard to season. But in the vast majority of species the pupæ in our cages hatch on the due date as regularly as hens' eggs. Yet there are good reasons for thinking that it is in the pupa state that most butterflies pass through the time when nature is against them. It is also not improbable that eggs laid at an unfavourable time remain unhatched till next season. Lastly, some *Hesperiidœ* hibernate in the larva state. The larva when full grown stops eating and shuts itself up in a cell as if it were about to become a pupa, but it does not actually undergo that change for some weeks or even months. We are not

disposed to believe that in this climate the imago hibernates as it commonly does in Europe.

Apart from hibernation, the length of a larva's life varies a good deal according to the supply of food. When tender leaves are plentiful they grow fast. Butterflies of strong build and powerful flight, such as *Charaxes* and the larger *Hesperiidæ*, live much longer in the larva state than others. The duration of the pupa state, on the other hand, seems to depend on little else than size. Small *Lycænidæ* emerge in a week, the majority of medium-sized butterflies in ten days, and the *Papilios* in a fortnight. *Troides* (*Ornithoptera*) takes three weeks.

We wish we could have made these papers more readable so that others might more fully participate in the enjoyment which we have derived from watching and catching the beautiful creatures represented by the hard names which are to follow; but the number of species to be described is so large that if we had allowed ourselves to be tempted to digress, the paper would have become too long for publication in any journal.

In conclusion, we must express our grateful acknowledgments to Mr. W. A. Talbot for his valuable help in finding the names of the plants on which our larvæ fed, and to Mr. Lionel de Nicéville for much assistance in the identification of butterflies.

Our illustrations were painted by Mr. Krishnarao Raghunathrao Rane, student at the Bombay School of Art, a young man who took much interest in the creatures themselves.

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

1. *Hestia lynceus*, Drury.

From the foot of the ghauts to the crest, and even some distance inland, wherever streams of water flow among high trees, the "wood nymph" may be found, sailing or floating with leisurely elegance, oftenest beyond the reach of the longest butterfly net. When it does come low, nothing is easier to catch. It is rarely, if ever, met with on the coast. It appears from October to June and probably from June to October, but we spend the rains at Karwar, where it does not occur. The larva feeds on *Aganosma cymosa* (order *Apocynaceæ*),

and has been described in this journal by Captain T. Macpherson, Bo. S. C., vol. ii, p. 164 (1887), with a plate showing the egg, larva and pupa under the name of *Hestia malabarica*, Moore. See also a further note on the subject by Mr. de Nicéville on page 242,

2. *Danais aglea*, Cramer (*D. grammica* in Marshall and de Nicéville).

Found throughout the district at all seasons, and very common in some places. We have reared larvæ in every month of the monsoon, and indeed throughout the year. The larva and pupa were described in our former paper, p. 262, n. 2.

3. *D. limniace*, Cramer.

We have put our species under this name, but monsoon specimens which we sent to Mr. de Nicéville were pronounced by him to be nearer to *D. septentrionis*, Butler, though much smaller than specimens of that species from the other side of India, and not quite so dark. On the other hand, some of our specimens are larger and paler than others, and those caught in the dry-season, especially above the ghauts, are typical *D. limniace*. The butterfly is fairly common throughout the district, very abundant in some places. The larva and pupa are described by Marshall and de Nicéville. See also our former paper, p. 266, n. 3.

4. *D. chrysippus*, Linnæus.

This ubiquitous butterfly is less common in Canara (at least on the coast) than in most parts of India. There is little left to be said about it, except that we have discovered that it does feed on something else than *Callotropis*, to wit, on *Asclepias curassavica*, a foreign plant of the same order which is now quite naturalised in the district. See our former paper, p. 266, n. 1.

Among the larvæ of this butterfly reared by us last season, two, which were brought to us together and evidently belonged to the same brood, produced fine specimens of the variety, *D. klugii*, Butler, which we have never seen in Canara before or since. We also reared a specimen which distinctly tended towards *D. alcippoides*, Moore.

5. *D. genutia*, Cramer.

Somewhat local on the coast, but common above the ghauts, where it is found at certain spots in swarms that literally block the road. We do not know what draws them together, but this species, as also

D. limniace, Cramer, and *E. core*, Cramer, is much attracted by certain plants when withering, notably by a certain species of *Crotalaria*. The larva and pupa have been described by Marshall and de Nicéville.

6. *Euplœa core*, Cramer.

There is no need to waste space on this species either. It is common everywhere and at all seasons. For one or two days every year, about the beginning of June, hundreds may be seen migrating northwards, together with a few of *D. limniace*, Cramer, and *D. aglea*, Cramer. The natives say that the rains always begin three days after this happens, and we have known one occasion when it was so, which is sufficient for faith. The larva and pupa of this species have been described by Marshall and de Nicéville. They may be found on almost any kind of *Ficus* and on many common apocynaceous plants. The common garden Oleander is often festooned with their silver chrysalids. See our former paper, p. 266, n. 4.

7. *E. coreta*, Godart (*E. coreoïdes* in Marshall and de Nicéville). Plate I, Figs. 1, 1*a*.

It is impossible to say how common this species may be, as it cannot be distinguished from *E. core*, Cramer, on the wing. We have taken a good many at Karwar during the monsoon, and last season we were fortunate enough to secure a larva. It was brought by a native boy upon a leaf which appeared to belong to the order *Apocynaceæ*. It was more elongated than the larva of *E. core*, and had only three pairs of filaments, of which the first was very long and turned outwards at the points, the next was nearly as long and almost straight, while the third was short and very thick at the bases. The head was bluish-white, with two darker triangular marks, the body uniform pale bluish-green, the corrugated skin giving the appearance of transverse bands a broad white line separated the darker colour of the underparts. The filaments were pale whitish-blue, edged with darker blue at the points and tinged with orange at the swollen bases. The pupa was like that of *E. core*, the colour being bright silver with the wing-cases and other parts defined in a pale green tint.

8. *E. kollari*, Felder. (*E. sinhala* in Marshall and de Nicéville.)

We have taken this both above and below the ghauts, and consider it commoner than *E. coreta*, Godart, but is almost as difficult to tell on the

wing from *E. core*, Cramer. The caterpillars of these two are almost as like as the butterflies, the only difference being that the tentacles of *E. kollari* are pink and curled at the top, whereas in *E. core* the front pair are never curled. The marginal band is also much whiter in this species. It feeds on several species of *Ficus*. The chrysallis is similarly shaped to that of *E. core*, but of course larger and of a brilliant golden colour, except on the wing-cases, which are silvery-green, if that is an admissible combination. The colour is probably variable, but it is distinguished by three pairs of small dorsal black spots, which are likely to be constant.

Subfamily SATYRINÆ.

9. *Mycalesis mandata*, Moore.

We have described and figured the larva and pupa of this in our former paper, p. 267, n. 5. It feeds on rice and various grasses. The butterfly may be found in damp situations at all seasons. It is most abundant near rice lands at the end of the rains.

10. *M. mineus*, Linnæus.

The only form of this group that we have bred in Canara appears to be that called *M. mineus* by Moore in his great work on the "Lepidoptera Indica" now being published, so we give it that name. It is a very common butterfly at all seasons. The transformations have been described in our former paper on p. 267, n. 6.

The form, or species *M. visala*, Moore, we found common during the dry-season above the ghauts; we have not bred it. With it, in the same locality, we found the form *M. perseus*, Fabricius, which is smaller, and has the rounded apex to the wing in the male, whereas *M. visala*, Moore, has the apex acute.

11. *M. junonia*, Butler. Plate I, Figs. 2, 2*a*.

More local than the last two and restricted more or less to forest, but common enough both above and below the ghauts. The larva, which feeds on grass, is exceedingly like that of *M. mineus*, Linnæus, and so is the pupa. They are distinguishable to one who knows them, but a description would not enable anybody to tell the one from the other. The pupa is stouter and more compact, and the cremaster (stalk) is more bent and never coloured red.

12. *Lethe europa*, Fabricius.

Not often found at Karwar itself, but commoner in places at the foot of the ghauts. It is a forest butterfly. A single larva, reared on bamboo, was described in our former paper, p. 350, n. 41, but the butterfly that came from it never expanded its wings properly, and we think now that there is reason to doubt the correctness of our identification. It may have been the next species.

After writing the above, we discovered a larva feeding on bamboo which differed in no wise from that of *L. todara*, Moore, but in the head point being a little shorter and quite separate ; this larva, which unfortunately was ichneumoned, died ; but we are convinced it was that of *L. europa*.

13. *L. todara*, Moore.

This is fairly common wherever there are bamboos, and may be met with at all seasons. It is abundant above the ghauts in the hot weather. The larva, which feeds on bamboo, is somewhat fusiform or spindle-shaped, the surface rough owing to minute and close-set tubercles ; head produced occipitally into a long horn composed of two united processes ; the anal segment bearing a similar composite process ; colour green, with a dorsal and subdorsal white line, and a lateral one also which is marked with crimson at the seventh and eighth segments ; head green, with a yellow lateral line ; horn pointed red. Pupa stout, slightly constricted between the thorax and the abdomen very like that of *Melanitis*, but rather more angular ; green, with wing-cases marked in yellow or gold ; suspended rigidly at an angle of 45°. It should be noted that both larva and pupa may be light rosy-brown instead of green, perhaps to match dry grass, for the larva affects concealment, lying close on the underside of a blade, like most of the subfamily.

14. *L. neelgherriensis*, Guérin.

This species, so abundant at Mahableshwar, scarcely comes so far south as Canara. A few have been seen in the north end of the district above the ghauts.

15. *Ypthima philomela*, Johanssen. Plate I, Figs. 3, 3*a*.

Moore separates this as *Y. baldus*, Fabricius. It is very plentiful everywhere, especially from August or September. Few are seen in the early part of the rains. It flies low and alights on the ground. The larva

feeds on grass and is of the usual satyrine cast, fusiform, with transversely rugose surface and two pointed processes on the last segment, but the usual horns on the head are represented in this species by two small tubercles, each surmounted by a single bristle. The colour is pale pinkish, with darker longitudinal striæ, forming to the naked eye a dorsal band or stripe, and a broader darker lateral one with a pale line under it ; but the colour is probably variable. The pupa is more slender than that of *Mycalesis* or *Melanitis*, and is distinguished from them also by two prominent dorsal ridges. The colour is mottled brown or greenish.

16. *Y. huebneri*, Kirby.

As common as the last and at the same season, but its first appearance after the monsoon is a little later. It seems absurd in nature to keep up two butterflies so like each other in every way. One would do. The larva of this also feeds on grass and is very like that of *Y. philomela*, Johanssen. The pupa is also very like, but wants the pronounced dorsal ridges.

17. *Zipœtis saitis*, Hewitson. Plate I, Figs. 4, 4*a*.

We have met with this only at three places on the ascent of the ghauts. It appears late in the evening. We were fortunate enough last September to get the larva on a species of bamboo with large leaves. It is very like that of *M. mineus*, Linnæus, but the head is not so distinctly marked off from the neck, the horns point forward, and the caudal processes are longer. When young, the larvæ were green with brown heads, but after the last moult the colour became brown, light on the back and darker on the sides, with an ill-defined dusty dividing line, and a dorsal row of dark spots with diverging dusky lines. The pupa is more like that of the genus *Junonia* than the *Satyrinæ* generally, having three or four pairs of small tubercles on the abdominal segments, a slight lateral expansion of the wing-cases, and a hump on the thorax; colour vitreous or whitey-brown.

18. *Melanitis ismene*, Cramer.

As common in this district as elsewhere. The monsoon form begins to appear about the end of May and lasts till the end of September. In October we have got both forms (the dry- and the wet-season) promiscuously from what seemed to be one brood of larvæ. Larvæ are plentiful throughout the year, or nearly so, feeding chiefly on rice,

but also on long grasses. The transformations are described in Marshall and de Nicéville. See also our former paper, p. 267, n. 7, *M. leda*, Linnæus.

19. *M. varaha*, Moore.

The discovery by de Nicéville that many of the described species of *Satyrinæ* are merely summer and winter forms of the same has upset the nomenclature so completely that Marshall and de Nicéville's book is now of little use for the naming of that subfamily, and we have followed Mr. Moore's new work in naming our form of this genus *M. varaha*. We see no reason to believe that we have more than one distinct species of this genus, but it is infinitely variable, some winter specimens being scarcely distinguishable from *M. ismene*, Cramer. The larva and pupa too are so like those of *M. ismene* that we have reared the one for the other. The larva of this (*M. varaha*) is, however, smaller and hairless. The butterfly, moreover, is different in its haunts, frequenting jungles rather than rice-fields or gardens. It is pretty common everywhere.

20. *M. gokala*, Moore.

In naming this also we have followed Mr. Moore's guidance. It is not common, being found chiefly in heavy forest. Some dry-season specimens are enormous. We have got the larva on bamboo. It is gregarious throughout its life as a larva, but does not differ much from that of *M. ismene*, Cramer, except in being longitudinally striped with very dark green. Nor does the pupa.

Subfamily Elymniinæ.

21. *Elymnias caudata*, Butler.

This is not very common anywhere, but occurs throughout the district in palm gardens and shady places resting on the underside of leaves. It is quite diurnal in its habits, but likes shade. The larva feeds on palms, and has been described and figured in our former paper, p. 268, n. 8.

Subfamily Amathusiinæ.

22. *Discophora lepida*, Moore.

This fine butterfly is probably not nearly so scarce as it is supposed to be, but as it frequents dense tiger-haunted bamboo-jungle, and does not fly till after sunset, few specimens are caught. We have got it both above and below the ghauts. It is a butterfly of swift and strong flight,

and alights on leaves or bushes, not on the ground like the *Satyrinæ*. The male has a powerful odour which can be detected as it flies past. The larva feeds on bamboo, like that of *D. tullia*, Cramer.

From two broods reared and a few specimens of this species that we have caught, we find that the colour is much darker in the monsoon than in the dry-season.

The larva is much more like that of a moth than a butterfly, and would have been passed over but for one feature which betrayed it, namely, the last pair of prolegs. They are erect, and not extended beyond the body as they almost always are in the larvæ of moths. Fortunately this little feature excited suspicion, and the larva was taken home and reared. It was cylindrical or slightly fusiform, head large, anal segment furnished with two stout conical processes, widely separated, but scarcely divergent; colour of head greenish-yellow, eyes black, body brown, with a broad pure white dorsal band flanked with conspicuous black marks, and a yellow lateral mark on segments six to eleven; head and body clothed with long reddish or brown hair.

The pupa is shaped not unlike that of *Mycalesis mandata*, Moore, the head-case being produced into two long-conical adjoined processes, the thorax slightly convex and carinated dorsally, the wing-cases evenly expanded, abdomen strongly curved dorsally; surface finely rugose; colour semi-transparent yellowish like a clean white bone, with the dorsal line and the veins of the wings marked in faint flesh colour, loosely attached by the tail.

The larva lives at first on the underside of a leaf, but afterwards it often makes a seat for itself, like the larvæ of *Charaxes*, by joining a couple of leaves together with silk. The larvæ are gregarious in their young days. The eggs are laid in parallel rows along the midrib on the underside of the leaf in very shady places in numbers from three to ten, probably more.

Subfamily ACRÆINÆ.

23. *Telchinia violæ*, Fabricius.

Common everywhere, but most abundant on grassy hills from November to March. The larva and pupa were described in our former paper, p. 268, n. 9. We have only reared it on the wild passion-flower (*Modecca palmata*), but it must feed on something else

during the dry-season. This butterfly is certainly "protected," like the *Danainæ*, by an offensive smell and taste.

Subfamily NYMPHALINÆ.

24. *Ergolis tabrobana*, Westwood.

This is one of the commonest butterflies in the district, frequenting forest rather than cultivated places or open plains. In our former paper, p. 269, nn. 10, 11, we described the larva as undistinguishable from that of *E. ariadne*, Linnæus. They both feed on *Tragia involucrata*, a creeper with stinging leaves, and both butterflies have emerged from one lot of larvæ in our cages which might easily have been taken to belong to a single brood. In form there was no difference, and the colour we thought was too variable to have any significance, ranging from pale green, with or without brown lines, to black, with a broad dorsal stripe of pure white. This year, however, we bred a larger number, and carefully separated the black larvæ from those in which the ground-colour was green, and found that the former produced *E. ariadne*, Linnæus, and the latter *E. taprobana*.

25. *E. ariadne*, Linnæus.

This is not nearly so common in Canara as the last. See remarks above.

26. *Byblia ilithyia*, Drury.

Mr. Blathwayt, the late Collector of Canara, had one specimen of this which was said to have been caught near to Karwar, but we have never met with it in the district. See our former paper, p. 269, n. 12.

27. *Euripus consimilis*, Westwood.

Decidedly a scarce butterfly. All our males have been caught on the tops of high hills, where they come to bask in the sun, from September to October and onwards. The few females we have secured have been met with in low ground at the foot of the hills. We have got them in September, December, and February. In all our specimens of both sexes the ground-colour is pure white.

28. *Cupha placida*, Moore. Plate III, Figs. 3, 3*a*.

Very common wherever the country is fairly well wooded, and more abundant in the dry-season than during the rains. In habits this butterfly is very like *Atella phalantha*, Drury, flitting restlessly from bush to bush, and keeping its wings in motion even when it alights. The larva, which feeds on the same plant as that species (*Flacourtia*),

is only distinguishable by the colour of the head and by the spines, which are inclined to be semi-transparent in *C. placida* and are black in *A. phalantha*. The pupa can be recognised at once by a double row of slender filaments springing from the principal tubercles, but this is not a point of any structural importance. See our former paper, p. 270, n. 14.

29. *Atella phalantha*, Drury.

This species is scarcely to be met with during the monsoon, but is common everywhere in the cold season, preferring open country. We have described the larva and pupa in our former paper, p. 269, n. 13. It is difficult to account for the descriptions of the larva by Horsfield and Moore which are quoted in de Nicéville's book. They differ from each other and from all the larvæ that we have reared.

30. *A. alcippe*, Cramer.

This is a very local species. We have met with it only at three places on the ascent of the ghauts, from January to April. In April last year we found the larva on a tree, which we believe to be a very local species of *Hydnocarpus*, but this requires verification. It is like that of *Cirrhochroa*, cylindrical, with six rows of fine branched spines, head unarmed, colour green, with longitudinal interrupted lines of brown or claret colour on the back only : head pale yellowish with two black bars. In habits it also resembles the restless and active larva of *Cirrhochroa*. The pupa is almost a smaller copy of that of *A. phalantha*, Drury.

The larvæ and pupæ of this and the last two species, as well as the aspect and habits of the butterflies, argue a much closer affinity with the genus *Cirrhochroa* than the arrangement adopted by de Nicéville would suggest.

31. *Cethosia mahratta*, Moore.

This is fairly common everywhere in wooded country, especially during the latter half of the rains. The larva, which is gregarious, feeds on *Modecca palmata*, or any passion-flower. We have described and figured it and the pupa in our former paper, p. 270, n. 15.

32. *Cynthia saloma*, Swinhoe.

Pretty common everywhere in forest from August or September onwards. Males congregate on the peaks of hills to bask in the sun. Monsoon specimens are conspicuously darker than those found in the dry-season. The larva and pupa have been described and figured

in our former paper, p. 270, n. 16. The female of this butterfly is often difficult to tell from *Parthenos virens*, Moore, on the wing, its flight being similar, though less powerful.

33. *Apatura camiba*, Moore.

Judging by the number of larvæ that we get from September to the end of the year, this butterfly must be much commoner than it seems. The males bask on the tops of high trees, and the females escape observation by their resemblance to *Ergolis*. In connection with this similarity it is curious, if nothing more, to note that the larva has the head armed, like that of *Ergolis*, with two long, spiny horns, and that they both have the peculiar habit of waving their heads from side to side incessantly as they walk. We have described the larva and pupa in our former paper, p. 271, n. 17. This is one of the few *Nymphalinæ* of which the larvæ rest always on the underside of a leaf.

34. *Precis iphita*, Cramer.

This is disgustingly common and constantly gets itself mistaken for more valuable species. The larva feeds on "karvi" (*Strobilanthes callosus*), and is like that of any species of the next genus. It is generally of a uniform dusky blackish colour. See our former paper, p. 271, n. 18.

Genus JUNONIA.

To save time we may say here that we have reared all our *Junonias*, and cannot ordinarily tell the larva or pupa of one from another. They differ a little in colour, but that is variable in each species. They all feed on acanthads. The larva of *J. lemonias*, Linnæus, has two minute spines on the head, which are wanting or less developed in the others.

35. *J. asterie*, Linnæus, or *almana*, Linnæus.

Common everywhere, frequenting damp grounds and ditches. The *almana* form appears in October and gives place to the *asterie* form in June. See our former paper, p. 272, nn. 19, 20.

36. *J. lemonias*, Linnæus.

Equally common, but frequenting drier country than the last, and also found in thick forest, where the larva feeds on *Strobilanthes*. See our former paper, p 272, n. 2.

37. *J. hierta*, Fabricius.

Pretty common in open country, but absent during the monsoon. See our former paper, p. 272, n. 22.

38. *J. orithyia*, Linnæus.

This species likes stony plains and bare hills, and is consequently comparatively rare in Canara, and altogether wanting during the monsoon. It rests always on the ground. See our former paper, p. 272, n. 23.

39. *J. atlites*, Linnæus.

This is not so widely distributed as the last four species, but is fairly common on the Canara coast about rice-fields, chiefly at the end of the rains. It occurs also above the ghauts. The larva is coloured more distinctively than the others, being dull smoky black, with a well-defined orange-brown stripe above the legs. The pupa is of a uniform slatey colour.

40. *Neptis hordonia*, Stoll. Plate II, Figs. 1, 1*a* and 1*b*.

This is very common in all the more open wooded or scrubby parts of the district during the latter half of the rainy season and throughout the dry months. During June and July it is rarely seen. The larva may be found on several species of *Acacia* and *Albizzia*, and has the curious habit of feeding by preference, not on green leaves, but on those which it has caused to wither. The trees on which it feeds have all bi-pinnate leaves with minute leaflets. It bites through one or two pinnæ, which immediately droop and dry up, but are kept from falling by a few threads of silk with which the larva has taken the precaution to attach them to the central leaf-stalk. Thenceforth it lives among them and feeds entirely on them. The larva has two forms, In the first (fig. 1*b*) the head is large and roughly triangular. The segments of the body increase to the fourth and then diminish gradually, and the third, fourth, sixth and twelfth have each two obtuse dorsal points. The forepart, from the fourth segment, is generally inclined downwards at an angle with the rest of the body, and is, with the underparts, of a dark greenish-brown colour. The rest is just that shade of greenish-grey which the leaves assume when withered, and is crossed by diagonal dark bands exactly representing the spaces between the leaflets as a painter would paint them—a most perfect disguise. The second form (fig. 1*a*) of the larva differs in having the head furcate,

while the dorsal points are replaced by long spine-like processes. The figure will give a better idea of the difference than any description.

After writing the above, we have discovered that the two forms of larvæ produce imagines differing in the colour of the "male-mark"; the butterfly resulting from the larvæ with spines and the bi-pointed head has a light male-mark; that resulting from the other a dark male-mark. Another fact which points to the two larvæ producing different species is that the two forms of larva are never found together, for the smooth type of caterpillar is often found in quantities on one bush; the larvæ also very slightly in their habits; and, whereas the smooth caterpillar feeds on *Albizzia* and *Acacia*, the spined one has never been found on any plant but *Acacia*. The butterfly with the light male-mark is typical *N. hordonia*, we are informed by Captain E. Y. Watson. See our former paper, p. 272, n. 24.

41. *N. viraja*, Moore. Plate II, Figs. 2, 2*a*.

This is not nearly so common as the last, but appears to be generally distributed. The larva feeds on the blackwood tree (*Dalbergia latifolia*), and also on *Dalbergia racemosa*, and has similar habits to those of *N. hordonia*, Stoll, which it resembles in form, but the head is bifid at the top, and the dorsal points are wanting, while the last segment is produced into a single blunt point. The colour is dark greenish-brown, the forepart, as in *N. hordonia*, being much darker than the rest, but bordered with pale grey. The pupa is like that of *N. hordonia*, but rather broader, and the wings more evenly expanded. See our former paper, p. 351, n. 43.

42. *N. leucothoë*, Cramer (*N. varmona* in de Nicéville).

This is by far the commonest and most widely spread of the genus. It may be found in any month of the year and anywhere, frequenting gardens and cultivated land more than the others. The larva, which feeds on various peas, is very like that of *N. jumbah*, Moore, but is more rugose. It has not the curious habits of the last two. The pupa also resembles that of *N. jumbah*.

43. *N. ophiana*, Moore.

This is the rarest of our *Neptes*. We once found eggs, which produced larvæ very like those of *N. jumbah*, Moore, but they died.

44. *N. kallaura*, Moore.

We found a pupa once of this species hanging to a leaf of *Dalbergia confertifolia* ; the larva had been feeding on the creeper. We did not recognise the species, mistaking it for the preceding, until some months after it was bred. This bred specimen is almost the only one we have: it was obtained in February in the Supa taluka. Pupa exactly like that of *N. jumbah*, Moore.

45. *N. jumbah*, Moore.

Common enough everywhere. The larva is almost omnivorous. It has been described by de Nicéville and in our former paper, p. 273, n. 25.

46. *Cirrhochroa thais*, Fabricius.

We believe in only one species of *Cirrhochroa* in this district, an infinitely variable butterfly as to size, colour and markings. It is very common in forest everywhere and at all seasons, restlessly flitting about from tree to tree, like species of *Cupha* and *Atella*, and alighting frequently with wings half open or in motion. In our former paper (p. 273, n. 26) we described the larva, which is as restless as its parent, but perhaps with more reason, for hundreds are destroyed by small ichneumons, and also by a large brown fly which comes to maturity within the pupa.

47. *Hypolimnas bolina*, Linnæus.

This is a common enough butterfly in all the moister regions of this presidency, but nowhere have we found it in such abundance as in Canara. It also appears to vary more here than elsewhere, and the varieties do not depend much upon season. It is true that at the beginning of the monsoon all the males are very small, not larger than *H. misippus*, Linnæus, with the spots on the upperside more white than blue, and with a distinct broad white fascia on the underside; but two months later these may be found side by side with the most splendid specimens of the form described as *H. avia* by Fabricius, and every grade between. During the dry-season this butterfly is not often met with. We have described the larva and pupa in our former paper, p. 273, n. 27. The favourite food-plant appears to be a nettle-like weed which we identify as *Fleurya interrupta*.

