

RECORDS

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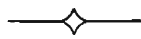
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I. DESCRIPTION OF A NEW SPECIES OF
ISOPODA OF THE GENUS *SYNI-*
DOTEA, HARGER, FROM THE
GULF OF MANNAR

By WALTER E. COLLINGE, D.Sc., F.L.S., etc., Research Fellow
of the University of St. Andrews.

(Plate I).

Dr. Annandale has kindly submitted to me for examination and report, a small collection of Isopoda belonging to the family Idoteidae, from the Indian Museum collection.

As yet very little is known of the members of this family from the Indian Ocean, and although the different genera and species find their greatest development in the colder seas, there is every reason to suppose that there are many genera and species awaiting discovery in the Indian Ocean.

The present collection contains a single new species referable to the genus *Synidotea*, Harger, from coral reefs at Kilakarai, Gulf of Mannar.

The genus *Synidotea* was constituted by Harger¹ in 1878 for a group of Isopoda characterized by the following features:—a multiarticulate flagellum of the antennae, a 3-jointed palp on the maxillipedes, the absence of coxal plates on the dorsal side of the mesosomatic segments, a single metasomatic segment, and uropoda with an endopodite only.

Miers² regarded the genus, as known to him, as synonymous with *Edotia*, Guérin-Mén., but although these two genera, at first sight, appear very similar, they are quite distinct from one another.

In all there are some sixteen or seventeen species belonging to this genus, but the detailed structure of very few of them has been described and figured. Miss Richardson³ has given figures of the maxillipedes of some species, but unfortunately these are incorrect in many cases.

The species here described is the first, I believe, that has been collected in Indian waters, the remaining species being distributed as follows:—

1. *S. hirtipes* (Milne-Edw.). Cape of Good Hope, South Africa.
2. *S. hirtipes* var. *laevidorsalis* (Miers). Jatiyama Bay, Japan.

¹ *Amer. Journ. Sci.*, (Ser. 3), vol. XV, p. 374 (1878).

² *Journ. Linn. Soc. Lond.*, vol. XVI, p. 65 (1881).

³ *Bull. U.S. Nat. Mus.*, no. 54, pp. 376-393 (1905).

3. *S. pallida*, Benedict. Choukof Island, Alaska.
4. *S. erosa*, Benedict. Sannakh Island, Alaska.
5. *S. nebulosa*, Benedict. Bering Sea, Alaska, etc.
6. *S. angulata*, Benedict. Off Cape Johnson, Washington.
7. *S. bicuspidata* (Owen). Alaska, Bering Sea and Kara Sea.
8. *S. marmorata* (Packard). Labrador.
9. *S. laticauda*, Benedict. San Francisco Bay.
10. *S. harfordi*, Benedict. California.
11. *S. nodulosa* (Kröyer). Arctic Seas and Pacific Coast as far as British Columbia.
12. *S. laevis*, Benedict. Alaska and Bering Sea.
13. *S. consolidata* (Stimpson). Pacific Grove, California.
14. *S. muricata* (Harford). Arctic Ocean.
15. *S. picta*, Benedict. Alaska and Bering Straits.
16. *S. ritteri*, Richardson. San Francisco, California.
17. *S. setifer*, Barnard. South Africa.

Synidotea variegata, n. sp.

(Pl. I, figs. 1-10).

Body oblong-ovate, female rather wider than the male, dorsal surface convex, almost smooth. Cephalon (fig. 1) wider than long, narrowing posteriorly, frontal margin straight, posteriorly there is a deep transverse furrow. Eyes large and oval, situated in the middle of the extreme lateral margins. Antennulae (fig. 2) with the first joint expanded, second and third short and wide, subequal; flagellum nearly two and a half times the length of the last peduncular joint, setae in bunches. Antennae (fig. 3) first and second joints subequal, together equal to the third, fourth rather longer and narrower, fifth half again as long as the fourth; flagellum composed of 21 joints and small apical style. First maxillae (fig. 4) with outer lobe terminating in 8 denticulate spines, inner lobe terminally has 2 long setose spines and a small setule. Maxillipedes (fig. 5) short and wide, palp 3-jointed, basal plate short but prolonged on the inner margin anteriorly, epipodite broad and excavate on the posterior margin, distal inner lobe rounded terminally. Segments of the mesosome (fig. 7) 2-4 subequal, 5-7 somewhat shorter, pleural plates of first segment with anterior and posterior angles rounded, in 2-4 anterior angle is produced forward a little and posterior angle rounded, 5-7 truncate, coxal plates not present on the dorsal side. In the middorsal line of segments 2-4 is an arcuate depression towards the anterior margin (fig. 6). Thoracic appendages 2-4 small and directed forwards, 5-8 larger and directed backwards. Metasome (fig. 9) composed of a single segment with narrow lateral sutures indicating a further coalesced segment, terminal segment with straight lateral margins gradually narrowing posteriorly, posterior margin bluntly rounded with small median notch, dorsal surface very faintly keeled. Uropoda (fig. 10) with lateral margins almost straight, excepting at the hinge, rounded anteriorly and setose on the inner margin, on the outer posterior

margin is a small denticulate spine; endopodite with straight inner margin and cut away on the outer side.

Length 7.5 mm. Colour (in alcohol) varying from a slaty-grey to yellow with irregular sepia-coloured markings.

Habitat.—Kilakarai, Ramnad District. From coral reefs. 12-ii-1913. No. $\frac{9306-09}{10}$ (S. W. Kemp).

Type.—In the collection of the Indian Museum.

This species exhibits a slight relationship to *S. harfordi*, Benedict and *S. angulata*, Benedict, from both, however, it differs in a number of structural features. It agrees with the former species in the form of the cephalon and in having the small rounded median notch or indentation on the posterior margin of the metasome. In the form of the mesosomatic and metasomatic segments it is not unlike *S. angulata*.

The mouth parts are undescribed for most species of this genus. In *S. variegata* the outer lobe of the 1st maxilla terminates in eight denticulate spines. Harger¹ states that in *S. nodulosa* (Kröyer) the outer lobe is armed with stout, curved, denticulate spines, and shows nine of these in his figure.

Stebbing² in his description of *S. hirtipes* (Mیلne-Edw.), states that there are ten or eleven spines on the outer lobe in that species, some of which are denticulate, and that the inner lobe is narrow at both ends and has two, rather long, plumose setae.

The 2nd maxilla in *S. nodulosa*, as figured by Harger, is very distinct from anything I have seen in any other species of this genus.

The maxillipedes of *S. variegata* are short and wide, a character common to most members of the genus.

The 2nd, 3rd and 4th segments of the mesosome are subequal and longer than the remaining three. This feature is more apparent in the wider female than in the male. All the segments are convex and the pleural plates of 1-4 stand out slightly. There is no trace of the coxal plates on the dorsal side.

In *S. harfordi* the lateral margins of all of the pleural plates are straight and in *S. angulata* the margins of segments 1-4 are angulate, those of 5-7 only being straight. In *S. variegata* the condition of the lateral margins of segments 1-4 and 5-7 forms a link between the two above mentioned species. In the 1st segment the angles are rounded anteriorly and posteriorly and in 2, 3 and 4 the anterior angle is produced forward slightly and the posterior angle rounded; the remaining segments are truncate.

The metasome is rather wider than in *S. harfordi*, and more bluntly pointed than in *S. angulata*.

¹ *Rept. U.S. Fish and F. Comms.*, 1878 (1880), p. 299, pl. vi, fig. 35c.

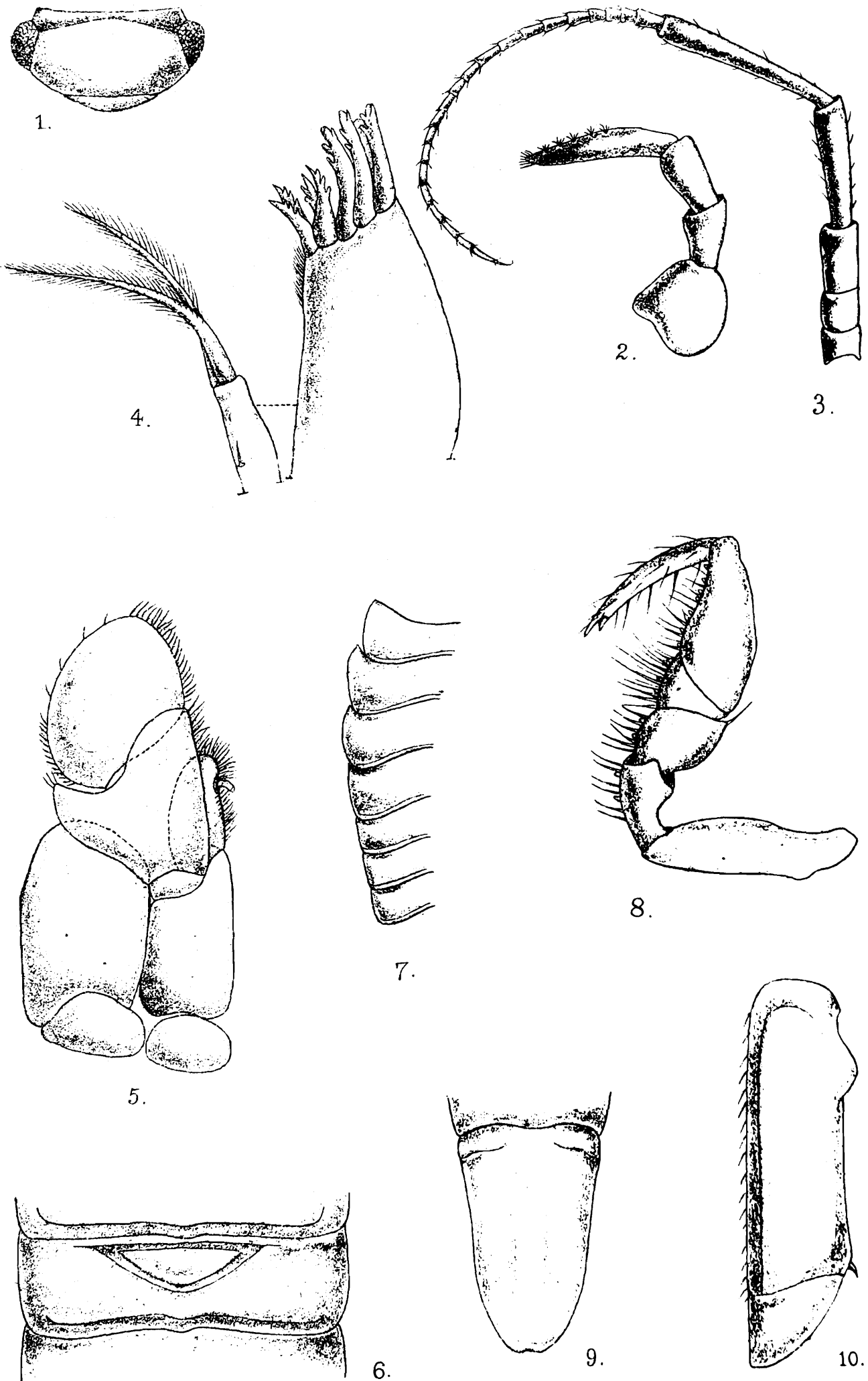
² *South African Crust.*, pt. II, p. 61 (1902).

EXPLANATION OF PLATE I.

Synidotea variegata, n. sp.

- FIG. 1.—Dorsal view of the cephalon. × 14.
,, 2.—Dorsal view of the left antennule. × 35.
,, 3.—Dorsal view of the left antenna. × 21.
,, 4.—Ventral side of the terminal portions of the inner and outer lobes of the left 1st maxilla. × 110.
,, 5.—Ventral side of the right maxillipede. × 56.
,, 6.—Fourth segment of the mesosome showing the arcuate marking.
,, 7.—Dorsal view of the lateral portions of the mesosomatic segments. × 12.5.
,, 8.—Ventral view of the 2nd thoracic appendage. × 42.
,, 9.—Dorsal view of the metasome. × 15.
,, 10.—Right uropod. × 21.

I desire to express my thanks to the Executive Committee of the Carnegie Trust for a grant to defray the artist's charges for the above figures.



R. S. K, del.

A. Chowdhary, lith.

SYNIDOTEA VARIEGATA, n. sp.

II NOTES ON THE TYPE SPECIMENS OF SOME BURMESE AND HIMALAYAN RATS

By C. BODEN KLOSS, F.Z.S.

The authorities of the Indian Museum have recently lent me for examination the types of some long-described species in the collections at Calcutta, and these slight notes on some little-known animals and little-studied material may be of use to workers on Eastern mammals.

Rattus bowersi (Anderson).

Mus bowersi, Anderson, *Anat. and Zool. Res.*, p. 304, pl. xvii (1878); Thomas, *P.Z.S.*, 1886, p. 62; Sclater, *P.Z.S.*, 1890, p. 524, pl. xlv, fig. 2; *id.*, *Cat. Mamm. Ind. Mus.*, II, p. 62 (1891); Thomas (*partim*), *Ann. Mus. Civ. Gen.* (2a), X (XXX), p. 937 (1892).
Epimys bowersi, Thomas, *Journ. Bombay Nat. Hist. Soc.*, XXIV p. 410 (1916).

The type is an adult female with slightly worn teeth collected by Anderson at Hotha, Kakhyen Hills, near Bhamo, Upper Burma. The body, which is preserved in alcohol, no longer serves to indicate the colour of the animal in life but shows that the pelage is of the same hispid type as in *R. berdmorei* (Blyth) and *R. ferreocanus* (Miller),¹ being composed of long, slender spines or bristles and a much softer under-fur.

