VII THE EVOLUTION AND DISTRIBUTION OF THE INDO-AUSTRALIAN THELYPHONIDAE, WITH NOTES ON THE DISTINCTIVE CHARACTERS OF VARIOUS SPECIES

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(Plates I—IV.)

It has recently been shown (*J.A.S.B.* [n.s.] X, 1914, pp. 201-210, pl. xxiv) that in several groups of animals the extraordinarily rich fauna of the Malay Archipelago is composed of highly specialized species, whose more primitive ancestors are represented by species found at the present day mainly in the surrounding countries. And it has been suggested that this is due to the conditions found in the Archipelago favouring the rapid evolution of highly specialized species, these replacing the less specialized, and tending to force them outwards towards, or even beyond, the borders of the combined Oriental and Australian Regions. In this way it is possible to explain the fact that primitive species found in Ceylon are sometimes more closely related to species found in Australia than to their allies found in the intervening countries.

The groups specially referred to were Passalid Coleoptera, Crinoids, and Thelyphonids. But the reference to Thelyphonids was based only on a short preliminary note published in the *Proceedings of the Asiatic Society of Bengal* for August 1911. The object of the present paper is to supplement this note by gathering together all available information bearing on the subject.

An excellent account of the Thelyphonidae was written by Kraepelin and published in "*Das Tierreich*" in 1899. Although several new species have since been described a complete synonymic revision of the group is as yet uncalled for, and would be largely a repetition of Kraepelin's work.

In many species, however, the distinctive characters are most difficult to describe with precision, and determinations have to be based largely on comparison with authentically named specimens or accurate figures. Opportunity has therefore been taken of publishing with this paper a number of figures which seem to be required.

The numerous specimens of certain of the commoner species of Thelyphonidae possessed by the Indian Museum have shown that the characters supposed to be distinctive of different species

are sometimes variable within the limits of a single species, and have enabled me to obtain some idea of the extent of this variation.

The number of teeth on the trochanter of the arm is one such character, and it sometimes happens that the variation is not uniform on the two sides of the body (see text-figs. 1-4, pp. 64, 72, 74 and 76).

The structure of the modified joints of the antenniform legs of the females of certain species, which Kraepelin has found to afford useful specific characters, is almost certainly connected with the mating habits of the group (Gravely 1915*b*, p. 522, pl. xxiv, figs. 25-26); and I have reason to think that it may possibly vary, not only according to the degree of maturity of a specimen, but also according to the proximity of the mating period. As, however, none of the species in which the structure in question is developed occur in the Indian Empire, I have been unable to make special collections bearing on this point, and the material at present in the Indian Museum is insufficient for its settlement.

Iwakawa (1908, pp. 287-291, pl. xi, figs. 1-4B) has shown that the form of the genital segment may vary considerably according to age, even when adult characteristics appear to be present.

Kraepelin's classification is based mainly on the presence or absence of a keel between the median and lateral eyes and of a tooth on the inner side of the gnathobase of the arm, the number of vitreous spots ("ommatoids") on the third caudal segment, and the form of the tibial apophysis of the male. It is now known, however (Gravely, 1912*a*, pp. 101 and 106), that the keel between the lateral and median eyes, and the tooth on the gnathobase of the arm, may either of them be present in the genus *Hypoctonus*, which Kraepelin believed to be characterized mainly by the absence of both. In this connection it is perhaps noteworthy that *Hypoctonus stoliczkae*, the only known species of the genus as hitherto defined in which there is a tooth on the gnathobase of the arm, occurs in the excessively damp region at the base of the Darjeeling hills together with the genus *Uroproctus*, which is also characterized by the possession of such a tooth; and that the remaining genus *Labochirus*, which is similarly characterized, is found in the excessively damp jungles of the Western Ghats and of the hills of Ceylon.[1] There seems, therefore, to be some connection, at present unaccountable, between the presence of this tooth and the degree of moisture characteristic of the natural habitat of the species possessing it; and its value as an indication of phylogeny is unlikely to be great.

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[1] That the S. Indian species inhabit excessively damp jungles is an assumption based on the habits of the Ceylon species. I failed to find any Thelyphonids in the damp jungles of Cochin. In Cochin, as in Ceylon, *Thelyphonus sepiaris* lives in comparatively hot dry places. Places suited to the existence of both forms are often found in close proximity to one another.

In my preliminary note on the evolution and distribution of the Thelyphonidae it was suggested that the distinction between the genera with and without keels between the median and lateral eyes was extremely ancient, and consequently of fundamental importance. The discovery of species, clearly allied not to the keeled but to the keelless group, in which this ridge, though not very strong, is quite distinct, renders this hypothesis less probable than it previously appeared. The fact, however, that the species of the keelless group which have the tibial apophysis of the male least specialized appear, so far as is known, to agree in having tibial spurs on the fourth pair of legs only, no matter from what part of the world they come, seems to imply that the group may really be an old one which once had a more continuously extensive distribution than it has at present. The only known exceptions to this rule are *Hypoctonus oatesi* and one or two other species leading up to the most specialized section of the latter group—a section confined to the neighbourhood of Burma and Assam. Nothing is, however, known of the male of the single African keelless species hitherto recorded; nor is anything known of the tibial spurs of the American keelless genus *Thelyphonellus*, in which the male appears to have retained its primitive form more nearly than has that of any Oriental species yet described.

The distinction between the keeled and keelless groups may therefore be accepted as being in all probability of fundamental importance, with the reservation that weak keels may occasionally be developed in species whose other characters, especially the form of the tibial apophysis of the male, show them to belong to the latter and not to the former group.

The keelless group is at present divided into an Indian genus *Labochirus*, in which a tooth is present on the inner margin of the gnathobase of the arm, and a (mainly) Burmese genus *Hypoctonus*, which is ordinarily without this tooth. But in view of the fact that the tooth is now known to be present in at least one species whose other characters show it to be a member of the latter genus, a revised definition seems necessary.

The number of legs bearing tibial spurs, a character which is correlated with the form of the tibial apophysis of the male[1], supplies an excellent basis for this definition. It is probable, however, that as yet the group is very imperfectly known. For it inhabits country which has for the most part been very imperfectly explored zoologically, and the range of most at least of its species seems to be somewhat circumscribed For the present, therefore, it will probably be best to transfer to the genus *Labochirus*, hitherto restricted to Indian species, the African and Burmese species in which only the fourth legs bear tibial spurs, although it is

[1] The tibial apophysis of the male has much the same form in the simpler members of both groups defined according to the presence or absence of tibial spurs on the third pair of legs; but in the more specialized species without these spurs the upper ridge of the tip of the apophysis is most strongly developed, while in those with these spurs the lower ridge is larger.

by no means unlikely that ultimately these African and Burmese forms will have to be separated under distinct generic names. It may be pointed out here that no two species, either of *Hypoctonus* or *Labochirus* as redefined, have ever been found together; but that several localities are known in which both genera are represented by a single species.

The keeled group can be split into three sections:—one in which the tibial apophysis of the male is strongly modified as in the Oriental species of the keelless group, one in which the hand is strongly modified, and one in which both tibial apophysis and hand are unmodified in the male and resemble more or less closely those of the female. The first, which includes only one genus, *Typopeltis*, may conceivably have been derived from the keelless group by the development of keels, and not from genera with keels and with the tibial apophysis of the male unmodified, as is here assumed. No proof is available for either hypotheses All species of the genus *Typopeltis*, however, are stated by Kraepelin to have tibial spurs on all three pairs of walking legs, not on the last one or two pairs only as in the keelless genera The spurs of *Mimoscorpius*, the only genus in which the hand is strongly modified, have not yet been described. In the larger genera, at least, of the section of the keeled group with unmodified or almost unmodified hands and tibial apophyses in the male, the number of legs with tibial spurs is variable.

The most primitive genus of the last-mentioned section of the keeled group appears to be the American *Mastigoproctus*, in which, according to Kraepelin, the sexes are scarcely distinguishable superficially. In all Oriental genera, except *Uroproctus*, the genital sternum of the male has a strong median groove, and the posterior margin of the following segment bears a strong median tubercle. *Uroproctus* differs, however, from *Mastigoproctus* in having the tibial apophysis of the male markedly slenderer than that of the female, and differs from this and from all other genera of the group in the presence of a tooth on the inner side of the gnathobase of the arm. The three remaining genera, *Thelyphonus*, *Abalius* and *Tetrabalius*, are distinguished from one another solely by the number of vitreous spots on the third caudal segment. Nothing whatever is known as to the function of these spots [1]; and their taxonomic significance appears to me to be equally uncertain. Provisionally, however, the distinctions which they afford may continue to be regarded as generic.