48. *H. misippus*, Linnæus.

This species affects more open country than the last, and is, perhaps for that reason, not nearly so common in Canara. During the rainy season we have never seen it, but it begins to appear in September or October, and continues till about the end of the year. We have twice met with the form of female which wants the black on the apex of the forewing bearing an oblique white band, and has been supposed to mimic *Danais klugii*, Butler. The larva differs little from the last. We have never reared it in Canara. In other districts we have found it on *Portulacca oleracea*. See our former paper, p. 274, n. 28.

49. *Parthenos virens*, Moore.

This is not by any means a rare butterfly in forest country, especially towards the end of the rainy season. Its grand spread of wing and bold flight always arrest attention. The manner of its flight is the same as that of *Limenitis*, *Athyma*, and some other genera, a jerky stroke at short intervals between which the wings are held stiffly outstretched and pointing a little downwards, but those genera lack the power of *Parthenos*. Sometimes a solitary one is met with travelling across open plains, but we do not know that it migrates. We described and figured the larva and pupa in our former paper (p. 274, n. 29). It feeds on a creeper belonging, we believe, to the *Cucurbitaceæ*.

50. *Limenitis procris*, Cramer. Plate II, Figs. 3, 3*a*.

This beautiful species is pretty common during the rains and even in the dry-season in open forest. It flies like the last, and rests, like it, with wings open on the upperside of a leaf. We do not mean that it sleeps in this position: probably it does not. We described the larva in our last paper (p. 274, n. 30) as feeding on *Mussoenda frondosa*. We have since found it oftener on *Wendlandia exserta*, another plant of the same order.

51. *Athyma perius*, Linnæus.

This species, which is plentiful further north, is the least common of the genus on the Canara coast. It appears, like them all, during the latter part of the rainy season and probably for some time after, if it does not last till May. It is more like a *Neptis* in its ways than the three which follow. It feeds commonly on *Glochidion lanceolatum*

and *G. velutinum*. We have described the transformations in our former paper (p. 275, n. 31).

52. *A. mahesa*, Moore. Plate II, Figs. 4, 4*a*.

This is perhaps the commonest of the genus with us. We described the larva and pupa in our former paper (p. 350, n. 42) and figure them now. Larvæ are found from August, feeding on *Olea dioica* and *Linociera malabarica*, and the butterfly becomes common in September and continues through the dry-season.

53. *A. inara*, Doubleday and Hewitson (*A. inarina* of de Nicéville.)

Males are common on the hill tops from August onwards. We get few females. The larva, which feeds on *Glochidion velutinum* and *G. zeylanicum*, is very like that of *A. mahesa*, Moore, cylindrical, with six rows of fine branched spines, the dorsal being longer than the lateral, and those on the third and fourth segments longer than the rest, the second segment unarmed, the bases of the legs set with short simple spines ; colour pure green, with a large brown patch on the ninth segment, spines brown, and head dark brown; head covered with short simple brown spines and white tubercles. The pupa is also like that of *A. mahesa*, but of the curious processes on the back the posterior one is much longer and more inclined forwards.

54. *A. selenophora*, Kollar.

This appears at the same season as the last, but is comparatively scarce, and the female must be considered a valuable butterfly. Males bask on the tops of the hills and put themselves in the way of being caught, but the females haunt the forest-clad sides and are seldom seen. This is true of all the *Athymas*, except *A. perius*, Linnæus, and of many other butterflies. The larva is very like that of *A. inara*, Doubleday and Hewitson, but the dorsal patch is much smaller, and there are some white spots on the sides. The pupa is distinguished from that of *A. inara* by slight differences in the shape of the grotesque processes on the head and thorax. The common food-plant is *Adina cordifolia* (*Rubiaceæ*).

55. *Symphœdra nais*, Forster.

This is almost unknown on the coast, but common enough above the ghauts. The larva, which feeds on *Diospyros melanoxylon* (the "Ebony tree," *Ebenaceæ*), has been fully described by de Nicéville.

56. *Euthalia laudabilis*, Swinhoe.

This is, generally speaking, the least common species of the genus with us, but some years it has been in great force at Karwar during the rains, and the number of larvæ brought in by native boys is surprising. The larvæ and pupæ of our *Euthalias* are almost alike in form, and the transformations of *E. garuda*, Moore, have so often been described and figured that it is unnecessary to waste space on the subject here. The collector may distinguish the different species at a glance by the colour, and they feed on different plants. The larva of *E. laudabilis* feeds on *Diospyros candolleana* (*Ebenaceæ*), and is green, with a vinaceous dorsal patch on each segment, enclosing a whitish dark-centred ocellus. These patches vary in size, those on the fourth, seventh and tenth segments being usually the largest, and those on the fifth and sixth small or obsolete. The pupa is green, with silver spots and a bright line of the same colour along the sides of the dorsal triangle. *E. laudabilis* is a forest butterfly. Specimens caught or bred in the monsoon are conspicuously smaller and richer in colour than those found in the dry-season. (See our former paper, p. 277, n. 35, under *E. evelina*, Stoll, that name being restricted to the Ceylonese form.)

57. *E. lepidea*, Butler.

This species is very common throughout the district, frequenting the undergrowth of shady forests and seldom coming into the sunlight. Its flight is not strong, and it rests much on leaves with wings open. The larva, which feeds on *Melastoma malabathricum* and *Careya arborea*, may be distingushed from the last by the dorsal ocelli, which are red with blue centres. The pupa has all the prominent points golden-yellow tipped with black. See our former paper, p. 276, n. 34.

58. *E. garuda*, Moore.

This is as common here as in other parts of the presidency, frequenting gardens and basking on walls. It is a thirsty insect, easily attracted by fermented *toddy*. The larva has a bright yellow dorsal line edged with blue in place of the ocelli which distinguish the last two species. It feeds on the mango, cashewnut, mulberry, and other things. The pupa has the points and ridges edged with yellow. See our former paper, p. 275, n. 32.

59. *E. lubentina*, Cramer.

This exquisitely beautiful butterfly is also very common, but different in its habits from the other two and therefore not so often noticed. The males are fond of basking in the sun on high trees or hill tops along with *Charaxes*, *Athyma* and *Cynthia*. With the exception of *E. garuda*, Moore, occasionally, the other *Euthalias* never do this. The females frequent the forests at the foot or on the slopes of the hills and do not show themselves much. The larva of this species, which feeds on *Loranthus*, commonly called "mistletoe," has the dorsal area of most of the segments brown or claret-coloured, with or without a pure white diamond in the middle. The pupa is distinguished by a small brown patch on each side. See our former paper, p. 276, n. 33.

60. *Pyrameis cardui*, Linnæus.

The "Painted Lady" is found sparingly throughout the district. At times it appears in great numbers, continues for a week or two and disappears again. As is well known, it is a migratory butterfly, and is known in almost every part of the world. It has a rapid, irregular flight, and is fond of settling on the ground and on rocks. The curious habits of the larva are described at length by de Nicéville. We have found larvæ in Canara in November, feeding on *Zornia diphylla*, and on a thistle-like plant of the genus *Blumea*, which is its common food in other parts of the presidency also. See our former paper, p. 277, n. 36.

61. *Cyrestis thyodamas*, Boisduval. Plate III, Figs. 1, 1*a*.

The "Map Butterfly" is pretty common throughout the district in suitable situations. A suitable situation is a clear stream of running water, among rocks, with trees growing over it, on which the butterfly may rest, pressed flat against the underside of a leaf. Curiously enough it lays its eggs on the banian (*Ficus indica*), which is not a tree at all peculiar to such situations. We described the larva and pupa in our former paper, p. 351, n. 44. They are quite unlike those of any other butterfly we know, so we give a figure of them both.

62. *Kallima horsfieldii*, Kollar. Plate II, Figs. 5, 5*a*.

We have only one species of *Kallima*, which may be called *K. wardi*, Moore, by those who believe in the distinctness of that form. It is a very variable butterfly and the wet- and dry-season

forms are as different as *Junonia asterie*, Linnæus, and *J. almana*, Linnæus. The former is small, dark, green-tinted above and faintly ocellated on the underside, with the apex of the forewing scarcely produced at all. The latter is large, pale on the upperside, very variable on the underside, but without a trace of ocellation, and has the apex produced into a point which is sometimes quite a quarter of an inch in length. Hyaline marks may be present in either form. The butterfly is very common, especially during July and August, among "karvi" (*Strobilanthes*), on which its larva feeds, but is more difficult to catch than most owing to the swiftness of its flight and its habits of always resting on the trunk of a tree (head downwards) in situations in which a net is not easily manœuvred. No butterfly, however, is more easily seduced with liquor. It flies in the day, but keeps out of the sun. We described the larva and pupa in our former paper, p. 277, n. 37, and figure them now.

63. *Doleschallia polibete*, Cramer. Plate III, Figs. 2, 2*a*.

From August onwards the males of this species may be found basking on the hill tops, but we very rarely see a female, and all our specimens of that sex were bred. We have found eggs and larva in September and October on a species of *Eranthemum*, which belongs to the same natural order, be it noticed, as the food-plants of all the *Junonias* and *Kallima*. The eggs are laid in batches, and the larvæ are gregarious. Both larva and pupa are described by de Nicéville. We figure them however.

64. *Charaxes schreiberi*, Godart.

This splendid species is certainly one of our rarest and most beautiful butterflies. The males have the habit, common to all the genus, of basking during the hottest hours of the day on chosen trees about certain rocky peaks, and as one of these basking points lies within a few miles of Karwar, we have secured a certain number of specimens, mostly much broken. But females cannot be got in this way. The larva feeds on "wagati" (*Wagatea spicata*), but this plant is much commoner than *C. schreiberi*, and is, moreover, so villainously thorny that the chance of finding larvæ is not proportionate to the travail of looking for them. What might we not have achieved if the hours spent in perusing the leaves of wagati had been devoted to some useful work! As if this were not enough, the creature has an

alternative food, *Rourea santaloides*, also too common by half. Up to this date we have only reared two specimens, which were fortunately both females. The larva is very like that of *C. imna*, Butler, but the white semicircle on the back of the latter is replaced by a yellowish crescent. The pupa is just like that of *C. imna*.

The flight of this butterfly is very powerful, as might be inferred from the robustness of the thorax. We have observed before that robust butterflies grow slowly, and this is borne out by the present species. A larva, which emerged from the egg on October 25th, did not become a pupa till January 26th, and no part of this time was passed in hibernation.

65. *C. athamas*, Drury.

This is found everywhere and at all seasons. We have described the transformations in our former paper, p. 227, n. 38. The food-plants are many, *Poinciana*, *Cæsalpinia*, *Grewia*, &c.

66. *C. fabius*, Fabricius.

Though more generally distributed, this is not nearly so common as the last. The larva, which feeds on the tamarind tree, was described and figured with the pupa in our former paper, p. 278, n. 39.

67. *C. imna*, Butler.

From the number of males that collect on popular basking places this cannot be uncommon, but females are rarely seen. The larva and pupa were described and figured in our former paper, p. 278, n. 40. We have reared them from June to November on "Wom" (*Saccopetalum tomentosum*) and on *Aglaia roxburghiana*.

Family LEMONIIDÆ.

Subfamily LIBYTHÆINÆ.

68. *Libythea myrrha*, Godart, or *rama*, Moore.

This is perhaps the rarest of all our butterflies. In six years we have got two specimens, both on the top of a high hill near Karwar.

Subfamily NEMEOBIINÆ.

69. *Abisara fraterna*, Moore.

This is very common at all seasons, perching on leaves with its wings partly open, and facing about every now and then in a way peculiar to itself. They fly much at dusk, very swiftly, chasing each other in the air. The larva and pupa were described in our former paper, p. 352, n. 45.

Mintern Bros. Chromo lith. London.

Mintern Bros. Chromo lith. London.

Mintern Bros. Chromo lith. London.

Explanation of the Plates.

Plate I.

Figs. 1, 1a... Larva and pupa of *Euplœa coreta*, Godart, p. 241.
„ 2, 2a... „ „ „ *Mycalesis junonia*, Butler, p. 242.
„ 3, 3a... „ „ „ *Ypthima philomela*, Johanssen, p. 243.
„ 4, 4a... „ „ „ *Zipœtis saitis*, Hewitson, p. 244.

Plate II.

Figs. 1, 1a... Larva and pupa of *Neptis hordonia*, Stoll, p. 250.
„ 1b ... Larva of ditto, second form, p. 250.
„ 2, 2a... Larva and pupa of *Neptis viraja*, Moore, p. 251.
„ 3, 3a... „ „ „ *Limenitis procris*, Cramer, p. 253.
„ 4, 4a... „ „ „ *Athyma mahesa*, Moore, p. 254.
„ 5, 5a... „ „ „ *Kallima horsfieldii*, Kollar, p. 256.

Plate III.

Figs. 1, 1a... Larva and pupa of *Cyrestis thyodamas*, Boisduval, p. 256.
„ 2, 2a... „ „ „ *Doleschallia polibete*, Cramer, p. 257.
„ 3, 3a... „ „ „ *Cupha placida*, Moore, p. 247.

(*To be continued.*)

THE POISONOUS PLANTS OF BOMBAY.

By Surgeon-Major K. R. Kirtikar, I.M.S., F.L.S.,
Civil Surgeon, Thana.

PART XIV.

(*With plate P.*)

(*Continued from Vol. X, page* 107.)

ALANGIUM LAMARCKII—(*Thwaites*).

Natural Order—Cornaceæ.

MARATHI—अंकोल (*Ankol*).

This is a very handsome tree, and grows very well in the Konkan. Whether in foliage, flower, or fruit,—in whatever condition or season it is seen,—it is a striking plant. It is beautifully green-leaved throughout the year, except when about to blossom. Every branch of it, from the largest to the smallest, is covered from head to foot with clusters of cream-white, sweet-scented flowers. The entire plant thus in full bloom is very attractive to the eye. Later on, when in the height of summer the branches are loaded with clusters of fruit of the size of an ordinary marble, their rich bright crimson is particularly charming to the eye.

TRUNK.—The trunk of the tree is short, erect, generally from 2 to 3 feet in girth. Rheede gives its girth as 6 feet (Hort. Mal., vol. iv, p. 55). Sometimes the trunk is irregular. There is a large tree in the compound of the Military Hospital, Thana, the girth of which is fully nine feet. The main trunk sends out underground stems or "*suckers*." The tree in the Military Hospital compound referred to has nearly half a dozen distinct trees developed from such suckers within an area of twenty feet around. In a Mahomedan grave-yard not far from the Civil Hospital, Thana, there are several large trees from which several smaller trees have developed through suckers. Writing about Central India plants, Brandis observes that the trunk "coppices well" (Forest Flora, p. 250). So it does in the Konkan.

The height of the tree varies from 30 to 40 feet; under favourable circumstances it is sometimes as much as 50 feet.

Isaac Benjamin del. Mintern Bros. Chromo lith. London.

THE POISONOUS PLANTS OF BOMBAY.

Alangium Lamarckii Nat. Ord. Cornaceæ.

A. The plant in fruit & new foliage. B. The plant in flower without foliage. C. Transverse section of fruit.

E. C. S. Baker del. Mintern Bros. Chromo lith. London.

DICÆUM CHRYSORRHŒUM.

The yellow-vented Flower-pecker

BRANCHES.—The branches and branchlets are said to be often spinescent. The Thana plants appear to be singularly free from spines of any sort. The branches are very irregular.

BARK.—The thickness of the bark as given by Brandis is only half an inch. I think I can safely say that the bark is not unfrequently about an inch in thickness. In young branches it is less than a quarter of an inch. When Brandis says that the bark is "grey with some white specks," it is to be understood that he refers to the bark of young and tender branchlets. The bark of the new off-shoots is light green. Whether in the young or old branches and branchlets, the bark is marked with irregular undulations. It is also deeply marked with the scars of the fallen leaves and pedicels of the former season.

WOOD.—The wood is described by Brandis as "light brown or yellowish-brown." "It is tough and strong, weighing 49 lbs. per cubic foot." Brandis very happily describes it further as "fine, even, close, and smooth grained." Kurz says that the wood is "dark-brown."* This answers the description of the wood examined in the Thana plants. "The wood is beautiful" says Roxburgh—(Flora Indica, p. 404—Calcutta, 1874).

LEAVES.—Exstipulate, petiolate, alternate; membranous, says Brandis; 3-6 inches long, 1-2 inches broad; entire. Both Hooker and Brandis say they are persistent, but of this more hereafter under the head of "Remarks." The shape of the leaves is very variable even on one and the same branch—from linear oblong to elliptic, obtuse, acute, or long-acuminate; pubescent or tomentose when young; glabrous or pubescent below when full grown; the base unequal, often somewhat equal. The chief character of most leaves is that they are three-nerved at the base. The nerves are pubescent and distinctly white and prominent on the under surface. The main lateral nerves vary from five to eight on either side of the midrib, joined by prominent transverse and intra-marginal veins. Brandis observes that in the axils of primary nerves there are often "tufts of hairs or hollow glands." This is a fit subject for microscopical workers who may be interested in the study of the morphology of the leaf of this plant. It may be observed here that in the axils of the leaves of one season

* Kurz—Forest Flora of British Burma, Vol. I, p. 543, 1877, Calcutta.

there are buds of the blossom and foliage of the next season. These buds are also well worthy of a more extended microscopical study.

PETIOLE.—Brandis very accurately describes it as "$\frac{1}{4}$ inch, hairy, often villous or woolly;" not unoften it is slightly twisted on its axis.

FLOWERS.—White; fragrant; hermaphrodite; silky white. jointed on the pedicel; in axillary, close small fascicles or condensed cymes. The flowers are seldom, hardly ever, more than three at a time in each axil. PEDICELS pointed, very short; $\frac{1}{8}$ inch.

BRACTS.—Clarke says (in Hooker's Flora of British India, vol. ii, pp. 741,742) that the bracts are entirely absent. Brandis, on the other hand, says that "the pedicels are bracteate" (*op. cit.*). Brandis further remarks that the peduncles and pedicels are usually woolly.

ÆSTIVATION.—"Twisted" say Wight and Arnott (Prodromus, p. 325); valvate says Clarke. This is notably so in the corolla.

CALYX.—Tubular; calyx tube woolly; minutely 5—10 toothed; "turbinate" says Brandis. Adnate to ovary; green; accrescent. The green colour of the calyx remains to the last, even in mature fruit.

COROLLA.—Very showy; greenish when unexpanded on the dorsal surface. Varying in colour when fully expanded from pale-white to cream-white, with an occasional dash of light crimson or pink.

PETALS.—Strap-shaped or linear oblong; reflexed; deciduous; varying in number from 5 or 6 to 10; this has given rise to the species described as *A. hexapetalum* and *A. decapetalum*. Wight and Arnott observe that the number of petals corresponds to the number of the segments of the calyx. "Blunt, tawny-velvetty," says Kurz.

ANDRŒCIUM :—

STAMENS.—Deciduous; exserted; varying in length from $\frac{1}{2}$ to $1\frac{1}{8}$ inch, woolly without (Brandis). Twice as many as the petals; thrice says Hooker, and four times as much say Wight and Arnott, as also Kurz (*op. cit.*).

FILAMENTS.—Distinct but short; "with long stiff hairs at base" (Brandis); "densely hirsute" says Kurz.

ANTHERS.—Very long; basifixed (Brandis); Wight and Arnott say "they are introrse, 2-celled, often sterile" (Prodromus, p. 325).

GYNŒCIUM :—

OVARY.—Inferior, globose, 1-celled, adherent to the calyx-tube firmly, surmounted by a disk. Wight and Arnott say that "the ovary is 1—2 celled." But this is not accurate. For, observe the following remark, quoted from Lindley, in Wight's Illustrations of Indian Botany (vol. i, p. 211, Madras, 1840), with reference to the "*Affinities*" of the Natural Order *Combretaceæ* :—"The solitary carpel of which the fruit consists is peculiar to these"—meaning the *Combretaceæ* (K.R.K.)—"and to the *Alangieæ*, and neatly distinguishes these two "orders from all others of the myrtal alliance."

OVULE.—Solitary, pendulous (Wight and Arnott).

STYLE.—One ; very long or "elongate" as Brandis terms it. Glabrous; uniformly cylindric; subulate,—that is to say, expanded at the base into a thick coloured disk which is fleshy and covers the top of the ovary.

STIGMA.—Large, capitate or subglobose. Wight and Arnott simply say it is "*dilated*," but this does not convey an accurate idea. I think the stigma may be termed "many-headed," as will be amply seen from the flowering branch in my illustration.

FRUIT.—Some call it a berry ; others call it a drupe, varying from ½ to 1 inch in vertical diameter ; ellipsoid ; tomentose says Brandis ; crowned by the somewhat enlarged calyx-limb ; quite smooth, with slight vertical ribs when dry (Thwaites). Clarke says it is closely pubescent or finally glabrous. The colour of the fruit is black says Clarke ; but, as will be observed from my illustration, it is rich crimson in its entire "epicarp." The "epicarp" is tough. The "mesocarp" or "sarcocarp" is pulpy and mucilaginous. The "endocarp" is bony, and separated from the sarcocarp like a putamen (Wight and Arnott).

SEED.—Oblong, solitary, pendulous.

ALBUMEN.—Ruminated; "fleshy" say Wight and Arnott.

EMBRYO.—Straight, inverse (Roxburgh).

RADICLE.—Superior, elongated.

COTYLEDONS.—Leafy ; crumpled ; note that Wight and Arnott say that they are "flat," and not crumpled. Note also that it is the

crumpled nature of the cotyledons of *Alangium* which distinguishes it from its congener, *Marlea*, which latter has a flat cotyledon.

REMARKS.

The following are the synonyms given in the Index Kewensis*:—

1. *Alangium acuminatum*, Wight = *Lamarckii.*
2. *Alangium decapetalum*, Lam. Encyc. I, 174 = *Lamarckii.*
3. *Alangium glandulosum*, Thw. Enum. Pl. Zeyl., 133 = *Lamarckii.*
4. *Alangium hexapetalum*, Lam. Encyc. I, 174 = *Lamarckii.*
5. *Alangium latifolium*, Miq. ex C. B. Clarke in Hook. f. Flora Br. Ind. II, 741 = *Lamarckii.*
6. *Alangium octopetalum*, Blancho, Fl. Filip. Ed. II, 310 = *Lamarckii.*
7. *Alangium sundanum*, Mig. Fl. Ind. Bot. I, 1, 774 = *Lamarckii.*
8. *Alangium tomentosum*, Lam. Encyc. I, 174 = *Lamarckii.*

This will be considered a formidable array of synonyms. But such of my readers as have hitherto followed my previous description and will note carefully the observations embodied hereafter under this head will be able to understand that, barring all seasonal and climatic changes, which are liable to vary at all times, from year to year, the principal characters of the species above depicted under their respective synonyms have been more or less alluded to in the foregoing description of the plant under notice. The terms *hexapetalum*, *octopetalum*, *decapetalum* are indicative of the number of petals. The term *acuminatum* refers to the apex of the leaf. The term *tomentosum* refers to the existence of a more or less villous condition of the leaf and flower. The term *latifolium* refers to the breadth of the leaf. The term *glandulosum* refers to the existence of glandular bodies, developing under special circumstances in particular localities under the influence of climate. The term *sundanum* refers to the special peculiarities of the plant as it is seen growing in the Straits of Sunda.

In describing the bark of the trees as examined by Brandis in North and Central India, he says it is " grey with some white specks." It must be understood that this description is of the bark of young

* Part I, page 70, Oxford, 1893. Edited by B. Daydon Jackson under the direction of Sir Joseph D. Hooker, as the noble gift of a noble man—Charles Robert Darwin—to the earnest student of Universal Botany (K.R.K.)

branches; for, as the bark gets old, it assumes a brownish tinge. The oldest bark is distinctly brown-black. Some Botanists describe the bark as smooth. Brandis describes it more accurately when he says it has irregular undulations. Brandis says that the wood of *Alangium Lamarckii* is well suited for ornamental work. It is easily worked, and when properly polished, it displays "a beautiful glossy surface." It may be noted here that the petals and stamens are distinctly deciduous. This fact is not specially mentioned by previous observers, except by Wight in the letter-press accompanying his plate No. $\frac{194}{1005}$.* This deciduous nature of the petals and stamens is well illustrated in Wight's fig. 2 in the plate just referred to. It is also shown in my illustration (plate P) accompanying this description, where, on the part of an old flowering sprig marked *B*, there are two unopened buds, and below them are the persistent green accrescent calyx and the white style capped with a multilobate stigma of the third flower, from which the petals and stamens have fallen in due course. *Apropos* of this compare the following description of Baillon :—"Style girt at "base with epigynous cupular or pulvinate disk, at stigmatose apex "clavate or capitate, oftener minutely 4—∞—lobate" (The Natural History of Plants, vol. VI, p. 286). Observe, as against this description of the stigma, the remark of Dr. Trimen that the stigma is large and only 4-lobed. (Hand Book of the Flora of Ceylon: Part II, 1894, pp. 285-286.)

The remarks which Wight and Arnott make at the conclusion of the description of the *Natural Order*, which they term *Alangieæ*, are specially worthy of the consideration of those who would engage themselves in the minute study of the very interesting flower of the plant I am describing. "The portion of the torus," say Wight and Arnott, "between the calyx and ovary, to which the stamens and petals are attached, is of a different colour and texture from the above-mentioned epigynous disk which induces us to refer the latter to the style, not to the torus."†

I may add one word more with regard to the entire blossom-process in *Alangium Lamarckii*. The following is the order every year. The entire foliage of the previous year falls in the hot weather. Then

* Icones Plantarum Indiæ Orientalis, vol. I, 1840, Madras.