The skull is in poor condition, as both the zygomata and the whole of the left side of the palate and tooth-row are broken, while the tips of all the incisors are much chipped. The species, however, is now well-established and a good number of specimens are available for examination in the South Kensington and Genoa Museums.

Mr. Thomas (*Journ. Bombay Nat. Hist. Soc.* XXIV (1916), p. 409) has forestalled me in a comparison of this species with *R. ferreocanus* of the Malay Peninsula: while, however, he had at his disposal numerous specimens of *bowersi* but only one of *ferreocanus*, there are available to me, on the contrary, several examples of the latter in the collections of the Federated Malay States Museums, but only the type of *bowersi*.

Thomas states that *bowersi* is larger, having a greatest length of skull of 55—57 mm., while that of *ferreocanus* is about 53 mm. One of three adults skulls of the latter, however, measures 55.5, so it is not impossible that when a larger series is available we shall

¹ *Proc. Biol. Soc. Washington*, XIII, p. 140, pls. iii, iv, fig. 2 (1900); type from Trang, Peninsular Siam.

find that there is not the difference in size at present believed. The skulls of both are of the same elongate form, only slightly curved above from front to back,¹ but the bullae of *bowersi* are considerably larger and more dilated than those of *ferreocanus*: on the other hand the molars are smaller (both shorter and narrower), the alveolar lengths of the upper tooth-rows being respectively 8·7 and 9·4 in skulls of equal length. In the type of *bowersi* the incisors are light orange-yellow; in *ferreocanus* they are ivory with pure white tips. The latter, though a member of the *bowersi* group and representing it in the Malay Peninsula, appears to be a well-marked and distinct species.

Some measurements of the type skull of *bowersi* are:—greatest length, 54·0; condylo-basilar length, 47·8; basilar length, 44·7; palatilar length, 25·2; length of palatal foramina, 9·0; diastema, 17·0; upper tooth-row (alveolus), 8·7; nasals, 20·7×5·3; inter-orbital breadth, 8·0; greatest cranial breadth, 21·3.

2. *Rattus berdmorei* (Blyth).

Mus berdmorei, Blyth, *Fourn. Asiat. Soc. Bengal*, XX, p. 173 (1851);
id., *op. cit.*, XXIII, p. 343 (1863); Sclater, *P.Z.S.*, 1890, p. 524;
id., *Cat. Mamm. Ind. Mus.*, II, p. 71 (1891).

Epimys berdmorei, Thomas, *Fourn. Bombay Nat. Hist. Soc.*, XXIV, p. 413 (1916).

All that remains of the type of this species, which was obtained by Berdmore at Mergui, Tenasserim (and which is still unique), is a portion of the skull including the zygomata to their posterior roots and possessing above the greater part of the parietals, but lacking below the bullae and basioccipital, etc.

I am glad to find that Thomas (*l.c.s.*) shares my opinion that this species possesses the same large bullae as my *R. b. magnus* of South-Eastern Siam (*P.Z.S.*, 1916, pp. 57-61, text-figure 1, where details and measurements of the skull of *berdmorei* are also given). The mandible has disappeared but the upper incisors are of similar colour to those of *bowersi* and show the same lack of curvature.

3. *Rattus rattus robustulus* (Blyth).

Mus robustulus, Blyth, *Fourn. Asiat. Soc. Bengal*, XXVIII, p. 294 (1859); *id.*, *op. cit.*, XXXII, p. 343 (1863).

Mus rattus var. *D. rufescens*, Sclater, *Cat. Mamm. Ind. Mus.*, II, p. 66 (1891).

The type of this form, an adult male with slightly worn teeth obtained by Berdmore at Schwegyin, Tenasserim, is a spirit specimen with a practically perfect skull.

It shows the following external dimensions:—head and body, 163 (approx.); tail 153 (possibly slightly imperfect); hind-foot, 33·5; ear, 19·5.

¹ Sclater's figure is excellent; Miller's (*loc. cit.*, fig. 4) I regard as less satisfactory.

The colour of the pelage has been discharged and altered by spirit, but the fur of the undersurface was apparently white with a grey base and the hands and feet were white.

I am unable to say how the skull compares with other Indo-Chinese forms of *rattus*, but it is quite distinct from those of Central and South-east Siam or of the Malay Peninsula. The upper profile is less curved, the rostrum is lighter but longer and the bullae are much smaller and much less dilated, while the tooth-row, diastema and palate seem longer. As compared with two scarcely adult examples of "*rattus*" from Calcutta (the only Indian material to hand) the skull though of larger size with broader palatal foramina has again much smaller and more constricted bullae.

Measurements of skull: greatest length, 45.8; condylo-basilar length, 40.2; basilar length, 37.5; palatilar length, 21.8; palatal foramina, 8.9 × 3.3; diastema, 12.5; breadth of palate between anterior roots of m^8 , 5.9; length of upper tooth-row (alveolar), 7.3; upper edge of ante-orbital foramen to tip of nasals, 15.9; nasals, 18 × 3.8; inter-orbital breadth, 6.5; zygomatic breadth, 21.0.

It is not easy to understand how Blyth subsequently (*J.A.S.B.*, XXXII, 1863, p. 342) considered this animal to be the same as his *Mus berdmorei*.

4. *Rattus concolor* (Blyth).

Mus concolor, Blyth, *Journ. Asiat. Soc. Bengal*, XXVIII, p. 295 (1859); *id. op. cit.*, XXXII, pp. 74, 344 (1863); Sclater, *P.Z.S.*, 1890, p. 526, pl. xlv, figs. 3, a, b, c (1890); *id.*, *Cat. Mamm. Ind. Mus.*, II, p. 68 (1891).

The types of this species, three specimens collected by Berdmore at Shwegyin, Tenasserim, and preserved in alcohol, are unsatisfactory. Specimen (*e*) of Sclater's catalogue is apparently adult though the teeth show no signs of wear, (*f*) is smaller than (*c*) and sub-adult with teeth quite unworn, while (*g*) is a juvenile. As the skull of (*e*) is unfortunately badly crushed I select the female specimen (*f*) as lectotype; for the skull figured by Sclater (*l.c.s.*) is evidently not one belonging to a member of the type series, but to some much larger individual. The skull (*f*) is complete and is in good condition except that the right parietal region is crushed inwards.

No colour details are available owing to long immersion in spirit.

Measurements of specimen (*f*):—head and body about 100 (108)¹; tail, 112 (131); hind foot, 23.3 (25); ear, 13.6 (15).

Skull: greatest length, 29.0; condylo-basilar length, 25.0; basilar length, 23.0, palatilar length, 13.2; length of palatal foramina, 5.6; diastema, 7.5; length of upper tooth-row (alveolar), 4.9; length of nasals, 10.4; inter-orbital breadth, 4.5; zygomatic breadth, 14.2.

Measurements in parentheses are those of the male individual (*e*).

5. *Rattus blythi*, nom. nov.

Mus cinnamomeus, Blyth, *Journ. Asiat. Soc. Bengal*, XXVIII, p. 294 (1859); *id.*, *op. cit.*, XXXII, p. 341 (1863).

Mus fulvescens, Thomas (*partim*), *P.Z.S.*, 1881, p. 537; Sclater, *P.Z.S.*, 1890, p. 524; *id.*, *Cat. Mamm. Ind. Mus.*, II, p. 69 (1891).

Mus cinnamomeus, Blyth, was described from two individuals collected by Berdmore at Shwegyin, Tenasserim, one of which has been mounted while the other is a skin in alcohol: both are accompanied by somewhat damaged skulls.

I propose to regard specimen (*a*) of Sclater's catalogue as the type for Blyth's name; for the measurements given by him, in his first account, were obviously made on a skin, while it is highly improbable that the colours he gave were recorded from the spirit specimen when another was available.

The mounted individual is in poor condition, the ears are very imperfect and the entire tail is missing.

The absence of the latter is unfortunate; for apart from the greater size of the animal, the impression conveyed by its pelage is that it is a member of the *cremoriventer* group,¹ distinguished by the slightly pencillate, unicoloured tail (of which a large form, *E. tenaster*, has recently been described by Thomas from Mt. Muleyit, Tenasserim, 5000 ft.).² On the whole the spines of the dorsal pelage are much slenderer than those of *cremoriventer* but a few are present which approach them in breadth and stiffness.

The skull, with teeth only slightly worn, closely resembles those of aged examples of *cremoriventer* and appears to differ only in narrower, less spatulate nasals and broader ante-orbital plates: the bullae are quite of the "*jerdoni*" type—small, flattish and but little dilated.

The upper incisors are, however, much more curved backwards and both pairs are *ivory-white* with no tinge of orange on the exposed portion—a character quite unknown in any rats of this section. On account of these features I think we must regard this rat as an example of a distinct species, and since the name *cinnamomeus* is preoccupied (Pictet, *Not. Anim. Nouv. Mus. Gen.*, 1844, p. 64, pl. xix) I propose to call it *blythi* after its first describer.

The pelage was said to have originally the upper parts as bright, or scarcely less so, as the British dormouse; of a fine cinnamon colour with inconspicuous black tips, the under parts white abruptly divided from the cinnamon hue above. Length of head and body about 152; tail, 197; hindfoot, 32 mm.

The colour of the dorsal fur to-day is perhaps best described as somewhat between the "ochraceous-orange" and "ochraceous-tawny" of Ridgway³ and grey at the base. The pure white

¹ Miller, *Proc. Biol. Soc. Washington*, XIII, p. 144, pl. v, figs. 2, a, b, c (1900).

² Thomas, *Ann. Mag. Nat. Hist.*, (8) XVII, p. 425 (1916).

³ *Colour Standards and Nomenclature*, 1912.

undersurface is sharply margined and extends down the inner and posterior sides of the fore-limbs on to the hands: the front and inner sides of the thighs are white also, but the white feet are isolated by a "cinnamon" band round the ankles, which colour also extends slightly down the median line of the metapodials.

Some measurements of the skull are:—greatest length about 38.0; palatilar length, 15.4; length of palatal foramen, 6.4; diastema, 9.4; upper tooth-row (alveolus), 6.0; nasals, 13.9 × 3.9; palatal breadth between last molars, 4.8.

6. *Rattus jerdoni* (Blyth).

Leggada jerdoni, Blyth, *Journ. Asiat. Soc. Bengal*, XXXII, p. 350 (1863).

Mus jerdoni, ? Thomas (*partim*), *P.Z.S.*, 1880, p. 537; Sclater (*partim*), *P.Z.S.*, 1890, p. 525; *id.*, (? *partim*), *Cat. Mamm. Ind. Mus.*, II, p. 69 (1891).

Epimys fulvescens, Wroughton, *Journ. Bombay Nat. Hist. Soc.*, XXIV p. 427 (1916).

The type of Blyth's *Mus jerdoni* (specimen *m* of Sclater's catalogue) was collected at Darjeeling by Jerdon, and is in a very bad state of preservation. The skin has been mounted and is now much torn and discoloured with the tail broken. The skull, which appears to have been removed later, consists of little more than the anterior portion; one zygomatic arch is complete, though fractured, but the tips of the nasals are broken away. The mandible is in fair condition.

The skull is that of a very young animal as only the first two molars are in sight. The combined lengths of these two molars, upper and lower as far as they show, are 5.0 and 4.8 mm. respectively.

The colour was described by Blyth as being "bright dark ferruginous above, pure white below; some fine long black tips intermingled among the spines of the back; limbs marked with blackish externally; the feet white. Length about 102; tail, 76; hindfoot 22 mm."

It was originally therefore much darker in colour than *fulvescens*, "*cinnamomeus*," etc., but not greyish like *niveiventer*. The colour to-day is very near Ridgway's "cinnamon-brown" on the back, becoming "ochraceous-tawny" on the lower parts of the sides (the base of the fur, as usual, grey) and one does not receive the impression that the darkish tone is due to immaturity only. The distribution of white on the underparts is as I have noted in the case of Blyth's "*cinnamomeus*."

On the rump the darker-tipped, pale spines are slender and elastic but they are stiff and flattened on the sides and mid-body. *The outer sides of the ears are very thickly clad with comparatively long hair of the same colour as the head.* The tail appears to have been bicoloured as stated by authors subsequent to Blyth; it is clad with very fine short hairs.

Thomas in 1886 (and other writers have followed him) held that *jerdoni* could always be separated from *fulvescens* on account

of its bicoloured tail, whereas in the latter the lower side was of the same tone as the upper: but quite recently Wroughton (*l.c.s.*) has come to the conclusion that *jerdoni* must be identical with *fulvescens* of which, therefore, it would be a synonym. I do not think, however, that we can yet take this as proved.

Associated with *jerdoni* by Sclater is a skull with much worn teeth from Darjeeling (specimen (*a*) of his catalogue). It most resembles the skulls of *cremoriventer* and of the type of "*cinnamomeus*" but is longer and relatively narrower with a rather long, pointed rostrum; the incisors are orange-coloured and are just a trifle more curved than those of the former. Available dimensions are:—greatest length, 40·0; condylo-basilar length, 32·8; basilar length, 30·3; palatilar length, 16·4; palatal foramina, 6·9×2·9; diastema, 10·0; upper tooth-row (alveolar), 6·3; palatal breadth between last molars, 4·3; posterior edge of ante-orbital foramen to tip of nasals, 13·2; nasals 15·3×4·5; inter-orbital breadth, 6·0; zygomatic breadth about 16·5; cranial breadth, 15·0.