The genera of Thelyphonidae may now be redefined thus:—

1. Keels between median and lateral eyes almost always absent, never very strong; tibial apophysis of male strongly modified in Oriental genera ... ... 2.
   Well developed keels always present between median and lateral eyes; tibial apophysis of male often unmodified ... ... 4.

[1] See Borner, 1904, pp. 25–26. Concerning improbability of their being luminous organs see Gravely, 1915*b*, p. 523.

2. Third caudal segment without vitreous spots; tibial apophysis of male slender, but otherwise not very different from that of female ... *Thelyphonellus* (American).
   Third caudal segment with the usual vitreous spot on either side; tibial apophysis of male more strongly modified ... ... 3.

3. Tibial spurs confined to the fourth pair of legs; tibial apophysis of male strongly modified ... *Labochirus*, p. 64.
   Tibial spurs present on (and confined to) the third and fourth pairs of legs; tibial apophysis of male often still more strongly modified ... *Hypoctonus*, p. 67.

4. Tibial apophysis strongly modified in male; modification of tarsus of antenniform legs of female, when present, affecting one or both of the eighth and ninth (terminal) joints ... ... *Typopeltis*, p. 70.
   Tibial apophysis of male not strongly modified; modification of tarsus of antenniform legs of female, when present, affecting the seventh joint with or without one or more joints on one or both sides of it ... ... 5.

5. Genital sternum of male without median groove, posterior margin of following sternum without median tubercle ... ... 6.
   Genital sternum of male with strong median groove, posterior margin of following sternum with median tubercle ... ... 8.

6. Hand flat, twice as broad as the long slender femur; unjointed finger strongly curved at apex *Mimoscorpius*, p. 71.
   Hand normal ... ... 7.

7. Tibial apophysis of male like that of female; no tooth on inner side of gnathobase of arm *Mastigoproctus* (American).
   Tibial apophysis of male much slenderer than that of female; a tooth on inner side of gnathobase of arm in both sexes ... ... *Uroproctus*, p. 71.

8. Third caudal segment with the usual single vitreous spot on each side ... . *Thelyphonus*, p. 73.
   Third caudal segment without or with two such spots on each side ... ... 9.

9. Third caudal segment without vitreous spots ... *Abalius*, p. 78.
   Third caudal segment with two vitreous spots on each side, one above the other ... ... *Tetrabalius*, p. 78.

Before considering the connection between the phylogeny of different forms of Indo-Australian Thelyphonidae with their distribution, it is necessary to summarize the zoogeographical information with regard to the family at present available.

In addition to the species mentioned in the summary of this information given below, "*Thelyphonus*" *spinimanus*, Lucas, *angustus*, Lucas and *lucanoides*, Butler, from unknown localities, appear to belong to Indo-Australian genera. The identity of the first two appears to have been lost beyond recall.[1] The third is stated by Butler (1872, p. 205) to be closely related to "*Thelyphonus*" *seticauda*, Doleschall. The latter species has now, however, been made the type of a distinct genus (*Tetrabalius*), to which,

[1] Lucas states that the types were in the Natural History Museum in Paris; but there is no mention of them in Kraepelin's catalogue of the Pedipalpi of that collection (1901).

according to Pocock (1894, pp. 122-3), the former does not belong. The type is in the British Museum and must be redescribed before the species can be recognized. Pocock believes it to have come from Borneo.

Localities mentioned below are marked with an asterisk (*) when represented in the Indian Museum collection. References to descriptions are only given in the case of species not mentioned by Kraepelin in "*Das Tierreich*," where descriptions of and references to other species will be found.

Genus **Labochirus**, Pocock.

This genus is found in western Africa, western India, Ceylon, Burma and the north of the Malay Peninsula; perhaps also Borneo.

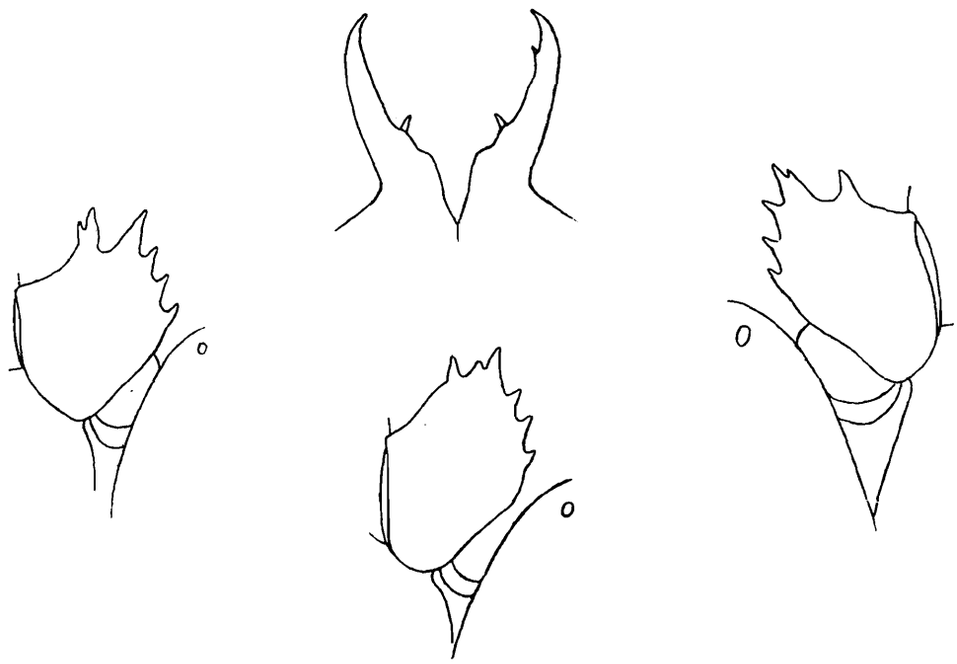

FIG. 1.—Abnormalities in the gnathobase and trochanter of the arm of *Labochirus proboscideus*, × 4.

Labochirus africanus (Hentschel).

Western Africa: Senegal.
? Northern Africa: Algeria.

This species was described by Hentschel from female specimens only in 1899. It was unknown to Kraepelin when the family was revised in "*Das Tierreich.*"

Labochirus proboscideus (Butler).

(Pl. i, figs. 1-4.)

Ceylon: Central Province—*Kandy, 1500-2000 ft.; *Peradeniya, 1600-1800 ft.; Haragama, *ca.* 1200-1400 ft.; *Galagedara, *ca.* 800-2000 ft.; *Nalanda, *ca* 900-1000 ft.; Matale; *? Sigiri.
? Western Province—Kalutara.

The Kalutara record is based on a young and indeterminable specimen in the Colombo Museum. The Sigiri specimens, which are also young, have remarkably red fore-arms and hands.

In young specimens of this, as of other species of Thelyphonidae, the abdominal sterna are all much alike. The genital sternum begins, however, to extend backwards at a very early stage. Unfortunately the material at my disposal does not show all stages of its development. Two early stages, and the final stage in both sexes, are figured (pl. i, figs. 1-4).

Among the five males and three females of this species in the Indian Museum collection one male bears an extra tooth on the gnathobase of the left arm, and three females show abnormalities in the armature of the trochanter of one arm. These abnormalities are illustrated in text-fig. 1. Among three young specimens one shows a slight abnormality in the trochanter.

Labochirus tauricornis, Pocock.

South India: Kanara.
Malabar—Mahé.

By an oversight this species was given the same name as the next when originally described (Pocock, 1899*a*, p. 745).

Labochirus cervinus, Pocock.

South India: South Kanara—Mangalore.

Described by Pocock in 1899, and not included in "*Das Tierreich.*"

Labochirus gastrostictus (Kraepelin).

(Pl. i, fig. 5.)

? Borneo.

This species is known only from a single female in the Vienna Museum. A figure of its anterior abdominal sterna, kindly supplied to me by Dr. Penther, is reproduced on pl. i, fig. 5.

Labochirus kraepelini (Simon).

(Pl. i, fig. 6; pl. ii, fig. 14.)

Malay Peninsula: *Lankawi Island.
Perak—*Grik.
E. Siamese Malay States—Biserat in Jalor; Bukit Grah in Nawng-Chik.