† Wight and Arnott's Prodromus, p. 325.

comes the beautiful sweet smelling blossom covering the tree, denuded of its leaves, from head to foot. As the fruit next forms, first green, then gradually turning beautiful crimson, capped with the uppermost portions of the toothed calyx, new foliage appears of bright light green colour before the monsoon sets in. The plant is at this time very charming to the eye. When the fruit matures, the village-boys gather round the tree in search of the sweet pulp covering the seed. It is to them—poor half-starved creatures—an out-of-door repast of much relish judging from the avidity with which they gather the fruit as fallen under the tree, or picked by an insidious ascent on the snarled branches of the coveted plant. Note that Baillon observes that "the branches of inflorescence are elongate or sometimes more or less contracted ; pedicels generally contracted."*

With regard to the observations of Loudon, who describes the plant as *Alangium decapetalum*, I have this to say : Loudon says† that the plant has ten petals ; the branches are spiny. His figure, however, is only a solitary flower. This is as incomplete as it is misleading. Baillon distinctly says that *Alangium* of Lamarck is *unarmed, sometimes spinescent.* The former, but not the latter, is my experience in the Thana plants. Loudon observes that the plant grows in light sandy soil. Be it so. I can add that in the *moorum* soil of Thana the plant grows very well indeed. Perhaps it may be said that in moorum soil, or any similar soil, the plant thrives superbly. "Cuttings," says Loudon, "root in sand under a hand glass in moist heat." This is quoted from Loudon for the information of those who would grow the plant in a soil which has no particle of *moorum* in it. Loudon describes it as an "Evergreen." It may be so in the country from which he writes the description. On this side of India it distinctly sheds its leaves entirely about the time of blossoming. Loudon classes the plant under *Myrtaceæ*. This was right enough according to his lights. To-day we classify the plant under the natural order *Cornaceæ*. There is a sufficient justification for this change according to our lights. Loudon describes the colour of the flowers of *A. decapetalum*, as "*pale-pu*," which I presume means "pale purple." If he had said it was "*pale-ru*" instead of

* Natural History of Plants, vol. vi, page 286.

† Encyclopædia, p. 468, article 1068

"pale-pu," I should have supposed that the "pale-ru" was an abbreviated form of the term "*pale-rufous*," which would have been nearer the truth; for I have often observed a reddish or pinkish tinge on the dorsal surface of some of the petals of the flowers just before expanding. This pink tinge is most marked in the petals facing the early morning sun. According to Loudon the plant appears to have been introduced into England so far back as 1779. In concluding my observations on Loudon's description of the plant described by him as *A. decapetalum*, I may add that he considers this plant to be capable of "propagation by cuttings." On this side of India we have no such contingency. The prevailing characteristic of the plant in Thana is that it throws out "suckers." In the vicinity of the plant that is now superbly growing in the compound of the Military Hospital in Thana, there are this day more than half a dozen plants—I should call them trees—which are distinctly the product of the main plant generated by means of "suckers."

It may be observed that the plant described by the elder DeCandolle* as *A. tomentosum* (Lamarck) is more like the Thana plant than any other I have yet seen described, especially as regards the characteristics of the fruit. Witness DeCandolle's own words:

"*Floribus* * * *; *ramis inermibus* (*i.e.*, having branches without spines), *junioribus petiolis nervibusque velutinis foliis oblongis, obtuse acuminatis, subtus vernulis reticulatis. Bacca vel drupa pubescens, cortice pubescens*" (true—K.R.K.) "*livide purpureo*" (true—K.R.K.)

In describing *Alangium decapetalum* (Lam.), Sprengel says it is spinescent.† *Alangium hexapetalum* (Lam.), says he, is spineless; and *Alangium tomentosum* (Lam.) is "*subinerme*" (slightly spineless?), whatever that may mean. All these, says Sprengel, are found in the East Indies. Trimen says that *A. Lamarckii* is occasionally armed with sharp short spinous branchlets.

As observed by Baillon, with regard to the ruminate nature of the albumen, I may add that Dr. Trimen of Ceylon also observes, in describing the seed, that the embryo is "straight in the axis of slightly *ruminate* albumen," and that the cotyledons are foliaceous.‡ It may

* Prodromus: DeCandolle: Vol. III, p. 203.

† Systema Vegetabilium, vol. II, Gottingen, 1825 (classified rightly under "*Polyandria—monogynia*)"—K.R.K.

‡ Trimen's Hand-book of the Flora of Ceylon, Part II, 1894, pp. 285-86. N.O. *Cornaceæ*.

be observed that Dr. Trimen gives June and July as the flowering time of *Alangium Lamarckii* in Ceylon; that its bark is bitter; its heartwood hard and close grained and dark yellow. I have found that in Baillon's illustration, figs. Nos. 247-248 of *A. decapetalum* (at page 272 of vol. VI of his Natural History of Plants) the fruit is marked ribbed. Dr. Trimen distinctly notes that the fruit is not ribbed. This will be amply apparent from my figures of the fruit as copied fresh in the natural condition. Dr. Trimen describes the fruit as "purplish-red." It is a rich "lake" colour as will be seen from the copy of the Thana fruit.

The description of the fruit and seed as given by Baillon (*op. cit.*) is worthy of reproduction here, and may be usefully read in connection with my remarks embodied in the main description of the plant I have already given. It is as follows:—

"Fruit, drupaceous, crowned with calyx or its scar; exocarp thin or thick fleshy; putamen, more or less hard, sometimes crustaceous, 1—2 spermous. Seed oblong; integument thin; albumen fleshy, externally smooth or sometimes sinuate or ruminate; cotyledons of axile embryo foliaceous, digitinerved at base, or flat, or slightly corrugate, or sometimes contortuplicate; radicle terte superior." Let it be noted further that Baillon observes that in the *Alangium* series, though in some flowers the introrse anther dehisces by two longitudinal clefts, these clefts may be looked for right at its margin, *i.e.*, externally instead of in the median line of the anther-cells.* The following observation of Baillon as regards the Ovary may be also usefully quoted here for the help of those who would engage themselves in the work of extended microscopical research:—"The Ovary set in the cavity of the receptacle, and consequently inferior, is unilocular in the true *Alangiums*, and encloses, inserted a little below the summit, a descending anatropous ovule with micropyle primarily superior and exterior, later lateral, afterwards slightly contorted." To this Baillon adds a very important footnote indicating that the ovule has a double envelope. The lucidity and accuracy of this description are my sole apology for such an extended quotation from Baillon. I leave it to the microscopic worker to judge of its utility.

* Baillon's Natural History of Plants; p. 272, vol. VI.

I may observe, in concluding this notice of *Alangium Lamarckii*, that Baillon classes the *Alangium* series under the natural order "*Combretaceæ*." The reader is referred to Baillon's Natural History of Plants itself for his reasons for setting forth such an arrangement. I prefer to accept the classification of the plant under the "*Cornaceæ*."

The plant described as *Pseudalangium* by the venerable Baron Sir Ferdinand Von Mueller under what he terms N. O. *Alangiaceæ*,* appears to be quite a different plant from the one I am describing here. It needs but a passing notice to show that our *Alangium Lamarckii* is not to be found in Australia—not certainly in the colony of Victoria, of which the venerable Baron has been the sole botanical guide for nearly half a century.

The plant prevails on the Coromandel Coast † as will be seen from the description given of it by Roxburgh.

Turning now to the consideration of the remarks of LeMaout and DeCaisne,‡ I may observe that their observation to the following effect is literally correct, namely, that the woody stem is sometimes subterranean, emitting herbaceous branches. My foregone remarks regarding the main tree now standing in the Military Hospital Compound in Thana and many others undescribed by me but existing in the close vicinity of my Military Hospital amply bear me out in my own description of the "suckers," as also in the quotation I now cite from LeMaout and DeCaisne. These joint authors rightly remark that "the leaves of the *Corneæ* are caducous or persistent." They are caducous in the sense that they fall when it is time for the flowers and new foliage to appear. The branches at this time are bare; the leaves fall just before the blossom appears. When the blossom appears there is not a single old leaf on the tree. This is what I have already stated, and I may repeat here to emphasize the chief characteristic of the plant at the time of its renewed foliage. This renewed foliage is the striking characteristic of the plant as the fruit is maturing.

In a small *brochure* published at Mangalore in 1891, by the Basel Mission Book and Tract Depository, entitled "Five Hundred Indian Plants; their use in Medicine and Arts," at page 68, *Alangium*

* Baron Sir Ferdinand Von Mueller's Fragmenta Phytographiæ Australiæ, vol. II, Melbourne, 1860-1861.

† Pl. Coromand., vol. III, p. 79, plate 283.

‡ P. 475 of Mrs. Hooker's Translation.

hexapetalum (Lam.), has for its synonym *Alangium karangolam* (Adans.) classed under family *Alangiaceæ*. At page 71 of the same *brochure* there is the following remark, which is worth reproducing :—"The sage-leaved *Alangium* described by Linnæus is also considered the *Alangium decapetalum* of Lamarck and the *Alangium acuminatum* of Wight."

In a small book, which now seems to be almost forgotten, but nevertheless valuable, published in Bombay so far back as 1840 (2nd Edition), by James Chesson in his "Times Press," under the title of "Manual of Gardening in Western India," and written by Mr. R. Riddell, there is a very important note (at page 71), which I may well reproduce here, fully believing that Mr. Riddell was then noting his personal experience. "*Alangium decapitelum* * (*sic*), native *ankool*," says he, "is a small tree with whitish flowers ; *the petals vary on the same tree from six, eight to ten.* The fruit is astringent, but eaten by natives." I quote these remarks with a view to group the *Alangium* species, or call them mere varieties, if you like, under one head, *viz.*, *Alangium Lamarckii*, no matter what the floral envelopes be, as regards the number of their respective parts, on the nature of their development. Dr. Balfour notes, what I have not seen noted elsewhere, that the wood of *A. decapetalum* is said to be peculiarly sonorous.

"In Ganjam," says he, "the leading bullock has a bell of it termed *lodoke* round its neck, the sound being heard to a great distance in the jungle."

POISONOUS PROPERTIES.

Baillon remarks, on the authority of Lamarck and DeCandolle, that "*Alangium decapetalum* and *Alangium hexapetalum* are said to be purgative and diuretic."† Brandis says that the root is aromatic. As will be seen from my remarks later on, I have sufficient reason to believe that the bark of the root is poisonous. Only remember, pray, that I use the word "poisonous" in its widest sense. It has distinctly dangerous emetic properties, followed by a weakened action of the heart. Here may be noted what I gather from the celebrated Rheede of sacred Botanic memory. Rheede says,‡ in sufficiently distinct terms, that "the root is *acrid* and bitter." The words used as regards odour in Rheede's work, written in Latin, are "*Odor gravis.*" I

* The proper word is *decapetalum*.—K.R.K.

† Baillon's Natural History of Plants, vol. vi, page 279.

‡ *Hortus Malabaricus*, vol. iv, pp. 55 56, tab. 26.

have found that some English writers say, in translating these words, that the odour is "*heavy*." I do not know whether to an Englishman or to a Briton, I should say, the word "heavy" is capable of conveying the exact sense of the Latin term "*gravis*" when it is made to mean "heavy." Here for a moment I may crave the indulgence of my strictly Botanical reader if I venture to try and determine the meaning of the Latin word "*gravis*" as used by Rheede with reference to the odour of the root bark, or, for the matter of that, the odour of anything whatsoever. I may here state, for the information of such of my readers as do not know Latin, that the Latin adjective "*gravis*," as applied to smell or flavour, means "strong," "unpleasant," or "offensive." The English rendering of it, as used by some in the word "heavy," conveys no meaning. According to the Latin Lexicographer Andrews, to whom, since 1866, I am much under obligation for my limited knowledge of Latin, the term "*gravis*" also means *bitter*. This meaning is implied in the works of M. Terentius Varro, a Roman writer on Husbandry, who flourished in the last century before the Christian era. According to Rheede, the *taste* of the leaves is acrid, but they have no *odour*. It may be noted in passing that the description of both Lindley and Brandis, to the effect that the root of *Alangium Lamarckii* (be it known under any of the synonyms I have detailed above) is *aromatic*, appears to conflict with the description of it given by Rheede. No Latin lexicographer has, so far as I know, given to the Latin word "*gravis*" the English equivalent of "*aromatic*." Here I crave the assistance of better Latin scholars, indifferent and poor as I am in my knowledge of the Latin tongue, which I studied thirty years ago, and of which I am no better master now than I was then. In describing the root Brandis is, in my opinion, more accurate (as he always is in all his Botanical utterances) when he says that the root is aromatic—for I do not think that the odour of the root is in any way "*strong*" or "*unpleasant*"—I can positively say it is not "*offensive*."

With regard to the action of the root on the alimentary canal, Rheede distinctly says it is cathartic. It produces, says he, serous and cathartic discharges from the intestinal canal.* If such is the

* In the original Latin text of Rheede the term "*alvus*" is used, which I think means not only "*the belly*" or "*abdomen*," but also the "*stomach and entrails*." "*Astringere alvum*" (Celsus I, 3) means to "make costive," *i.e.*, to bind the entrails—produce constipation.—K.R.K.

experience of Rheede, and of those indigenous learned writers who gathered for him their ancient knowledge as found prevalent on the Malabar Coast, from whence he wrote in days gone-by, I may say that I cannot but congratulate myself, at the present day, in my own experience as regards the poisonous nature of the root-bark, *nay even the entire root*, on this side of Western India. Rheede wrote in his day, strengthened by the researches of his native co-workers. I am writing in my day with the help of past experience, but without the special help of any co-worker. I wish I had the help to-day that Rheede commanded when he worked on the Malabar Coast. All the more do I express this wish, for I feel that there will be some who will question my taste in including this plant under the "poisonous head." But I fear no contradiction, as I crave for more co-operation in determining the poisonous nature of the root-bark of *Alangium Lamarckii*; and I wish to specially point out a dangerous property in the root-bark which has not been yet experienced or specifically recognized by the recognized writers on Indian Toxicology who have preceded me. Rheede notes that the fruits are seldom eaten. "For," says he, "they heat the blood exceedingly." "Heating the blood" is a popular expression in India, and as I fear Rheede was only copying an expression of those natives of Malabar who helped him in his botanical researches, he has fallen into a popular error which is easily pardonable. Nevertheless such an error is misleading to a student of Pharmacology and Physiology trained in an English or European school in the nineteenth century. I am not yet able to understand what the term "heating the blood" means. Perhaps it is my ignorance, and Rheede in his day knew better. All I can say is that, without the slightest fear of heating their blood, the Thana boys devour the fruit greedily. It is a distinct seasonal treat to them, judging from the avidity with which they devour the ripe fruit. Rheede's native reporters might have represented to him, according to their lights, possibly dim, that their native brethren "seldom ate" the fruit in Malabar. Possibly the tastes of their brethren in Malabar differed from those of my co-inhabitants of Thana. But that does not go to prove that the fruit of *Alangium Lamarckii should be declared* absolutely inedible. In support of *my view regarding* the edible nature of the fruit, I may quote DeCandolle. He says pointedly that the fruits of the entire *N. O.*

Alangiaceæ are edible. Such is my experience ; or rather my recent experience supports DeCandolle's earlier observation. Lindley* observes that the Malays attribute purgative and hydrogogue properties to *Alangium decapetalum* and *Alangium hexapetalum*.

One word more with regard to the edible and non-poisonous nature of the fruit. I can cite two very eminent Botanists who hold the view that the fruit is absolutely free from any poisonous or "blood-heating" properties so-called. Royle repeats the opinion of Lindley that the fruit is edible. Dr. Wight also says that the fruit of the *Alangiums* "is eatable, but not palatable, being mucilaginous and insipid." I may add that Brandis and others state that the fruit has a somewhat sweet and astringent taste. Such is my own experience. "The nucleus," says Rheede, "is *bitter-sweet* ;" I can say that it is so.

It is well worth noticing here that instances of fruits of plants being edible, and on the other hand their roots being emetic, are not unknown. I have distinctly referred to one marked instance given by Mr. W. Bartlett† in one of my former papers in connection with this series (*vide* my paper on *Moringa pterygosperma*, in Vol. ix, p. 168, of this Journal). Mr. Bartlett refers therein to the dangerous sickness caused by eating the root of the French Bean plant.

In detailing the properties of *Alangium decapetalum* (Lam.), classed under *N. O. Alangiaceæ*, Colonel H. Drury observes‡ that "the juice of the root is reckoned anthelmintic and purgative. It is also employed in dropsical cases, and, pulverized, is a reputed antidote in snake-bites." This is a quotation from Roxburgh ; but neither Roxburgh nor Drury mentions specifically whether the root is an antidote to the poison of the "colubrine" or of the "viperine" snakes. Symptoms of poisoning vary in each case, as is well known to those who have devoted special attention to this subject. For years past the term "snake-bite" has been very vaguely used, and passes muster in the eyes of those who would pose as discoverers of a cure for the deadly cobra-bite, *i.e.*, the bite of the genuine *Naja trepudians*.

* Treasury of Botany, vol. i, p. 720.

† Pharmaceutical Journal, vol. ii, p. 721, 1st Series.

‡ The Useful Plants of India : London, 1873, 2nd Ed., p. 24. [Observe that in this work *A. tomentosum* (DeC.), and *A. hexapetalum* (Roxb.) are cited as synonyms.]—K.R.K.

Surgeon-General E. Balfour of Madras also states* that the aromatic roots of *A. decapetalum* [synonyms *A. hexapetalum* (Roxb.), and *A. tomentosum* (Lam., D.C.)] are used by natives in snake-bites. This observation has the same vagueness to which I have just referred above. Surgeon Lee of Mangalore † distinctly says, however, that powder of the bark (40 grains made into a bolus) is given in cases of cobra-poisoning. He is not decided, however, in saying that it is a cure. He remarks that the root is well worth trying in cases of cobra-bite.

The following observations from the writings of Hindu writers may be usefully read in connection with the properties of the plant under notice. According to the quotation from Shiva Datta given by Katâ Bhat of Junagadh (*vide* his compilation entitled "Nighant Sangraha," p. 123), the spine-bearing, white-flowered, red-fruited *species*, or call it *variety*, if you will, has a thick root, which is distinctly cathartic and emetic. In Narhar Pandit's Râj-Nighanta, it is mentioned that the oil expressed from the seed also is cathartic (*vide* p. 84, Benares Edition, 1883). In Madan Pâl's "Nighanta" (Calcutta Edition of Shri Bhuvan Chandra Basu, 1886, p. 13), the plant is supposed to possess hypercathartic properties. In the yet more recent work known to Marathi readers as "Nighanta Ratnâkar,"‡ it is stated in five Sanskrit *shlokas* (stanzas) that the juice of the entire plant is emetic and highly purgative, *i. e.*, productive of watery, alvine discharges. The authorship of the *shlokas* is not declared, but I think we may safely believe that they convey the experience of the ancients. In passing, I may observe that in this work the juice of the plant is credited with the property of curing the poisonous bites of bad snakes, and also those of "dogs, mice, and cats!" Rather a large order this, and of doubtful curative powers. The writer goes further, and credits the juice of the plant with the still more doubtful property of driving the devil (Sanskrit—*Pishâch-pîdâ*) out of human kind! I know no individual of the vegetable kingdom yet that can be said to possess such a quality. The "devil" may be safely said to have it all his own way, in spite of the curative resources of the vegetable kingdom. The "devil's kingdom" is unassailable by the members of the vegetable world.

The "Encyclopædia" of India, vol. i, p. 63; 3rd Ed., London.

† *See* Watt's Dictionary of the Economic Products of India, p. 154, vol. i, 1889, Calcutta.

‡ Published in Bombay in three volumes in 1867 by Vishnu Vasudev Godbole. (*See* pp. 20, 21, vol i.)

The cathartic properties of this plant are also referred to in "Dhanvantari Nighanta" (*vide* p. 60, *shloka* 250, advanced proofs, Edition Ânandâshram Series of Mr. M. C. Apte). So far as I know, Bhâv-Misra does not allude to this plant in his celebrated work entitled "Bhâv-Prakâsh."

Coming to the later indigenous writers of our own generation we have the following information. Jaikisson Indraji maintains distinctly that in large doses the root-bark is emetic, but he adds that it is safe. In this I fear he follows Mooideen Sheriff, and has no special clinical experience of his own to guide him. Dr. Sakharam Arjun does not refer to any of the cathartic or emetic properties of the plant. When he dismisses his note on this plant in his Catalogue of the Bombay Drugs in the brief manner he does, one can gather he had no personal knowledge of the use of the plant. It certainly does not grow in Bombay; and when, in 1882, he saw it with me in the Thana Military Hospital, some years after he had published his Catalogue, he admired the tree immensely—the true lover of beautiful plants he ever was. A younger indigenous writer of the present day is Dr. Virji Zinâ Râval, L. M. and S., of the Bombay University. He notes in his Gujerati work named "Arya Aushadha" (p. 169, 1889, Ahmedabad) that the root is diaphoretic and emetic; for the former purpose smaller doses suffice (1 to 2, *wâls*); for the latter ¼ tola is required.* "As a purgative," says he, "the dose is up to one *wâl*."

To Honorary Surgeon Mooideen Sheriff of Madras is due the credit of having brought to the notice of the profession of our day the emetic properties of the root-bark of *Alangium Lamarckii*. The first reference to this experience of Mooideen Sheriff appears to have been made by Dymock so far back as 1879† in the Pharmaceutical Journal of London. Watt has subsequently referred to the same in his "Dictionary of the Economic Products of India."‡ The emetic properties referred to are mentioned by Mooideen Sheriff in his supplement to the "Pharmacopœia of India." He says that "*the root-bark has proved itself an efficient and safe emetic in doses of fifty grains; in small doses it is*

* A *tola* is 48 *wâls*; a *wâl* is about 4½ or 5 grains.

† Vol. ix, 3rd Series, 1878-79, p. 1017. (The same reference is repeated by Dymock in the "Pharmacographia Indica," *vide* vol. ii, pp. 165-66.—K.R.K.)

‡ *Vide* vol. i, pp. 154-155.

nauseant and febrifuge " (the italics are mine.—K. R. K.). The following quotations, marked (*a*) (*b*) and (*c*) from Watt's " Economic Dictionary " (pages quoted), may be usefully read in connection with Mooideen Sheriff's remark just quoted by me in italics :—

(*a*) " In an official correspondence forwarded by Mooideen Sheriff to the supreme Government regarding the Pharmacopœia of India, Dr. Mooideen Sheriff says further of this drug : 'It possesses the emetic and nauseant properties of ipecacuanha.' " (*b*) " It is a good substitute for ipecacuanha, and proves useful *in all the diseases* * in which the latter is indicated except dysentery." (*c*) " Doses as an emetic from 45 to 50 grains ; as a nauseant, diaphoretic and febrifuge from 6 to 10 grains; and as an alterative tonic from 2 to 5 grains." These points will be referred to later on. There is one observation in Watt's citations in his Dictionary from writers who have helped him in the compilation of his cyclopædiac work, which I cannot pass unnoticed : " Surgeon Joseph Parker, M. D., Poona," as he then was, is a well known brother-officer of the Indian Medical Service, now a Surgeon-Lieutenant-Colonel, and the Medical Storekeeper of Bombay. On the testimony of this officer, not sanctioned by personal experience, as the officer himself candidly says, Watt enters in his dictionary a remark which I think is of doubtful accuracy. It is to the following effect :—" The oil of the root-bark is said to be a useful external application in rheumatism." Should this happen to meet the eye of Surgeon-Lieutenant-Colonel Parker, I should like to know if he is still of the same opinion ; and I should be thankful to know if I am wrong in maintaining the view that, botanically speaking, there is no source for any oil in the structure of either the root or the root-bark. So far as I can ascertain at present, I might say that one might as well " by repeated efforts extract oil from the sea sand" (as the Marathi proverb goes) as expect to get any oil from either the root or root-bark of *Alangium*.

With reference to the quotations (*a*), (*b*) and (*c*) cited above from Mooideen Sheriff, I may dispose of his remarks under (*b*) and (*c*) by saying that they refer to points which I cannot very well discuss in this journal by unnecessarily occupying its pages on purely medical

* The italics are mine.—K.R.K.

and clinical questions. Other journals of a less popular character are open to me for a discussion, which could hardly be expected to be of any importance or use to the readers of this journal. I wish to direct my remarks in the following pages to what I consider the kernel of my observations under the head of *poisonous* properties in the description of this plant.

The chief point, then, that I wish to impress upon the readers of this journal is that, recognizing, as I do fully, the emetic properties of the root-bark, I have sufficient reasons, from personal experience, to be able to say that, although the root-bark may, and does in my experience, prove an efficient substitute for ipecacuanha *as an emetic*, I cannot endorse the opinion of Mooideen Sheriff "*that it is safe in doses of even fifty grains.* I would rather use ipecacuanha as an emetic—certainly not *Alangium* root instead. The officinal dose of ipecacuanha powder as an emetic is 15 to 30 grains. Dr. A. B. Garrod* distinctly says that "in large doses it has considerable power in lowering the circulation." This veteran therapeutist includes the drug amongst those that act as *sedatives on the vessels and capillary system.* Dr. Lauder Brunton says† that "ipecacuanha is one of the drugs which, while it increases the secretion of the lungs and bronchi generally, tends *to lessen the blood-pressure.*" In the earlier portion of his work (p. 219) he says, with regard to *Emetin*, which is the uncrystallized active principle obtained from ipecacuanha, that, "when injected either subcutaneously or into the veins, it produces death by *cardiac paralysis.* It paralyses the vessels first and then the heart, so that the blood-pressure sinks to zero, while each cardiac pulsation is still powerful." Dr. Ringer ‡ says "that in large doses it produces both nausea and vomiting, and, like other emetics, some *general weakness with sweating.*" On the authority of M. Chouppe and Dyce-Duckworth, Dr. Ringer further says that "emetin acts through the terminations of the pneumogastric nerve," and that it "without doubt enters the blood." According to Dr. Ringer, ipecacuanha is a distinct depressant.

Sir Robert Christison, writing so far back as 1845, considers that *emeta* (which is the term he uses for *emetin* of the present day) "is a

* Materia Medica, p. 396, 3rd Ed., 1868.

† Pharmacology, 1885, p. 867.

‡ Therapeutics, 1880, 8th Ed., pp. 406 to 419.

powerful poison. Two grains of the pure alkaloid will kill a dog; and the symptoms are frequent vomiting, followed by sopor and coma, and death in fifteen or twenty-four hours. In the dead body the lungs and stomach are found inflamed. The same effects result from injecting it into a vein, or applying it to a small wound (*Magendie*). It appears then to be a narcotico-acrid. But its irritant properties are so prominent that it might be properly arranged with the vegetable acrids."*

Dr. Alfred S. Taylor, in his work on Poisons,† makes the following remarks regarding *emetin*:—"Pelletier and Magendie found that from 6 to 10 grains of the impure alkaloid given to animals caused violent vomiting, followed by stupor and death in about fifteen minutes. On inspection the alimentary canal was observed to be inflamed."