III NOTES ON *LACHESIS ANAMALLENSIS* AND ALLIED FORMS

By C. R. NARAYAN RAO, M.A., L.T., Mysore University, Bangalore.

(Plate III).

I had an opportunity to examine recently a small collection of viperine snakes from Coorg and I noticed that the description of *Lachesis anamallensis* given by Boulenger in his volume on "Batrachia and Reptilia" (*Fauna of British India*, p. 430) really covers two distinct species. Obviously there is considerable divergence of opinion in regard to the specific characters of this viper. Major Wall gives sketches of it in his book on "*The Poisonous Snakes of India*", which do not quite fit in with Boulenger's description referred to above. For example, the figures indicate only one postocular and eight upper labials, while Boulenger makes out "two or three small postoculars and nine or ten upper labials." Moreover, Major Wall mentions (page 53) that small scales may or may not be intercalated between the nasal and the second labial, which fact is not noticed by any of the early writers.

Fayrer gives examples of specimens which differ from Günther's description of the scales on the head and on the body of *T. anamallensis* as being more or less distinctly keeled in twenty-one rows (*Thanatophidia*, p. 20). Jerdon regarded (*Journ. As. Soc. Bengal*, 1854, vol. XXII, p. 523) his *Trigonocephalus malabaricus* as very closely allied to *T. nigromarginatus*, forms which have since been considered identical respectively with *T. anamallensis* and *T. trigonophalus* (Boulenger, *Faun. Brit. Ind., Rept. and Bat.*, pp. 430-431). It is also noteworthy that Günther calls attention to Jerdon's reference to smooth scales in his description of *Trigonocephalus malabaricus* and he maintains that "they are keeled in our species as in all *Trimeresuri*." Further he proceeds to mention that "Mr. Elliot possesses a drawing of a young specimen, named *T. malabaricus* (Jerd.). It resembles our species in coloration, but has a white, black-edged temple-streak instead of a black one. Mr. Jerdon does not mention either a black or a white temple-streak" (*Rept. Brit. Ind.*, p. 387).

After examining the specimens in my collection I cannot resist the conclusion that these writers are really alluding to two distinct species which in certain respects possess common characters, and Boulenger's description accordingly requires, in my opinion, recasting; for his diagnosis of *T. anamallensis* is wide

enough to receive several species of *Trimeresuri*. I make out that *Trigonocephalus malabaricus* is specifically distinct from *T. anamallensis*, and I give below separate diagnoses for them. I retain the specific name of the former species given by Jerdon.

***Lachesis anamallensis*¹ (Günther).**

Trimeresurus anamallensis, Boulenger, *1 ann. Brit. Ind., Rept.*, p. 430 (in part only); Günther, *Rept. Brit. Ind.*, p. 387.

Head considerably longer than broad, in the ratio of 5 to 3, and distinctly triangular. Snout far more acute than round, and the temporal swellings modest. Scales on the margin of snout in front more or less concave; they may form a distinct outer ridge in some cases. Scales on the head small, cycloid, slightly imbricate. Those on the snout and the scales adjacent to the supraoculars are slightly larger. Internasals separated by a big scale. Supra-loreal descends to connect the nasal and the second upper labial which forms the anterior boundary of the facial pit. One or two intercalary scales between the nasal and the 2nd upper labial rarely absent. Rostral broader than deep. The upper margin of rostral visible from above. Supraocular faintly or distinctly divided into two. Seven to eleven scales between the supraoculars. Two or three postoculars and a single subocular. The second loreal slightly more than half the size of the first or the third. Nine or ten upper labials separated from the subocular by two rows of scales: the lower series consisting of bigger scales, the posterior ones keeled. Twelve to thirteen lower labials and seven sublinguals. In some specimens the fourth sublingual is quite as large as the first. Temporals fairly large and keeled.

Body. Neck very much narrower than the posterior region of body which is fairly rounded. Scales round the neck 23 to 26, in the middle of body and the preanal region 21 to 23. All the scales on the body keeled. Sometimes those on the posterior region smooth, hexagonal, non-imbricate. Scales on the thickest portion of the body large. Ventral shields: 147 (138 to 155, Boulenger).

Tail perfectly rounded, acutely pointed and strongly prehensile. In spirit specimens the tail may become twice coiled. Subcaudals, two rows 47 (44 to 58, Boulenger).

¹ Major Wall adopts the nomenclature of Dr. Noguchi and perhaps the justification for such a procedure is that it is more convenient to have a common terminology. In such a case *Bothrops*, *Trigonocephalus*, *Trimeresurus* and *Lachesis* would be synonymous generic terms, but it is doubtful whether the generic identity of the Asiatic and the American species has been established. Dr. Noguchi agrees with Stejneger that the South American *Lachesis* is sufficiently characterized by the peculiar scutellation of the tail. Apart from this, the more or less prehensile nature and the shortness of the tail in the Asiatic forms and other general characteristics peculiar to this group are sufficient for Stejneger to employ the designation of *Trimeresurus* for these forms. But Noguchi considers that there is greater affinity between the Asiatic and New World pit-vipers than there are differences and accordingly uses the common generic name *Lachesis*. It has the merit of simplicity and in this paper his terminology is followed.

Colour. Green or sometimes yellowish, side of the belly with or without white spots : these are edged below by a black longitudinal band. The white spots when present become horseshoe-shaped markings in the preanal region. Dorsal surface with large oval or lozenge-shaped brown spots which run into a zigzag line posteriorly. Head mottled. Two roundish green or yellow spots on the front of the nape. Temporal streak present. A dark transverse line between supraoculars and another behind the internasals only in the green forms. Lips green, belly green, tail banded with brown or green stripes. Tail sometimes speckled. Young forms have a conspicuous black temporal streak. Body green. Tail banded by white bands which are incomplete. Tip of tail white (Total length $2\frac{1}{2}$ ft. Tail 4.5 inches, Boulenger).

Habitat. South India. This is a purely arboreal snake and its staple food consists of small birds, rodents and lizards. The colour of the body exactly harmonizes with its surroundings, variegated by light and shade, and the animal is thus able to attack victims without being noticed. The fangs are enormously big, a specimen 25 inches long may have fangs measuring nearly 12 mm. along the outer curve.

***Lachesis malabaricus* (Jerdon).**

Trigonocephalus (Cophias) malabaricus, Jerdon, *Journ. As. Soc. Bengal*, XXII, p. 523 (1854).

Trimeresurus anamallensis, Boulenger, *Faun. Brit. Ind., Rept.*, p. 430 (in part).

Head. The interorbital space fairly deeply concave. Snout marked off from the head, with a conspicuous out-crop of large imbricate scales. Head (without the snout) squarish ; temporal swellings conspicuous. Snout rounded. Rostral scale squarish. Internasal large, united or only separated anteriorly by a very minute white fleshy tubercle. The supraloreal forms the roof over a secondary pit formed by the nasal and the second labial, which are in contact. This secondary pit may or may not open into the loreal pit by a dorsal groove ; the supraocular somewhat narrow, divided into three, clasped by two large scales ; 6 to 8 scales between the supraoculars, faintly or obtusely keeled ; 8 or 9 upper labials. The second praeocular always less than half the size of the first or the third which are nearly equal. Subocular large, single, and one large postocular or two small ones. Three small, very strongly keeled temporals, very often conical. Occasionally the first upper labial fused with the nasal. One large scale intercalated between the fourth and fifth upper labial and subocular. The series of scales between the subocular and the upper labials strongly keeled ; ten lower labials and five sublinguals.

Body not fat. Neck about the size of the preanal portion ; 21 rows of scales round the neck, round the thickest portion of the body and in front of the anal region ; all strongly keeled. Ventral shields 150 to 160 ; anal entire, fairly large.

Tail perfectly triangular in cross section, not prehensile, subcaudals in two rows, 55 to 58.

Colour. Body rufous with broad brown bands; head also rufous. Spirit specimens show a broad temporal band with a few white dots in the centre, sometimes the whole surface of the body is brownish with deeper bands. Ventral surface steel bluish, a few white spots on the sides in the anterior third of the body. Tail dark with gray bands or dotted white. Ventral surface of the tip of the tail whitish with the extreme point black. Total length 19 inches, tail 3.5 inches.

Habitat. West coast of Peninsular India, including Coorg. This species is not arboreal like its congener *L. anamallensis*, but frequents low scrubby jungle full of dried twigs. The protective disguise is almost perfect and it is reported to be very fierce in its habits.

***Lachesis coorgensis*, sp. nov.**

The collection of snakes received from Coorg, which forms the subject matter of this paper, included this species, a specimen of which I am sending to the Director of the Zoological Survey of India. I have named the snake after the place from where the specimens were obtained and it may be described as follows:—

Head perfectly oval, slightly broader than long, snout nearly squarish, passing insensibly into the head, temporal swellings large, scales of the head and snout moderate, smooth and imbricate. Internasals separated by a scale nearly as long, and the rostral broader than deep by at least 1 mm. A groove or a secondary pit formed by the supraloreal, nasal and the second upper labial may or may not be present. When present it opens behind into the loreal pit. The second loreal less than half the width of the first or the third, supraocular large, broken into three, sometimes into four divisions: one very large postocular, subocular sometimes divided, usually four small rounded smooth temporals. Nine upper labials, third and the succeeding ones separated from the suboculars by a row of three broad smooth scales. Sometimes an intercalary small scale between the third loreal and the supraocular, the same also separating the third labial and supraocular. Twelve lower labials and four sublinguals, the hinder scales of the temporal region very broad and keeled.

Neck and Body. Neck about the girth of preanal region or markedly narrower, scales round the neck 24, round the thickest portion of the body 21 to 23. In the preanal region 15 to 16. Ventral shields 152 to 153, the preanal incomplete and the penultimate shield notched in the middle, anal entire and broad.

Tail slightly prehensile, thick, truncated at the end; it is compressed and oval in cross section, with a small spine at the tip; subcaudals in two rows, 35.

Colour. Head brown, sometimes suffused with yellow, a very broad temporal band (conspicuous in spirit specimens) edged with white, rostrum and upper lip gray, lower lip either gray or

brownish, body reddish-yellow with gray cross bands, ventrally grayish. Sometimes bluish with white spots all along the side,  shaped, involving the lateral scale and half of the succeeding ventral shield. Colour markings on tail somewhat similar to those of *L. malabaricus*. Total length 23 inches, tail 2.5 inches.

Habitat. Coorg Town, alt. 3500-4000 ft. (South India). These specimens were found on an Acacia tree in a plantation and the protective colouration is most striking.



EXPLANATION OF PLATE III.

Lachesis anamallensis (Günther).

FIGS. 1-2.—Side and upper views of head after Major Wall.
,, 3-5.—Side, upper and lower views of head (type).

Lachesis malabaricus (Jerdon).

FIGS. 6-8.—Side, upper and lower views of head.

Lachesis coorgensis, sp. nov.

FIGS. 9-11.—Side, upper and lower views of head.

FIG. 12.—Under surface of tail.