The anterior abdominal sterna of the female are shown in pl. i, fig. 6, a figure prepared from the type from Bukit Grah, kindly lent me by the Zoological Museum of Cambridge University. The "*Tierreich*" revision does not include this species, which was described by Simon from the female sex only in 1901.

Mr. B. H. Buxton recently presented specimens of both sexes to the Indian Museum. The male, which was previously unknown, may be described as follows:—Length of carapace 8·7-10·0 mm.; maximum breadth of same 5·0-5·8 mm. Closely allied to *L. dawnae*, from which it differs only in the following particulars:—the distance between the median eyes is perhaps scarcely as great; the ridge in front of the lateral eyes is indistinct; the coarser granules on the carapace are somewhat more clearly defined and more regularly rounded; the arm and hand show more frequently a slight rugosity; the spine on the lower surface of femur of the arm is sometimes obsolete; the tibia and hand are somewhat slenderer; the tibial apophysis (pl. ii, fig. 14) is slenderer and is not expanded distally—from above it seems no more strongly modified than that of *Uroproctus assamensis*, but it is triangular in section with the side nearest the hand strongly grooved.

Labochirus dawnae (Gravely).

(Pl. i, fig. 7; pl. ii, fig. 15.)

Lower Burma: Amherst District—*Dawna Hills, from Misty Hollow near top of western slope (*ca.* 2200 ft.) to Thingannyinaung at base of eastern slope (*ca.* 900 ft.).

This species was described in 1912, and is not included in Kraepelin's revision. The tibial apophysis of the male (pl. ii, fig. 15) is shorter than in the preceding species, but is of the same general form. In both these species this apophysis is very like that of the Ceylonese (? and Indian) species of the present genus, and like that of *Hypoctonus oatesi*, which appears to be the least highly specialized form yet known in the next genus.

Labochirus browni (Gravely).

(Pl. i, fig. 8.)

Upper Burma: Hsipaw (N. Shan) State—*Parni near Monglong.

Also described in 1912. Only the female is known.

Labochirus andersoni (Oates).

(Pl. ii, fig. 16.)

Upper Burma: Bhamo District—*Second Defile of Irrawady.
? Ruby Mines District—*Pudupyu Mountain.

The latter record is that of a mutilated and immature specimen that Oates described as the female of this species.

The tibial apophysis of the male (pl. ii, fig. 16) is somewhat highly modified, as in the following species.

Labochirus ellisi (Gravely).

(Pl. i, fig. 9; pl. ii, fig. 17.)

Lower Burma: Tharawady District—*Zigon Division.

Described with *L. dawnae*, etc., after the appearance of "*Das Tierreich.*"

Labochirus spp. juv.

S. India: Mysore—*Koppe.

Upper Burma: *Pum-Ga-Taung, 13 miles east of Wan-hsaung, 3600 ft. (half way between Sadon and Myitkyina).

Genus **Hypoctonus**, Thorell.

The genus Hypoctonus, as here restricted, is found mainly in Burma, but is known to extend to Penang, Western Siam and Southern China, and through Chittagong and Western Assam to the base of the Darjeeling hills.

Hypoctonus oatesi, Pocock.

(Pl. ii, fig. 18.)

Assam: Sylhet—*Shamshernager, *ca.* 100 ft.

The male was first described in the Arachnid volume of the "*Fauna of British India*" series (1900). The female was described in 1912 (*a*).

The tibial apophysis of the male is very like that of the simpler members of the preceding genus. There is no lamina either on the upper or the lower border of the grooved surface, but the apical angle of the latter is somewhat swollen.

The genital sternum of the female has the same form as in the preceding genus, instead of being strongly produced backwards in the middle as it is in most species of *Hypoctonus*.

Hypoctonus carmichaeli, n. sp.

(Pl. ii, fig. 19.)

Chittagong: *Rangamati.

Three specimens, all mature males, were obtained by the Museum collector who accompanied H.E. Lord Carmichael to Rangamati in July of last year.

The species is closely allied to *H. oatesi*, from which it differs only in its smoother and much slenderer arms, and in its more highly modified tibial apophysis, which arises before the distal end of the joint, is strongly curved at the base and has the apical angle of the lower border of the grooved surface produced into a large and lightly curved triangular papilla (pl. ii, fig. 19).

Hypoctonus birmanicus, Hirst.

Lower Burma: Pegu.

Only the male is known. It was described in 1911. It is said to be closely related to *H binghami.*

Hypoctonus binghami (Oates).

Lower Burma: Tavoy—*Reef Island at mouth of Tavoy River.
Megui—Owen Island.

In this species also the genital sternum of the female is not extended backwards in the middle. The male is unknown to me, but appears from descriptions to have a somewhat more strongly modified tibial apophysis than has that of *H. oatesi.*

Hypoctonus formosus (Butler).

(Pl. ii, fig. 20.)

Lower Burma: Amherst District—*Moulmein (*H. formosus, s. str.*); *Double Island (*H. formosus*, subsp. *insularis*).

Also recorded from Taoo, a place whose whereabouts is unknown to me.

Thorell gives a number of additional localities, this being the only form without keels between the median and lateral eyes that was recognized when he wrote. His records probably refer to several distinct species. Simon's specimens from Tavoy, similarly, were no doubt *H. binghami* as already suggested by Oates (1889, p. 16).

In this, as in all the following species of the genus, the lower ridge of the grooved surface of the tibial apophysis of the male (pl. ii, fig. 20) is strongly developed near the tip, and the genital sternum of the female is produced backwards in the middle.

Hypoctonus rangunensis (Oates).

(Pl. ii, fig. 21.)

Lower Burma: *Rangoon; ? *Arakan.

Also recorded from Palon, of whose whereabouts I am uncertain.

The Arakan specimen is a female with all the characters of the Rangoon species.

Deep grooves are present between the paired cavities and posterior margin of the genital sternum of all females of this species that I have seen.

Hypoctonus sylvaticus (Oates).

(Pl. i, fig. 10; pl. ii, fig. 23.)

Lower Burma : Tharawadi—*Zigon ;. Minhla.
The female of this species was first described in 1912 (*a*).

Hypoctonus saxatilis (Oates).

(Pl. i, fig. 11; pl. ii, fig. 22.)

Lower Burma : *Thayetmyo.

Hypoctonus wood-masoni (Oates).

(Pl. i, fig. 12; pl. ii, fig. 24.)

Lower Burma: Amherst District—*Dhammathat, Gyaing River a few miles from Moulmein (sea level); *Sukli, E. side of Dawna Hills, *ca.* 2100 ft. ; *Myawadi, Burmo-Siamese frontier, *ca.* 900 ft. ; *near Mulaiyit Mountain ; *Meetan (? Mita of Imperial Gazetteer) in the Haung-tharaw Valley.

This appears to be a somewhat widely distributed species ; but many of the above records are based on females only.

The figure of the genital sternum of the female (pl. i, fig. 12) has been prepared from Oates' specimen Since it was prepared specimens have been added to our collection which indicate that this one is scarcely fully mature. In these the posterior median expansion of the genital sternum is even narrower in proportion to its length and more abrupt, and its posterior margin may be lightly cleft in the middle line.

Hypoctonus stoliczkae, Gravely.

(Pl. ii, fig. 25.)

E. Himalayas : Darjeeling District—*Punkabari.

Described in 1912. The lamina developed from the lower ridge of the grooved surface of the tibial apophysis is exceptionally large in this species.

Hypoctonus granosus, Pocock.

China : Yunnan.

Only the female is known. Pocock, who described it in 1900 (*a*), states that it is recognizable from all previously described species by the coarse granulation on the upper side of the hand.

Hypoctonus spp.

China: Yunnan—*Lo-po-ssu-Chuan.
Siam: *Meetaw forest, Raheng, 2000 ft.

Upper Burma: *On high ridge (*ca.* 1000 ft.) at source of Kyathe, Myaung, Bawbin forest reserve; *Pyinmanna, Yamethin, Meiktila; Bhamo; Mandalay; Thigyam.

Lower Burma: Prome; *Farm Caves near Moulmein; Kathistan, *ca.* 900 ft., and Western slopes of Pegu Yomas, 1000-1100 ft., Thayetmyo District; Thagata-Juva in Mulaiyit Mountain.

Malay Peninsula: Penang Island.

Genus **Typopeltis**, Pocock.

This genus is confined to far eastern Asia from Cochin China to Siberia and Hong Kong to Japan. Since the publication of the Revision in "*Das Tierreich*" Pocock (1900*a*, p. 298) and Tarnani (1901, p. 214) have published keys for the determination of species.