I should not have deemed it fair to occupy the attention of my readers with such elaborate quotations on the poisonous properties of *emetin* did I not think that the active principle of *Alangium Lamarckii*, from my experience of fifteen years, possesses in a pre-eminent degree the properties of *emetin*, whether as a vascular sedative or as a "narcotico-acrid" as very appropriately termed by Christison. In my experience the root-bark powder of *Alangium Lamarckii*, besides being a sure emetic, has a decidedly more powerfully sedative effect on the human heart and blood vessels. It is besides productive of violent irritation of the mucous coat of the stomach, followed by gastric catarrh lasting many days.

The recent researches of the writers of the "Pharmacographia Indica" (Dymock, Wardell and Hooper‡) have, happily for me, isolated a very bitter non-crystallizable alkaloid, which they have provisionally called *alangine*. It is to be hoped that, now that Dr. Dymock is gone, Dr. Wardell and Mr. Hooper may be able to establish the identity of *Alangine* with *Emetin*. I leave it to other future investigators also of the pharmacological properties of Indian plants to decide this point.

"The bark of Dogwood," a congener of *Alangium*, especially of *Cornus florida*, say Le Maout and DeCaisne,§ "is bitter and astrin-

* A Treatise on Poisons, p. 892, 4th Ed., Edinburgh.

† Ed. of 1848, p. 759.

‡ *Vide* p. 166, vol. ii.

§ Mrs. Hooker's Translation of their General System of Botany, 1873, page 477.

gent, and yields a principle (*Corniine*), which is administered in North America instead of quinine." Note that the recent researches of Sohn term this active principle *Cornin.** It is neutral and bitter, and consists of crystalline silky needles, soluble in water, alcohol, or ether. (*Ann. Chem.*, Ph. 14, 206, &c.) It does not appear to possess any poisonous properties.

The next question I would suggest to future workers in pharmacology is as to whether *alangine* can be classed under the group of *Saponins*,† which in small doses cause symptoms in man "closely resembling the nauseant stage of emesis, that is, a raw feeling in the throat, tendency to cough, and increased secretion of mucus."

To sum up, the result of my experience is that, even although the root-bark of *Alangium* is a safe substitute for ipecacuanha as a mere emetic, as stated by Mooideen Sheriff, it is a more powerful cardiac sedative than ipecacuanha is reputed to be. As compared with ipecacuanha, I think *Alangium* is a tardy and not a prompt emetic. From the very fact that ipecacuanha is a prompt emetic, one may consider it safe, as it does not remain in the stomach, but is discharged from it before a large quantity of it has time to be absorbed by the blood. Emesis being slow in *Alangium*, the root-bark of it has more time to be absorbed by the blood. Hence, probably, its pronounced action on the cardiac inhibitory nerves.

* Dictionary of the Active Principles of Plants : London, 1894, page 45, § 79.

† Schmiedeberg's Pharmacology (translated by Dixon, 1887), page 68.

SOME FURTHER NOTES ON THE GENUS *TERIAS*.

By Capt. E. Y. Watson, Indian Staff Corps.

(*Read before the Bombay Natural History Society on* 14*th Jan.*, 1896.)

In a paper entitled "Notes on the Synonymy of some Species of Indian *Pierinæ*," published in the Society's Journal, vol. viii, page 489, (1894), I stated on page 517 that I was unable to suggest to what species certain forms of *Terias* described under the names *T. sodalis*, *T. contubernalis* and *T. andersonii*, all of Moore, should be assigned, as the forms were not represented in the British Museum, on which collection the paper was based. The above-named forms, together with some others, were described by Mr. Moore in a paper on Butterflies from the Mergui Archipelago, published in the Journal of the Linnæan Society, Zoology, vol. xxi, page 29, (1886), and through the instrumentality of Mr. de Nicéville I have been enabled to examine the actual specimens which were described, which are in the collection of the Indian Museum at Calcutta, in addition to which Mr. de Nicéville has sent me over 500 specimens of *Terias* from his own collection to assist me in working out the affinities of the different forms.

In the present paper I therefore propose to discuss the distinctness of each species mentioned by Mr. Moore, and to try to point out what corrections should be made in their synonymy owing to our recently-acquired knowledge of the seasonal variation which occurs in the genus.

The following are the species mentioned by Mr. Moore:—

"TERIAS FORMOSA, Hubner." This, as I have already pointed out, is a synonym of *T. harina*, Horsfield.

"TERIAS SODALIS, n. sp." In describing this species, Mr. Moore says it differs from typical Javan and Sumatran *T. sari*, Horsfield, in being smaller, and in some slight differences in the markings. However, none of the points of distinction given holds good. Mr. Moore gives the expanse of his *T. sodalis* as from 1·4 to 1·5 inches. I find from actual* measurement of the specimens described

* It is probable my method of measurement is not the same as Mr. Moore's, which would account for the discrepancy between the measurements given by him and by me of the same specimens.

that they vary from 1·4 to 1·7 inches, the female "type" expanding 1·6 inches, while of some twenty Javan and Sumatran specimens of *T. sari* available to me, one expands only 1·1 inches and the remainder vary from 1·5 to 1·9 inches. The only other character of any importance given by Mr. Moore is the relative breadth of the black margins on the upperside, and though, as far as the material goes, Javan and Sumatran specimens are slightly more heavily marked than specimens from Mergui and other parts of Burma, yet this character is so well known to be eminently variable in other species of the genus that it cannot be accepted as specific without the very greatest hesitation. *T. sari* is a very constant and easily recognisable species: it has on the underside only a single wavy line in the discoidal cell of the forewing, in addition to the usual disco-cellular markings, and the whole of the apex widely and evenly chocolate-brown, and also has a more or less diffused dark spot towards the outer angle.

"TERIAS SILHETANA, Wallace." The Mergui specimens are quite typical *T. silhetana*, which can be readily recognised by having three markings in the discoidal cell on the underside, in addition to the marking on the disco-cellular nervules, this being a character found in no other described species of the genus. I may add that, since the publication of my previous paper, Messrs. Davidson and Bell have bred *T. silhetana* at Karwar in the Bombay Presidency, and have obtained all its seasonal forms. They inform me that the caterpillar differs from that of *T. hecabe* in having a black head instead of being uniformly green, and further that it is gregarious in its habits, whereas the caterpillar of *T. hecabe* is solitary.

"T. HECABEOIDES, Ménétriès." The Mergui specimens are typical *T. hecabeoides*, which grades into and is inseparable from *T. hecabe*.

"T. CONTUBERNALIS, n. sp." The Mergui specimens belong to the ordinary dry-season form of *T. hecabe*, which has also been described by Mr. Moore under the names *T. excavata* and *T. simulata*.

"T. PATRUELIS, n. sp." This is also the ordinary dry-season form of *T. hecabe*; it has the dark marginal border on the upperside of the hindwing rather narrower than in *T. contubernalis*, but all the specimens vary *inter se*.

"T. FRATERNA, n. sp." Of the four specimens labelled *T. fraterna* in Mr. Moore's handwriting, one is quite typical *T. hecabeoides*, and the other three are again the ordinary dry-season form of *T. hecabe* and might be equally well arranged under either *T. contubernalis* or *T. patruelis*. Neither *T. fraterna* nor *T. patruelis* has been correctly identified in the British Museum collection, where rather different dry-season forms of *T. hecabe* from North-West India have been identified under these names, as will be seen by a reference to the key to the genus given in my previous paper. This misidentification is, however, of very small importance, as the forms described by Moore and those identified in the British Museum are all nothing more than slight variations in the dry-season form of *T. hecabe*.

"T. MERGUIANA, n. sp." This has also been wrongly identified in the British Museum, where the ordinary rainy-season form of *T. silhetana* is arranged under this name. True *T. merguiana* is a form of *T. hecabe*, with the typical form of which the male type agrees in the markings of the underside, but on the upperside of the forewing the dilatation of the black margin at the outer margin, instead of being squared, has its inner edge inclined obliquely outwards. This is a character also found in *T. silhetana*, as well as in many forms of *T. hecabe*, *e.g.*, *T. swinhoei*. It is curious to note that of the six specimens labelled *T. merguiana* by Mr. Moore, three are without apical markings on the underside of the forewing, while the other three (one of which is the female "type") have these markings more or less developed. *T. merguiana* is the commonest form of *T. hecabe* found in Sumatra, and grades imperceptibly into the typical form.

"T. ANDERSONII, n. sp." This appears to be a quite distinct species; it is the *T. kana* of the British Museum, but not of Moore; it is also therefore the species previously referred to by me as *T. kana*, and is also the species recorded under that name from Sikhim by Mr. de Nicéville, on my identification, in the "Gazetteer of Sikhim," 1894, p. 167, n. 424. I find, on enquiry, that I was mistaken in supposing that the single specimen of this species in the British Museum was labelled "*T. kana* type;" the true type of *T. kana* is now before me, and is referred to below. In *T. andersonii*, as in *T. merguiana*, Mr. Moore allows considerable variation, and if he had treated the

species as he has treated *T. hecabe*, he might easily have made two if not more "species" out of the six specimens of *T. andersonii* in the Indian Museum.

"T. KANA, n. sp." This is another form of *T. hecabe*, differing from those described above in having a broader black margin on the upperside of the hindwing.

I would therefore make the following additions and corrections to my previous paper :—

T. sodalis, Moore, is a synonym of *T. sari*, Horsfield.

T. contubernalis, Moore, is a synonym of *T. hecabe*, Linnæus.

T. merguiana, Moore, is also a synonym of *T. hecabe*, and is not the rainy-season form of *T. silhetana*, Wallace, as identified in the British Museum.

T. kana, Moore, is also a synonym of *T. hecabe*, and is wrongly identified in the British Museum, where *T. andersonii* stands as *T. kana*.

T. andersonii, Moore, is a distinct species, and is the *T. kana* of the British Museum and of my previous paper.

ORNITHOLOGICAL NOTES FROM THE COCOAWATTE ESTATE, LUNUGALA, IN THE PROVINCE OF UVA, CEYLON

By A. L. Butler.

(*Read before the Bombay Natural History Society on* 14*th Jan.*, 1896.)

I venture to hope that the following paper, embodying my observations on ornithology during a year in a district of the province of Uva, Ceylon, may not be altogether without interest to Naturalists.

I have given rather lengthy notes on the breeding of species whose nidification is not described in the second edition of "Nests and Eggs of Indian Birds," such as the Ceylonese hornbill and Layard's woodpecker, and on other such interesting birds as the crested tree swift, the Malabar trogon, the frog-mouth, etc; but I hope my observations will possess sufficient interest to atone to some extent for their length. If one does not depart occasionally from the "very common, breeds, eggs white" style of note, it is almost impossible to make a paper readable. Subsequent workers in Ceylon are immensely indebted to Colonel Legge for his charming book on the birds of the island, which makes the study of its avifauna very easy for them; and the completeness of Colonel Legge's work is such that in the fifteen years since his book was published, only three species have been added to his list—*Asio accipitrinus*, Pallas, a hen-bird from Jaffna, Nov. 1891; *Coturnix coromandelica*, Gmelin, obtained at Colombo in 1883; and *Alcedo beavani*, Wald., procured by Mr. A. P. Green near Dambool in 1892, and subsequently obtained by him in other localities and by myself in this district as noticed in these notes.

The centre from which I write is the Cocoawatte Estate, four miles from Lunugala, in the Uva Province. I have confined my notes to the birds observed and positively identified within a radius of ten miles from the estate, excluding the species I have met with a little further off, and even as it is the total number noticed, 161 species, is a large one, and shows the locality to be very rich in bird-life. The piece of country dealt with slopes down from the district of Madulsima (4,500 ft.) to Lunugala (about 2,500 ft.), and then over two low ranges of hills to the village of Madigama (1,000 ft.), the lowest point alluded to in this paper.

Very briefly speaking, this tract of land consists in the higher parts of jungle and tea estates; then of undulating patna-land and rocky hills covered with Maana-grass, and intersected with jungle dells wherever there is a stream; and lower down of blocks of forest dotted with numerous Kurrakan clearings, large sheets of "lantana" scrub, extensive paddy-fields, and native gardens.

One thing I must remark on is the extraordinary destruction of small birds' eggs which goes on in the jungles. In two cases out of three, a nest left with eggs is empty when revisited next day, and many a good egg I have lost by waiting to secure a complete clutch. The chief offenders appear to me to be squirrels and lizards, and probably jungle-cats, the black kite-eagle, the rat-snake, and the little nocturnal loris do their share of nest-rifling as well.

Nor do the birds fare much better on the open patnas, as the natives always burn these off in the dry weather (just the breeding season) to produce a supply of young grass for their cattle, and among the nest and young of such species as *Francolinus pictus*, *Perdicula asiatica*, *Turnix taigoor*, *Drymœca insularis*, *D. valida*, *etc.*, these extensive fires must work inestimable havoc.

I will now proceed with my notes on the different species of birds observed; it must be remembered that I have only been a year in the district, and my list must of necessity be far from complete.

1. *Circus æruginosus*, Linn., the Marsh Harrier.—Common about the paddy land at Madigama (1,000 feet.) in N.-E. monsoon.

2. *Circus macrurus*, Gmel., the Pale Harrier.—Common all over the district in N.-E. monsoon. Young birds far outnumber adults.

3. *Astur trivirgatus*, Temm., the Crested Goshawk.—Not very common as far as I know. I have only killed a few specimens.

4. *Astur badius*, Gmel., the Indian Goshawk.—I found four nests this season; from one I secured a clutch of three fresh eggs on April 30th; another nest found in May contained three eggs on the point of hatching and useless; the third contained three youngsters in down; the fourth nest was inaccessible.

5. *Neopus malayensis*, Temm., the Black Kite-Eagle.—There are generally one or two of these fine birds sailing about the hills here, but I do not know where they breed. One I killed contained the remains of a bat.

6. *Spizætus ceylonensis*, Gmel., the Ceylon Hawk Eagle.—Have seen it here occasionally, but have not killed one.

7. *Spilornis spilogaster*, Blyth, the Ceylonese Serpent Eagle.—Plentiful ; the commonest eagle in the Ceylon hills, where its squealing cry is one of the most familiar of bird notes. I knew of two nests this year—one was on a single tall tree standing in a sheet of lantana scrub at Madigama (1,000 feet.) This nest was found on May 11th, 1895 ; it was loosely constructed of sticks, with a handful of green leaves under the egg. This was considerably incubated, but made a good specimen. Size $2\frac{1}{2}'' \times 1\frac{15}{16}''$, ground-colour dirty white with a group of rusty-red stains and blotches forming a sort of cap at the small end. The second nest noticed was on one of a scattered group of trees on a steep patna hillside at about 2,500 ft. elevation. A cooly sent to visit it reported two young eaglets ; he said they were quite small, but the nest was empty when revisited a few days later. This nest was also found in May.

8. *Elanus cæruleus*, Desf., the Black-winged Kite.—Resident but not nearly so numerous as on the Uda-Pusselawa side of the province. Never found a nest.

9. *Pernis ptilonorhyncus*, Temm., the Indian Honey Buzzard.—Have seen it here once or twice. Have shot it as high as 5,000 feet in Uda-Pusselawa.

10. *Cerchneis tinnunculus*, Linn., the Common Kestrel.—Common in the N.-E. monsoon.

11. *Ketupa ceylonensis*, Gmel., the Brown Fish Owl.—Fairly common up to 2,500 feet. I was told of a nest about five miles from here this May, but the man I sent to inspect it reported that the young had flown. I have a fine pair of these owls in an aviary, and they are most interesting birds to watch. They bathe every morning regularly, and, as Colonel Legge remarks of *Syrnium indrani*, "put their feathers into trim afterwards by leading them out from base to tip and working them with a quick movement of the under mandible." When angry they spread their wings and ruffle up all their feathers until they look a tremendous size, inflating their white throats until there seems as much of the bird's face below the bill as above it, and all the time growling savagely exactly like a dog, and snapping their bills. This demonstration, however, they are not nearly so much

given to as my live *Glaucidium castanonotum*. Pieces of food too large to bolt they hold up in one foot exactly like a parrot. As Colonel Legge says that, as a rule, owls do not utter their natural calls while in confinement, it may be worth mentioning that this species does so. My pair keep up the "hoom-oh-hoom!" all night, and a wild outsider frequently visits the trees near their cage and joins in!

12. *Scops bakkamuna*, Forster, Forster's Scops Owl.—Fairly common. I hear its "wok-wok" every night, but do not see much of the bird, which seems strictly nocturnal. On May 25th I found a nestling unable to fly in the tea quite close to my bungalow. Where he was hatched I could not make out, as I could find no likely hole in any of the neighbouring trees. I kept the chick for about three weeks, and he seemed to be doing well, but one morning I found him dead. Its call note was different from that of the old birds—a low "ook-ook."

13. *Ninox scutulata*, Raffles, the Brown Hawk Owl.—Common at 2,000 feet; much more so down at Madigama. My collecting coolie shot a male in April, and at the shot a second bird flew out from a hole in the same tree. The hole was empty, but as the testes of the male bird were much enlarged, I suppose they would have laid in it shortly. I have always found this bird very shy. After quitting its place of concealment during the day, it strikes off on a foraging expedition, taking exactly the same line night after night, and stopping to utter its "coo-whoop" on the same trees.

14. *Glaucidium castanonotum*, Blyth, the Chestnut-backed Owl.—Common. Extremely diurnal in its habits, uttering its queer little hoot of "kraw" all through the day. I believe it feeds during the day too, as I once shot one at 11 A.M., which had, I am almost certain, a mouse in its claws. However, it dropped the object in fluttering down through the jungle, and I could not find it to make sure. Previously I thought it lived entirely on insects. But one which I have alive eats birds in such a business-like way (carefully plucking out the wing and tail feathers and then beginning with the brain) that I fancy they must form a regular part of its food. My bird was first pinioned by a shot, and the plucky little fellow was eating meat from my fingers three hours afterwards, and shutting his eyes and bending his head down with apparent pleasure when I scratched it. When alarmed it throws

itself on its back and snaps its bill rapidly. This species is not a shy bird, and walking quietly one can generally get close up to it without difficulty.

15. *Syrnium indrani*, Blyth, the Brown Wood Owl.—Fairly common. Its hoot heard close is "oot-oot-to-whoo," but the two first notes are jerked out in a very low tone and at a very short distance only the "to-whoo" is audible. This species is generally credited with being the "Devil Bird," but I do not think so myself. Whatever the "Devil Bird" is, it is resident in this valley, and, though I hear it nearly every night in the year, all my attempts to shoot or even see it have been in vain, as it always slips quietly off when stalked. The note I have heard is not particularly uncanny, and is evidently what Mr. Mitford described (Tennent's Nat. Hist. of Ceylon, p. 248) as a "magnificent clear shout." I should say "wailing shout" myself. My collecting coolie, who has spent whole nights after it, got close up to it once, but the cartridge missed fire, "proof," as the man said shewing the deeply dented cap, "that it *was* a devil!" He said it was "bigger than my fish-owls;" this, and the fact that the mysterious cry is so loud and powerful, makes me believe that *Bubo nipalensis* is most probably the bird. It can hardly be even a breeding seasonal cry of such a common bird as *Syrnium indrani*, or every one in the island would have heard it again and again. In other districts where *S. indrani* is common I have never heard it, and as I hear the cry here at all times of the year, I take it to be the regular call of some other species, more especially as I seldom hear the ordinary note of the Wood Owl in the particular jungle from which the extraordinary cry usually comes. I hope to shoot the bird some day and settle the question. In my opinion it will turn out to be *Bubo nipalensis*, or, failing that, *Phodilus assimilis*.

16. *Palæornis eupatrius*, Linn., the Alexandrine Parrakeet.—Common at 1,000 feet, above which I have not seen it.

17. *Palæornis cyanocephalus*, Linn., the Blossom-headed Parrakeet.—Very common and ranges up to 5,000 feet. Found a nest with one egg in May, but something destroyed it.

18. *Palæornis calthropæ*, Layard, Layard's Parrakeet.—Very common; took a clutch of four eggs in May (averaging $1\frac{1}{8}'' \times \frac{9}{10}''$), and

found nest with three young on April 23rd. I have heard of five eggs in a clutch.

19. *Loriculus indicus*, Gmel., the Ceylon Lorikeet.—Very common; breeds here from March to June, during which months I took a few clutches of eggs this year. The bird generally makes use of some small natural cavity in a tree, inside which, if the wood is soft, it usually excavates a downward passage from 2 to 4 feet in depth. In all the nests I examined the eggs were laid on a pad about an inch thick, composed of fresh green leaves and halves of leaves torn off lengthwise along the midrib. The eggs are two to three in number, broad dull white ovals, but they soon become marked with faint greenish stains from the juices of the leaves on which they are deposited. Two eggs measure $\frac{3}{4}\frac{1}{0}'' \times \frac{5}{8}''$ and $\frac{3}{4}'' \times \frac{5}{8}''$. I was struck with the rapidity with which the Love-birds passed up and out of their nest passages when alarmed on their eggs. In one case the bird always darted out simultaneously with my tapping the tree with a stick, exactly as if it had been sitting just inside the entrance when disturbed; and yet her eggs were four feet below it down a tunnel about 3 inches in diameter, up which she had to pass to effect her escape. In all cases the trees chosen were rather small ones standing in the open. The nest-holes were 5 to 15 feet from the ground.

20. *Picus mahrattensis*, Lath., the Yellow-fronted Woodpecker.—Not uncommon at 1,000 feet.

21. *Yungipicus gymnophthalmus*, Blyth, the Pigmy Woodpecker.—Fairly common up to 3,500 feet. Always works the branches of trees instead of the trunks like its larger allies.

22. *Chrysocolaptes stricklandi*, Layard, Layard's Woodpecker.—Fairly common from 2,000 feet upwards. I have the following note on its nidification :—Found a nest on January 12th, 1895. Bird flew out as I passed the hole, so close that I could see the whitish bill which distinguishes it from the commoner *B. ceylonus*. The hole was about 3 inches in diameter and 25 feet from the ground, drilled through the hard outer shell of the tree into the softer core, when it descended for about a foot to the egg chamber, which contained one single partially incubated egg lying on the rotten wood. Mr. C. B. Murdoch, who was with me, did the climbing, and did it right well, having to hang on for a long time while he cut out the hole with a pocket knife. The tree would have been beyond me.

There is no record of this egg being taken in "Nests and Eggs," but I conclude from the notes on the nidification of allied species that the bird only lays one egg.

I have since received another single egg of this species taken at Balangoda. Both measured $1\frac{3}{16}'' \times \frac{13}{16}''$.

23. *Chrysophlegma chlorigaster*, Jerd., the Southern Yellow-naped Woodpecker.—Fairly common up to 5,000 feet. Found nest in dead stump with two young on May 2nd.

24. *Brachypternus ceylonus*, Forster, the Red Woodpecker.—Common up to 2,500 feet. Nest with two large young found, October 1st.

25. *Megalæma zeylanica*, Gmel., the Brown-headed Barbet.—Very common, but have failed to get eggs.

26. *Megalæma flavifrons*, Cad., the Yellow-fronted Barbet.—Very common. Have taken its eggs in May and June.

27. *Xantholæma rubricapilla*, Gmel., the Little Ceylon Barbet.—Very common. Procured one egg on the 6th of May, and found several nests with young in same month.

28. *Xantholæma hæmacephala*, Müll., the Crimson-breasted Barbet.—Much scarcer than the other three Barbets, and I have not noticed it above 2,500 feet.

29. *Cuculus sonnerati*, Lath., Sonnerat's Cuckoo.—Rather scarce. A male obtained on November 22nd this year had the testes much enlarged.

30. *Surniculus lugabris*, Horsf., the Drongo Cuckoo.—Was exceedingly plentiful here this year in July and August, after which it almost entirely disappeared.

31. *Coccystes jacobinus*, Bodd., the Pied-crested Cuckoo.—Rather scarce.

32. *Eudynamys honorata*, Linn., the Indian Koel.—Common at 1,000 feet.

33. *Phœnicophaës pyrrhocephalus*, Forster, the Red-faced Malkoha.—Not uncommon up to 2,000 feet. Keeps in small parties and frequents heavy jungle, especially along streams. My five specimens all bore out the sexual difference which Colonel Legge notes, *i. e.*, males had brown and females white eyes. In May my bird-nesting coolie reported that he had found a nest of this bird just

commenced. As it was five miles off in jungle, I sent him again ten days later to report progress before going to examine it myself, and to my disappointment he said it was deserted. He said the nest was only just commenced when he found it—only a dozen or more thin sticks put together in a thorny bush about 10 feet high. He saw one of the birds carry a stick to it, and he knows the species well, so the little information given is probably correct. Colonel Legge does not describe the immature bird of this species, so the following rough description of a young male killed on August 6th may be of interest:—Iris, brown; bill, greyish-green; legs and feet, pale bluish-grey. Instead of the handsome scarlet face of the adult bird the young has only a small bare patch of brick-red skin round the eye, without any of the peculiar papillose growth. The feathers of the crown are edged with dull-grey instead of white as in the old bird, and the markings do not extend down the back of the neck. Tail about 2 inches shorter than in the adult, and with the white tips to central feathers only half an inch deep and tinged with fulvous; while the breadth of the central pair of feathers (across the web placed flat on the rule) is $1\frac{3}{10}$ inches against $1\frac{3}{4}$ inches in the old bird. Chin, and sides of neck and chest, greyish with black centres to the feathers. The black feathers on the throat and chest are more striated with white than in the mature specimen, and the narrow stiff feathers are confined more to the centre of the throat. Abdomen, thighs, and under-tail coverts strongly tinged with fulvous.

34. *Zanclostomus viridirostris*, Jerd., the Green-billed Malkoha.—Not uncommon, but by no means abundant.

35. *Centropus rufipennis*, Ill., the common Coucal.—Very common.

36. *Taccocua leschenaulti*, Less., the Dark-backed Sirkeer.—Fairly common up to 3,000 feet. Have seen as many as five here in a day. Always single or in pairs.