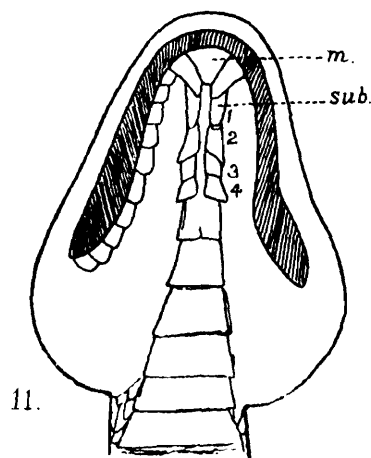
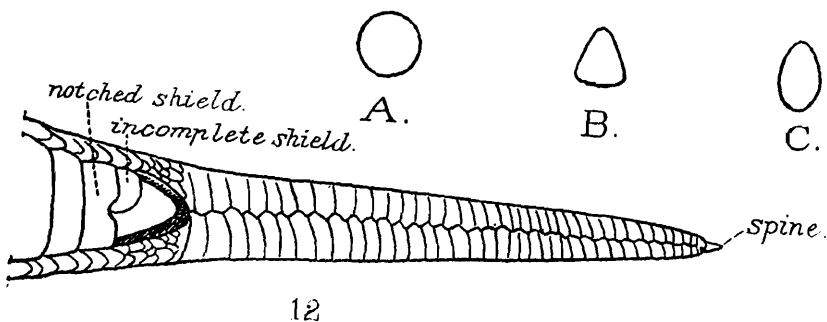
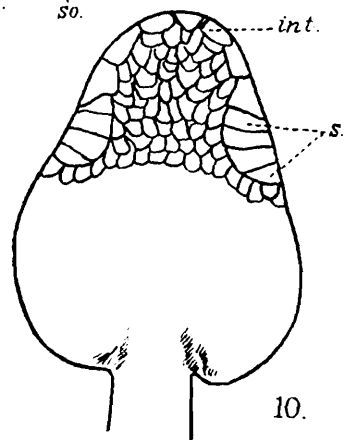
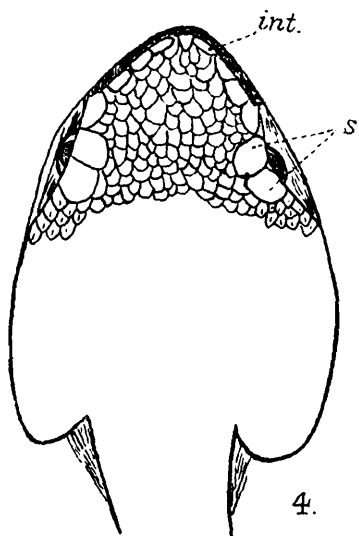
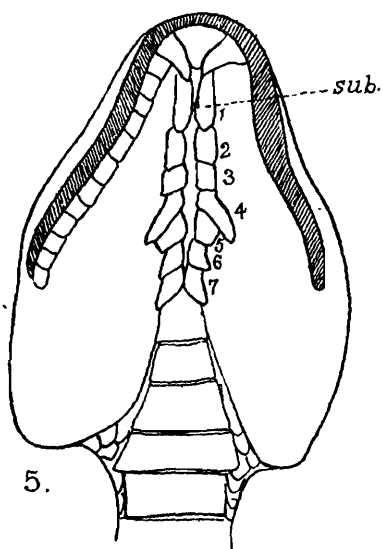
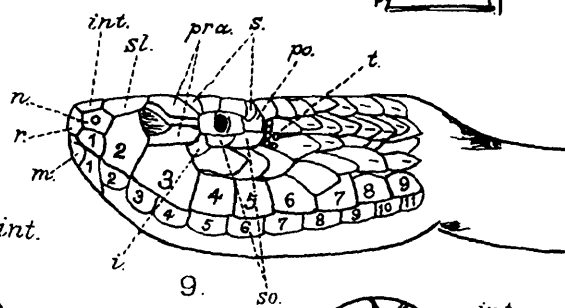
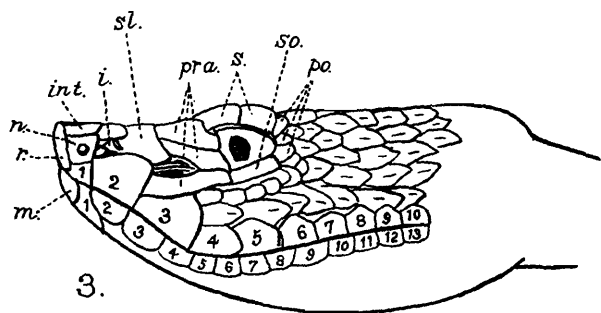
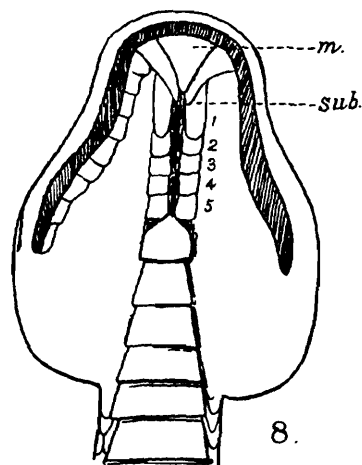
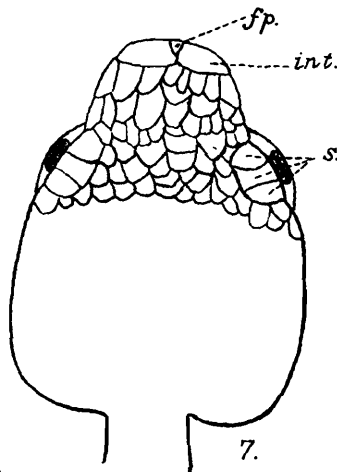
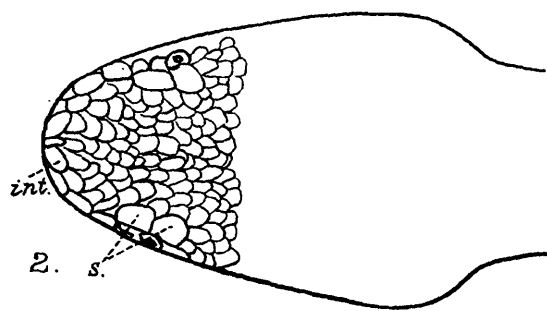
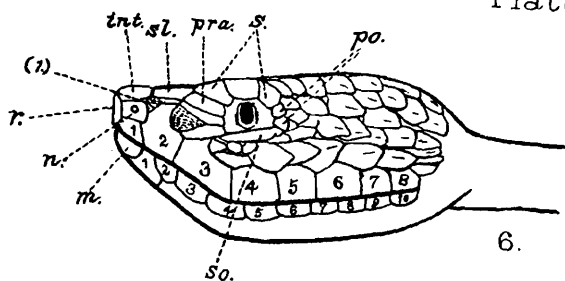
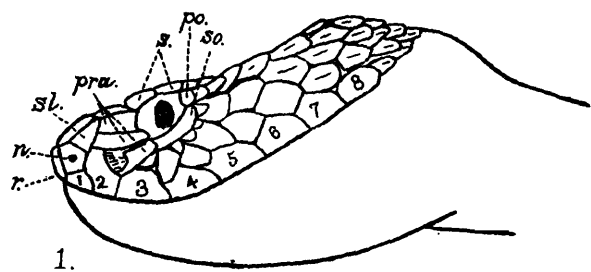
LETTERING.

A. Section of tail in *L. anamallensis*.

B. „ „ *L. malabaricus*.

C. „ „ *L. coorgensis*.

(1.) = secondary pit : fp. = fleshy papillae : i. = intercalary scale : int. = internasal : n. = nasal : m. = mental : po. = postocular : pra. = praeocular : r. = rostral : s. = supraocular : sl. = supraloreal : so. = subocular : sub. = sublingual : t. = temporal.



IV A NEW GENUS OF LIMBLESS SKINKS FROM AN ISLAND IN THE CHILKA LAKE

By N. ANNANDALE, D.Sc., F.A.S.B., Zoological Survey
of India.

The island of Barkuda is situated in the extreme north-eastern corner of the Madras Presidency. It is about three quarters of a mile long by half a mile broad and lies in the Chilka Lake a mile off the mainland. The water¹ round it is always brackish but varies in salinity with the seasons.

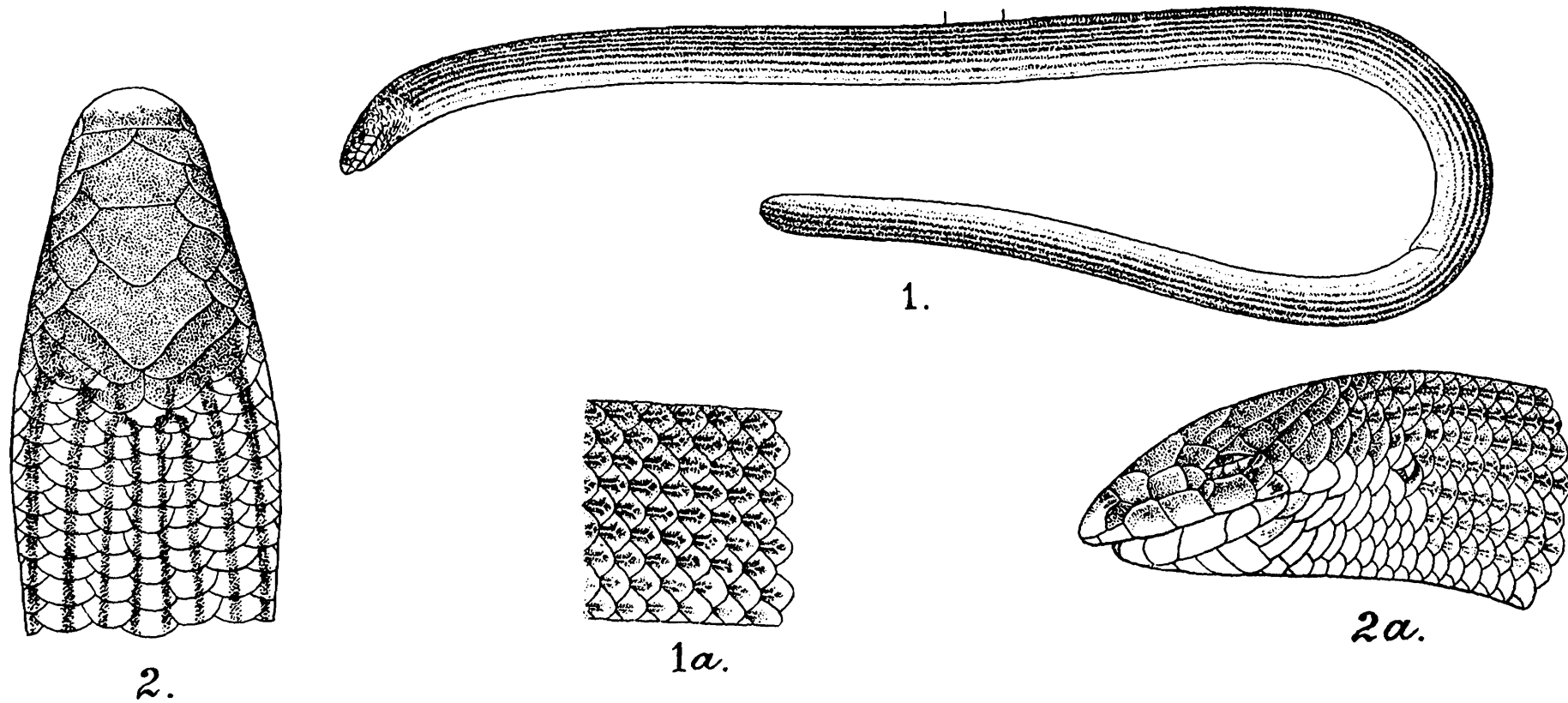
A stony laterite soil and a rainfall probably smaller than that of the neighbouring mainland and certainly never excessive do not encourage either a luxuriant growth of vegetation or the existence of a rich fauna, but the greater part of the island is covered with fairly dense jungle in which bushes and even large trees flourish in abundance. All these trees and shrubs have tough glossy leaves and a rather sombre foliage. The largest are figs of two species, the Banyan (*Ficus bengalensis*) and *Ficus rumphii*; the most abundant shrub is *Glycosmis pentaphila*, a common form in waste places in many parts of India. True xerophytic plants also occur, for example Cacti (*Cereus* and *Opuntia*), which have probably been introduced accidentally, and an indigenous tree-euphorbia (*Euphorbia nivula*). One of the few creepers, a vine with a curious segmented stem (*Vitis quadrangularis*), also belongs to this category.

There is no cultivation on the island, but paths have been cut, a considerable area cleared for the erection of a bungalow and wells and a small pond dug. The only permanent human inhabitant is the keeper of the bungalow.

The fauna of the island is even less rich than that of the plains of India generally and many species that are abundant on the adjacent mainland are here very scarce or altogether absent. The only terrestrial mammals are the Chital (*Cervus axis*), of which a small herd has been introduced by the owner of the island for sporting purposes, a large reddish mongoose (probably *Mungos smithii* or a local race thereof) and a form of the common Black Rat (*Rattus rattus*), which is fairly abundant round the bungalow.

There are no small Passerine birds in the woods. Most of the larger species that occur are forms of very wide distribution. Among the land-birds perhaps the commonest are the Indian

¹ See Annandale and Kemp, *Mem. Ind. Mus.*, V, p. 10 (1915).



Barkudia insularis, gen. et sp. nov.

FIG. 1.—Lateral view of the type specimen ($\times 1\frac{1}{2}$).

„ 1a.—Lateral scales from near middle of body, further enlarged. The position of these scales is indicated in fig. 1 by two short vertical lines.

„ 2.—Head from above $\times 5$.

„ 2a.—The same from the right side.

House-Crow (*Corvus splendens*) and the Jungle-Crow (*C. macrorhynchus*). Both of these fly over from the mainland in large numbers every evening to roost on the island, and a few individuals of both also spend the day there when the fruit of the Banyan, to which they are very partial, is ripe. The common Green Pigeon (*Crocopus chlorogaster*) is also common, and flocks of the Grey Hornbill (*Lophoceros griseus*) are often to be seen or heard.

The most noteworthy features among the Arthropoda are the small number of species represented, the absence of large or conspicuous forms (except among the Lepidoptera and Odonata) and the large proportion of predaceous species.

Perhaps the most interesting element in the fauna is that associated with the fig-trees and in particular with the Banyan. Apart from the species that feed on its fruit and leaves, which do not seem to be numerous, these animals live mostly either in dead wood or in the earth. The great horizontal branches of the Banyan are supported on vertical trunks that originate from them in the form of aerial roots, so reach the soil and then grow stout and trunk-like. These supports frequently rot away and then the branches fall in ruins on the ground. The fauna of their dead wood is comparatively poor, entirely lacking the Lamellicorn beetles found in dead wood in damper districts, but includes interesting beetles of the family Tenebrionidae, and species of the orders Thysanura and Collembola, as well as a considerable number of wood lice. The main trunks of the Banyan and also those of Rumphius's Fig are strengthened at their base by stout buttresses that project in such a way as to form pockets or recesses filled with loose soil. In these pockets flourishes a fauna rich in burrowing forms, many of which are predaceous. It includes a number of trap-door spiders (Mygalomorphae), several Myriapoda (among the most interesting of which is perhaps the curious little Scolopendrid centipede *Pseudocryptops agharkari*, Gravely¹) and the only terrestrial earthworm² yet found on the island. It also includes the peculiar lizard which it is the main object of this paper to describe and two (*Typhlops acutus* and *T. diardi*) of the four snakes found upon the island.

Family SCINCIDAE

Genus *Barkudia*, nov.

The palatine bones do not meet in the median line of the palate, which is toothless. The teeth are conical. The eye is very small and surrounded by relatively large scales; the lower eye-lid is scaly, the upper eye-lid not developed. The ear-opening

¹ *Rec. Ind. Mus.*, VII, pp. 416-417 (1912). Dr. Gravely tells me that specimens from Barkuda represent the race (*singbhumensis*) he described from Chota Nagpur.