Typopeltis amurensis (Tarnani)[1].

E. Siberia: between Olga Bay and the Amur River.

China: Canton—Sikiang.

Annam.

Also recorded from Haut Song Chai and Moïs Balnar, whose whereabouts I have been unable to trace.

The tarsi of the antenniform legs of the female are unmodified.

Typopeltis kasnakowi, Tarnani.

Siam: Arran Kull; Ta-ta-kham (? or -khaw): Watanaa.

This species was described by Tarnani in 1901 from male specimens only.

Typopeltis niger (Tarnani).

China.

Also known from the male only.

Typopeltis tarnani, Pocock.

N. Siam: Lampun.

This species was described from the male only in 1902.

Typopeltis dalyi, Pocock.

Siam: Lampun; Lacan *via* Raheng.

This species was described in 1900 (*a*); it does not appear in the "*Tierreich*" revision.

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[1] See below, p. 80, footnote.

The tarsi of the antenniform legs are modified in the female of this and all the remaining species of the genus.

Typopeltis stimpsoni (Wood).

Incl. *T crucifer*, Pocock.

(Pl. i, fig. 13.)

Japan: Yokohama.
Loochoo Islands: Oö-Sima.
Formosa: Tam-sui on the Keelung River; Kushaku Mountain; *Takao
Hong Kong.

This appears to be a most variable species. Iwakawa (1908) has shown that *T crucifer* cannot be separated from *T stimpsoni*. This author does not appear to have been aware that Schwangart (1906) had suggested splitting the former species into two subspecies, a proceeding whose validity now seems very doubtful.

Among other characters, the armature of the lower side of the trochanter of the arm seems to be very variable (compare pl. i, fig. 13 of the present paper with pl. i, fig. 15 of Kraepelin, 1897).

Typopeltis harmandi, Kraepelin.

Cochin China.

This species was described by Kraepelin in 1900. It does not appear in his revision in "*Das Tierreich.*" Only the female is known.

Genus **Mimoscorpius**, Pocock.

Mimoscorpius pugnator, Butler.

Philippine Islands.

Only the male is known.

Genus **Uroproctus**, Pocock.

Uroproctus assamensis, Stoliczka.

(Pl. iii, figs. 26, 27; pl. iv, figs. 35, 36.)

E. Himalayas: Darjeeling District—*Punkabari and *Sevoke (both near base of hills); *Ghumti Tea Estate, 2500 ft.; Pedong; Maria Basti[1].
*Dafla Hills.
Abor Country—*Kobo, 400 ft.; *banks of Siyom River below Damda, 1300 ft.; *beside stream below Balek; *Rotung, 1300 ft.;

[1] Dr. Sutherland informs me that Maria Basti is the same place as that called Kaggia Monastery on the Survey of India map of the Darjeeling District.

*Upper Rotung *ca.* 2000 ft.; *between lat. 28°·45 and 29°, *ca.* 4000 ft.

Assam: *Goalpara District.
Darrang District—*Assam-Bhutan frontier north of Mangaldai, *ca.* 300 ft.; *Kowpati; *Tezpur; Burroi[1]; *Harmutti[1].
Lakhimpur District—*Dikrang Valley; Sadiya.
Sibsagar District—*Dumar Dulong, Moran P.O.
*Garo Hills
Khasi Hills—*Cherra Punji.
Sylhet—*Shamshernager, *ca.* 100 ft.; *Langla, *ca.* 100 ft.
Cachar—*Silcuri forests.

In addition to the above localities "*Thelyphonus assamensis*" was recorded by Simon in 1885 (p 452) from the Malay Peninsula and Indo-China. In 1896 he again recorded the species from Indo-China, this time from Pavie's collection. In his full report upon

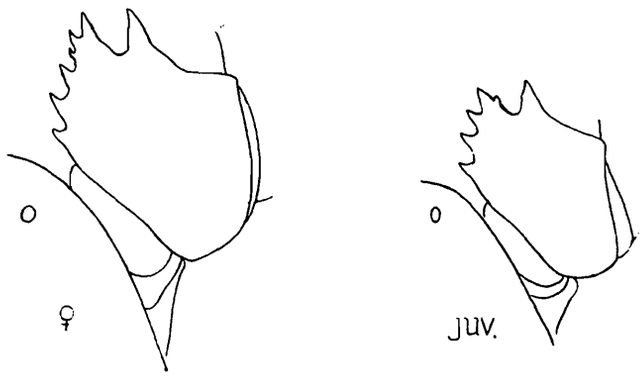

FIG. 2.—Abnormalities in the trochanter of the arm of *Uroproctus assamensis*, × 4.

that collection, however, he records *Thelyphonus schimkewitschi* instead (1904, p. 293). *Uroproctus assamensis* is not otherwise recorded either south or east of Assam, and there can be no doubt, I think, that the record from the Malay Peninsula as well as that from Indo-China was based upon an incorrect determination. Kraepelin records the species from Calcutta; but this record probably refers not to the original place of capture, but to the place of dispatch; for there do not appear to be any Thelyphonids in the Gangetic Plain or Delta.

Uroproctus assamensis is an extremely constant species, in spite of its abundance and wide distribution. Even abnormalities in the teeth on the trochanters of the arms, such as are shown in text-fig. 2, are very rare, occurring only in two or three out of over fifty specimens examined.

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[1] According to the labels these two localities are situated at the base of the Dafla Hills. They must therefore be in or near the Darrang District. I cannot ocate them with greater precision than this.

The genital sternum is very little modified in adults of either sex (see pl iii, figs. 26 and 27). In the female especially it remains throughout life very like that of immature specimens of all forms of Thelyphonidae.

Genus **Thelyphonus**, Latreille.

This genus occurs throughout the Oriental Region, with the exception of Burma where it is largely, if not entirely, replaced by *Hypoctonus*; and it extends far eastwards among the Polynesian islands.

Thelyphonus sepiaris, Butler.

Incl. *T cristatus*, Pocock.

* "Western Bengal" (probably Chota Nagpur, which is no longer included in Bengal).
Orissa : *Balasore ; *Barkul on the Chilka Lake, 0-1000 ft.
South India : Ganjam District—*Gopkuda Island, Chilka Lake ; foot of Mohiri Hills, 3 or 4 miles from Berhampur[1].
Karnul District—*Nandyal.
Chengalpat District—*Poonamallee; *Tiruvalur.
Coromandel coast—Pondicherri ; Genji.
Salem District—*Yercaud in the Shevaroy Hills.
Coimbatore District—*Ootacamund in the Nilgiri Hills ; foot of Anamalai Hills.
Mysore—Bangalore, *ca.* 3000 ft. ; French Rocks.
Cochin—Trichur.
Travancore—Trivandrum ; Athengil[2]; Aramboly[2].
Ceylon : North-Central Province—*Anuradhapura ; *Minneriya ; *Polonuruwa.
Central Province—*Sigiri; *Nalanda.

Thelyphonus sepiaris was originally described by Butler (1873, p. 131) from "Tongoo" (? =Taung-ngu) in Burma and from Ceylon ; and Pocock (1894, p. 134) states that the type of Butler's *T nigrescens* from Tenasserim is identical with *T sepiaris*. But no original records from outside the Indian Peninsula appear to have been made since. Pocock (1900 *b*, p. 105, foot-note) regards the locality recorded for *T nigrescens* as probably incorrect ; and in this he is doubtless right.

The Tongoo cotypes of *T sepiaris* were only lent to Butler and seem now to have disappeared—possibly they may have

[1] Mr. Fischer tells me that his observations on the courtship of the species (1911) were made at this place.
[2] Specimens in the Trivandrum Museum.

been *T schnehageni*, Kraepelin. Altogether it seems most unlikely that *T sepiaris* really occurs in Burma at all.

Butler does not say whether his figure of *T sepiaris* (1873, pl. v, fig. 6) was taken from one of his Burmese or Ceylonese specimens. It differs from specimens of *T sepiaris* from India and Ceylon in having the tibia of the arm slightly broader instead of narrower than it is long. I have no knowledge of the shape of the tibia of the arm of *T schnehageni*.

Thelyphonus sepiaris is a much more variable species than *Uroproctus assamensis*. The range of variation in the teeth of the trochanters of the arms is indicated in text-fig. 3. One male of *T sepiaris* in the Indian Museum collection has the hand relatively narrow as in the female. The shape of the fingers is somewhat variable in both sexes.