37. *Harpactes fasciatus*, Forster, the Malabar Trogon.—Sannassy, my bird-nesting coolie, who has been carefully trained and is pretty reliable, brought me three eggs on May 7th, which he said belonged to this species. He said that, noticing a likely looking hole in a stump in jungle, he threw a stone up against it, when out flew a trogon hen. The stump was quite rotten; hole about 12 feet up; the entrance was not quite large enough to admit the man's hand, and in enlarging it

he caused the stump to break off with a crash just above the eggs which were left exposed. These were frightfully hardset, live and struggling chicks in all three. The shell, however, of this egg is very thick and strong, so that by making a huge hole in each I got the chicks out, and by patching up the eggs with paper made fair specimens of them. The embryo chicks confirmed the coolie's identification, the trogon feet and broad bills being unmistakable. The eggs are perfect spheres of a very pale buff colour (exactly the tint of a bronze-wing's egg) and very glossy. They were resting on the bare wood. Dimensions $\frac{15}{16}$" × $\frac{15}{16}$".

On the 9th I found another nest. Riding round the work I saw a *H. fasciatus* hen fly out of a dead stump standing in the cocoa, about 20 yards from the jungle boundary. The hole was about 18 feet up ; the stump was in a state of crumbling rottenness, and would have come down with the weight of a baby. However, a strong young jak-tree sapling grew within 3 feet of the stump, and by climbing up this my horse-keeper was able to put his hand into the nest-hole. To my disappointment it contained two young ones, lying on the bare wood only an inch or two below the entrance, which was about 4 inches in diameter, round and even. On the 10th, I concealed myself in a clump of cardamoms and watched the nest with binoculars for an hour, during which time only once did a bird, the male, visit the nest with food. While feeding the young he clung to the lower edge of the hole with his tail pressed against the tree as a support ; he then flew to a tree about 50 yards off, where he sat perfectly motionless with his head drawn in between his shoulders all the remaining time I watched. The hen never put in an appearance at all. The young trogons seem easily satisfied in the way of food ! However, there were only two of them, and the insect brought while I watched was a rather large one—a moth I think.

I heard of another nest of this species in May only about 5 feet from the ground, but as the native who told me of it had caught the female in the hole and curried her and her two eggs, the cause of science was not much advanced in this case.

38. *Anthracoceros coronatus*, Bodd., the Crowned Hornbill.—Not uncommon at 1,000 feet elevation ; in the N.-E. monsoon I have seen it up as high as 2,500 feet. It is extremely wary and hard to shoot.

39. *Tockus cingalensis*, Shaw, the Ceylonese Hornbill.—Very common and occurs up to 4,000 feet. I found a nest on August 25th, 1894. It was in a hole in a small tree (about a foot in diameter) on a patna hillside at edge of jungle. The hole was about 15 feet from the ground; the original diameter of the entrance had been about 6 inches, but it had been reduced by plastering with cement to about 2½ inches. The hole was about 18 inches deep, and contained one large young one which I took. There was no lining of any sort to the cavity; only a few small dried up fruits and berries under the nestling. The old bird betrayed its secret by flying into the tree with a fruit in its bill, but glided off again on finding itself observed, and did not reappear while I was at the nest. The young bird only lived for a week, though it fed greedily on plantains and seemed to be doing well. A description of the nestling may be of interest:—Bill with no trace of serrations; upper mandible greenish-grey at basal half, yellow along culmen and at tip. Feet dusky greenish; eyelid dirty yellow; bare skin round orbit dark flesh-colour. Iris dark bluish-grey with an inner circle of brown. Secondaries and a few feathers on the back edged with fulvous. Plumage otherwise of same colour as in adult. The material employed in plastering up the entrance is a hard and light cement of a dark brown colour, apparently the dried ordure of the bird, as it seems to be composed of disjected seeds and pulp of fruit, with a few minute fragments of green beetle's wings in it. As far as I could see in this case the hole must have been enlarged to release the sitting hen and narrowed again to confine the nestling. Of another nest I have the following note:—April 30th, 1895. This evening saw a hornbill fly into a tall tree in jungle with something in its bill. Sannassy climbed the tree, and then saw the nest hole in the one next to it, about 50 feet from the ground. He climbed across to it by a "jungle rope" which grew between the trees, rather a dangerous performance, and after peering into the hole announced one white egg and a hornbill inside. Had to leave the nest till next morning for want of a chisel. The hole was a mere slit so that the man could not get his hand in beyond the fingers, nor was it narrowed by cement. How on earth the hen bird got in I cannot make out. As the tree was hollow for a long way down there must have been another entrance concealed by the creepers which grew thickly all up the trunk. I revisited the nest next day, and sent Sannassy up with a

light one-hand axe and hammer and chisel. The cutting into the nest took a long time, as he was unable to use the hammer and chisel having to hang on with one hand while he wo rked with the axe-head. At last he got his hand in and reported three eggs. The hen moved further down the cavity and disappeared. The eggs were long ovals of a dull white, much discoloured with brown and greenish stains. They were very hard set. Both birds were absolutely mute during the robbing of their nest. I since obtained two fresh eggs on May 22nd, and a single one on June 6th, this last an extraordinarily lop-sided egg, nowhere near round. It was also unusually small, measuring only $1\frac{6}{10}'' \times 1\frac{1}{4}''$. I sent the others home without noting the dimensions, but they were all much larger.*

40. *Ceryle rudis*, Linn., the Pied Kingfisher.—A female was shot and skinned for me by a Cingalese schoolmaster at Bibile, about ten miles from here, in October this year. I should think its occurrence so near the hills is very uncommon.

41. *Alcedo bengalensis*, Gmel., the Little Indian Kingfisher.—Common. Found a nest in May, but unfortunately cut into it too soon.

42. *Alcedo beavani*, Wald., Beavan's Kingfisher.—Not very uncommon, although it has been overlooked in Ceylon until quite recently. I procured two fine specimens here, both males, on a jungle stream at an elevation of 1,800 feet. They were killed on November 2nd, 1894, and April 12th, 1895 ; I have since *seen* one or two others.

The birds were kindly identified for me by Mr. J. H. Gurney of Norwich, and were exhibited by him at a meeting of the Zoological Society as the first specimens of this species obtained in Ceylon. This, however, was not the case, as I subsequently learned that it was first procured in Ceylon in 1892 in the neighbourhood of Dambool by Mr. A. P. Green of Colombo, to whom the credit of adding it to the Ceylon list is due. He informs me that he has since obtained several specimens of both sexes from various parts of the island, but all at an elevation of less than 2,000 feet.

In Ceylon Beavan's kingfisher frequents lonely forest streams and tanks, and seems shy of the vicinity of paddy-fields with their noisy cultivators and lumbering buffaloes. It is most extraordinary that this bird has been overlooked entirely in Ceylon by previous

*I have since received the measurements of three of these eggs—$1\frac{5}{8}'' \times 1\frac{3}{8}''$, $1\frac{5}{8}'' \times 1\frac{1}{4}''$, $1\frac{3}{4}'' \times 1\frac{1}{4}''$.

collectors. It can only have escaped notice by its resemblance to *Alcedo bengalensis*, causing it to be mistaken for the commoner species.

43. *Pelargopsis gurial*, Pearson, the Indian Stork-billed Kingfisher.—Common ; have seen it as high as 3,500 feet.

44. *Halcyon smyrnensis*, Linn., the White-breasted Kingfisher.—Very common. Took numerous nests in May and June. Five was the largest clutch I obtained ; in several cases four and three eggs were partially incubated, while one nest contained only one young one.

45. *Ceyx tridactyla*, Pall., the Indian three-toed Kingfisher.—Occurs sparingly on lonely streams and water courses here up to 2,000 feet. During the last year I have obtained three beautiful specimens, a male and two females, and seen half a dozen others. A female killed on March 3rd, 1895, would probably have bred in May. To my mind this is the most lovely bird in Ceylon ; flitting down stream in the sunlight it is a very gem of colour. After heavy rain, when the streams it frequents are in "spate," *Ceyx tridactyla* may be occasionally met with in jungle at some distance from water.

46. *Merops philippinus*, Linn., the Blue-tailed Bee-eater.—Very common during the N.-E. monsoon, but almost entirely disappears before the hot months of June to August.

47. *Merops viridis*, Linn., the Green Bee-eater.—Common at 1,000 feet all the year round; never seen it higher.

48. *Merops swinhoei*, Hume, the Chesnut-headed Bee-eater.—Fairly common all the year. On April 19th I noticed a single bird sitting on a tree, and guessing it to be a cock with a hen sitting somewhere near, instituted a search and found a nest hole in a red sandy bank in the tea. This I dug out with my shikar knife, and 4 feet in came upon a female *M. swinhoei*, and five beautiful fresh eggs.

49. *Chætura gigantea*, Temm., the Brown-necked Spine-tail.—I occasionally see a few in this valley after rain, but they always fly high, and I have not procured specimens.

50. *Cypselus melba*, Linn., the Alpine Swift.—Same remarks apply.

51. *Cypselus affinis*, Gray, the Indian Swift.—Always some about after rain, but it does not breed here.

52. *Cypselus batassiensis*, Gray, the Palm Swift.—Very common. I noticed a colony of four or five pairs evidently breeding in the large

fan-shaped leaves of a single tall Palmyra palm at Madigama in April, but I had no opportunity to examine their nests.

53. *Collocalia francica*, Gmel., the Indian Swiftlet.—Very common. A small colony breed annually in a fissure of a precipice near here ; I procured some eggs from this spot on April 22nd. All the nests of this species I have seen have been at least half composed of moss, lichen, etc. Does the bird ever make a nest of saliva only ? All the nests contained two eggs or two young.

54. *Dendrochelidon coronatus*, Tickell, the Indian Crested Swift.—Common. I have the following notes on nests found :—May 1st, 1895. Riding up the steep zig-zag road to Lunugala this morning, I noticed a Tree-swift sitting across a thin dead bough of a tree below me on the hillside. When I returned in the evening it was in exactly the same position. Going closer I saw it was a hen bird. I commenced to climb the tree, and after raising itself very upright and staring at me with its crest straight on end, it flew off and commenced circling round. I climbed to a higher branch, and looking down saw the tiny nest on the side of the bough, quite filled by one long whitish egg. This was a very difficult nest to reach, the branch it was on being very thin and perfectly rotten. I sent up my horse-keeper, who is a light weight, and by holding with one hand to the bough from which I had looked into the nest and resting his feet on a mere twig, he could just touch the edge of the nest with the very tips of his fingers. I told him to come down and get a spoon from the bungalow, but the beggar said, "No, I can get it," and in trying to get hold of the egg between the tips of his fingers he managed to push it over the edge of the tiny nest, and of course it went into fragments on the ground below, to my intense disgust. The remains showed that the egg had been beautifully fresh ; the fragments were pale grey rather than white.

The nest is a tiny shallow semi-circular bracket fixed on one side of the upper surface of the branch, and is composed of small flakes of bark and a few of the bird's own feathers, the whole glued firmly together with saliva. A rupee placed over the nest almost entirely hides it.

Having found one nest of this species I kept a keen look-out for others, and the next day spotted another; but this was quite inaccessible. Three days later I found a third nest. The bird was sitting on it, apparently secreting saliva, and kept bending its head down to apply

it to the sides of the nest. I revisited the spot on May 11th, taking a coil of rope, saw, etc. Sannassy did his duty nobly, and after quite an hour of unsuccessful attempts managed to get hold of the egg by hanging almost head downwards by a rope tied to a bough above. The egg is a long oval, of a pale stone-grey colour. The birds kept flying round the whole time I was at the nest and seemed much excited. On the 24th I found a *fourth* nest, and with some difficulty secured the egg.

The males in this species take a share in incubation, as I several times saw them on the nests. Frequently both birds would settle close together at the side of their nest and caress each other with their bills, uttering a low chattering note. The bird always sits in the same position, *i.e.*, with its head and breast on the same side of the bough as the nest; I mean to say, with its feet on the bough where it forms the inner side of the nest, and its breast bent forward on the egg. The eggs I obtained were pale stone-grey and not "white" as described in "Nests and Eggs of Indian Birds," but they probably fade to almost white in time.

55. *Batrachostomus moniliger*, Layard, the Ceylonese Frog-mouth.—Common. During the year I have been here I have almost every night heard a peculiar nocturnal bird-note, which I always suspected must be that of the frog-mouth, but as the sound always came from heavy jungle, I could never obtain the author of it. However, at last, after many moonlight stalks, Sannassy killed me a beautiful female specimen of this bird in the act of uttering the curious call, and, the identity of the bird with its note once established, though its strictly nocturnal habits and partiality for dense jungle cause it to be very seldom obtained, I have no hesitation in describing it as common—so common that rarely a night passes without my hearing four or five different birds calling in the jungles bordering the estate. Its note is very hard to describe, but somewhat resembles the words "Coorroo! coorroo! coorroo!" uttered very rapidly in a sort of chuckle. The bird pauses for some time between each call, and does not utter its note nearly so frequently as the night-jars. I am sure this bird is not nearly so common at a high elevation as it is below 2,000 feet. I have only once heard it up-country at an elevation of 5,500 feet, and, curiously enough, in the jungle above Ragalla estate in Uda Pusselawa, the exact locality where

Mr. Edwin Watson came across one twenty years ago, as recorded by Colonel Legge.

Colouring of soft parts of my specimen (♀) :—Iris, dull yellow, a very narrow circle as the black pupil is very large ; bill, greenish-brown ; lower mandible, paler ; feet, *yellow* (Legge notes "fleshy grey" ?) ; claws, dusky brown : inside of mouth, pale yellowish-green.

Measurements :—Length, $8\frac{17}{20}''$; wing, $4\frac{1}{8}''$; tail (from vent), $4\frac{1}{4}''$; bill to gape, $1\frac{3}{20}''$; bill across gape, $1\frac{1}{4}''$. The bird was killed on August 26th. The prevailing colour of this bird was a rich rufous-brown. Since writing the above, I was lucky enough to obtain on October 14th a second specimen of this curious bird. Walking round the estate after a heavy night's rain, I noticed a draggled dead frog-mouth lying in a drain. It looked a hopeless rag, but fortunately it was still fresh, and, after washing it bodily under water for some time and then cleaning it with plaster of Paris, I was able to make a beautiful specimen of it. It was in good condition, and the stomach was full of remains of beetles. I fancy it had been killed by the deluge of rain during the night, and I was fortunate in finding it before the ants and the tropical sun had destroyed it. It was a male, a larger bird than the female mentioned above, and plumaged very differently, the general colouring reminding one something of that of the wryneck.

Length, 9″ ; wing, 4·6″ ; tail, 4·25″ ; bill to gape, 1·25″ ; across gape, 1·3″.

Iris, straw-yellow ; pupil, extremely small ; bill, greenish-brown ; lower mandible, paler ; legs and feet, brownish flesh-colour.

It is curious that in the hen-bird, shot dead in bright moonlight, the pupil was greatly dilated, while in the male, picked up dead after a pitch-dark night, it was narrowed to a mere dot.

56. *Caprimulgus kelaarti*, Blyth, Kelaart's Nightjar.—Common. Becomes quite silent in the rains. Its note is "chooker ! chooker !" and I once heard it calling in a jungle at 10 A.M. Never found a nest here, though in Uda Passelawa I once found two pairs of eggs under tea bushes within 20 yards of each other—handsome salmon-pink eggs with purplish-grey marks.

57. *Caprimulgus atripennis*, Jerd., the Jungle Nightjar.—Common. Breeds from May to August, laying its two eggs on the bare

ground near a bush, or under thin lantana scrub. I think there must have been a mistake made in the identification of the eggs sent to Mr. Hume from the Nilghiris and described ("Nests and Eggs," 2nd Ed., Vol. III, p. 47) as having a "pale creamy-pink ground faintly streaked and mottled over almost their entire surface with the palest possible reddish-brown and purple." I have taken many eggs, and they all agree exactly with Colonel Legge's description :—"Buft ground-colour very sparsely spotted with very dark sepia-brown, rather roundish blots." Six eggs average $1\frac{11}{80}'' \times \frac{67}{80}''$. Sannassy declares that he has seen *three* eggs laid by this bird occasionally. I went with him once to visit a nest which he had found with three small chicks the day before, but though the Nightjar rose from the spot when we approached, something or other had apparently taken the young as there were no signs of them.

58. *Corone macrorhynca*, Wagler, the Black Crow.—Very common.

59. *Cissa ornata*, Wagler, the Ceylonese Jay.—Fairly common ; most so in the N.-E. monsoon. Keeps in small parties and sticks to heavy jungle. Feeds a good deal on tree-frogs, and is also very partial to the large *Sphinx* moth caterpillar which infests cinchona trees, to obtain which it ventures out on to estates to some distance from the jungle. A friend told me he had seen its nest in the top of a cinchona tree on Lover's Leap Estate, Newara Eliya, some years ago.

60. *Oriolus melanocephalus*, Linn., the Black-headed Oriole.—Common. Took a clutch of three fresh eggs on May 20th.

61. *Graucalus macii*, Less., the Large Indian Cuckoo-shrike.—Shot a male on September 25th this year.

62. *Pericrocotus flammeus*, Gray, the Orange Minivet.—Common. I found one nest in December, but it was inaccessible. Called "Flame-bird" in Ceylon.

63. *Pericrocotus peregrinus*, Linn., the Little Minivet.—Common. Its beautiful little nest has been often described before, so I only give the dates on which I procured eggs this year—April 4th, and May 12th, two eggs in each nest.

64. *Lalage sykesi*, Strickl., the Black-headed Cuckoo Shrike.—Fairly common. Took a clutch of two eggs on May 5th, and a single egg on May 26th, and found one or two nests with two young about same date.

65. *Tephrodornis pondicerianus*, Gmel., the Common Wood-shrike.—Fairly common. Took a pair of fresh eggs on May 10th, and found a few nests with young later.

66. *Hemipus picatus*, Blyth, the Little Pied Shrike.—Common ; but, though I tried hard, I failed to get eggs. On May 12th, after watching one for some time, I found its nest, a tiny shallow cup covered exteriorly with cobweb, placed on a small dead lichen-covered bough 20 feet from the ground. It contained to my disappointment three very small young, though the bird, on going to the nest, sat on it for some time before I went up, leading me to expect eggs. A very difficult nest to " spot. "

67. *Lanius cristatus*, Linn., the Brown Shrike.—Common in N.-E. monsoon.

68. *Buchanga leucopygialis*, Blyth, the Ceylonese White-bellied Drongo.—Very common ; took a few nests in March, April and May. The eggs—it lays two or three—vary greatly. Some are flesh-coloured with marks of pale grey and pale reddish-brown ; others white with a few large blotches of a deep rusty-red. The nest is placed in a horizontal fork of a bough. The nest described by Colonel Legge as 2¼" in diameter must have been an unusually small one, or else the figure has been misprinted.

69. *Dissemurus paradiseus*, Linn., the Racket-tailed Drongo.—Fairly common about 2,000 feet and downwards.

I have the following notes of nests :—

April 11th.—Started at six this morning to visit the racket-tailed drongo's nest which Sannassy found yesterday. Passed through the village to get a boy to do the climbing ; selected a little fellow who could not have weighed more than 30 lbs. * * * Proceeded up stream for about 1½ miles, wading ; bed of river was about 15 yards broad, a mass of large boulders of rocks, between which the water ran fast and strong. On each side was tall forest, from which came the scale-like call of the spur-fowl and the metallic crow of the jungle-cock ; it was beautifully cool at that hour, and, had it not been for the myriads of leeches which infested the river banks, the morning would have been most enjoyable. As it was, I was soon bleeding from head to foot from scores of irritating punctures. Presently we arrived at the nest. A single sapling grew from a small island of rocks at the

water's edge ; it was about 30 feet high and 3 or 4 inches in diameter at base ; where the nest was, about 20 feet up, it was barely an inch thick. The nest was built in a horizontal fork about 2 feet to the side of the main stem. I sat down on a rock and sent up the boy. At this stage of the proceedings the drongo put in an appearance, scolding angrily. I could easily have shot her, but it was not necessary. The boy got within 4 feet of the nest, and then got frightened at the bending of the tree. However, after a little persuasion and exhibition of some small change, he went on again, and reaching the nest announced "gittera" (eggs). He then brought down in his hand a beauty and went up again, but this time the sapling bent like a fishing rod, and his awkward position caused him to crack one of the two remaining eggs. However, it made a pretty fair specimen. The ground-colour of the eggs was pink, and the markings were lilac-grey and reddish. The nest, which I have before me, is a broad shallow saucer ; foundation of small twigs and roots ; lining of finer roots and vegetable fibre of sorts. There are a few pieces of moss, lichen, and cobweb on the outside. External diameter about 6 inches. The nest was suspended in a fork, and had a long stay of roots and fibres running up the bough for about 10 inches from the inner angle of the fork.

Another nest found on April 20th contained three young.

On the 5th of May the bird whose nest I took as described above had built again in the same tree, and the nest contained one fresh egg. I left it, and revisiting the spot two days later to my disgust found the nest empty. Usual luck. I would have thought the drongo could have kept off lizards and squirrels, the principal egg destroyers, and I do not see what else could have taken the egg, placed as the nest was.

70. *Terpsiphone paradisi*, Linn., the Paradise Flycatcher.—Fairly common at 1,000 feet, immature birds far outnumbering the white males, which I have only noticed in the N.-E. monsoon. This species ranges far higher into the hills than 2,000 feet, above which Colonel Legge did not notice it. I have seen young red birds frequently in the N.-E. monsoon as high as 5,500 feet in Uda Pusselawa and Dimbulla, and Mr. E. V. Carey once told me he had seen a long-tailed white bird at 6,000 feet.

71. *Hypothymis ceylonensis*, Sharpe, the Azure Flycatcher.—Common up to 2,500 feet. Builds a lovely little nest in a fork of a

bush or hanging rope-like creeper, composed of green moss, fibres, tendrils, etc., and decorated with cobweb, small white cocoons and such like. Eggs two to three, fleshy-white with small reddish spots at large end. Seen in the shade in jungle this bird appears a dull greyish-blue and does not look nearly so pretty as it really is, till in a sally on a passing insect it flutters out into a ray of sunshine, when it becomes the "Azure" Flycatcher all over.

72. *Culicicapa ceylonensis*, Sharpe, the Grey-headed Flycatcher.—Common at 4,000 feet, but gets scarce lower down. The nests are little moss watch-pockets, built against a tree or face of a rock. I took one on May 6th with two fresh eggs; though the nest had only been looked at twice and not touched, it was apparently forsaken. I have only known a few nests, but the bird seems to me a shy breeder, deserting readily, although it is otherwise the very tamest of birds. I once watched a pair frequenting a nest quite 50 feet from the ground on the trunk of a huge tree; all the other nests I have seen have been from 10 to 20 feet high.

73. *Rhipidura albifrontata*, Frankl., the White-fronted Fantail.—Common. Breeds from March to May. Nearly always builds a second nest quite close if the first is taken. I watched one pair this year build their pretty little nest, and then, as Mrs. Fantail's expectations were not fulfilled quite as soon as she had anticipated, they occupied the interval in building a second nest on the next tree, which was ready just in time for the event; the first nest was left unused.

I have always found two or three eggs. The nest is a beautiful little cup placed on a single thin branch, made of fine grass and wound round and round outside with cobwebs until it appears quite greyish-white. The birds relieve each other on the nest, as a fantail cannot keep still for long under any circumstances. It is a plucky little bird, and fearlessly attacks any larger species passing too close to its nest. I have seen it go for that black marauder, the Malay eagle, in the most determined way.

There can hardly be a prettier sight than to see this bird fearlessly settling on the head of an old bull buffalo—now balancing itself on the big hairy ear and flirting its tail, till a sudden flap of the ear sends it fluttering up into the air to resettle on one of the horns; now hovering round the great grim face, snapping up an insect here and there, and

occasionally capturing a tiny eye-fly with such a vigorous peck in the great brute's eye as to cause it to shake its head disapprovingly, and send the fantail off in a hurry to the nearest tree ; whence, however, after fidgeting about for a few seconds, it generally drops down again to resume its search for parasites on the buffalo's back and head.

74. *Alseonax latirostris*, Raff., the Brown Flycatcher.—Occurs sparingly in N.-E. monsoon. Habits very like those of the English spotted flycatcher. I have generally found it solitary, but have once or twice noticed it among the gathering of birds that takes place when a flight of winged termites are issuing from their nest hole. Luckless termites ! What with crows, swifts, drongos, brown shrikes, common and green bulbuls, sun-birds, and munias all on the look out, their first flight into open air is generally short ! *Lanius cristatus*, not being a sportsman, stands at the mouth of the hole and nails them as they walk out ; but all the others take them flying, even the little munias (*punctulata*).

75. *Alseonax mattui*, Sharpe, the Rusty Flycatcher.—I obtained a male on November 7th this year. I think I have once or twice seen it before, but am doubtful about it ; the birds might have been only *A. latirostris*.

76. *Stoparola sordida*, Wald., the Ceylonese Blue Flycatcher.—Common, most so at about 4,000 feet. Nests in banks, crevices in trees, etc., from March to May. The nest and eggs are very like an English robin's. I have never found more than two eggs. This flycatcher is very partial to mulberries.

77. *Siphia tickelli*, Sharpe, the Blue Redbreast.—Common. Breeds from April to June. Builds a nest like a robin's in banks or trees at a height of from 2 to 15 feet. Lays generally three, but sometimes only two eggs, of an olive colour, *very* faintly and finely mottled with rufous. I killed the hen-bird of the first nest I found for identification ; the cock at once found another mate, and a second nest was built in the same bank within eight yards of the first one, but the taking of this seemed to shake the birds' faith in the locality and they went elsewhere.

78. *Muscicapa hyperythra*, Cabinis, Nietner's Robin Flycatcher.—Fairly common in N.-E. monsoon, but keeps to a high elevation.

79. *Copsychus saularis*, Linn., the Magpie Robin.—Very common. Breeds from April to July.