² Stephenson, *Rec. Ind. Mus.*, XII, pp. 340-341, pl. xxxiii, figs. 32, 33 (1916). Three aquatic species are found on the shore (see Stephenson, *Mem. Ind. Mus.*, V, pt. i, pp. 139-146, pl. x (1915), and V, pt. 6 (*ined.*)).

is distinct but minute. The nostril is situated in a distinct nasal; it is remote from the first labial and separated from the rostral by a rounded tubercle. Three azygous shields exist on the top of the head; there are no praefrontals or frontoparietals. The body is elongate and snake-like, with no external trace of limbs.

Type-species.—*Barkudia insularis*, sp. nov.

The genus is closely allied to *Sepophis*, Beddome which was described from almost the same part of India but from hilly country, and to *Chalcidoseps*, Boulenger, only known from Ceylon. It differs from both in the position and structure of the nostril.

***Barkudia insularis*, sp. nov.**

The head is small, somewhat flattened above, triangular, but with the snout bluntly rounded in front; the snout projects far beyond the lower jaw. The rostral is large, the portion seen from above being considerably longer than the suture between the supranasals; the frontonasal is somewhat longer than the rostral, bluntly pointed in front, transverse, heptagonal; the frontal is broader than long and angularly emarginate laterally by the second supraocular; the interparietal is broader than long, emarginate anteriorly, hexagonal, larger than either the frontonasal or the frontal. The rostral extends beneath the nasal to the first labial; four upper labials are present, the second being the largest and the third entering the orbit; there are two scales between the orbit and the supranasals, both considerably larger than the nasal. There are three supraoculars but no true superciliaries; a single relatively large scale intervenes between the second and third supraoculars and the orbit. A small subocular is present near the anterior margin of the orbit, and a larger praeocular above it; there are two postoculars. The ear-opening is situated some distance behind the gape and is provided with minute lobules.

There are twenty scales round the body. There are two enlarged praeanals with a narrow scale external to each on either side of the vent.

The total length of the head and body is about 30 times the greatest breadth of the latter. The tail is stout, tapering very little and bluntly rounded at the tip.

The *colour* of the body is yellowish-white, with fourteen fine dotted longitudinal black lines on the back and sides; the head is blackish above, marbled with yellow, the tip of the snout yellow. The ventral surface is unspotted.

Measurements.

Total length	..	..	..	164 mm.
Head	..	..	.	9 „
Body	..	..	..	96 „
Tail	..	..	..	59 „
Greatest vertical diameter of body	..		..	5 „

Habitat.—Barkuda Island, Chilka Lake, Ganjam district, Madras Presidency.

Type.—No. 18075, *Rept.*, Zoological Survey of India (Indian Museum).

The only specimen of this species as yet known was dug from loose earth among the roots of a Banyan-tree (*Ficus bengalensis*) by Dr. F. H. Gravely in July, 1916. The earth was dry at the time.

The following is a list of the other terrestrial reptiles¹ known to me from Barkuda :—

Lizards.

Hemidactylus frenatus.

Hemidactylus brookii.

Calotes versicolor major.

Varanus bengalensis.

Snakes.

Typhlops acutus.

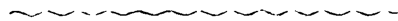
Typhlops diardi.

Dendrelaphis tristis.

Bungarus caeruleus.

The only frog is *Rana cyanophlyctis*, which is abundant in the small artificial pool in the middle of the island.

¹ For an account of the aquatic species see *Mem. Ind. Mus.*, V, pp. 167-174 (1915).



V A LIST OF THE DRAGONFLIES
RECORDED FROM THE INDIAN EMPIRE
WITH SPECIAL REFERENCE TO
THE COLLECTION OF THE
INDIAN MUSEUM

PART I. THE FAMILY CALOPTERYGIDAE.

By F. F. LAIDLAW, M.A.

(Plate II).

This is the first part of a series of papers in which I hope to give a full list of the dragonflies of the Indian Empire. The number of species occurring within the limits of the Empire is considerable, as one would expect from the size of the area under consideration, and from the great variety of physical conditions found in different parts of the country.

I hope that these papers will at least serve to show how little is known of this fascinating group of insects, and will stimulate those who are fortunate enough to have opportunities, to add to what is known of them, both of their life-history and of their distribution.

The material used in drawing up the list is as follows:—

Firstly, the large collection of the Indian Museum entrusted to me for revision by Dr. Annandale. The collection contains a very large number of specimens which have been named by the late Baron de Selys. These specimens although unfortunately often dilapidated have an historical value.

Secondly, an extensive collection of several hundreds of specimens sent to me by Mr. H. Stevens from Gopaldhara (Assam).

Thirdly, additions made to the Indian Museum collection in the last two years by members of the Museum staff.

NOTE ON CLASSIFICATION ADOPTED, AND ON NOMENCLATURE.

I follow here Needham in giving family rank to the first of the two great divisions of existing zygopterous dragonflies (Needham, *Proc. U.S. Nat. Mus.*, XXVI, p. 742; 1903).

This procedure is adopted by Ris in the paper quoted below, and in other recent papers; by Muttkowski and others.

Following the example set by Ris and Tillyard, two amongst the foremost entomologists of to-day, I retain for the family the name Calopterygidae, using the term as synonymous with Selys'

Calopteryginae, and equivalent to Kirby's Agrioninae. Further I propose in this series of notes to use the term Agrionidae as equivalent to Kirby's Coenagrioninae. I am aware that this is opposed to the views and practice of authorities on nomenclature. I comfort myself with the reflection that if I sin, it is in good company. Needham (*loc. cit.*) allows three subfamilies for existing Calopterygidae. One of these, Thorinae, is entirely (tropical) American. The second which he calls Vestalinae I prefer with Tillyard to label Calopteryginae; the third is his Epallaginae, less the genera *Rhinocypha*, *Micromerus*, *Libellago* (and *Rhinoneura*). I propose to erect a separate subfamily the Libellaginae to contain these. They form a compact natural group readily distinguished from the Epallaginae their nearest relatives. I admit that they are probably a specialized offset from the Epallagine series, but it is I believe convenient to contrast them with typical members of that series.

In the matter of quotations I give references as a rule only to papers published subsequently to Kirby's Catalogue of Odonata, and to that invaluable work of reference.

The following list of the Calopterygidae recorded from the Indian Empire includes 14 genera, or 66 per cent of the genera found in the Oriental Region, and no less than 35 per cent of all existing genera known; allowing 40 genera for the whole world. And this wealth is the more striking in that Peninsular India and Ceylon are by no means rich in genera or species of the family.

The Indian genera fall into two main categories.

A.—Genera largely confined to the mountain-systems of the North-East, often extending east to China and even Japan.

CALOPTERYGINAE.

EPALLAGINAE.

Mnais.

Bayadera.

Matrona.

Anisopleura.

Caliphaea.

Philoganga.

B.—Genera with wide distribution in Indo-Malaya.

CALOPTERYGINAE.

EPALLAGINAE.

LIBELLAGINAE.

Neurobasis.

Pseudophaea.

Rhinocypha.

Vestalis.

Micromerus.

Lastly, *Echo* extending through Assam and Burma into China, reaches also down the Malay Peninsula into Sumatra.

Group (A) can be reinforced by sections of the genus *Rhinocypha*, viz. *unimaculata* and *trifasciata*.

Group (B) might reasonably include the section *fenestrata* of the same genus.

It will be noticed that Ceylon and Peninsular India have only representatives of group B.

Sub-family <i>CALOPTERYGINAE</i> .		Range.
		All tropical and temperate continental lands except Australia.
Genus	Species	
<i>Echo</i>		Assam, Burma, Malay Peninsula, S. China, Tonkin, Sumatra.
<i>Mnais</i>	<i>margarita</i> , Selys	Assam, Burma.
	<i>andersoni</i> , McLachlan	Burma, Japan, China.
<i>Matrona</i>	<i>earnshawi</i> , Williamson	Burma, Yunnan.
		Burma.
<i>Neurobasis</i>		Burma, Assam, West China, Japan, Tonkin.
	<i>basilaris</i> , Selys ? race	Himalaya, Moupin, Indo-China, Burma, Assam.
	<i>nigripictus</i> , Selys	Himalaya.
	? sp.	Oriental Region to N. Guinea.
<i>Vestalis</i>	<i>chinensis</i> (Linn.)	Oriental, with well-marked races in Celebes, Philippines and N. Guinea.
		Indian Empire, Indo-China, Malay Peninsula and islands to Philippines.
<i>Caliphaea</i>	<i>gracilis</i> (Ramb.)	India, Ceylon, Burma, Assam, Tonkin.
	<i>apicalis</i> , Selys	Ceylon, S. India.
	<i>smaragdina</i> , Selys	Burma, S. China.
	<i>confusa</i> , Selys	Nepal, Assam, S. China.
		Nepal, Assam.

Sub-family <i>EPALLAGINAE</i> .		Tropical continental lands (except Africa and Madagascar), S. E. Europe, Asia Minor.
Genus	Species	
<i>Bayadera</i>		Himalaya, Indo-China, S. China.
<i>Epallage</i>	<i>indica</i> (Selys)	Darjiling, Assam.
	<i>hyalina</i> , Selys	Khasia Hills, Kurseong, Formosa.
<i>Anisopleura</i>	<i>fatima</i> (Charp.)	Greece, Asia Minor, Persia, Kashmir.
		As genus.
<i>Pseudophaea</i>		Himalayas to Burma.
	<i>comes</i> , Hagen	Himalayas to Assam.
	<i>lestoides</i> , Selys	Himalaya, Tonkin.
	<i>furcata</i> , Selys	Burma.
<i>Philoganga</i>		Indian Empire, Indo-China, S. China, Malaya to Philippines.
	<i>dispar</i> (Ramb.)	Nilghiri Hills.
	<i>ochracea</i> (Selys)	Burma to Malay Peninsula, Indo-China (Borneo?).
	<i>brunnea</i> (Selys)	Burma to Indo-China.
	<i>masoni</i> (Selys)	Burma, Indo-China.
	<i>splendens</i> (Selys)	Ceylon.
	<i>carissima</i> , Kirby	Ceylon.
	<i>montana</i> , Selys	Himalaya, S. China.
		Darjiling.

Sub-family <i>LIBELLAGINAE</i>		Old-world Tropics.
Genus	Species	
<i>Rhinocypha</i>		India (excl. Ceylon), Assam, Burma, Oriental Region to N. Australia and Solomon Is.
group <i>tri-fasciata</i>	<i>trifasciata</i> , Selys	Darjiling and westward.
	<i>bifasciata</i> , Selys	Assam.
	<i>immaculata</i> , Selys	Assam, Khasia Hills.

group <i>fenestrella</i>	<i>cuneata</i> , Selys	Darjiling to Assam.
	<i>fenestrella spuria</i> , Selys	Khasia Hills, Burma.
	" <i>quadrinaculata</i> , Selys	Himalayas to Burma.
group <i>trima</i>	<i>t. imaculata</i> , Selys	Assam.
	<i>unimaculata</i> , Selys	Himalaya, Darjiling to Assam.
	<i>ignipennis</i> , Selys	Assam.
group <i>fenestrata</i>	<i>iridea</i> , Selys	Burma.
	<i>bisignata</i> , Selys	Deccan.
	<i>perforata</i> (Perch.)	Burma, Siam, Malay Pen., Hainan.
	<i>biforata</i> , Selys	Burma, Siam, Malay Peninsula.
	<i>whiteheadi</i> , Kirby	Assam, Tonkin, Hainan.
<i>Micromerus</i>		India, Ceylon, Indo-China, Malaya.
		Philippine Is., Celebes.
		<i>lineatus</i> (Burm.)
		India, Ceylon, Assam, Burma, Malaya.
		<i>finalis</i> , Selys
		Ceylon.
<i>Libellago</i>		Tropical Africa, Burma to Philippine Is.
		<i>asiatica</i> , Selys
		Burma, Tonkin, Philippine Is.

The accompanying diagram will serve to show at a glance the distribution of Indian genera so far as it is known to me. Genera occurring in neighbouring subregions which do not extend into the limits of India are named in brackets. Dotted lines between districts are intended to show that the faunistic relations of such districts are very close. I should add that the diagram was suggested to me by those in Mr. Beddard's book on Zoogeography.

Genus *Echo*, Selys.

I. *Echo margarita*, Selys.

Echo margarita, Kirby, *Cat. Odonata*, p. 101 (1890).

" " Laidlaw in *Fascic. Malayenses* (Zoology), pt. I, p. 192 (1903).

1 ♂. Cherrapunji, Assam. ($\frac{82.01}{20}$), x-14 (S. W. Kemp).

Type locality of the species.

When I defined the genus *Climacobasis* for a male specimen of the species which I then called *C. lugens*, I had not seen a male example of this species, or indeed of any species of the genus *Echo*. The present example differs from the female in having an elongate pterostigma, exactly like that of my *Climacobasis*. The only character then separating *Climacobasis* from *Echo* falls to the ground and *Climacobasis* must be regarded as a synonym of *Echo*.

The following list of the species of the genus may be useful:—

Echo margarita, Selys.

Echo margarita, Kirby, *Cat. Odonata*, p. 101 (1890). Loc. Assam.

Race *tripartita*, Kirby, *Cat. Odonata*, p. 101 (1890). Khasia Hills.

Echo uniformis, Selys.

Echo? uniformis, Kirby, *Cat. Odonata*, p. 101 (1890). Sumatra.

Echo uniformis, Kruger, *Stettin Entomol. Zeit.*, 1898, p. 72.

Echo iricolor? Kruger, *loc. cit.*, p. 72.

Echo incarnata, Karsch.