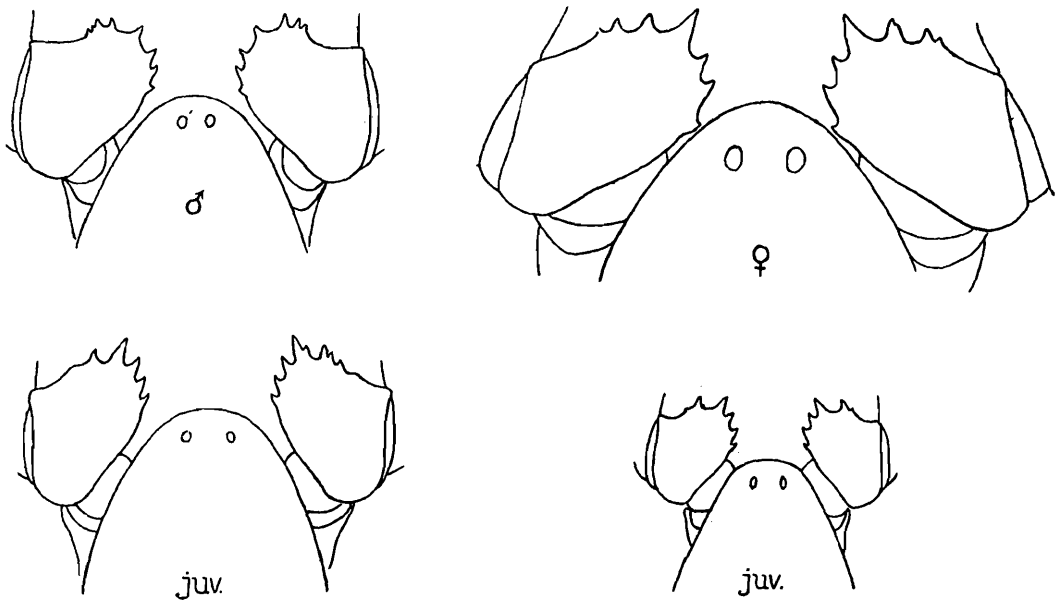

FIG. 3.—Abnormalities in the trochanter of the arm of *Thelyphonus sepiaris*, × 4.

Specimens answering to Pocock's descriptions of the subspecies *indicus* and *muricola*, and to that of the form which he regarded as a distinct species *cristatus*, occur with various intermediate forms in various places, and I am unable to regard any of them as in any way distinct.

Thelyphonus schnehageni, Kraepelin.

Burma: Rangoon.

Only the female is known.

Thelyphonus manilanus, Koch.

Philippine Islands: Manila.

Moluccas: Halmaheira (subsp. *halmaheirae*, Kraepelin).

New Guinea (introduced).

Thelyphonus wayi, Pocock.

Siam : Bathambang.

Described from a single female in 1900(*a*).

In this species and the next the tarsal joints of the antenniform legs, though long as in *Uroproctus assamensis* and the preceding species of *Thelyphonus*, are modified in mature females as in the remaining species of *Thelyphonus*.

Thelyphonus anthracinus (Pocock).

Borneo: Batu Song in Eastern Sarawak.

The antenniform legs of the female are of the same transitional type as in the preceding species. The male has probably been described by Thorell (see below, p. 76).

Thelyphonus caudatus (Linnaeus).

(Pl. iii, figs. 28, 29; pl. iv, figs. 37, 38.)

Java; Batavia; *Buitenzorg; *West Java.

Pocock (1894, p. 122) gives Hong Kong as well as Java. As, however, there are no records from intervening countries the occurrence of the species in the former locality needs confirmation before it can be accepted.

Thelyphonus linganus, Koch.

(Pl. iii, figs. 30, 31; pl. iv, figs. 39, 40.)

Malay Peninsula: Penang.
Perak—Ulu Selama; *Grik; *Lenggong Cave; ? Larut Hills, 3400 ft.
Kelantan—Kuala Aring.
*Johore—Johore Bahru; up to about 500 ft. on Gunong Pulai.
*Singapore.

Sumatran Islands: Sumatra; Linga; *Sinkep.

The specimens from Perak differ from those from further south in that the tarsi of the antenniform legs are less distinctly modified, being of more uniform thickness and lacking the grooves on the sixth and seventh segments and the hook on the seventh. In a series of specimens from Johore and Sinkep Island the grooves are, however, usually absent from the sixth segment and often from the seventh, while the tooth is not always well developed. Probably, therefore, the differences are not specific.

Tarnani (1895) records this species from Batavia; but his description is inadequate, and his figure of the tarsus of the antenniform leg indicates a mistaken identification, the eighth joint being, for instance, shorter instead of longer than the seventh, and the third longer instead of shorter than broad.

Thorell (1888, pp. 390-395) records a male from Borneo; but from his description of the tarsus of the antenniform legs it is clear that the identification is at fault. Kraepelin (1897, pp. 32-3) believes this specimen to be the male of *T anthracinus*, Pocock.

In Kraepelin's key for the identification of species the presence of a longitudinal groove in the last sternum is mentioned as one of the principal characteristics of both sexes of *T linganus*. In the female, however, this is not so well developed as in the male, and in some specimens it is absent.

In a series of 27 specimens of *T linganus* from Johore, eight show abnormalities of some kind in the armature of the trochanter. Five of these are shown in text-fig. 4. There are no such ab-

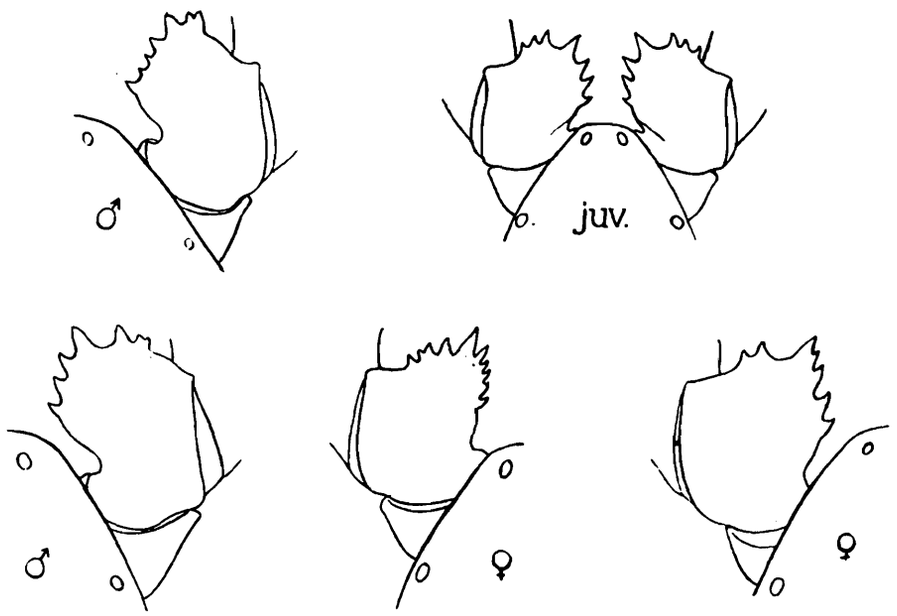

FIG. 4.—Abnormalities in the trochanter of the arm of *Thelyphonus linganus*, × 4.

normalities among our eleven specimens from Perak, ten from Sinkep Island, and two from Singapore.

Thelyphonus borneensis, Kraepelin.

Borneo.

Only the female is known.

Thelyphonus klugi, Kraepelin.

Sumatra.

Celebes.

Thelyphonus celebensis, Kraepelin.

Celebes.

Only the female is known.

Thelyphonus doriae, Thorell.

(Pl. iv, figs. 34, 41.)

Malay Peninsula: Singapore.
Sumatran Islands: Billiton Island, half way between Sumatra and Borneo.
Java.
Borneo: Sarawak—*Kuching; Mt. Dulit (var. *hosei*).
West Borneo (var. *hosei*)—Pontianak.
Central Borneo.

Thelyphonus sucki, Kraepelin.

(Pl. iii, fig. 32; pl. iv, fig. 42.)

South-East Borneo: Tandjong; *Bendjermasin.

Thelyphonus semperi, Kraepelin.

Philippine Islands: Mindanao—Zamboanga, the Western extremity of the Island.

Thelyphonus pococki, Tarnani.

Celebes.

This species has been described (Tarnani, 1900, p. 482) since the revision of the family in "*Das Tierreich.*" Only the female is known. It appears to be closely related to *T. semperi.*

Thelyphonus schimkewitschi, Tarnani.