80. *Cittocincla macrura*, Gmel., the Long-tailed Robin.—The shama is fairly common here, inhabiting the jungles and wooded dells on the patnas to 3,000 ft. or more. It is a shy bird, and not very easy to shoot if you walk after it, but if you stand still and imitate (however feebly) a few of its trilling notes, a cock-bird will come fluttering through the cover and settle quite close to you. To my mind this is an unrivalled songster. I found a pair building a nest in a hole in a tree in jungle this July, but just as it was ready for eggs a deluge of rain flooded the hole ; and with me shama's eggs are still *desiderata*. Nest was about 40 feet from the ground and similar to magpie robin's.

81. *Thamnobia fulicata*, Linn., the Black Robin.—Common. Breeds from April to September.

82. *Larvivora brunnea*, Hodgson, the Indian Woodchat.—Killed a male here on November 11th. It is certainly scarce in this part of the Province ; as Colonel Legge says, "In the eastern parts of Uva it is not common, the great expanse of patnas below the plateau and the deep valley of Badulla probably proving a barrier to its progress."

83. *Turdus spiloptera*, Blyth, the Spotted Thrush.—Fairly common, but is a shy bird and sticks to jungle. I have taken nests in April, October, and November, so it breeds twice a year, just before and just after the hot season. A shy bird when breeding, and slips off the nest before you are near it. Lays three eggs.

84. *Hypsipetes ganeesa*, Sykes, the Black Bulbul.—Very common. At some times of the year the jungles simply ring with its noisy notes. It lays two eggs only, pinkish-white with claret-coloured and grey spots. May was the only month I found nests. They were from 15 to 25 feet from the ground and pretty well concealed.

85. *Criniger ictericus*, Strickl., the Forest Bulbul.—Fairly common. Breeds in April and May. I found a few nests, but was unfortunate in their containing either young or very hardset eggs. It lays two. I procured three specimens only.

86. *Iaos luteolus*, Less., the White-eyebrowed Bulbul.—Very common. Breeds in May in the lantana bushes and lays two eggs. I have examined a lot of nests, and never saw more than two eggs or young. The majority of eggs *are* exactly like common bulbul's eggs, only more stumpy. I italicize the *are*, as Mr. Hume in "Nests and Eggs," 2nd Ed., Vol. I, p. 190, says they are excessively *unlike*. It

lays two types of eggs, and the *scarcer* one here is what Mr. Hume describes as being "marked with the colour one would get by mixing brown with vermilion." Only one pair out of several answered this description, and there was no doubt as to the identification of all my specimens. But I see Mr. Hume had only two eggs before him when he wrote.

87. *Rubigula melanictera*, Gmel., the Black-headed Bulbul.—Common, but I have failed to find a nest. I shot a hen with a largely developed egg in her in August.

88. *Kelaartia penicillata*, Blyth, the Yellow-eared Bulbul.—I can find no note on this bird's breeding in Legge or "Nests and Eggs." I have found its nest in Dimbulla in April—a large cup of moss and elephant-grass leaves. It contained one fresh egg when I found it, but when I visited it again next day it did not ! And I was unlucky in clumsily breaking an egg sent me from Balangoda this year. The egg is a broad oval, and (I write from memory) of a pinkish ground-colour, marked with rather blurred blotches and streaks of pinky brown. I do not see the bird much below 4,000 feet.

89. *Pycnonotus hæmorrhous*, Gmel., the Madras Bulbul.—Extremely common.

90. *Phillornis jerdoni*, Blyth, the Green Bulbul.—Very common, but never found nest.

91. *Phillornis malabaricus*, Blyth, the Malabar Green Bulbul.—Same applies.

92. *Iora tiphia*, Linn., the Common Bush Bulbul.—Fairly common. Had a pair of eggs sent me this year from Balangoda, but I have never seen a nest myself.

93. *Malacocercus striatus*, Swains.—Fairly numerous ; but I have never seen its nest.

94. *Pomatorhinus melanurus*, Blyth, the Ceylonese Scimitar Babbler.—Common. Makes a domed nest of grass in a bank, something like a large willow-wren's. I took a clutch of three fresh eggs on January 1st, and another of three eggs too hard set to blow in March. Another clutch of three was sent me from Balangoda in May. The eggs are pure white and very glossy.

95. *Dumetia albogularis*, Blyth, the White-throated Wren Warbler.—Common. Have found a few nests between May and September.

All had three eggs. I was deprived of one clutch in a rather peculiar way. I found a nest building, almost on the ground, in long grass. I visited it eight days later and found it replaced by a fresh white ant hill. Kicking it open, I found the ants had used the globular mass of grass as a foundation and imbedded the ill-fated nest in a cone of earth 2 feet high.

96. *Alcippe nigrifrons*, Blyth, the Ceylon Wren Babbler.—Breeds in the rainy season and up to May. It makes three or four nests before it lays in one, so that they are very common in jungle, though almost always empty. Lays two eggs.

97. *Pellorneum fuscicapillum*, Blyth, the Whistling Quaker Thrush.—Very common, but a fearful little skulk and not easy to shoot, as it flutters off through the dense jungle underwood directly it is approached. Colonel Legge recognized it as a common bird by the frequency with which he heard its whistle, which he describes exactly by the words "to meet you," and I believe it is even more numerous than an acquaintance with its whistle would lead one to believe, as, though sometimes it whistles incessantly, I have several times seen three or four pairs in a day without hearing its note once. A male shot on April 4th was in a state of breeding. This bird when shot was clinging to a perpendicular rock like a *Pomatorhinus*.

98. *Pyctorhis nasalis*, Legge, the Black-billed Babbler.—Common. Breeds in May. Builds a cup-shaped nest between stems of maana grass. Lays three eggs, short and broad in shape, white with large blotches of sienna-brown.

99. *Orthotomus sutorius*, Forster, the Indian Tailor-bird.—Common. I have seen its nest in a single leaf of a kind of vegetable-marrow, between two leaves of a large-leaved jat of tea plant, between two coffee leaves, and between quite a *dozen* leaves of cinchona—the broad-leaved *succirubra* variety, in which case the leaves were about four-deep all round the nest. This was at 5,500 feet in the wet weather, so I suppose the object was shelter against rain and wind.

100. *Prinia socialis*, Legge, the Ashy Wren Warbler.—Very common. Breeds here from January to June. Although Colonel Legge says that "nothing can be more un-tailor-bird-like than the nest which it builds in Ceylon," and proceeds to describe the nest as "a shapeless ball of guinea-grass roots *thrown* as it were between the

upright stalks of the plant," I think the type he describes is quite the exception and not the rule. I have seen *dozens* of nests of this bird, and one only answered exactly to Colonel Legge's description, while *all* the others were of the tailor-bird style. It lays almost always three eggs; I have found two hard set; have never seen four in a nest.

101. *Prinia hodgsoni*, Blyth, Hodgson's Wren Warbler.—Fairly common. Have not procured eggs. Breeds about May, as I have seen broods of young in July and August.

102. *Drymœca valida*, Blyth, the Robust Wren Warbler.—Fairly common. Found four nests building in May, but they were all destroyed by patna fires before the birds laid. It builds a domed nest in maana grass near the roots.

103. *Drymœca insularis*, Legge, the White-browed Wren Warbler.—Very common. Have found numbers of nests, mostly in May, but I have seen odd nests all through the year.

104. *Cisticola cursitans*, Blyth, the Common Grass Warbler.—Common in *short* grass or paddy fields, but seems to leave the tall rank-smelling maana grass to *Prinias* and *Drymœcas*. Have found one nest.

105. *Phylloscopus nitidus*, Blyth, the Green Tree Warbler.—Common in N.-E. monsoon.

106. *Parus atriceps*, Horsf., the Grey-backed Titmouse.—Common, but much more so above 2,000 feet than below it. Have found nests with young in April and May, but have not got its eggs.

107. *Dendrophila frontalis*, Horsf., the Blue Nuthatch.—Common In May I saw a pair carrying feathers into a small round hole (probably a little barbet's) in a tall dead stump which was too rotten to climb. The hole was about a foot below the top of the stump, and the Nuthatches always settled on the top and crept downwards into the nest exactly as described by Miss Cockburn in "Nests and Eggs."

108. *Cinnyris lotenius*, Linn., Loten's Sun-bird.—Common. Breeds from April to June. It is extremely fond of building its nest into the deserted web of a species of caterpillar which is common here, and these nests are very hard to detect. It also builds a hanging nest of the usual sun-bird type. One had a train of flakes of bark, some 2 inches long, attached to each other by spider's web, hanging for 14 inches below it. It lays two eggs very little larger than those of *C. zeylonicus;* perhaps, as a rule, of a longer shape and a grayer tint.

109. *Cinnyris zeylonicus*, Linn., the Ceylonese Sun-bird.—Common. Have taken plenty of nests in earlier part of year. I have never seen one built in a caterpillar's web, as *C. lotenius* is so fond of doing.

110. *Dicæum minimum*, Tick., Tickell's Flower-pecker.—Common. Have taken a few of its lovely little pendant pear-shaped nests in April and May. They contained two white eggs, large for the size of the bird, being as large as small eggs of *Munia striata*.

111. *Piprisoma agile*, Blyth, the Thick-billed Flower-pecker.—Not uncommon I think, but as it frequents tall trees in jungle, it is hard to distinguish it for certain from immature sun-birds. I have killed five specimens here.

112. *Zosterops palpebrosa*, Blyth, the Common White-eye.—Very common. Breeds in early part of the year.

113. *Zosterops ceylonensis*, Holdsw., the Ceylonese White-eye.—Common at 4,000 feet and over. Nest and eggs very similar to the common white-eye's. It is fond of building in the *grevillea* trees which are so extensively planted on Ceylon tea estates as belts to break the force of the wind. Coffee trees, too, are often chosen. This species is easily distinguished at a distance from the previous one, as the latter has a yellowish tint in its plumage, which our "peculiar" bird quite lacks. It is also much tamer then *Z. palpebrosa*. I have twice caught it in a butterfly net.

114. *Hirundo rustica*, Linn., the Common Swallow.—Common in N.-E. monsoon.

115. *Hirundo hyperythra*, Layard, the Ceylon Swallow.—Very common, but I have not procured eggs. It builds a good deal under culverts on the roads, and also, I believe, in rocky caves in the hills. A pair built under my bungalow this July. The nest was only two feet from the ground, and was a large martin-like structure which they took a month putting together. My cat, however, took such an absorbing interest in them that they eventually forsook it.

116. *Hirundo javanica*, Sparm., the Bungalow Swallow.—Common. Keeps more to the neighbourhood of houses and factories than the last species, and is very tame, building fearlessly in rooms in daily use.

117. *Passer domesticus*, Linn., the House Sparrow.—Very common of course and just the same cheeky bird in the native bazaars of

Ceylon as in the streets of London. Curiously enough some bungalows never have a sparrow near them—why, I cannot say.

118. *Motacilla melanope*, Pall., the Grey Wagtail.—Common in the N.-E. monsoon.

119. *Budytes viridis*, Blyth, the Grey-headed Wagtail.—Have occasionally seen flocks in the paddy fields at 1,000 feet.

120. *Corydalla rufula*, Kelaart, the Common Pipit.—Common. Breeds from May till September.

121. *Mirafra affinis*, Jerdon, the Madras Bush-lark.—Fairly common at 1,000 feet.

122. *Ploceus philippinus*, Linn., the Common Weaver-bird.—Not uncommon at 1,000 feet and under. Twelve miles further down the Batticaloa cart-road it is common.

123. *Munia kelaarti*, Blyth, the Hill Munia.—Common over 4,000 feet. Breeds in trees at a good height.

124. *Munia punctulata*, Hume, the Spotted Munia.—Common. Breeds in trees all round the bungalow.

125. *Munia striata*, Blyth, the White-backed Munia.—Common. Breeds in the cocoa trees and in long grass. One has got a nest at the present moment in the hole in a stump in which I found a trogon's nest with young, previously alluded to. Is not this a most unusual site for it to select?

126. *Artamus fuscus*, Vieill., the Ashy Wood Swallow.—Common at 1,000 feet, becoming less so up to 3,000 feet, above which I have not noticed it.

127. *Acridotheres melanosternus*, Legge, the Ceylonese Myna.—Very common. Breeds of course in holes of trees; they make capital pets.

128. *Eulabes religiosa*, Jerdon, the Southern Myna.—Very common. Have not obtained eggs. I have not seen *E. ptilogenys* in this district, though I have procured it elsewhere in similar localities.

129. *Pitta coronata*, Hume, the Indian Pitta.—Common at all elevations in N.-E. monsoon. It is curious that it is much more noisy in the low country than in the hills. In Uda Pusselawa I have flushed several in a day, but seldom heard its call. Here at 2,000 feet the peculiar double whistle sounds on all sides at sundown. The *Pitta* frequents the same spot week after week, and is easily caught

under a sieve-trap set near a manure heap to which it resorts ; a fat white coffee-grub proves an irresistable bait. I once kept three in an aviary for some time, but they all died when the time for migration arrived. They got very tame, hopping up to me and taking worms and coffee grubs from my fingers without fear. They seemed rather quarrelsome birds, frequently ruffling up to each other like game-cocks with half-spread wings, thus showing off the brilliant blue shoulder patches.

130. *Palumbus torringtoniæ*, Kel., Lady Torrington's Pigeon.—Not uncommon at any time, but only at all numerous about September and October. Its note is far more like the hoot of an owl than the "coo" of a wood pigeon—a deep guttural "hoom" repeated at intervals. I have one egg, taken by my brother, Mr. C. E. Butler, in Uda Pusselawa on November 11th, 1894. He described the nest as placed in a small tree in jungle about 25 feet from the ground. The egg is similar to, but smaller than, an English wood pigeon's, $1\frac{3}{8}'' \times 1\frac{1}{8}''$. At the present minute I know of a nest being built near here (September 24th). I believe it only lays one egg, as the one my brother took was hard set, and Mr. Bligh mentions frightening a single young one from a nest ; but natives tell me it lays two eggs.

131. *Turtur suratensis*, Blyth, the Spotted Dove.—The common dove here ; very numerous ; breeds in early part of the year.

132. *Chalcophaps indica*, Linn., the Bronze-winged Dove.—Common. I have found its nests in April, July, August, September and October. I think it breeds all the year round. The nests are from 4 to 10 feet from the ground ; the two eggs are pale buff colour, and vary greatly in size. This lovely dove seems to take a pleasure in dashing with lightning speed through the open windows of bungalows and through verandahs. I have more than once known one to fly through my tea-factory when work was going on, entering the door and escaping at the windows on the other side in an instant. What on earth could be the reason of its flying straight at a large building standing right in the open and echoing with the rattle and clank of machinery I do not know. I do not think it can be attracted by the reflection of trees in the windows, as I have never seen it strike a pane.

133. *Carpophaga ænea*, Gray, the Imperial Green Pigeon.—Fairly common occasionally at 1,000 feet.

134. *Osmotreron bicincta*, Jerdon, the Orange-breasted Green Pigeon.—Resident at 1,000 feet. A male killed from a flock on March 3rd was in a state of breeding. In September and October the birds ascend to 2,000 feet or so when certain jungle-trees are fruiting, but I do not think they range higher.

135. *Osmotreron pompadoura*, Gmel., the Pompadour Green Pigeon.—Resident all the year round ; most common in the N.-E. monsoon. Ranges up to 3,000 feet at that season. I found a nest building in June, but the bird never laid.

136. *Gallus lafayetti*, Less., the Ceylon Jungle Fowl.—Common. Breeds chiefly in May and June; at any rate the crow of the old cock is most frequently heard then. The clutches I have taken have always been three to four eggs. The average of eleven now before me is $1\frac{7}{20}'' \times 1\frac{2}{5}''$; the largest measures $2'' \times 1\frac{7}{20}''$; the smallest $1\frac{7}{10}'' \times 1\frac{7}{20}''$. The eggs are generally covered all over with small brown specks, but I have one without any of these, looking exactly like a village hen's egg.

I may mention that on April 21st I found a nest of this bird containing three extremely small abortive eggs without any yolk. They were devoid of spots and had a very rough surface.

Of the stupefying effect which the "nilho" seed is supposed to have on these birds I have had no experience ; but I have twice seen apparently healthy old cocks skulk under a bush and allow themselves to be caught by hand. Whether this was due to intoxication caused by eating "nilho" seeds I cannot say. I should think that Mr. Holdsworth's suggestion that the bird occasionally eats some noxious fungus growing in the same jungles as the "nilho" is probably right.

If the "nilho" seed has any narcotic qualities, it seems strange that it should not affect the bronze-winged doves, which also feed on it greedily, crowding up-country in years when the plant is seeding until the jungles resound with their lowing note.

Colonel Legge says the adult male has the "legs and feet wax yellow ;" I have occasionally shot an old cock with the legs of a dark reddish flesh-colour.

137. *Galloperdix bicalcarata*, Forster, the Ceylon Spur-fowl.—Common, but very shy and almost impossible to shoot without a dog. I find from my notes that I have taken eggs in every month from

March to September. Seven eggs measured average $1\frac{13}{20}'' \times 1\frac{1}{5}''$, and vary considerably from $1\frac{1}{2}''$ to $1\frac{17}{20}''$ in length, by $1\frac{1}{8}''$ to $1\frac{1}{4}''$ in breadth. Most eggs are covered with a profusion of small chalky white specks, but in some these are almost entirely absent. Personally I have not found more than two eggs in a nest, though I have once seen three chicks with a hen. The nests are mere scratchings in the ground in jungle, with only a leaf or two for lining.

138. *Francolinus pictus*, Blyth, the Painted Partridge.—Scarce, and is, in this neighbourhood, unfortunately getting scarcer. The reason is probably partly due to the damage done to its nests and young by the periodical patna fires which I have mentioned, and partly owing to the cock-bird's fatal habit of crowing from the top of a rock or ant-hill. Unfortunately powder and shot are now so cheap that the native no longer restricts himself to deer and pig as formerly, and when once the francolin has given himself away by crowing, the stealthy-footed native gunner finds it easy to stalk him. However, in another part of the province I knew of $4\frac{1}{2}$ brace being bagged by two guns last season in a morning's shooting over dogs.

139. *Perdicula asiatica*, Gould, the Jungle Bush-quail.—Common up to 3,000 feet. A bevy when flushed scatter in all directions, but if you remain quiet after a minute you hear their peculiar ventriloquistic "tirri-tirri-tirri" sounding from all sides; presently it ceases, and if you beat about, up get the whole bevy again as if they had never been dispersed. I have failed to get a nest, but I have seen a hen with a large brood of tiny cheeping chicks in June.

140. *Coturnix chinensis*, Blyth, the Blue-breasted Quail.—Common in suitable, *i. e.*, damp, localities. Not at all a bird of the dry patnas like *T. taigoor* and *P. asiatica*. It breeds in the rank grass growing at the edges of paddy fields, and on the bunds which separate the terraces. I have taken nests in March, April, and May. The largest clutch was *nine*, taken on March 13th; but as two eggs seem rather larger and less speckled than the others, the nest was probably a joint stock concern. The next largest clutch of eggs taken numbered seven. The eggs are olive-brown, finely speckled all over with reddish-brown spots.

141. *Turnix taigoor*, Sykes, the Black-breasted Bustard-quail.—Very common. Have taken nests all the year round; males take part in incubation. Four eggs is the most I have come across in one nest.

142. *Porzana fusca*, Linn., Blyth, the Ruddy Rail.—Have seen it here in the N.-E. monsoon. Could the unidentified rail's eggs noted in the remarks on *H. striata* belong to this bird? The measurements agree well with those Mr. Hume gives for the eggs of this species, and are small for those of *H. striata*.

143. *Hypotænidia striata*, Linn., the Blue-breasted Rail.—Common in suitable spots, but a terrible skulk. Though it has been previously recorded as only a migrant to Ceylon, it is my firm belief that numbers remain and breed in the island, and that three eggs in my possession are those of this bird. They were brought to me at Fort Macdonald in May, 1893, by a native who declared them to belong to this species. The eggs are exact miniatures of those of *E. phœnicura*. This year, on July 1st, two more similar eggs were brought me taken here. They were too cracked to preserve, and contained large rail chicks, covered with black down. What else could they be but *H. striata*? On August 20th this year I watched a pair of these rails feeding in a ditch for some time, and in addition to this, intelligent natives have told me that they often come across its eggs when reaping the paddy. It might very easily escape notice in the breeding season when the paddy is high, especially as sportsmen hardly ever go near the paddy fields after the departure of the snipe. Two of the eggs I refer to measure $1\frac{1}{4}'' \times \frac{7}{8}''$ and $1\frac{1}{8}'' \times \frac{13}{16}''$.

144. *Erythra phœnicura*, Penn., the White-breasted Water Hen.—Common; but have only obtained two eggs.

145. *Gallicrex cinerea*, Gmel., the Water Cock.—Rather scarce. I have met with it a few times at 1,000 feet in N.-E. monsoon, but it is most likely resident all the year.

146. *Rhynchæa capensis*, Linn., the Painted Snipe.—Rather scarce in this part of the province. I have never found a nest, though a pair killed on January 5th this year were obviously breeding.

147. *Gallinago stenura*, Blyth, the Pin-tailed Snipe.—Very common in N.-E. monsoon. The first shot in Ceylon this year was killed on August 31st.

148. *Totanus glareola*, Temm., the Wood Sand-piper.—Very common in N.-E. monsoon.

149. *Totanus ochropus*, Temm., the Green Sand-piper.—Fairly common in N.-E. monsoon.

150. *Tringoides hypoleucus*, Linn., the Common Sand-piper.—Occurs sparingly in N.-E. monsoon. Sticks to streams and rivers in preference to paddy-fields.

151. *Tringa subminuta*, Midd., the Long-toed Stint.—At 1,000 feet a few may generally be seen among the large flocks of Wood sand-pipers which frequent the newly-ploughed paddy fields. I have shot this Stint at Fort Macdonald at an elevation of 3,500 feet.

152. *Charadrius falvus*, Gmel., the Asiatic Golden Plover.—Small parties about the lower-lying paddy fields this December and January, though I did not observe any last year.

153. *Lobivanellus indicus*, Bodd., the Red-wattled Lapwing.—Always a few in the paddy fields at 1,000 feet in N.-E. monsoon.

154. *Sterna anglica*, Montagu, the Gull-billed Tern.—Occasionally ascends to 1,000 feet in large numbers in very wet monsoon weather, feeding on crabs, etc., in the newly ploughed paddy fields.

155. *Dendrocygna javanica*, Holdsw., the Indian Whistling Teal.—Saw a single bird flying round and round a large inundated paddy-field at Madigama this January, the first I have seen here.

156. *Dissura episcopa*, Bodd., Holdsw., the White-necked Stork.—Occurs occasionally in N.-E. monsoon in paddy fields up to 1,000 feet.

157. *Bubulcus coromandus*, Hume, the Cattle Egret.—Very common at 1,000 feet to 2,500 feet. I do not think it breeds near here.

158. *Ardeola grayi*, Holdsw., the Pond Heron.—Same applies.

159. *Ardeiralla cinnamomea*, Gmel., the Chestnut Bittern.—Common; breeds in May, as a female shot then was evidently laying.

160. *Gorsachius melanolophus*, Raffl., the Malay Bittern.—Since these few notes had the honour of being read before the Society, I have procured a beautiful specimen of this scarce Bittern, a male, killed near Bibile some ten miles from here this January. Colonel Legge enumerates nine instances of its occurrence in Ceylon between 1852 and 1877.

This concludes the list of species I have been able to identify during the year. I have also met with a small brownish warbler once or twice in short grass at 2,000 feet or so, which is new to me. It rises at your boots, flutters jerkily for fifteen yards, and then drops like a stone into the grass, and nothing on earth will induce it to show again. It has a broadish tail, and is, I think, brown below as well as above. There is no bird on the Ceylon list which this could be, except *Locustella erthiola* or *Schœnicola platyura*; but *S. platyura* was added to the Ceylon list on the strength of a single skin, history unknown, in the British Museum, labeled "Ceylon: ex Cuming," and no ornithologist in the island has met with it since. I must endeavour to procure a specimen of my bird. The only information I can find on the habits of *S. platyura* applies well to it, though the chances are against its being such a rarity. Whatever it may be, it is from its extraordinarily skulking habits just the bird to be overlooked.

I have also a note of a shrike seen at 1,000 feet in October, but not procured:—"Body greyish, head quite grey with conspicuous black eye stripe; certainly not *L. cristatus*, but about the same size. A pukka *Lanius* of sorts." Would this be *L. lucionensis*, with which I am not familiar?

I have once or twice seen a fine eagle on the wing which I take to be *Spizœtus kelaarti*.

Hydrophasianus chirurgus, I am told, straggles up to 1,000 feet here occasionally, but I have not seen anything of it myself.

REVIEW.

The book before us is a penultimate instalment of the Secretary of State's "Fauna" of India (Birds).*

The first order and family noticed are the broad-bills, which do not occur in the Bombay Province. Then come the woodpeckers, of which we have several, here duly described. One Maratha name for them here given is "Lohar" (smith), which is not as common as the more appropriate "Tokera" (hammerer or pounder), and "Sutar" (carpenter). The latter is given (p. 160) as a name of the Hoopoes. Their commoner and better name is "Sonar" (goldsmith). It distinguishes their light and silent picking action as resembling that of the trade, with its toy-tools falling on precious metals ; commonly almost backed by silent compost.

If the "roll" were not almost unknown to Indian drummers, the woodpeckers would probably have a name from that trade too, as it is one of their favourite bits of music, and not used by any other winged carpenter.

Their relations, the wrynecks, are not found in Bombay, nor is the Indian honey-guide (*indicator*), which has not yet shown anybody any honey.

After these come the barbets. Mr. Blanford restricts the generic name *Megalœma* to species outside our bounds, but allows us two species of *Thereiceryx*, apparently a new name of his own. *Thereiceryx zeylonicus* is now the full style and title of the common Indian green barbet, and we are well rid of *inornata*, unnecessarily distinguished as a species of "the Bombay coast."

The coppersmiths remain *Xantholœma*, but *X. indica* becomes *Hœmatocephala*, an older name and more descriptive. Nothing is added to our knowledge of it.