S. China.

Echo incarnata, Karsch, *Berlin. Ent. Zeitschr.*, XXXVI, p. 455 (1891).

" " *id.*, *Entomol. Nachr.*, XX, p. 84.

PALAEARCTIC REGION.

KASHMIR <i>Epallage</i> 1 (? <i>Calopteryx</i>)	HIMALAYA <i>*Rhinocypha</i> 2 <i>Matrona</i> 1 <i>Bayadera</i> 2 <i>Neurobasis</i> 1 <i>Anisopleura</i> 2 <i>Caliphaea</i> 1 <i>Philoganga</i> 1 <i>*Rhinocypha</i> 3	ASSAM <i>Echo</i> 1 <i>Matrona</i> 1 <i>Neurobasis</i> 1 <i>Vestalis</i> 1 <i>Caliphaea</i> 1 <i>Bayadera</i> 2 <i>Anisopleura</i> 2 <i>*Rhinocypha</i> 4 <i>Micromerus</i> 1	INDO-CHINA <i>Psolodesmus</i> <i>Calopteryx</i> <i>Dysphaea</i> <i>Tetraneura</i>
IRANIA	CENTRAL INDIA <i>Neurobasis</i> 1 <i>Micromerus</i> 1 <i>Vestalis</i> 1 ?	BURMA <i>Echo</i> 1 <i>Matrona</i> 1 <i>Mnais</i> 2 <i>Neurobasis</i> 1 <i>Vestalis</i> 2 <i>Bayadera</i> 2 <i>Anisopleura</i> 2 <i>Pseudophaea</i> 6 <i>*Rhinocypha</i> 4 <i>Micromerus</i> 2 <i>Libellago</i> 1	
	W. DECCAN E. <i>Neurobasis</i> 1 <i>Vestalis</i> 2 <i>Pseudophaea</i> 1 <i>Rhinocypha</i> 1 <i>Micromerus</i> 1 <i>Neurobasis</i> 1 <i>Vestalis</i> 2 (?) <i>Rhinocypha</i> 1 ? <i>Micromerus</i> 1 ?	MALAYA <i>Dysphaea</i> <i>Tetraneura</i>	
	CEYLON <i>Neurobasis</i> 1 <i>Pseudophaea</i> 2 <i>Vestalis</i> 2 <i>Micromerus</i> 2		

* Numbers after *Rhinocypha* refer to groups not species.

Archineura basilactea, Kirby, *Ann. Mag. Nat. Hist.* (6) XIII, pp. 84-86, text figs. (1894).

" " *id.*, *op. cit.*, pp. 455-456.

Archineura incarnata, M'Lachlan, *Ann. Mag. Nat. Hist.* (6) XVII, p. 370 (1896).

Echo modesta (Laidlaw).

Malay Peninsula.

Echo modesta, Laidlaw, *Proc. Zool. Soc. London*, 1902 (1), p. 84, pl. vi fig. 6.

Echo (Climacobasis) modesta, Laidlaw in *Fascic. Malayenses* (Zoology), pt. I, p. 191 (1903).

Climacobasis modesta, Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 186, fig. 17 (1904).

Climacobasis lugens, Laidlaw, *Proc. Zool. Soc. London*, 1902 (1), p. 85, pl. vi, fig. 5.

Echo maxmia, Martin.

Tonkin.

Echo maxmia, Martin, *Mission Pavie*, Neuroptères (sep.), pp. 16-17.

The confusion which has arisen in the synonymy of this interesting genus appears to me to be due to the fact that de Selys founded the genus on a female specimen of *E. margarita* the wings of which he figured.

The females of all the species of the genus so far as is known have very small trapezoidal pterostigmata. When attempting to find a place for the male of *E. modesta* I was struck by the considerable length of the pterostigmata which contrast markedly with the small corresponding structure of the female (see Williamson's photographic figures, *loc. cit.*).

When Selys described the male *E. margarita* he did not call attention to this difference in the sexes, and I was not aware of its existence.

The male of *E. uniformis*, however, appears from Kruger's account to have a small pterostigma like the female.

The same peculiarity evidently largely induced Kirby to erect the genus *Archineura* for the large *E. incarnata*, but he had a further justification in the dense reticulation of the anal area in that species. I do not know the female of this species, nor have I seen an example of Martin's *E. maxmia*, but I am now of the opinion that all these species may properly be referred to the Selysian genus.

Genus *Matrona*, Selys.

2. *Matrona basilaris*, Selys.

Matrona basilaris, Kirby, *Cat. Odonata*, p. 100 (1890).

" " McLachlan, *Ann. Mag. Nat. Hist.* (6) XVII, p. 370 (1896).

" " Martin, *Mission Pavie*, Neuroptères (sep.), p. 15 (1904).

Matrona nigripictus, Kirby, *loc. cit.*, p. 100.

" " Martin, *loc. cit.*, p. 15.

Matrona basilaris race *nigripictus*, Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 52 (1891).

See also Foerster, *Ann. Soc. Ent. de Belgique*, XLI, p. 206 (1897).

I have before me eight examples of the genus representing probably two distinct races, and have examined the material in the

British Museum. The former include 1 ♀ "Upper Assam." Length of hind-wing 49 mm.; breadth of hind-wing 17 mm. Neuration especially at base of wings more complicated than in other specimens ($\frac{1.6.2.3}{9}$).

2 ♂ ♂ 2 ♀ ♀ Cherrapunji, Assam, alt. 4,000 ft., taken by S. W. Kemp.

Length of hind-wing, ♂	37.5 mm.
" " " ♀	37 "
Breadth " " ♂	12 "
" " " ♀	12 "

2 ♂ ♂ 1 ♀ Shillong, Khasia Hills ($\frac{6.3.0.6-6.3.0.7}{2.0}$).

Length of hind-wing, ♂	41 mm.
" " " ♀	44 "
Breadth " " ♂	14 "
" " " ♀	14.5 "

The males agree in colouring with the race '*nigripectus*.' It is evident that more material is required here to estimate specific values.

Genus *Mnais*, Selys.

3. *Mnais andersoni*, McLachl.

Mnais andersoni, Kirby, *Cat. Odonata*, p. 101 (1890).

" " Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 485 (1891) (*partim*).

" " Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 185 (1904).

The Museum collection contains a single adult male of this species, in poor condition. It is from Leito in Burma, and bears a label written by de Selys. ($\frac{3.9.2.0}{1.3}$).

4. *Mnais earnshawi*, Williamson.

Mnais earnshawi, Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 185, fig. 16 (1904).

" " Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 485 (1891) (*partim*).

Not in the Museum collection. I have not seen an example of this species.

Known only from Burma. Distinguished from *M. andersoni*, so far as the males are concerned, by the venation of the wings being yellowish red, in *andersoni* it is black.

Genus *Vestalis*, Selys.

5. *Vestalis smaragdina*, Selys.

Vestalis smaragdina, Kirby, *Cat. Odonata*, p. 103 (1890).

" " Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 488 (1891).

" " subsp. *velata*, Ris, *Supplementa Entomologica*, No. I, p. 56, t. iv, fig. 2 (1912).

2 ♀ ♀ 1 ♂ Cherrapunji, Assam, 4,400 ft., 2—8-x-14 (S. W Kemp) ($\frac{8.18.9}{2.0}$).

Recorded from Khasia Hills; Meteles (Burma) by de Selys; Moupin (M'Lachlan); Tsa-Yin-San (Kwang-Tung) by Ris as sub-species *velata*.

6. *Vestalis gracilis* (Ramb.).

Vestalis gracilis, Kirby, *Cat. Odonata*, p. 102.

„ „ Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 55 (1891).

„ „ Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 183, fig. 15 (1904).

„ „ Martin, *Mission Pavie*, Neuroptères (sep.), p. 15.

„ „ Laidlaw, *Rec. Ind. Mus.*, VIII, p. 340.

The limits of the range of this species are not sufficiently known. Williamson records it for Burma and Lower Siam. The Abor Expedition obtained examples in Assam, and I have specimens from Gopaldhara taken by Mr. Stevens. The Museum has specimens from Sibsagar ($\frac{6.30.3}{2.0}$). Also the Museum collection includes spirit specimens from Cochin State, 5 ♂ 4 ♀, which are certainly *gracilis*. They differ from the Assam-Burmese specimens in one respect, the metallic colouring of the body is coppery in hue, that of the eastern and northern specimens is brilliant emerald green.

I have not seen specimens from the great river-valleys; nor yet from the hills west of Assam, but the collection contains a damaged female specimen from Cutch ($\frac{2.9.9.3}{4}$).

7. *Vestalis apicalis*, Selys.

Vestalis apicalis, Kirby, *Cat. Odonata*, p. 102.

Neurobasis apicalis, id., *Proc. Zool. Soc. London* 1891, p. 204, pl. xx, fig. 2.

Vestalis apicalis, id., *Journ. Linn. Soc. (Zool.)* XXIV, pp. 558-559 (1893).

A characteristic species of Ceylon and apparently also of Southern India. I found one specimen a female in a tube with three examples of *V. gracilis*, taken apparently at the same time and in the same place with them in Cochin State ($\frac{8.2.2.5}{2.0}$).

The collection includes also an imperfect male ($\frac{8.9.1.8}{1.3}$) and an immature female ($\frac{3.9.1.8}{1.3}$), both from Ceylon. I have also seen examples from Kadur district (Mysore) in the British Museum.

Genus *Caliphaea*, Selys.

8. *Caliphaea confusa*, Selys.

(Pl. II, fig. 1).

Caliphaea confusa, Kirby, *Cat. Odonata*, p. 108.

Notholestes elwesii, McLachlan, *Ent. Mon. Mag.*, XXIV, p. 31 (1887).

„ „ Kirby, *Cat. Odonata*, p. 111.

See also McLachlan, *Ann. Mag. Nat. Hist.* (6) XVII, p. 371 (1896).

The position of the genus is obscure. Features of the neurathion worthy of remark are: the petiolation of the wings, the posi-

tion of the nodus at one-third of the wing length from the wing base, and the characters of the sectors of the quadrilateral. These points I think all suggest specialization. The metallic body-colour and the shape of the anal appendages of the male may indicate a relationship to the Calopteryginae, rather than to the Epallaginae. I am inclined to regard *Caliphaea* as an early offshoot from the main Calopterygine stem which has undergone specialization along lines of its own. I am indebted to Mr. Stevens for specimens and to Messrs. H. and F. E. Champion for the photograph showing the wings of a male.

Genus *Anisopleura*, Selys.

9. *Anisopleura lestoides*, Selys.

Anisopleura lestoides, Kirby, *Cat. Odonata*, p. 108.

" " Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 489.

I have examined specimens of this form from the neighbourhood of Darjiling, and from Mr. Stevens's collection from Gopaldhará, where the species appears to be abundant.

10. *Anisopleura comes*, Hagen.

Anisopleura comes, Kirby, *Cat. Odonata*, p. 108.

" " Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 459.

This, the largest species of the genus, is common near Darjiling, and I have seen specimens from Kurseong (*N. Annandale*) as well as many from Gopaldhara in Assam (*H. Stevens*). The latter are distinctly smaller than those from further west. I have also seen specimens from the Forestry Research Museum taken near Bhowali, Kumaon.

11. *Anisopleura furcata*, Selys.

Anisopleura furcata, Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 488 (1891).

" " Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 181, fig. 13.

Recorded by Selys from Puepoli in Burma (*loc. cit.*), where it was collected by Fea.

Genus *Bayadera*, Selys.

12. *Bayadera indica* (Selys).

Bayadera indica, Kirby, *Cat. Odonata*, p. 108 (1890).

" " Martin, *Mission Pavie*, Neuroptères (sep.), p. 15.

" " Ris, *Supplementa Entomologica*, No. I, p. 49 (1912).

Specimens are in the Museum collection from Lord Carmichael's collection, taken in May in the Darjiling district at an altitude of from 1,000-3,000 ft. above the sea. (C.C. 1163, etc.).

13. *Bayadera hyalina*, Selys.

Bayadera hyalina, Kirby, *Cat. Odonata*, p. 108.

" " Ris, *Supplementa Entomologica*, No. I, pp. 50-52, text-fig. 3, taf. iv, fig. 1 (1912).

Recorded from the Khasia Hills by Selys. A single damaged and very mature male collected by Mr. Stevens probably belongs to this species. It has the wings evenly tinged with yellow, so that at first sight it resembles somewhat *Euphaea ochracea*.

Genus **Pseudophaea**, Kirby.

14. **Pseudophaea dispar** (Ramb.).

Pseudophaea dispar, Kirby, *Cat. Odonata*, p. 109 (1890).

Not in the Museum collection. Known from Southern India only.

15. **Pseudophaea splendens** (Selys).

Pseudophaea splendens, Kirby, *Cat. Odonata*, p. 110 (1890).

" " *id.*, *Four. Linn. Soc. London (Zool.)* XXIV, p. 560 (1893).

2 ♂ ♂ Nalanda, Ceylon. (³⁸⁹⁹/₁₃).

This fine species is I think a local development of the stock to which also *P. variegata* (Ramb.) belongs.

16. **Pseudophaea carissima**, Kirby.

Pseudophaea carissima, Kirby, *Fourn. Linn. Soc. London (Zool.)*, XXIV, pp. 559-560 (1893).

" " var. *viridissima*, *id.*, *loc. cit.*

Evidently closely allied to *P. splendens*.

Not in the Museum collection. I have examined the type and other specimens in the British Museum.

17. **Pseudophaea masoni** (Selys).

Pseudophaea masoni, Kirby, *Cat. Odonata*, p. 110.