(Pl. iii, fig. 33; pl. iv, fig. 43.)

Siam: *Pitsanuloke, *Bangkok; Koh Si Chang (Island); Chantaboon.
Laos: Luang Prabang.
Cambodia.
Cochin China: Saigon.

Thelyphonus burchardi, Kraepelin.

East Sumatra: Sungei Lalah.

This species has been described from female specimens only (Kraepelin, 1910, pp. 99-100, pl. i, figs. 1*a-c*) since the revision of the family in "*Das Tierreich.*"

Thelyphonus insulanus, Keyserling.

New Hebrides.
Fiji Islands: Viti—Kandanavu.

Pocock (1899*b*, p. 98) says that this is a true *Thelyphonus*, not an *Abalius* as suggested by Kraepelin (1897, p. 17). Kraepelin

(1899, p. 322) finally suggests affinities with *T schimkewitschi*. I have not seen a description of the species.

Thelyphonus hanseni, Kraepelin.

Philippine Islands: Mindanao.

Thelyphonus asperatus, Thorell.

Java.
Amboina.

Thelyphonus leucurus, Pocock.

Solomon Islands: New Georgia—Narowal; Rubiana.

Thelyphonus sumatranus, Kraepelin.

Sumatra.
Described from the male only.

Genus **Abalius**, Kraepelin.

In one species of this genus (*A. rohdei*) the tarsi of the antenniform legs are long as in *Uroproctus*, and are not modified in the female. In the rest they are short, and are modified in the female as in the more highly specialized species of *Thelyphonus*.

Abalius rohdei, Kraepelin.

New Guinea.

Abalius samoanus, Kraepelin.

Samoa: Upolu.
Male unknown.

Abalius willeyi, Pocock.

New Britain.
Male unknown.

Abalius manilanus, Kraepelin.

Philippine Islands: Manila.

This species has been described from a female specimen (Kraepelin, 1900, p. 7, text-fig. 2) since the revision of the family in "*Das Tierreich.*"

Genus **Tetrabalius**, Thorell.

This genus occurs in the Moluccas and Borneo.

The tarsi of the antenniform legs are moderately short and are slightly modified in the female of the only species in which they have been examined.

Tetrabalius seticauda (Doleschall).

Moluccas: Halmaheira; Amboina; Ternate; Batjan; Ceram.

Tetrabalius nasutus, Thorell.

Borneo.

Only one specimen is known. It is said to be a female, but both antenniform legs are damaged.

It will be seen from the foregoing pages that among the Thelyphonidae evolution has chiefly affected three organs—the tibial apophyses of the male, the tarsi of the antenniform legs of the female, and the genital sternum of both sexes.

The modification of the tarsi of the antenniform legs of the female occurs at about the place at which the male holds them between his chelicerae during courtship (see Gravely, 1915*b*, p. 52-2, pl. xxiv, fig. 25) and there can be little doubt that it implies a specialization connected with this process. Species in which these tarsi are modified must therefore be regarded as higher in the evolutionary scale than allied species in which they are unmodified.

Nothing definite is known as to the uses of the modified tibial apophyses of males; but since this modification is also confined to one sex it is presumably also connected in some way with sexual processes. In any case, since the tibial apophyses of both sexes of some genera, and of females of all, are alike simply conical, those species must clearly be regarded as most highly specialized in the males of which these apophyses are most widely removed from this fundamental form.

With regard to the genital sterna, those species in which these plates undergo the greatest change when maturity is reached must similarly be regarded as the most highly specialized.

Specialization of the genital sterna appears to be roughly correlated with specialization in other parts. Thus in the keelless genera, in which the antenniform legs are never modified, it is not known to occur in the genus *Labochirus*, very few members of which have the tibial apophysis as highly modified as is usual in the genus *Hypoctonus*; and in the genus *Hypoctonus* it appears to be confined to the most specialized species—*i.e.* to those in which the tibial apophyses of the male bear a distinct lamina on the lower border of the grooved surface. Similarly in the keeled group it appears to be least marked, among Indo-Australian forms, in the genus *Uroproctus*, in which the tibial apophyses of the male are scarcely, and the antenniform legs of the female not at all, modified. Specialization of the genital sternum appears, moreover, often to be more marked in males than in females in genera in which the antenniform legs of the latter are more strongly modified than the tibial apophyses of the former, and *vice versa*. It seems impossible to say more at present with reference to modifications of the genital sternum.

The genera characterized by the specialization of the tibial apophyses of males are three in number—*Labochirus*, *Hypoctonus* and *Typopeltis*.

The distribution of the genus *Labochirus*, as already pointed out (above, p. 61), suggests that this genus, which contains almost all the most primitive representatives of the keelless group in the Indo-Australian area, once had a more continuously wide distribution than is at present the case. Its most highly specialized species appear to be confined to Burma, in and around which country and nowhere else the remaining Indo-Australian genus of the keelless group—*Hypoctonus*—is found. The more primitive species of this genus closely resemble those of the last, proving a common origin for the two; but the proportion of highly specialized species is much greater. I have already alluded to the concentration of this highly specialized genus in Burma as evidence that the conditions found among the secluded valleys of this country have acted as a stimulus to evolution in the same sort of way as the conditions found among the islands of the East Indian Archipelago, a conclusion which finds support in other groups (see Gravely, 1915*a*, p. 416).

The genus *Hypoctonus* appears to be dominant over the whole of Burma, and its range extends beyond the Siamese frontier almost to Raheng in the Me Ping Valley, an immature specimen having been sent to us by Mr. C. S. Barton from laterite jungle in the forest surrounding the Metaw River, a river which joins the Me Ping from the west close to Raheng. From open ground in this forest Mr. Barton has also sent us an immature specimen of the genus *Thelyphonus*, a genus which appears to be widely distributed in Siam and Indo-China. It is difficult to determine, from the evidence at present available, whether *Thelyphonus* or *Typopeltis* is the dominant genus of the two last named countries, or whether both are equally common.

Typopeltis extends northwards to Japan and Siberia. It resembles the keelless genera already dealt with in having the tibial apophyses of males strongly modified, though perhaps in general a little less strongly. In addition, however, the tarsi of the antenniform legs of females—though always long—are often somewhat modified, a thing which is unknown in the keelless genera. It is impossible in the present state of our knowledge to locate the evolutionary centre of this genus, but it is noteworthy that the only species in which the antenniform legs of the female are known to be unmodified is *Typopeltis amurensis* [1] from Siberia on the periphery of the range of the genus.

Omitting the genus *Mimoscorpius* (from the Philippines), of which scarcely anything is known, the keeled genera with unmodi-

[1] The type specimen is a female from Siberia. Kraepelin (1897, p. 13) identifies with this a male from Canton. In view of the limited range of most species of Thelyphonidae the correctness of this identification can scarcely be considered certain. Unfortunately nothing is known of the sex of the Indo-Chinese specimens in the Paris Museum.

fied or almost unmodified male tibial apophyses remain for consideration. Of these the genus *Uroproctus*, whose unmodified genital sternum indicates its primitive character, contains only one species, a species the females of which have the tarsi of their antenniform legs long and unmodified. In two at least of the other three genera the females of some species have the tarsi of their antenniform legs long and unmodified, while those of most have them short and modified, two species of *Thelyphonus* being transitional in so far as these tarsi are long although modified. The phylogenetic value of the distinctions between these genera is very doubtful, and they may be treated here as together forming a single unit.

The species found in the Malay Peninsula and Archipelago and the Polynesian Islands are as follows:—

Thelyphonus manilanus,
,, *anthracinus*,
,, *caudatus*,
,, *linganus*.
,, *borneensis*,
,, *klugi*,
,, *celebensis*,
,, *doriae*,
,, *sucki*,
,, *semperi*,
,, *pococki*,
,, *burchardi*,
Thelyphonus insulanus,
,, *hanseni*,
,, *asperatus*,
,, *leucurus*,
,, *sumatranus*,
Abalius rohdei,
,, *samoanus*,
,, *willeyi*,
,, *manilanus*,
Tetrabalius seticauda,
,, *nasutus*.

In two of these—*Thelyphonus sumatranus* from Sumatra and *Abalius nasutus* from Borneo—the structure of the antenniform legs of the female is not definitely known.[1] But the tarsi of these legs are short in the male of the former species, and as shortening appears to follow modification it may be assumed that they are modified in the female. In the only known specimen of the latter species they are damaged.