At this point we come to the order *Anisodactyli*, about whom there has been much difference and discussion, such as would be out of place here. The first of them are the rollers (*Coracias*), commonly called jays from their blue colouring and noisy bustling habits ; but if any one will look at a European jay's wing, the different arrange-

* The "Fauna" of British India, including Ceylon and Burma, published under the authority of the Secretary of State for India in Council, edited by W. T. Blanford. Birds, vol. III, by W. T. Blanford, F.R.S. London : Taylor and Francis. Bombay : Thacker & Co., &c., &c.

ment of its blue surface is easy enough to note. We have the common Indian roller or *Tas*, and occasionally in the cold weather the European roller visits our northern districts, especially Sind. Mr. Blanford only admits lizards to the Indian roller's dinner-table with a "perhaps," but we have seen it eat both lizards and small snakes.

The bee-eaters come next, with no noticeable remark and no serious alteration of nomenclature.

Different is the case of the kingfishers. The pied kingfisher is now finally separated from *Ceryle rudis* as *C. varia*, and contrarywise the little blue kingfisher is united to the European species *Alcedo ispida* for good. The name *bengalensis* is well out of the way and *sindiana* can scarcely be said to have ever been in it. Mr. Blanford gives *Khandu*, *Khandya*, as Maratha names; but in the Konkan the true name is *Dis*. Our great kingfisher, *Pelargopsis gurial*, keeps its place; so does our middle-sized blue kingfisher, *Halcyon smyrnensis*, with the just remark that it is not much of a fisher, living "chiefly on insects and small lizards, and sometimes on mice and land crabs;" the last three pretty strong diet for so small a bird. The next set of birds are the hornbills.

"Fleas are not lobsters," said Sir Joseph Banks (as reported, we think, by Peter Pindar); and "hornbills are not toucans,"* says Mr. Blanford, very truly and very necessarily. It is a reasonable function of this Society to enforce that doctrine, as also that "crocodiles are not alligators," and one or two other dogmas of the sort. The toucan and the alligator are not in India. The hornbills, however, we have, and three in our province, including what is, perhaps, the finest of the lot, *Dichoceros bicornis*, the "garuda" of the Konkans. This living caricature of the Prussian eagle is fairly abundant as far north as the hills under Mahableshvar, and may probably exist north of Bombay in Tungar and such places. Once seen and heard, it is never forgotten. Mr. Blanford quotes a

* "Toucan," Jerdon, 242, says that "this appears to be their name" (*i.e.*, the horn bills,) "in some of the Malayan isles, the word signifying a worker from the noise they make." Now "Tukáng" certainly does mean a workman or "artisan" in Malay (*vide* Marsden's and Elout's dictionaries *sub voce*, but neither gives it as meaning a hornbill, though "Tugáng" means a pheasant; *what* pheasant is not stated. We cannot find "Toucan" in either of two Dutch dictionaries, but the French, Spanish, and Portuguese all give it for the American birds, of whom one conspicuous species is said to have a call like "Túcáno"!

valuable suggestion of Mr. Ogilvie Grant, that the "extraordinary noise made * * * * while flying 'may be' produced by the air rushing between the quills" which are not covered at the base by other feathers, leaving a translucent spot that reminds one of the bull's-eye windows in some moth's wings. Here and on other (white) parts of the plumage one is apt to find a yellow stain, not part of the true coloration, but apparently laid on by the bird itself in the operation of "preening." "The food consists mainly of fruit, but insects and lizards are also eaten" to which we may add snakes. Indeed, any bird or beast that will eat lizards will also eat snakes if small enough, which is fair, because both lizards and snakes will commonly eat birds and their eggs on the same condition. The great hornbill, however, is on the whole much less carnivorous and insectivorous than the great Indian bustard (*Eupodotis*), and is as good for the table, that is, very second-rate game, but quite good enough to be very welcome as a change from tough fowl and goat. He is very much better than the "beefsteak-bird" (white-necked stork), but this delicacy of the past generation is not often found at a modern camp-table. Certain African hornbills are said to eat habitually not only snakes but carrion—low-lived fowls, which condescend to go on the ground; our hornbills will not, under less persuasion than that of an arrow. Their great size and frequent stupidity lay them open to the shafts of the Katkaris of Kolaba, and certainly, with the choice before us, we should choose a rook-rifle for their slaughter rather than a shot-gun. A wounded hornbill will often disappear into the forest in a way extraordinary for so great a bird, moving through the thick tree-tops without noise, and hanging on with a dying clutch, as green pigeons often do.

The extraordinary nidification of these birds is well described and illustrated by a "heading," to which the artist's name might as well have been put. Borrowed plates are fairly acknowledged throughout these volumes. Of our other Bombay hornbills, Jerdon's *Hydrocissa coronata* becomes *Anthracoceros*, and *Meniceros dicornis* (the common grey hornbill) *Lophoceros birostris*. It occurs as far south with us as the neighbourhood of Mahád in sight of Mahabaleshvar, but is not a bird of deep forest. *Anthracoceros coronatus* may be found

in the forests of the same neighbourhood. Something very like it has been seen there, but not brought to bag. It has been reliably reported from the next district—Ratnagiri. Mr. Blanford has well sealed the rejection of the specific name *malabaricus* for another *Anthracoceros*, the Bengal pied hornbill, which is not found in Western India, but seems to represent ours in the North-East and Burma.

Next come the hoopoes, a small sub-order closely allied to the hornbills, having only two families—one confined to Africa and one spread over the warmer parts of the Old World, though it has only one genus, *Upupa*. We have two species—the Indian hoopoe in all our districts out of Sind, and the European bird, a cold weather visitor to all but (perhaps) Kanara. The latter has white marks on its crest; the former none. A good many at least of our native members must be well acquainted with the amusing Semitic legends which connect this northern hoopoe with King Solomon and the Queen of Sheba (Queen Balkis), whose name Mr. Browning makes to rhyme with "just one small kiss"—a false quantity bad enough to make her turn in her grave.

Leaving these pretty and attractive birds, we follow our author to his next order: VI, *Macrochires*, swifts and "goat-suckers" (who do not suck goats). Of the former, our commonest is perhaps the Alpine *Cypselus melba*, "probably, with the exception of the larger species of *Chætura*, the swiftest and most powerful flyer amongst birds." But near Bombay the little palmswifts (*Tachornis*) are more common, and although Mr. Blanford does not report any of the genus *Chætura* (spine-tailed swifts), from our province, we shall probably hear of them in it sooner or later. These wonderful birds are not very easy to observe when in a hurry, nor to catch and identify. Our most talked-of bird in this order is the Edible-nest Swift (*Collocalia fuciphaga*). It is a pity that the chance of getting rid of the specific name has not been taken. It implies that the bird eats sea-weed—which it does not—and so misleading a term was entitled to no more mercy than the specific names embodying errors as to distribution, from several of which Mr. Blanford has delivered us. The nests of this species, by the way, are recorded as inferior to those of *C. innominata*, "second sort nests" in short. Amongst the goat-suckers or night-jars we have several species of *Caprimulgus*; none, as yet

recorded, of *Lyncornis*, nor of *Batrachostomus*. They are not familiar birds to the eye, being night-flyers ; but the note of two species (both of Bombay) is often heard at night and has given them the name of "ice-birds," resembling the sound of "ducks and drakes" made upon the ice by little boys with "chuckie stanes."

The next order is that of the *Trogones* with only one family, and in India only one genus, of which we have only one species, *Harpactes fasciatus*, the "ugly duckling" of a group containing several very highly-coloured birds. The eighth order are the *Coccyges* ; with two families of which we have only one—the *Cuculidæ*. The true cuckoos, who head the list, are well known as perhaps the worst conducted of all birds ; their matrimonial alliances are, at the best, ephemeral, the maternal affections are unknown, and all that a young cuckoo gets from either parent is the inheritance of a hideously unscrupulous talent for throwing his poor little foster-brethren out of their own nest. The fact that such a race of birds exists, and seems likely long to exist, is a distressing proof of the distance by which even the parental instinct of the highest birds is separated from reason. That most birds will try to mob cuckoos is true, but this seems to be due only to their finding the latter skulking about nests, and in some cases to their mistaking the cuckoos for hawks. None of the victims seems to be capable of telling a cuckoo's egg or young from their own, or of resenting the changelings' murderous evictions. Mr. Blanford furnishes one crumb of comfort in the assurance that sometimes two hen-cuckoos lay eggs in one nest of other birds, in which case (the right heirs being first got rid of) the bigger young cuckoo pitches the lesser after them ; so he, at any rate, gets his deserts. He tells us further that one cuckoo did once hatch her own egg and fed her own baby (referring to 'Ibis,' 1889, p. 219). As there is little prospect of her finding imitators, it is recommended to all good men to shoot cuckoos at sight. The eggs, he says, are laid on the ground ; and then conveyed by the mother "in her mouth to the nest (of another bird) selected."

We are cursed with several cuckoos, and firstly with the typical European bird, *Cuculus canorus*. This vermin, indeed, is not commonly found in our province in the breeding season—May and June, but Mr. Blanford shows its occurrence in latitudes as low at that season,

and the present writer has observed and heard it in the late hot weather in the Khandesh Satpuras, where the Bhils knew it familiarly enough to say that its peculiar call was a sign of rain.

As this is a breeding call uttered by the males only, these at least must be supposed to be in season then and there. But local proof of their finding what one can hardly call mates is apparently wanting as yet.

The Indian cuckoo, *C. micropterus*, is also found in our province, but "scarcely anything seems known about the migration and breeding." "Its call is a fine melodious whistle." We have also two "hawk-cuckoos," whose plumage and flight imitate those of hawks. But they are not known to presume, upon this, to put their eggs into hawks' nests. Probably, as their beak and claws are *not* raptorial, the tables would be turned on the young cuckoo who tried to evict a contemporary "eyas," whose beak is nearly as sharp as the mother-hawk's.

But another cuckoo, *Surniculus lugubris*, imitates the common "King-of-the-Crows" (*Dicrurus*), and does seem to profit by this disguise to put off its own eggs upon the latter bird. It is not yet recorded from our province, but will be—probably.

We have two crested cuckoos (*Coccystes*), one of which, *C. jacobinus*, extends into Africa. The other, *C. coromandus*, with chestnut wings, has been once recorded in our province—by Mr. Vidal.

After these come the *Phœnicophainæ*, the most of whom are ground or bush cuckoos of irreproachable domestic manners. But at the head of them—apparently for want of a better place—we find the genus *Eudynamis* (spelt by Jerdon with two "ys"), of which we have one species, the well-known Koil (*E. honorata*).

This horrid bird appears to be created just to show that *something* can be wickeder and slyer than a crow. "Honoured" it is, indeed, by the natives of India, with the support of our author, for its "rich, melodious call-notes." Most Anglo-Indians are rather of the mind of that Griffin who answered to the thousandth shrill question "Who are you?" "I'll jolly soon let you know who I am, with an ounce of snipe-shot, you brute!" This, however, is commonly a vain threat. The koil, indeed, is bold enough in approaching and annoying houses and tents. And this is part of his wickedness; because he knows well that at short ranges his impertinent questions are more piercing and exasperating. But he can hide his black plumage in

the thick and lofty tree-tops that he loves, as well as any of the green birds. And, like most fowl of monotonous notes, he seems, to a man's ear, a bit of a ventriloquist. This is probably an effect of echo, or other deception, as a call-note which led the female bird astray would be of little use. Or, perhaps, the frequent appearance of koils, coppersmiths, and corn-crakes in the place where you did not hear them is due simply to a rapid and silent change of place. Mr. Blanford gives the ordinary note as "kee-il," and another, uttered by the male alone, as "ho-y-o." It is the latter, of course, that gives the bird our Bombay name "Who are you?" There is, however, a third call or noise—an outburst of screaming clatter—which generally accompanies the koil's hurried flight across an open place in frantic flight from a pursuing crow who has forced him out of his tree. Jerdon mentions this, and a fourth "somewhat melodious and rich liquid call and thoroughly *cuculine*." He observes that the female "in general lays one egg only in each crow's nest, and mostly, but not always, destroys the eggs of the crow at the time of depositing her own"—a wise precaution, as the ejection of a young crow older than himself might be no easy job for the changeling. Further he quotes the native belief that "the crow discovers the imposture when the young koil is nearly full-grown and ejects it from the nest, but with dissent for reason given. Mr. Blanford's greater command of evidence helps us here. He does not mention the mother-koil's breaking the crow's eggs, but does say that "not unfrequently two or more koil's eggs may be found in the same nest." When this happens, we can hardly doubt that the strongest changeling evicts his weaker brethren—one of the few cases in which we can have no sympathy with the victim. The natives would give the credit to the old crows. They are slow to admit that a crow can be altogether made a fool of by any bird. But European observation is all to the effect that the crows are just as completely deceived as any other victim of any other cuckoo. And although they may often be seen hunting the male-koil, the female, quieter in colours and notes, seems usually to escape their notice, though she is their real enemy. It may well be that their pursuit of the male furnishes her opportunity for invading their nests. The koil does not seem to victimise any birds but crows. He is one of the "brain-fever birds," perhaps the chief; but the term is vague, and belongs rather to the "Bengal side of the Punkah."

And he is like the true cuckoos, and unlike the true *Phœnicophainæ*, an arboreal bird, using low cover little and the ground less.

From the company of crows and cuckoos we emerge into a clearer ornithomoral atmosphere ; and it is only for convenience' sake that we take the next genus (*Centropus*) a little out of its order. It has four species in India, of which we have one in Bombay, *C. sinensis*. Mr. Blanford has rid us of some unnecessary species, but observes that "those who require a distinct term for the Indian Peninsular bird should call it *C. castanopterus* (Stephens, 1826), and not, as hitherto, *C. rufipennis*." This is the "crow-pheasant" of most writers—a bad name, as it is neither a crow nor a pheasant. The commonest old English name in Bombay, "Malabar Pheasant," is not quite so bad, implying, with a gentle irony, that it was as like a pheasant as anything else in Malabar. Perhaps the best name would be the "Griffin's pheasant." For few of us have put one out of a roadside ditch for the first time without taking it for something "good to kill." Beaters and shikaris, mostly thinking it good to eat, are apt to encourage the idea with "ulterior motives." The best native name is the Maratha one, "Kumbhar-kukada" (Potter-cuckoo), which puts it in the right family and notices its queer mixture of black and red colours like those of an overburnt clay-pot.

Next the "Griffin's pheasant" (before and after him in our book) comes a lot of other *Phœnicophainæ*, for whom we may borrow half a name from the Telugu and call them "parrot-cuckoos." Most of them have the frame and plumage of a short-winged cuckoo, but an arched beak, more or less brightly coloured. They are birds of low cover and of the ground, and of academical interest chiefly.

The parrots constitute Mr. Blanford's ninth order, of which we have only one family and two genera. The second, *Loriculus*, is rather Malayan than Indian, and we have but one species, *L. vernalis*, the loriquet, or dwarf paroquet of the ghâts—a bird not common and apt to escape notice, as it is small, shy, and protectively coloured ; but it has been recorded up "to the latitude of Bombay."

We have taken it first to clear the ground, as the other Indian paroquets need some remarks. "Paroquet," it may be observed, is the best English name to use for them, leaving "parrot" to the short-tailed birds. The first to notice are the Alexandrine paroquets, of which Mr. Blanford enumerates four, careful to observe that they "are

merely races or sub-species of one well-marked form." Oddly enough, he will not allow any of them to be "the true *Palœornis alexandri*," which, he says, is a Javanese species. As the paroquets were introduced into Europe by Alexander the Great's expedition from India, it is a pity that this name should go to where he did not go, only because of a mistake made in the seventeenth century. The conqueror's birds were probably the classifier's *P. nepalensis* and *P. torquatus*, both of which occur on his route. *Palœornis torquatus* is the common rose-ringed paroquet of all the Indian plains, and the Greeks could not have helped seeing it in the Punjab and Sind. *P. nepalensis* is a forest bird, and therefore they may not have seen it wild ; but it was probably a common cage-bird then as now. It and its three races are all characterized by a deep red wing spot, not found on *P. torquatus*. Alexander's men were the first Europeans who saw any parrot. Oddly enough, the Egyptians, who imported a good many birds and beasts from interior Africa, do not seem to have got parrots among them. At least these appear to be unknown on their older monuments. Herodotus is silent as to their occurrence, and Solomon, though he got "apes and peacocks," had no parrots on his bills of lading. Perhaps the parrots had not yet learnt to talk,* or surely sailors would have brought them home, as almost every sailor will now whenever he gets the chance. We have in Bombay both the birds above mentioned, but *P. nepalensis* does not seem to cross the Tapti to the south'ard. It may be represented in North Kanara by *P. eupatria*, a Ceylonese form. There is a third race in the Andamans and a fourth in Burma.

We have also a "blossom-headed paroquet," whose head is coloured like a ripe red plum, with the "bloom" on it. It has a red or orange wing-spot ; but the thing to note is the conspicuous white tip of the chief tail feathers, which distinguishes it, on the wing, from our common paroquet, *P. torquata*. It is also more "jungly" and shyer, especially when breeding. The blue-winged paroquet occurs on the ghât forests up to the Malsej Ghât at least. One must stretch a point "compliment any of the tribe upon their talking, which is very poor compared to that of some African birds ; and their natural screeching is merely a nuisance.

* The East African negroes are said, at this day, to have little taste or talent for taming and teaching animals.

The tenth order, the owls (*Striges*), " form almost as natural an order as the parrots, and occupy, both in external characters and in their anatomy, a position between " them and the true *Accipitres*. So far our author, Jerdon, though he did not give them an order to themselves, points out that they approach, " on the one side, the harriers, which have large ears, a ruff, and noiseless flight, and, on the other side, have some affinity with the parrots," one genus of which, the Australasian *Strigops*, is very owlish in appearance and ways. At least one parrot has, within modern times, become carnivorous ; but its full style and title are not here " convenient." It is a New Zealand bird, and manages to kill sheep by the hideous process of biting a hole through their backs. It may be added, although the authority is not very scientific, that the Katkaris of Kolaba count the " harrier-eagle" (*Spilornis*) to be a sort of owl. Many of the owls are very widely distributed, and the long lists of synonyms attached to their titles show that we have now been rid of a lot of unnecessary species. The first on the list, *Strix flammea*, is a case in point, the Indian " barn-owl " or " screech-owl " being now identified with the European bird. Further thanks are due from it and us to our author for that he has found " a sufficient excuse " for not disguising it as *Aluco*. He points out that several of its Indian names mean " bad bird," or " death-bird," indicating an old and wide-spread superstition. Mr. Swettenham, in a recent book, records a Malay belief respecting another owl (probably *Huhua orientalis*) that its appearance and cry announce the death of a raja ; and probably some idea of the kind is current wherever owls are prevalent. The Maratha name only indicates the bird's cry. It is *Ghubad*, the second syllable *short*. We have only one other Indian *Strix* (*S. candida*), the grass-owl, often put up by quail-shooters. Mr. Blanford denies it to " the Bombay Deccan" and, by exclusion, to our area generally, leaving us another " grass-owl " (*Asio accipitrinus*), which we share with most countries outside the Polar circles. It is worth while here to remark that this is the horned grass-owl ; so, if any Bombay sportsman shoots a grass-owl *without* horns, he is requested to attend to it and inform the editor of this journal. *Asio otus*, the long-eared owl, is found in Sind at times and is even recorded from Cutch. But it is a forest bird properly. We have two " wood-owls " (*Syrnium*) and one fish-owl (*Ketupa*) commonest upon forest rivers.

The great horned owl (*Bubo ignavus*), occurs in Quetta, and may very likely visit Western Sind and Baluchistan as a straggler. Its specific name (sluggard) is ludicrously inappropriate to a bird which can kill hares, crows, and even, it is said, fawns. The rock horned owl (*B. bengalensis*) is common with us, and may often be seen many miles from any rock where river banks are steep enough to serve its turn. The darker *Bubo coromandus* is only allowed to us in Khandesh and "the better-watered parts of Rajputana." But, as the province of Gujarat "comes cranking in" between these localities, the bird may be looked for in any of its north-eastern jungles, in the Panch Mahals, the Mahi and Rewa Kantas, Prantej, Morata, or the Gaekwad's inner dominions.

These are all fine birds, as big and strong as small eagles, and often called "eagle-owls." But perhaps that name would be better kept for the genus *Huhua*, in which the young has "a perfectly distinct plumage, an exceptional case amongst owls," but normal with eagles. *Huhua bengalensis* is found on the Nilgiris and in Malabar, and may very likely extend to our Ghât forests. It "is somewhat diurnal in its habits," but a regular owl in horn and hoot. The great snowy owl is a bird of similar size and anatomy to the last three or four owls, and is necessarily, in its own Arctic regions, a hunter by daylight all summer, when the darkness is short or none. It has once been procured in India at "Mardán" (? Hot-i-Mardán), but can hardly be expected to range into our province.

The next genus is *Scops*, composed of small owls with long horns, quite nocturnal, and chiefly insectivorous. The first has been eased of 15 unnecessary names and united with a European bird, *Scops gin*. The second is a Central Asian bird, *Scops brucei*, and oddly enough is reported in India chiefly from our province, *viz.*, from Ahmednagar and Khed in Ratnagiri, "probably in Western Khandesh," and naturally from Sind and Chaman where it breeds. A matter of some interest is that our own members are the chief witnesses to its Indian appearances, though it has been seen in Oudh and at Gilgit. "Kutruz" is given as a Maratha name. It is odd that so rare a bird should have a Maratha name at all, and probably this is a local name for more owls than one. We have one other of the genus, *Scops bakkamœna*, found all over "the oriental region." The specific name is given as a Singalese one for the brown fish-owl, and probably includes many owls.

After these come the dwarf owls or "owlets." The latter word properly means the young of the larger owls (in dialect, sometimes, the adult birds), and had better be kept for them. The first genus can now well afford to give up a mere conversational name, as Mr. Blanford has restored to them "Boie's peculiarly appropriate generic name *Athene*," of which they had been stripped in favour of certain butterflies. The butterflies' claim was based on "competent false witness," in the shape of a date "1816" on the title-page of a book "not really published until 1823 or 1824."

The alternative generic name for the owls was *Carine*—a pretty word enough, but liable to mispronunciation and having a rather remote meaning, "a lady who sings dirges." In our province these owls do not sing dirges, but chatter prophecies of good luck as well as bad, as shown in a pretty story in "Old Deccan Days." They are called Pingale. Oddly enough, so is the pied king-fisher, *Ceryle varia*, by the Kolaba Kolis. *Athene brama* is the common species; *A. blewitti*, a rare forest species; least rare, apparently, "at the foot of the Satpuras in North-Western Khandesh, where three specimens out of five recorded were obtained by Mr. Davidson. A third, *Athene bactriana*, is a Central Asian form, "a local race of *A. glaux*, which again is merely the eastern desert form of the South European *A. noctua*."* It is found in our limits in Baluchistan. Another dwarf genus is *Glaucidium*, of which we have one species, *G. radiatum*, a forest bird. The dwarf owls have no horns, very little "facial disk" and ruff. They are, if not fond of broad daylight, at least quite ready to come out well before sunset, but do most of their hunting after it.

The last of the Order are the hawk-owls (*Ninox*). We have one, *N. scutellata*, a forest bird. The ruff and "facial disk" are "quite obsolete" (*i.e.*, it has none), whence, in part, its hawk-like appearance and name. But it is still "chiefly nocturnal." It is rather smaller than (to name a well-known bird) the *Turumti* (*Æsalon chicquera*), and accordingly lives much on insects, which it hawks on the wing, but also on mice and lizards. Here ends the order of owls.

(*To be continued.*)

* *A. noctua* is supposed to have been the owl of Pallas Athene and therefore, like our Pingale, a bird of counsel rather than of ill-omen. The Egyptians paid no respect to it, though the "white and horned owl" appear on the monuments, and one of them is an hieroglyphic bird, standing for M.

MISCELLANEOUS NOTES.

No. I.—THE GIANT ORCHIS.

The Giant Orchis, *Habenaria Susannæ*, Brown,—*Platanthera Susannæ* Lindley,—Natural Order, *Orchideæ*, according to Dalzell and Gibson, the authors of the "Bombay Flora," occurs in the "Concans and Ghauts in several places, but nowhere abundant." The Honourable Mr. Birdwood, in his "Catalogue of the Flora of Matheran and Mahableshwar," says that "only one plant of this splendid orchis has been found by Dr. Cooke at Mahableshwar, and only one at Matheran." From my own experience of the Bor Ghaut range, I find that, though the Giant Orchis is commonly reported to be rare and nowhere abundant, it is certainly plentiful on the Bhoma Hill at Khandala, from which place the plant does not seem to have been recorded before.

On the Bor Ghaut the plant appears to grow towards the end of June or the beginning of July, and begins to flower about the middle of September. After the flowering is over and the fruiting is finished, the plant with the parent root-tuber gradually shrivels up and is ultimately withered in December or January, leaving in the ground a healthy young root-tuber crowned by a well-developed bud, from which the flowering-stem shoots up afresh the following season. In the axil of the lowest leaf of this bud there is always a minute bud in a rudimentary state. While the older parent root-tuber is withering away, the rudimentary bud continues to grow and finally swells out in the next season into a young bud-tuber, which, in its turn, becomes the parent of a new flowering-stem.

Sir Joseph Hooker gives the height of the stem from two to four feet. At Khandala, however, the plant attains a height of a little less than two to almost five feet.

The Marathi name of the plant is *Wágh-chaorá*, meaning the metacarpus of the tiger's foot. Among the Kathkaris, Thakurs, and other Marathi-speaking people living on the Bor Ghaut, the root-tuber of the Giant Orchis is believed to be a sovereign remedy for the cure of blebs or bullæ, especially those occurring on the metacarpus or the palm of the hand. These blebs or bullæ, on account of their supposed resemblance to the raised metacarpus of the tiger's foot, are known as *Wágh-chaorá* in the Deccan. Hence the vernacular name of the plant. There are some persons who believe that the plant is called *Wagh-chaorá* because the flower looks like the claws or jaws of a tiger.

R. M. DIXON, B.A.

BOMBAY, *January*, 1896.

No. II.—A LEPORINE MONSTROSITY.

One morning about three years ago some coolies told me that the day before on their way to work, they had come suddenly round a corner upon a hawk on

a stump, and that the bird, on taking wing, had dropped from its claws a leveret with eight legs. At my order they went and fetched it to me, but it was so decomposed—hair all slipping off—that I did not preserve it.