" " *id.*, *Ann. Mag. Nat. Hist.* (6) XIV, p. 113 (1894).

Euphaea masoni, Laidlaw, *Fascic. Malayenses* (Zool.), Pt. I, p. 194.

" " Martin, *Mission Pavie*, Neuroptères (sep.), p. 15 (1904).

" " Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 182 (1904).

Not in the Museum collection.

In addition Martin (*loc. cit.*) gives *Pseudophaea bocki*, McLachlan as a species from 'India.' This is a Sumatran species which he records also from Tonkin. As he does not give a more precise localization I only make note of it here and hope that I shall be able to get fuller information from Mr. Martin later.

18. **Pseudophaea ochracea** (Selys).

Pseudophaea ochracea, Kirby, *Cat. Odonata*, p. 109

Euphaea ochracea, Selys, *Ann. Mus. Civ. Genova*, (2) X, pp. 56-57 (1891).

" " Laidlaw, *Proc. Zool. Soc. London* 1902 (i), p. 87.

" " Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 181, fig. 14 (1904).

" " Martin, *Mission Pavie*, Neuroptères (sep.), p. 15 (1904).

The Museum collection contains only a single damaged male of this species. It is fairly common in the Malay Peninsula. The Museum specimen is from Puepoli, Burma.

19. *Pseudophaea brunnea* (Selys).

Pseudophaea brunnea, Kirby, *Cat. Odonata*, p. 109.

Euphaea brunnea, Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 57.

" " Martin, *Mission Pavie*, Neuroptères (sep.), p. 15 (1904).

This is a large form closely allied to the smaller *P. ochracea*. A very similar large species or subspecies from Lombok has been named *Euphaea lava* by Foerster, but I am not able to find the reference.

P. brunnea is not in the Museum collection.

Genus *Philoganga*, Kirby.

= *Anisoneura*, Selys (nom. praeocc.).

20. *Philoganga montana* (Selys).

Philoganga montana, Kirby, *Cat. Odonata*, p. 111.

See also Ris, *Supplementa Entomologica*, 1912, No. 1, pp. 44-48, fig. 1.

The position of this remarkable genus in the subfamily Epalaginae is doubtful. Other genera included by Selys in the legion *Amphipteryx*, which do not concern us here, though not necessarily allied to *Amphipteryx* will also probably require to be removed from the subfamily.

Genus *Rhinocypha*, Ramb.

This is the most characteristic genus of dragonflies of tropical Asia, striking both in respect of the great beauty and brilliance of its members and of the abundance of species. In the whole Oriental Region the island of Ceylon and the great valleys of N. India alone are lacking in representatives.

The arrangement I have adopted in the following list differs a little from that hitherto used, especially in the grouping together of *R. unimaculata* and *R. trimaculata*. I believe these species to form a natural group within the genus. I hope that students who have the good fortune to be able to study these fascinating and exquisite insects in the field will soon furnish us with information as to their life-history and habits.

Mesothoracic triangle reaching the antealar sinus.

Triangle very large, rather rounded at apex ... Group *trifasciata*.

Wings of male opalescent, hind-wings with opaque bands ... spp. *trifasciata*, *bifasciata*.

Wings colourless in both sexes... sp. *immaculata*.

Triangle large, pointed at apex; in the female in some cases not reaching the antealar sinus.

Wings of males broad, with brilliant amethyst iridescence and rich purple opacities ... Group *fenestrella*.

Mesothoracic triangle not extending one-half the length of the mid-dorsal carina. Wings of males

narrow, with amethyst iridescence and purple opacities ... Group *fenestrata*.
 No mesothoracic triangle; wings of males with rich coppery iridescence. Tibias and femurs of females with light marks on anterior surfaces ... Group *unimaculata*.

The males of the groups *immaculata*, *fenestrella* and *fenestrata* all have the anterior surfaces of the hinder pairs of tibias of a beautiful chalky white colour, which, as Annandale has remarked, are shown conspicuously by them when mating. Of the group *unimaculata*, the species *unimaculata* has this surface of the tibias of a yellowish colour, *trimaculata* is said by Selys to have them "probably whitish" (Selys, *Monograph. Calopt.*, p. 212); *ignipennis* seems to be without this character. In passing it may be remarked that the males of the Bornean species *R. cucullata*, Selys, have the anterior surface of the two hinder pairs of tibias not white but of a vivid chalky blue.

Group IMMACULATA.

21. *Rhinocypha trifasciata*, Selys.

(Pl. II, fig. 2).

R. trifasciata, Kirby, *Cat. Odonata*, p. 113 (1890).

5 ♂ ♂. Kailana, N.-W. Provinces (*J. C. Moulton*).

It seems likely that this form has a westernly distribution, whilst the next, *viz. R. bifasciata*, Selys, is its representative in Burma and Assam.

22. *Rhinocypha bifasciata*, Selys.

R. bifasciata, Kirby, *Cat. Odonata*, p. 113.

3 ♂ ♂. Gopaldhara (*H. Stevens*).

This form is so closely allied to the preceding that it may be treated as a local race; or, by reason of its differences from *R. trifasciata* being constant, as a distinct species according to the views held by the list maker. I prefer to treat it as distinct as a matter of convenience.

1 ♀ (?). Gopaldhara, 4-x-14 (*H. Stevens*).

The mesothoracic triangle is continued up to the antealar sinus, the outer two-thirds of the pterostigma is of a bright-yellow colour. The mesothoracic triangle is not by any means as broad as in the female of *R. immaculata*, where it equals in size that of the male. Antero-lateral bands and postero-lateral spots are present on segments 2, 3, 4 of the abdomen. The specimen is fully adult.

23. *Rhinocypha immaculata*, Selys.

R. unimaculata, Kirby, *Cat. Odonata*, p. 113 (misprint).

R. immaculata, *id.*, *ibid.*, p. 186.

2 ♂ ♂ 3 ♀ ♀ ($\frac{8.2.0.3}{2.0}$), Cherrapunji, Assam, 4,400 ft., 2—8-x-14 (*S. W. Kemp*).

The female differs from the male in colour, mainly in that the markings on the head and dorsum of the thorax are of a yellowish green colour instead of being bright blue. The large mesothoracic triangle, so conspicuous in the male, is outlined in colour but its central part is black. The abdomen has an antero-lateral stripe on segments 2, 3, as well as a postero-lateral spot of yellow colour on the same segments. The latter mark only is present in the male, at least when adult. The rest of the abdomen in both sexes is black.

The anterior surface of the two posterior pairs of tibiae of the male is white and the curious exudation, referred to by de Selys (*loc. cit.*), is well seen in the spirit specimens.

Group UNIMACULATA.

24. *Rhinocypha unimaculata*, Selys.

(Pl. II, fig. 3).

R. unimaculata, Kirby, *Cat. Odonata*, p. 113 (1890).

This is the largest of all Indian species of the genus. It is abundant from Darjiling to Assam, but the limits of its range are not known.

The dimensions of a male specimen are :—

Length of hind-wing	31 mm.
„ „ abdomen	24 „

25. *Rhinocypha trimaculata*, Selys.

R. trimaculata, Kirby, *Cat. Odonata*, p. 113.

The locality 'Thibet' given for this species by Selys should almost certainly be rather Assam. I have not seen an example of this, one of the smallest and probably one of the rarest of the *Rhinocyphas*; it is closely allied to *R. ignipennis*.

26. *Rhinocypha ignipennis*, Selys.

R. ignipennis, Kirby, *Cat. Odonata*, p. 113.

„ „ Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, pp. 179-181.

2 ♂♂ ($\frac{82.02}{20}$), Cherrapunji, Assam. 1 ♂, 1 ♀ ($\frac{82.83}{20}$), Shillong, Assam, 4,900 ft.

The female specimen has the anterior surface of the femurs marked with white.

Group FENESTRELLA.

This group is restricted entirely to the mainland of Asia ranging from the Himalayas to the extremity of the Malay Peninsula. The species or races present marked individual variation, and in view of this I think it well to treat some of the species as local races, a course already suggested by de Selys in his paper on

the Dragonflies of Burma (*Ann. Mus. Civ. Genova*, (2) X (XXX), p. 491, 1890) for *spuria* and *quadrimaculata*. I have not seen an example of Foerster's *R. adamantina*, but I think it will be found to be a race of *cuneata*.

The members of this group are I think the most brilliantly coloured and beautiful of all the genus.

- A. Apical spot on hind-wing always approaching to within two cell-rows of anterior wing margin (post-nodal costal and post-nodal radial rows).
 Large species (hind-wing 26 mm. long or more).
 Range: Himalaya, Darjiling eastwards ... *R. cuneata*, Selys.
- B. Apical spot on hind-wing never less than 4 cell-rows from anterior wing margin ... *R. fenestrella*, Ramb.
- a. Large form, hind-wings 25 mm. or more in length.
 Range: Khasia Hills ... race *spuria*, Selys.
- b. Smaller form (hind-wings 23 mm. or less in length).
 Northern race.
 Range: Himalaya (Darjiling) to Burma race *quadrimaculata*, Selys.
 Southern race.
 Range: Burma; Siam to Singapore ... race *fenestrella*, Ramb.

27. *Rhinocypha cuneata*, Selys.

(Pl. II, fig. 4).

R. cuneata, Kirby, *Cat. Odonata*, p. 113.

„ „ Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 173.

Specimens examined from Darjiling District and Gopaldhara,
 16 ♂♂, 2 ♀♀

Scarcely two of the males are alike in detail, though the general resemblance is close. Variation consists chiefly in differences in size of the apical hyaline spot of the hinder wing, and in the extent of subdivision of the median series of spots; in the example figured (from Gopaldhara) this series is broken into three areas, more usually it consists of two only; one specimen shows three on one side and two on the other. The average length of the hind-wing of the male is about 27.5 mm., extreme measurements are 26.5 mm. and 28 mm.

28. *Rhinocypha fenestrella quadrimaculata*, Selys.

R. quadrimaculata, Kirby, *Cat. Odonata*, p. 112.

„ „ Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 176,
 fig. 8.

„ „ Martin, *Mission Pavie*, Neuroptères (sep.), p. 17.

Specimens examined from Darjiling District, Sikkim, Gopaldhara, Narbong Valley, Tenasserim.

Average length of hind-wing (22 specimens) 22.5 mm., extremes 21.5—23 mm.

Williamson (*loc. cit.*) has pointed out that *quadrimaculata* may be distinguished from *fenestrella* by having the anterior of the

median row of spots decidedly nearer the nodus, and the middle spot of the row about half the length of the anterior and posterior spots; in *fenestrella* the three are more often sub-equal (see his figures 8-11, *loc. cit.*). Specimens of *quadrимaculata* from Darjiling have occasionally all the spots of the median row quite small though there is marked individual variation both in these and in the size of the apical spot.

On the whole, however, it is correct to say that the specimen figured by Williamson, which is from Burma, is less easy to distinguish from *fenestrella* than the average specimen from Darjiling so far as my experience goes.

29. *Rhinocypha fenestrella spuria*, Selys.

R. spuria, Kirby, *Cat. Odonata*, p. 113.

„ „ Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 59.

2 ♂♂, Khasia Hills, old Museum collection.

Labelled by de Selys *R. quadrимaculata*.

Length of hind-wing 28 mm.

These specimens from their size and their locality are evidently examples of the race described as *R. spuria* by de Selys. Except on account of their large size I believe they cannot be distinguished from typical *quadrимaculata*.

De Selys gives the length of the hind-wing of his examples as 26-27 mm.

There are two males in the British Museum collection which I believe belong to this race. They are labelled from the Chin Hills, Burma.

30. *Rhinocypha iridea*, Selys.

(Pl. II, fig. 5).

R. iridea, Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), pp. 492-494 (1891).

This beautiful species is not represented in the Museum collection. There are several examples in the British Museum.

It occupies a position somewhat isolated in the group to which it belongs. Its wings are distinctly wider than in other species of the *fenestrata* series, and the colour pattern is to some extent, I think, intermediate between the typical *fenestrata* forms and the *quadrимaculata* group. I am inclined to regard it as an annectant species between the two groups. In its own group its nearest ally would appear to be *R. fenestrata* (Ramb.) of Java. The present species is probably confined to Burma.

31. *Rhinocypha biforata*, Selys.

R. biforata, Kirby, *Cat. Odonata*, p. 114.

„ „ Laidlaw, *Proc. Zool. Soc. London*, 1902 (i), p. 88.

„ „ Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 179, fig. 12 (1904).

Ranges from the Malay Peninsula to Burma. Not in the Museum collection.

32. *Rhinocypha bisignata*, Selys.

(Pl. II, fig. 6).

R. bisignata, Kirby, *Cat. Odonata*, p. 114.

3 ♂♂, Parambikulam, Cochin State, 1700—3200 ft. ($\frac{8\frac{2}{2}6\frac{3}{3}}$).

Resembles *R. biforata* in general in the colour pattern of the wings, and is probably closely allied to that species, "representing" it in S. India. It differs from other species of the section to which it belongs in the body-colours, the markings being of an orange red here whilst other species have them lilac or blue.

So far as is known this is the only representative of the genus found in Peninsular India, and it does not reach Ceylon. Compare the distribution of another equally characteristic Indo-Malayan genus *Draco*.

See note under *R. perforata*, the next species.

33. *Rhinocypha perforata perforata* (Percheron).

R. perforata, Kirby, *Cat. Odonata*, p. 114 (1890).

" " Martin, *Mission Pavie*, Neuroptères (sep.), p. 17.

" *inas*, Laidlaw, *Proc. Zool. Soc. London*, 1902, pp. 88-90, pl. vi, fig. 6.