In all the others, except *Thelyphonus anthracinus* from Borneo, *Thelyphonus manilanus* from the Philippines and Moluccas, and *Abalius rohdei* from New Guinea, they are both modified and short. In the first of these three exceptional species they are modified but long; in the other two they are both long and unmodified.

In Continental Asia (excluding the Malay Peninsula and including Ceylon) on the other hand, only two out of five species belonging to the keeled group have the antenniform tarsi modified, and in one of these they are long. Both species are, moreover, confined to Siam and Indo-China, *i.e.* they are the nearest of all to the Archipelago.

The country west of Siam and more directly north of the Malay Peninsula is occupied by the keelless genera *Hypoctonus*

[1] I have not seen a description of *T insulanus*. If it is allied to *T schimkewitchi* as Kraepelin suggests it must have the antenniform legs of the female modified.

and *Labochirus*. Only one species of *Thelyphonus—T schnehageni* from Rangoon—has been recorded from this country. Throughout Assam and the Eastern Himalayas the present group of genera is represented by *Uroproctus assamensis*; and throughout the Indian Peninsula and Ceylon by *Thelyphonus sepiaris*. In all of these three species the tarsi of the antenniform legs of the female are long and unmodified.

It is clear, therefore, that species of this group are more numerous and as a rule more highly specialized in the Archipelago than in Continental Asia.

SUMMARY OF CONCLUSIONS.

1. The degree to which different species of Thelyphonidae have been affected by the process of evolution can best be seen in the genital sternum of both sexes, the antenniform legs of the female, and the tibial apophyses of the male (p. 79).

2. The modifications seen in the genital sternum are not sufficiently definite or varied to be of much use for the purposes of this paper. Broadly speaking, however, they are correlated with the modifications seen in the other two structures mentioned (p. 79).

3. One of these two structures is affected in some genera, and the other in the rest. Only in the genus *Typopeltis* are both affected together. The relationships of this genus are rendered obscure by the fact that it differs from other genera with modified male tibial apophyses in having keels between the median and lateral eyes, and that it differs from other genera with modified female antenniform legs in having a different (more nearly terminal) series of joints affected by the modification (pp. 62 and 80).

4. The genera *Uroproctus*, *Thelyphonus*, *Abalius* and *Tetrabalius* are closely related. Except in so far as the structure of the genital sternum of *Uroproctus* indicates the primitive character of this genus, they are separated by characters of doubtful phylogenetic significance and they are best treated together as a unit group for the purposes of this paper. In all species the tibial apophysis of the male is simply conical, though often slenderer than that of the female; in the more highly specialized species the antenniform legs of the female are modified (pp. 62 and 81).

5. Twenty-three of the twenty-eight species belonging to these four genera are found in and confined to the Malay Peninsula, the Malay Archipelago and the Polynesian Islands. Of these the females of only two have unmodified antenniform legs; one of the remaining twenty-one has the tarsi of these legs unshortened although they are modified (p. 81). Of the two species which inhabit Siam and Indo-China one has these tarsi shortened and the other unshortened; both have them modified (p. 81). One species has been recorded from Burma, where the keelless genera with modified male tibial apophyses are dominant. Like the two species occurring (and dominant) in Assam and in the Indian Peninsula (with Ceylon) respectively it has the antenniform legs of the female unmodified

(pp. 81-82). Species found in and near the Archipelago are evidently, then, more highly specialized and much more numerous than those in Burma, Assam and the Indian Peninsula.

6. The keelless genera may for the present be regarded as two in number; but it has been necessary to redefine them (pp. 61-63). The genus *Labochirus* as redefined occurs in Africa, in South India and Ceylon, in Burma and the north of the Malay Peninsula, and perhaps in Borneo (pp. 64-67). It is composed almost entirely of relatively primitive forms which presumably had at one time a more continuously wide distribution than at present. Two species (*L. andersoni* and *L. ellisi*), however, show a specialization of the male tibial apophysis similar to that found in the higher members of the genus *Hypoctonus*, but affecting the upper instead of the lower border of the grooved surface. Both these species are confined to Burma (pp. 64 and 80). The genus *Hypoctonus*, which consists chiefly of the more highly specialized species of the group, is also confined to Burma, whose secluded valleys presumably form the main evolutionary centre of the group. The fauna of these valleys is very imperfectly known, and the species of this group have for the most part very restricted ranges. Probably, therefore, there is still much to be learnt with regard to them (pp. 61 and 80).

7. In the genus *Typopeltis* the number of records, especially from Continental Asia, is exceptionally small in comparison with the range of the genus, which indicates that here too there is still much to be found out. For the present the most that can be said is that the evolutionary centre is presumably somewhere in the tropics, that the genus does not extend south of Indo-China, and that the only species in which the female is known to have unmodified antenniform legs occurs in Siberia on the northern periphery of the range of the genus (p. 80).

8. Nothing can be said of the genus *Mimoscorpius* from the Philippines, as next to nothing is known about it.

9. Before concluding it may be well to note that the two American genera, which do not properly come within the scope of this paper, are both extremely primitive. *Thelyphonellus* has the male tibial apophysis less modified than any of its Oriental keelless allies; and *Mastigoproctus* has the genital sternum as little modified as the allied and primitive Oriental *Uroproctus*, and the tibial apophyses alike in the two sexes.

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(*b*) " Exhibition of living Pedipalpi, with Remarks on the Distribution of the Order." *Proc A S.B.*, Aug. 1911 (1912), pp. cxxiii-cxxv.

1915. Gravely, F. H.—(*a*) " The Evolution and Distribution of Indian Spiders belonging to the Subfamily Aviculariinae." *J.A.S.B.* (n.s.) X, 1914 (1914-5), pp. 411-420, pl. xxxi.

(*b*) " Notes on the Habits of Indian Insects, Myriapods and Arachnids." *Rec. Ind. Mus.* XI, 1915, pp. 483-539, pls. xxii-xxv.

EXPLANATION OF PLATE I.

FIG. 1.—Anterior abdominal sterna of *Labochirus proboscideus*, very young, × 4.

,, 2.—Anterior abdominal sterna of *Labochirus proboscideus*, young, × 4.

,, 3.—Anterior abdominal sterna of *Labochirus proboscideus*, ♀ × 4.

,, 4.—Anterior abdominal sterna of *Labochirus proboscideus*, ♂ × 4.

,, 5.—Anterior abdominal sterna of *Labochirus gastrostictus*, ♀ × 4.

,, 6.—Anterior abdominal sterna of *Labochirus kraepelini*, ♀ × 4.

,, 7.—Anterior abdominal sterna of *Labochirus dawnae*, ♀ × 4.

,, 8.—Anterior abdominal sterna of *Labochirus browni*, ♀ × 4.

,, 9.—Anterior abdominal sterna of *Labochirus ellisi*, ♀ × 4.

,, 10.—Anterior abdominal sterna of *Hypoctonus sylvaticus*, ♀ × 4.

,, 11.—Anterior abdominal sterna of *Hypoctonus saxatilis*, ♀ × 4.

,, 12.—Anterior abdominal sterna of *Hypoctonus wood-masoni*, ♀ × 4.

,, 13.—Lower surface of left trochanter of *Typopeltis stimpsoni*, ♂ × 4.