The leveret was a *Lepus nigricollis* about three or four days old, and a curious monstrosity. The head and fore legs were as usual, but at the shoulders the leveret divided in a V into two bodies, each with a pair of hind legs and tail, while between the shoulders, at the junction of the two bodies, an extra pair of fore legs stuck up straight into the air, making eight legs in all. I believe such monstrosities are much more uncommon among wild creatures than domesticated animals, so perhaps this instance may be worth recording. The hawk was most probably *Spilornis spilogaster*.

A. L. BUTLER.

COCOAWATTE, CEYLON, *November*, 1895.

No. III.—BISON IN THE KAMPTEE CANTONMENT LIMITS.

Considerable excitement was caused on the 18th October, 1895, owing to the appearance of a fine pair of Bull Bisons on the Rifle Range here, well within the Cantonment limits, and at a time when a party of the 12th Bombay Infantry, under a European officer, were at musketry practice. I may add that there are those who say there were three seen and others four. However it is certain there were two.

They came within 200 yards of the party and about half a mile from the Railway station.

The following items of information regarding this hitherto unknown event were supplied to me by a native gentleman who, at my instigation, gleaned all the information available regarding them. I give it in his own words, which are not entirely destitute of unintentional humour: "When they were observed by the musketry party, a havildar asked permission to fire at them but was not allowed to do so. They then appear to have been observed by the Railway officials, who were joined by a crowd, and then appear to have gone towards them ; but no one then appears to have fired at them. The musketry now being over, the havildar who first noticed them appeared on the scene, and in the meanwhile one of the beasts made off towards a village called Anjini, whilst its fellow came towards the crowd, causing a great confusion. The Havildar being a little in advance of the rest, the Bhaisa (Bison) chased him, but he succeeded in avoiding its attack by returning to the assembled throng of people. The brute then went and sat down near the Railway fencing. The havildar then climbed up the nearest tree, together with another naik of the same regiment and one Mr. Brown, and fired at the beast with a gun lent to him by the Station Master, wounding it in the right shoulder. Mr. Brown also fired, but missed and retired. The Bison therefore grew furious and crossed both Railway fencings and proceeded towards the Bazaar shortly pursued by the havildar, who again fired at him a second time,

wounding it on the same shoulder. It then fell, and as it was rising up, it was again fired upon and this time the animal was struck upon the forehead and settled. Subsequently a regular volley was discharged at the disabled animal by the Railway staff, so that it is not possible to say who dealt the fatal blow."

The head is in my possession, and the measurements are 30″ from base to tip outside the curve, 16″ round the base of the horn.

S. BANKS, Brigade-Surgn.-Lieut.-Col.

KAMPTEE, C.P., *November*, 1895.

No. IV.—RED ANTS AS SMELLING SALTS.

Looking through a back number of the journal, I see E. H. A. records the jungle people in the Canara District eating red ants! (Vol. IV, p. 153).

The Tamil coolies here use them as *Smelling Salts!* I don't know whether the practice is common in India; anyhow it may be worth noting. The *modus operandi* is to go up to a nest in a bush, seize it with both hands, rub ants and nest together violently between the palms and then take a few good long sniffs of the strong ammonia-like fumes which rise from the mass of crushed and bruised insects.

I am told this instantly relieves a severe cold in the head if the sufferer has no objection to a few dozen of the more active ants burying their mandibles in various parts of his person while he is sniffing at the remains of their community!

I should object to this myself, so I cannot speak with authority as to the efficacy of the remedy.

A. L. BUTLER.

COCOAWATTE, CEYLON, *December*, 1895.

No. V.—THE FOOD OF THE MUSK-RAT.

Three or four times lately I have been disturbed at night by the cries of a bull-frog. I concluded that a snake was making a late supper, and, as I do not care about such company so close to the bungalow, I got up and, armed with a stick and a lantern, proceeded to hunt for it. On each occasion, however, it turned out to be a musk-rat, and not a snake, that had caught the frog, and I was much surprised to see the determined and savage way in which the attack was made. In one case I separated the frog and its assailant with a stick, but the moment the stick was withdrawn the latter actually ran over my feet in its eagerness to catch the frog again and, having caught it, proceeded to punish it frightfully, biting it about the head and back. I again separated them, and this time the frog managed to hide itself; and, when I returned to bed some minutes later, I left the rat still quartering the ground in the hopes of finding the frog again. On the other occasion, when they were not separated, the musk-rat, after some time, apparently succeeded in killing its victim

and dragged it ignominiously away, with the hind legs trailing limply behind, to a hole in the wall or fernery, where, I presume, the musk-rat ate the frog. I send this in case it may be of interest, and may elicit some further information regarding the food of the musk-rat and its methods of obtaining it.

G. K. WASEY.

MARMAGAO, 15*th January*, 1896.

No. VI.—FIELD NOTES FROM CUTCH.

On the 26th December last, while out on ten days' leave in the northern part of Cutch, along the south shore of the great Rann, I was all day after Chinkara, and succeeded in bagging a good head of exactly 12 inches. On returning to camp at the village of D., and just as the sun was going down, my shikari spied a wolf trotting through some reeds in a half-dried salt marsh, evidently on its way to get a drink, and about 100 yards ahead of our cart. I got out quickly and loaded my rifle. Suddenly the wolf wheeled right round and went off at a tremendous pace. At first I thought she (it turned out to be a gaunt female) was bolting at sight of us, but my shikari said, "No Sahib, she is after a hare." I stopped the cart and stood upon it, thus getting a good view of as fine a chase as I have ever seen. A grey-hound, a good dog to boot, would have been utterly out of it both with regard to speed and turning powers. The wolf headed the hare almost immediately and kept on heading and turning it until it must have got quite sick from giddiness. Then they disappeared behind a jhâs bush at the edge of a field on the left side of the cart track about 200 yards ahead of us. I waited a minute or two, expecting to see them re-appear the other side of the hedge, but, as they did not come into view, I proceeded quietly to the place where I had seen them disappear. On arriving within a few yards, the shikari said, "There it is, eating the hare; come this way, Sahib." I went round to the field side of the bush and then caught a glimpse of the beast feeding ravenously. On seeing me, it ran through the bush and came out again on the cart-track. I was round in the twinkling of an eye and on my knee when out came the wolf, trotting majestically and showing its teeth, about 30 paces off. Taking a fine sight below the shoulder, I fired, and hit her through the lower portion of the ear, the bullet traversing the skull and coming out of the right eye. The skull was smashed to pieces, and after a few kicks she lay still. We went to the place where she had caught the hare and found not a morsel left. When she was cut open and skinned next day, the mangled remains of the hare, which had evidently only been chawed up a bit and then bolted, were found. The whole chase only lasted three or four minutes, and the brute was swallowing its well-earned meat within fifty yards of a Kunbi working in his field, who, with the usual apathy of his race, took no interest whatever in the proceedings. Wolves are very plentiful and destructive this year in Cutch, and it is difficult to mark

them down, the country which they infest being for the most part a barren rocky desert. On the 27th we shot the big nala, well known to everybody who has shot there as a first-rate ground for duck and snipe. While waiting behind a large screen of reeds for the duck to be driven overhead, I saw a flight of a dozen common starling (*Sturnus vulgaris*) pass over my head. The nala contained a good many gadwall, wigeon, and teal, also a few mallard and spotbill, but the birds were so wild that we did not bring many to bag, and snipe-shooting was very trying owing to the immense number of swallows and martins flying about, which quite put one off. The nala is a veritable Irish bog, and woe betide the man who failed to put his foot (contrary to what we would do in Ireland though) on the greenest of grass tussocks. This makes the snipe-shooting still more difficult, as the wily bird always manages to get up when you have to leap from one tussock to another and have lowered your hammers to half-cock, or put your safety bolt at "safe." Grey lag geese, though never plentifully scattered in Cutch, were found in places where I have never seen them before. The avocet (*Avocetta recurvirostra*) is very plentiful this year. I have never seen it before, nor is it recorded in the "Birds of Cutch." Spotted sand grouse (*P. senigallus*) are very plentiful. It is extraordinary how some men—keen shikaris—will persist in calling this bird the "Pintailed grouse," to which it bears no resemblance whatever; simply because it has a pinnated tail I suppose. The true painted grouse (*P. alcheta*) does not occur at all here. *P. arenarius* (the "Imperial" as we call it) is not numerous this year owing to the poor rains and lack of food in the fallow fields.

The shooting here is, however, not equal to that of Kathiawar, but it is strictly preserved and no one may shoot without His Highness' permission. A strict close season is observed for all game except florican, rain-quail and sand grouse (*P. exustus*) from the 15th March to the 15th September. I have also to record the occurrence of *Falco babylonicus* (the Red-cap falcon), which has hitherto only been recorded from Sind. Two were shot by His Highness, whose shikaris said they were "shahin" (*Falco peregrinator*), but I identified them from Hume's description of a female shot by him, which he recorded in "Rough Notes," an extract from which appears in Barnes' "Birds of Bombay." The birds sent me tallied exactly with that description of *F. babylonicus*, but differed somewhat from Jerdon's.

His Highness the Rao tried to introduce the Somali guinea-fowl (common blue-headed sort) into his oreserves at Godsar, some four miles from Bhuj, and turned several couple loose. Eggs were found (broken), but none of the birds have been seen for some time, and I fear they must have been destroyed, as wild cats of three species—jackals, mungooses, and foxes—are very abundant, and the birds must have become particularly tame after some weeks in confinement. Grain used to be thrown out for them at a certain spot, but after a time they gave up coming. The Somali spur-fowl (a Francolin of sorts) was also tried,

but the birds died before they could be let loose. Cutch is very suitable for several species of N. African Antelopes—*G. sommeringii*, *Oryx beisa* and *G. walleri*, and I am sure His Highness would be very pleased to receive any of the above and have them turned loose in some of his preserves. The two oryx—male and female—which I gave him in 1891 unfortunately died through over-feeding on the part of their keeper, who gave them oil-cake and goor of all things, and allowed them little or no exercise. They were eight months old when I brought them from Aden, and I had brought them up from calves of one month and two days respectively. They were very tame, but the bull was beginning to have the use of his horns.

Any that might be sent here for acclimatisation trial would be let loose at once in the preserves after the former experience.

C. D. LESTER, LIEUT., 17*th Bo. Infy.*

BHUJ, *January*, 1896.

No. VII.—NOTE ON *VIRACHOLA PERSE*, HEWITSON, A LYCÆNID BUTTERFLY.

Having lately reared several larvæ of *Virachola perse*, Hewitson, for the purpose of investigating the action of the ants attendant upon them, I now give an account of my observations, which, although very incomplete, may serve as a stepping-stone to further researches, if not as an explanation of the several rather conflicting accounts upon the subject.* In the first batch of larvæ I obtained on the Fagoo Tea Estate, British Bhutan, at 2,500 feet elevation, in June, 1895, the larvæ were about half-grown, and feeding on the interior of the fruit of wild pomegranates. In every case one larva occupied a fruit to itself, with one exception only, in which the fruit was inhabited by a half-grown larva, and was bored near the apex by a very small larva. The small larva, however, soon left the larger in full possession, and sought a fruit for itself. Some of these half-grown larvæ were attended by a black ant of slow movements with extremely flattened head and abdomen. As the hole made by the larva in the fruit was the same size as its anal scutate segment and that segment only was exposed, only two ants at most were found attendant upon the larva. The excrement of the larva, which would otherwise have filled up the hole, was presumably removed by the ants in order to allow themselves entrance. Although I never happened to observe this operation, still it is probable that it was so, as I occasionally found the hole filled with excrement, the attendant ants being on the outside of the fruit, and soon after found the passage cleared and the ants busied on the exposed segment of the larva. Of course, it is quite possible that the larva itself removed the stoppage by backing, as it must have done where no attendant ants were found. In the earlier stages the larvæ seem in a particularly unsettled state, residing in the interior of one fruit for a few days only, and then beginning on another.

**Vide* de Nicéville's and Aitken's notes in "The Butterflies of India, Burmah and Ceylon," vol. iii, pp. 481, 482 (1890).

They are occasionally found on the outside of the fruit for a few hours, but I am of opinion that they do not remain outside for any great length of time, except in the case of injury, when they prefer to come outside to die. After this first batch of larvæ had been in captivity for two or three days, the black ants disappeared, and their places were taken by a far greater number of a smaller species of red ant, found commonly about every building and living in the crevices of window and door frames. I now removed a larva from its habitation in order to watch the operations of the ants more closely. On the example taken there were five ants, three of which seemed to wander about the anterior segments, and two paid close attention to the scutate anal segment. I noticed that those on the anterior segments did not seem to be doing anything in particular, only occasionally touching the back of the larva with their antennæ, and sometimes combing the same through their mandibles. These may have been taking up some of the fermented juice of the fruit from the larva's back and eating it, but there could be no certainty on the point, and the antennæ of those observed were only cleaned in this way at long intervals. The other two ants seemed in a far more excited state, and often ran to the upper part of the scutate segment, and continued for some time to keep up a sharp vibration of their antennæ, the tip of each of which alternately struck the larva. I noticed at that time that there was a depression in the segment between the points where the antennæ of the ant struck the skin, but I did not observe any moisture exuding from it, or did the ant, on any occasion of my observation, place its mouth in contact with the depression. These two ants seemed to be constantly attracted to the same place, and went through the same performance many times. I also noticed that on each side of the scutate segment there was an obliquely placed oval orifice which seemed to be of the same formation as the breathing apertures on the other segments, but that, instead of being dark coloured with a shiny dark margin, it was pale buff with a margin of the same colour. I am nearly certain that these are merely breathing apertures or spiracles and have no relation to these tentacle-bearing apertures which are found on the penultimate segments of other *Lycœnidœ*. My chief reason for holding this view is because, when the larva has buried itself wholly in the fruit, its breathing powers by the lateral spiracles would be extremely hampered if not altogether stopped, but the presence of these two spiracles on the scutate exposed segment enable it to breath with facility. There are no other similar apertures in the segment. It is possible that these may be the apertures mistaken by Mr. F. E. Pargiter in the case of the very closely allied *Virachola isocrates*, Fabricius (*vide* Butt. of India, vol. iii, p. 481) for tentacle-bearing ones. This larva was then allowed access to the broken fruit from which it had been taken, but it preferred to begin on a fresh fruit.

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

FAGOO, BRITISH BHUTAN, *September*, 1895.

No. VIII.—NOTE ON *LEHERA ERYX*, LINNÆUS, A LYCÆNID BUTTERFLY.

The larva of *Lehera eryx*, Linnæus, is curiously similar to that of *Virachola perse*, Hewitson, with which I found it ; its habits are also identical. The only differences noted were as follows :—

Whereas in *V. perse* the medial segments were a deep red-brown, and the three anterior and three posterior segments ochreous, the medial ones in *L. eryx* were more purplish in tint (inclining to indigo when undergoing the pupal change), and the anterior segments more orange than ochreous. The last pair of breathing apertures in *V. perse* were pale buff (the others being black), but those of *L. eryx* were the same colour as the other lateral ones, *viz.*, black with shiny black rims. Both larvæ had a quadrate buff patch occupying the central dorsal portion of the two medial segments, but in *L. eryx* the patch was rather smaller and paler than that of *V. perse*.

On 20th June, 1895, at Fagoo, 2,500 feet, British Bhutan, I found eleven pupæ of *Lehera eryx*, Linnæus, in the interior of the fruit of the wild pomegranate. They were enclosed in precisely the same manner as those of *Virachola perse*, Hewitson, which feeds on the fruit of the same plant. Out of these pupæ only one had the opening in the side of the fruit closed with a web, the rest being quite open, and, as the fruit was in all cases in a rotten condition, it was also occupied by small dipterous (fly) larvæ, and *Coleoptera* (beetles), in two or three cases with a very small ant which did not *attack* the pupæ, but I cannot see what use they could be to this insect as they are to other lycænids. The pupa is robust, reddish-brown mottled with fuscous, especially on the back and sides. In some specimens the first two abdominal segments were dorsally yellowish. The butterflies commenced to emerge within a week after I found the pupæ.

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

FAGOO, BRITISH BHUTAN, *September*, 1895.

PROCEEDINGS

OF THE MEETING HELD ON 14TH JANUARY, 1896.

A meeting of the members of the Society took place on Tuesday, the 14th January, 1896, the Hon. Mr. H. M. Birdwood presiding.

ELECTION OF MEMBERS.

The election of the following new members was announced :—Lieutenant A. R. Burton (Bolarum), Mr. A. Ryves (Allahabad), Mr. A. L. Butler (Ceylon). Mr. A. Earle (Bombay), Mr. Joseph Greig (Bigura), Surgeon-Captain W. H. W. Elliott (Dehra Ismail Khan), Mr. H. M. Thompson (Bombay), Mr. F. H. Sutton (Bombay), Mr. H. Slade (Burma), Mr. A. J. B. Hare (Jalpaiguri), Mr. S. P. Leggett (Kurachi), Lieutenant R. S. Gillespie, R.E. (Bombay), H. H. the Maharajah of Kotah (Kotah), Dr. Bassett Smith (Bombay), Colonel T. Freeman (Bombay), Lieutenant W. G. Nisbett (Burma), Mr. R. H. B. Taylor (Mangalore), Mr. Lionel Truninger (Malakhand), Surgeon-Captain F. E. Swinton (Poona), Mr. F. J. Rome (Bombay), Mr. A. H. Birkenshaw, C.E. (Gaya), Mr. E. P. Stebbing (Teesta), Lieutenant K. L. W. Mackenzie (Poona), Captain R. H. Rattray (Dera Ismail Khan), Mr. W. Jamrach (London), Mr. H. C. Sterndale (Jalpaiguri), Surgeon-Captain J. H. Sellick (Burma), Captain E. C. Townsend, I.S.C. (Burma), Mr. J. C. Rees, C.E. (Pegu), Mr. J. C. P. Maynard, C.E. (Bombay), Mr. S. B. Bates (Burma), Mr. T. H. Tilly (Burma), Surgeon-Captain A. G. Hojel (Bombay), Mr. E. McArthur Moir (Chakrata), Mr. J. A. McKee (Nagpore), Mr. James Dodgson (Bandra), Mr. A. G. Edie (Poona), Mr. E. R. Jardine (Bombay), Mr. W. H. Tarleton (Burma), Mr. H. FitzGerald Beale (Poona), Mr. Charles Chambers (Delagoa Bay), Mr. H. O. B. Showbridge (Bombay), Mr. G. L. Benwell (Hyderabad), Mr. H. A. Crump (Hoshangabad), Mr. W. T. Jardine (Oorun), Mr. J. A. Jeffrey (Bombay), Mr. T. Hollis (Bombay), Mr. James Adam, C.E. (Bombay), Mr. F. Linnell (Seoni), Mr. V. S. Fellowes Wilson (Calicut), Mr. R. Lambert (Sind), Captain M. Tighe (Sind), Mr. B. T. Coggan (Cachar), Mr. F. W. D. Trotter (Silchar), Mr. George Oakes (Ootacamund), Mr. Nowrojee Dorabjee Dhakmarvala (Bombay), Mr. Ambrose Rodocanachi (Bombay), Mr. F. Bagley, C.E. (Mandalay), Mr. J. W. Fellowes (Thana), Lieutenant H. B. Span (Trimulgherry), Surgeon-Captain J. B. Jamesoni, Captain E. Guinness, R.A. (Bangalore), Mr. J. Sutherland, C.E. (Burma), Captain A. Bourchier (Ellichpur), and Captain John Thornhill (Berhampore).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions since the last meeting :—

Contribution.	Description.	Contributor.
Sea Shells and Pearls	.....	Lieut. F. W. Wodehouse.
Photographs of Horns.....	.....	Major R. Pentland.
Japanese Crabs.....	Dorippe callida.....	Capt. John Campbell.

Contribution.	Description.	Contributor.
1 Bison's Head	Bos gaurus	Mr. N. Devlin.
1 Dhaman	Zamenis mucosus	Surg.-Col. T. Weir.
A number of Beetles	.....	Mr. E. Ansell.
1 Cobra (alive)	Naga tripudians	Surg.-Capt. B. Lenmann.
1 Indian Ratel	Mellivora indica	Mr. J. W. Fellowes.
A number of Insects	.....	Mr. W. Mahon Daly.
2 Lesser Floricans	Sypheotides aurita	Mr. C. H. Kirkpatrick.
2 Panther Cubs (alive).	Felis pardus	Mr. G. Keatinge.
A Collection of Butterflies & Moths.	.....	Mr. A. St. J. Cooke.
1 Albino Snake	Tropidonotus stolatus	Surg.-Lt.-Col. Mapleton.
1 Snake	Dipsas trigonata	Mr. E. H. Elsworthy.
2 Snakes (alive)	Silybura macrolepis	Surg.-Col. T. Weir.
1 Daboia	Viper russellii	Col. Rowe.
1 Fœtus	Sus domesticus	Dr. deMonte.
1 Skull of a Malay Tapir	Tapirus indicus	Vet.-Capt. G. H. Evans.
1 Cobra (alive)	Naga tripudians	Surg.-Col. T. Weir.
A collection of Sea Shells	.....	Mr. L. Penny.
3 Water Tortoises (alive)	Kachuga smithii	Mr. C. Maries.
1 Snake	Tropidonotus stolatus	Do.
Eggs of Ceylon Spur Fowl	Galloperdix singalensis	Mr. A. L. Butler.
Eggs of Ceylon Hornbill	Lophoceros singalensis	Do.
A collection of Botanical Specimens.	Cyperaceæ	Mr. G. M. Woodrow.
1 Sparrow Hawk	Accipter nisus	Mr. Alfred Walker.
Fossil bones of Crocodile, Mastodon, and Rhinoceros.	From Gulf of Cambay	Mr. J. N. Unwalla.
1 Snake	Zamenis gracilis	Capt. Baugh.
1 Peregrine Falcon (alive)	Falco peregrinus	Mr. A. J. Jardine.
1 Snake (alive)	Dipsas trigonata	Mrs. Sanders-Slater.
1 Crow Pheasant (alive)	Centrococcyx rufipennis	Mr. R. N. Branson.
1 Snake	Gongylophis conicus	Mr. W. Thacker.
1 Bittern	Botaurus sinensis	Mr. N. S. Symons.
1 Snake	Zamenis faciolatus	Mr. J. Brand.
1 Daboia (alive)	Vipera russellii	Mr. A. Corrodi.
1 Snake (alive)	Lycodon aulicus	Do.
A number of Shells	.....	Lieut. A. J. Peile, R.A.
1 Hornet's Nest	Vespa cincta	Mr. W. P. Thomas.
1 Black-necked Stork (alive)	Mycteria australis	Mr. H. Boardman.
1 White-breasted King-fisher (alive).	Halcyon smyrnensis	Mr. J. Brand.
1 Black-capped King-fisher (alive).	Halcyon pileata	Do.
1 Crocodile's skull	Crocodilus palustris	Mr. R. H. Lee.
1 Boar's skull	Sus indicus	Do.
1 Panther's skull	Felis pardus	Do.
2 Snakes	Tropidonotus plumbicolor	Do.
1 Shoveller	Spatula clypeata	Mr. N. S. Symons.
1 Gadwall	Chaulelasmus streperus	Do.
1 Crested Grebe	Podiceps cristatus	Do.
1 Black-tailed Godwit	Limosa Ægocephala	Do.
1 Black-throated Weaver Bird.	Ploceus bengalensis	Do.
A Painted Bat	Kerivoula picta	Sergt.-Maj. Griffiths, R.A.
5 Slender Loris	Loris gracilis	Mrs. A. Breul.
A number of Beetles	.....	Mr. H. S. Ferguson.
1 Snake (alive)	Dryophis mycterizans	Mr. H. Otto.
2 Tree Mice	Vandeluria oliveacea	Mr. Babajee Gopal.
23 Snakes from Coonoor	.....	Mr. Charles Gray.

Contribution.	Description.	Contributor.
1 Flamingo	Phœnicopterus antiquorum.	Mr. Douglas Bennett.
1 Wood Snipe	Gallinago nemoricola	Mr. Thomas H. Moore.
1 Snake	Zamenis diadema	Sur.-Capt. W. Ricketts.
1 Sucker Fish	Echeneis albescens	Mr. A. Corrodi.
1 Black-necked Stork	Mycteria australis	Mr. N. S. Symons.
1 Snake Bird	Plotus melanogaster	Do.
2 Leaf Insects from the Seychelles (alive).	Phyllium scythe	Capt. Whitehead.
1 Sparrow Hawk (alive)	Accipiter nisus	Mr. J. Brand.
1 Pale Harrier	Circus macrurus	Do.
1 Black-throated Wood Partridge.	Arboricola atrogularis	Lt. H. A. D. Fraser, R.E.

CONTRIBUTIONS TO THE LIBRARY.

Description of Indian Squillidæ (Wood-Mason), from Indian Museum; the Spiders of Burmah (Thorell), from Mr. E. W. Oates; the Movements of the Kosi River, from Mr. F. A. Shillingford, Proceedings of the Zoological Society of London, Parts I, II, and III, from Mr. W. F. Sinclair; the Flora of Ceylon, Vol. VIII, from Dr. Trimen; the Birds of India, Vol. III, from Mr. W. T. Blanford; Back Numbers of our journal, from Mr. L. Penny; the Flowering Plants and Ferns of N. S. Wales, from Mr. J. H. Maiden; and Report on the Experimental Farm at Poona, from Government.

PAPERS READ.

The following papers, which were then read and discussed, will appear in the next number of the Society's Journal:—1. The Flora of Matheran and Mahableshwar, by the Hon. Mr. Birdwood. 2. Ornithological Notes from Cocoawatte, Ceylon, by A. L. Butler. 3. Sea Shells collected at Aden, by Captain E. R. Shopland, R.I.M. 4. The Butterflies of the North Canara District, by J. Davidson, I.C.S., T. R. Bell, and E. H. Aitken. 5. Description of a New Indian Snake, by G. A. Boulenger. 6. Indian *Chrysididæ* by Vicomte Robert du Buysson. 7. Miscellaneous Notes. (*a*) Bison in Kamptee, by Brigade-Surgeon-Lieutenant-Colonel S. Banks. (*b*) The Giant Orchis, by R. M. Dixon. (*c*) A Leporine Monstrosity, by A. L. Butler. (*d*) Red Ants used as Smelling Salts, by A. L. Butler.

A vote of thanks was passed to Mr. Birdwood for his valuable paper and interesting remarks.

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