" *apicalis*, Laidlaw in *Fascic. Malayenses* (Zoology), part I, p. 196.

" " Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 174.

Not in the Museum collection. The species *inas* from Perak is at best a local race of this species; I am not able to compare series from different localities, but I am inclined to think that the name cannot stand, whereas *whiteheadi*, Kirby, is tolerably well marked, and has been accepted as distinct by Martin. Of the value of Selys variety *limbata* (Kirby, *loc. cit.*) I cannot speak with any certainty, again for lack of material. Kruger (*Stettin Entomol. Zeitung*, 1898, p. 79) has named a species from Sumatra as *R. bisignata*, Hagen? = *apicalis*, sp. n. Foerster (*in litt.*) has identified therewith my species *inas* which would then become a synonym of *R. apicalis*, Kruger. One may say with conviction that the species *bisignata*, Hagen, does not occur in Sumatra. Kruger's account of *apicalis* is totally inadequate, but Williamson has accepted the species and says (*loc. cit.*) that he cannot separate *inas* and *whiteheadi* therefrom. But as *inas* is I think beyond question a synonym of *perforata* it follows that *apicalis* must take the same place.

34. *Rhinocypha perforata whiteheadi*, Kirby.

(Pl. II, fig. 7).

R. whiteheadi, Kirby, *Ann. Mag. Nat. Hist.* (7) V, p. 536, pl. xii, fig. 4.

" " Martin, *Mission Pavie*, Neuroptères (sep.), p. 17.

A single male from Sibsagar, collected by S. E. Peal ($\frac{6\frac{3}{2}10^0$).

This is the most northerly record that I know of for any species of the *fenestrata* group of the genus.

R. whiteheadi would seem to be the northern race of the *perforata* series. It is distinguishable from the typical *perforata* by the following characters :—

- (a) Absence of the backward prolongation along the costal margin of the fore-wing of the dark colouring.
- (b) Absence of the hyaline border which lies along the anal margin of the coloured parts of both wings.

Genus *Micromerus*, Ramb.

35. *Micromerus lineatus*, Burm.

M. obscurus, Kirby, *Cat. Odonata*, p. 115.

„ *lineatus*, *id.*, *loc. cit.*

„ „ Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), p. 62 (1891).

„ „ Laidlaw in *Fascic. Malayenses* (Zoology), pt. I. p. 197 (1903).

„ „ Williamson, *Proc. U.S. Nat. Mus.*, XXVIII, p. 171. figs. 5, 6 (1904).

I think that *M. obscurus*, Kirby, is a young specimen of *M. lineatus*. It is at any rate so immature that no determination from a single specimen can be satisfactory. The species ranges from Ceylon through India to Assam and down the Malay Peninsula.

One of the smallest of all the Calopterygidae, it has a more extensive range than any, save a very few.

I have seen a specimen from Gopaldhara, Assam, taken by Mr. Stevens, with the note, 'undoubtedly rare.'

I believe that Martin regards the Ceylon species as worth subspecific rank, and refers to the same subspecies examples from the Andaman Islands.

36. *Micromerus finalis*, Selys.

M. finalis, Kirby, *Cat. Odonata*, p. 115.

A species apparently peculiar to Ceylon.

Micromerus blandus, Selys, from the Nicobar Islands is no doubt a local race of *M. lineatus* and is probably the same as that from Ceylon which Martin regards as subspecifically distinct. I have seen in the British Museum examples labelled by Mr. Martin from Ceylon and from the Andamans, with a varietal name. This name has not been published and is not likely to be for some time. As I do not wish to anticipate Mr. Martin, I will do no more than refer to the matter here.

Genus *Libellago*, Selys.

37. *Libellago asiatica*, Selys.

Libellago asiatica. Kirby, *Cat. Odonata*, p. 112.

„ „ Selys, *Ann. Mus. Civ. Genova*, (2) X (XXX), pp. 58-59.

„ „ Martin, *Mission Pavie*, Neuroptères (sep.), p. 17.

I have not seen an example of this species. Williamson (*Proc. U.S. Nat. Mus.*, XXVIII, p. 173) records without reference *L. vittata*, Selys, evidently referring to Selys's report of the species from Burma. I cannot find a reference to *vittata* but Selys (*loc. cit.*) comments on differences between the Burmese specimens and typical examples from the Philippine Islands.

Genus **Epallage**, Charp.

38. **Epallage fatima** (Charp.).

E. fatima, Kirby, *Cat. Odonata*, p. 108.

„ „ Morton, *Trans. Entomol. Soc. London*, 1907, p. 305.

The inclusion of this Mediterranean species serves only to emphasize the strongly Palaearctic character of the Odonate fauna of Kashmir.



EXPLANATION OF PLATE II.

- FIG. 1.—Wings of *Caliphaea confusa* ♂
 „ 2.— „ *Rhinocypha trifasciata* ♂, from Kailana.
 „ 3.— „ *Rhinocypha unimaculata* ♂, from Darjiling.
 „ 4.— „ *Rhinocypha cuneata*, from Gopaldhara (*H Stevens.*)
 „ 5.— „ *Rhinocypha iridea* ♂, from specimen in the British Museum.
 „ 6.— „ *Rhinocypha bisignata* ♂, from Cochin State.
 „ 7.— „ *Rhinocypha perforata whiteheadi* ♂

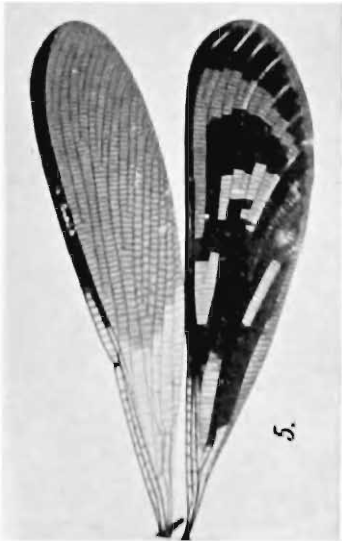
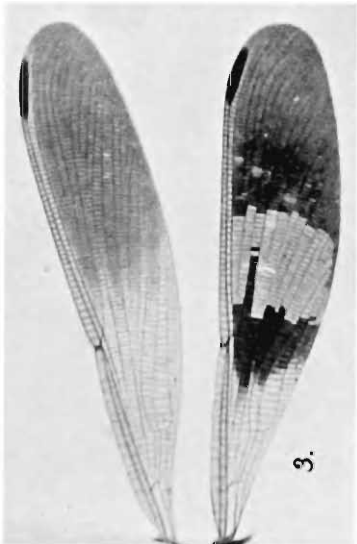
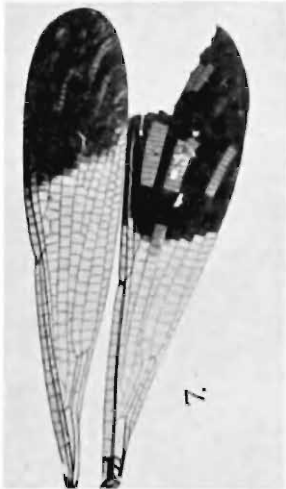
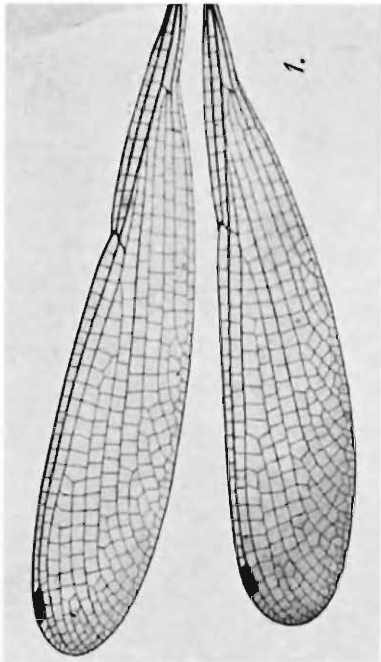
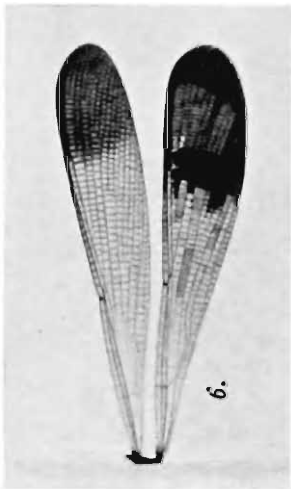
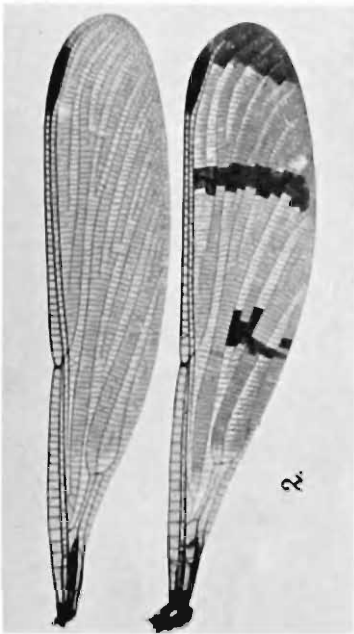
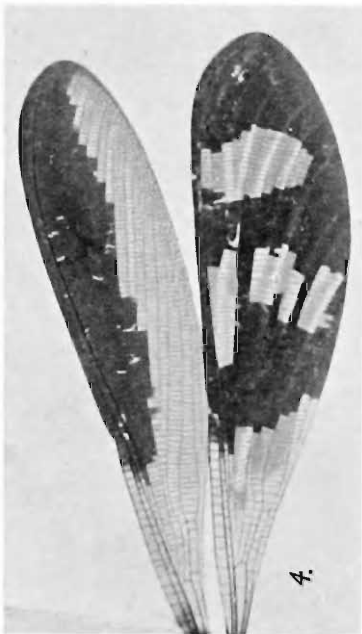


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INDIAN CALOPTERYGIDAE

VI ON TWO NEW SUBSPECIES OF SQUIRREL FROM SOUTHERN INDIA.

By H. C. ROBINSON, C.M.Z.S.

Funambulus tristriatus annandalei, subsp. nov.

Type. Adult female. Indian Museum No. 8498, skin and skull (lower mandible missing), collected at Sasthancotta, west side of Western Ghats, Travancore, on 8th November, 1908, by Dr. N. Annandale.

Diagnosis. A large richly coloured form allied to *F. t. tristriatus* (Waterh.), but larger, smaller than *F. t. wroughtoni*, Ryley,¹ from Coorg. Longitudinal stripes on back narrow, whitish, traceable to neck. Saddle black, tail with white tips to hairs exceptionally well developed, anal region and midrib to tip rich chestnut.

Colour. Head and cheeks to behind the eye ferruginous, speckled with black, richest on top of head, rest of upper surface speckled black, greyish and fulvous, the rump with a strong ferruginous suffusion, the longitudinal stripes almost pure white, narrow and well defined except on the back of the neck, "saddle" almost pure black; hands speckled greyish black, feet with a more fulvous tint. Tail black, with broad white tips to the hairs and a buff basal and sub-basal band, when viewed from above; beneath rufous chestnut basally, black mesially, with the apical part broadly white, anal region chestnut, undersurface pure white.

Dimensions. External measurements, taken in the flesh: head and body 170 (195)²; tail 161 (172); hindfoot 46³ (35); ear 20 (18) mm.

Skull. Total length, 43.2 (48); condylo-basilar length, 37.8 (44.2); diastema 10.4 (11.6); length of upper molar series, including *pm.* 8.4 (9.5); zygomatic breadth, 24.5 (26.7); median length of nasals, 14.0 mm.

Specimens examined. Five skins and skulls, four from the type locality, and one from an unknown locality.

Remarks. In default of authenticated specimens from Madras I have taken modern skins from Kanara⁴ as typical of

¹ Ryley, *Journ. Nat. Hist. Soc. Bombay*, XXII, p. 437 (1913).

² Measurements in parentheses are those of the type of *Funambulus wroughtoni*.

³ 40 mm. measured dry.

⁴ Since the date of this manuscript, and after I had returned the specimens to India, the description of yet another subspecies of *Funambulus striatus*, *F. t.*

F. palmarum tristriatus, Waterh., though it is by no means impossible that these will prove to represent yet another form. The present race will probably prove to be confined to the forest country west of the Ghats in Travancore, being the analogue of *F. palmarum comororinus*, Wroughton. The differences in size have already been noted by Wroughton (*Journ. Nat. Hist. Soc. Bombay*, XVI, p. 411, 1905).

***Funambulus layardi dravidianus*, subsp. nov.**

Type of the subspecies. Immature skin and skull. Indian Museum No. 9773, collected by Dr. N. Annandale on the western side of the Western Ghats, Travancore.

Diagnosis. Differs from the type in having the top of the head and cheeks rich rufous orange, and the undersurface yellowish orange instead of dull chestnut. Area between the light bands on the back, deep lustrous black.

Skull. The specimen is quite immature with the deciduous premolars in place, and is much damaged so it is useless giving any measurements.

Remarks. It is unfortunate that there is no original label attached to this specimen and that there are therefore no measurements to be quoted.

It however serves to confirm Jerdon's statement that the species is found in Southern India, and I have therefore ventured to name it. It is to be hoped that further specimens may shortly be available.

numarius was published by Mr. Wroughton (type from Helwar, Satara District). Kanara specimens are stated to be "clearly intermediates between this form and *tristriatus*, but as they approach more nearly to the present form they may be reckoned as *F. t. numarius*" (*Journ. Nat. Hist. Soc. Bombay*, XXIV, p. 646, 1916).

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