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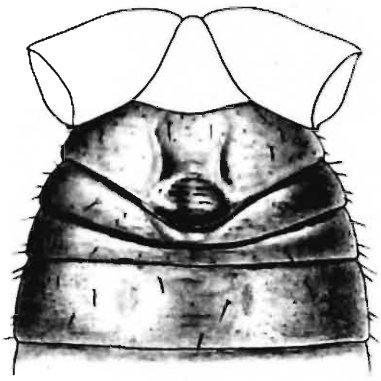

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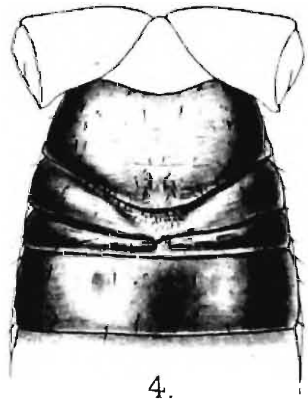

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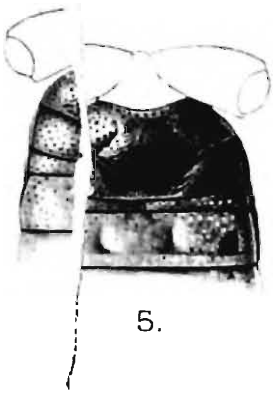

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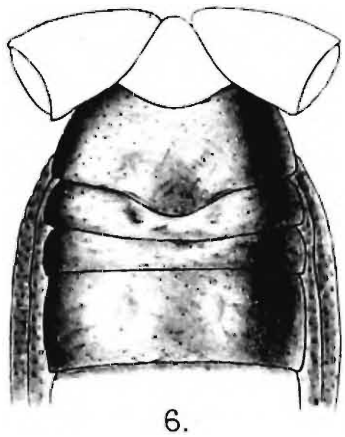

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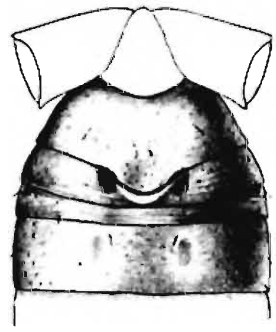

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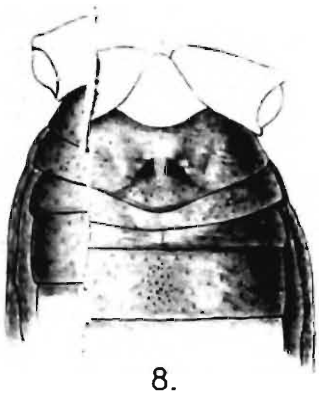

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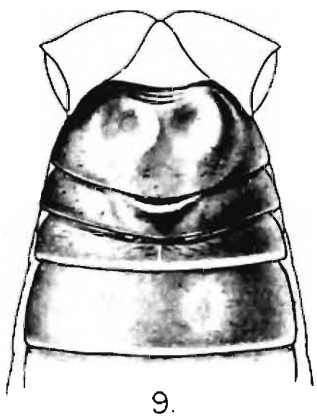

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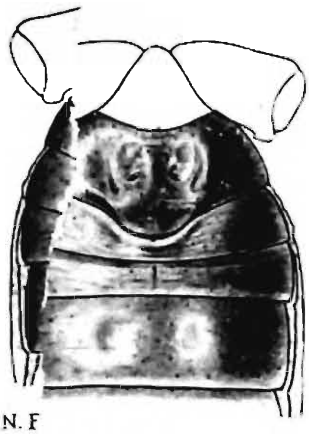

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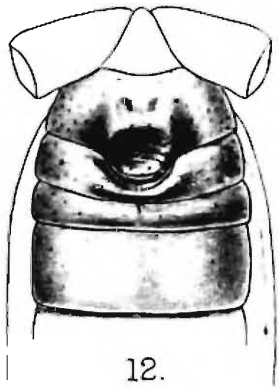

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LABOCHIRUS AND HYPOCTONUS.

EXPLANATION OF PLATE II.

FIG. 14.—Tibial apophysis of *Labochirus kraepelini*, ♂

,, 15.— ,, ,, ,, ,, *dawnae*, ♂

,, 16.— ,, ,, ,, *andersoni*, ♂

,, 17.— ,, ,, ,, ,, *ellisi*, ♂

,, 18.— ,, ,, ,, *Hypoctonus oatesi*, ♂

,, 19.— ,, ,, ,, ,, *carmichaeli*, ♂

,, 20.— ,, ,, ,, ,, *formosus*, ♂.

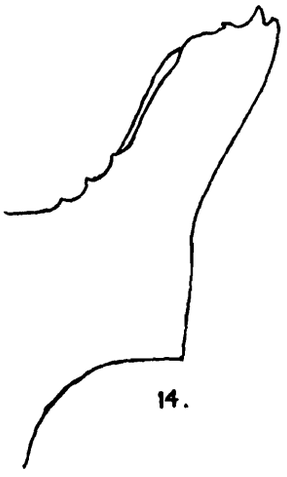
,, 21.— ,, ,, ,, ,, *rangunensis*, ♂

,, 22.— ,, ,, ,, ,, *saxatilis*, ♂

,, 23.— ,, ,, ,, ,, *sylvaticus*, ♂

,, 24.— ,, ,, ,, ,, *wood-masoni*, ♂.

,, 25.— ,, ,, ,, ,, *stoliczkae*, ♂.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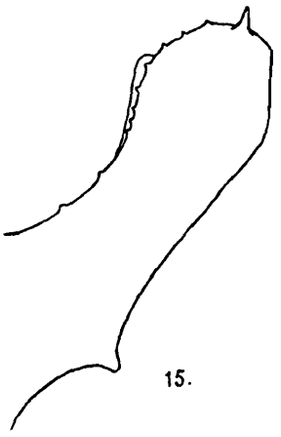
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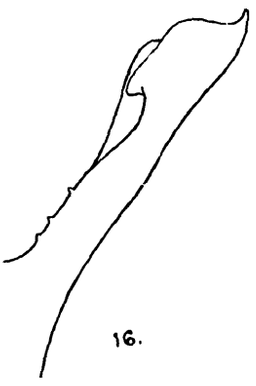
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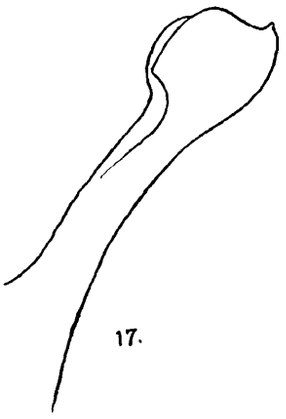
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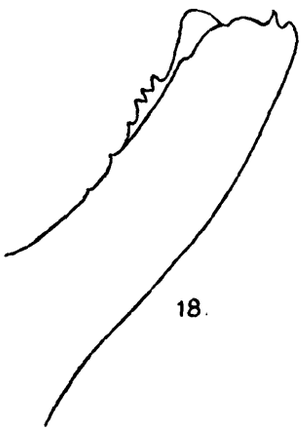
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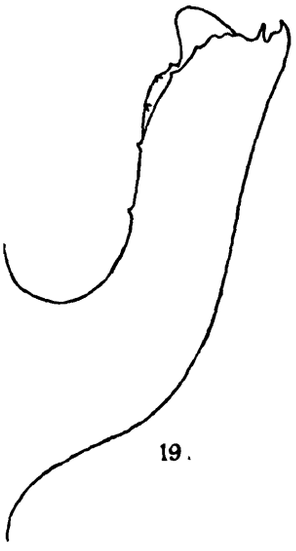
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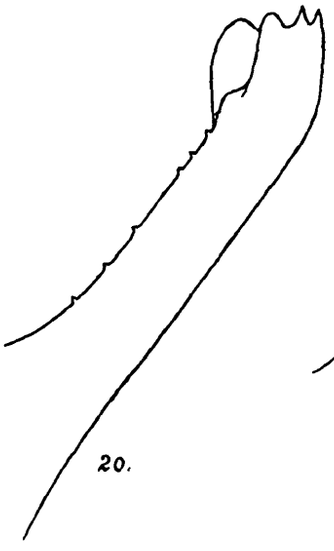
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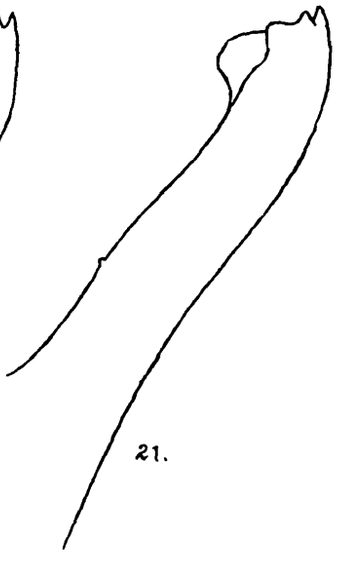
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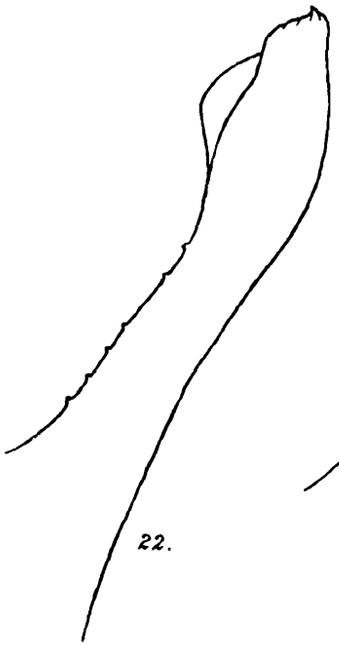
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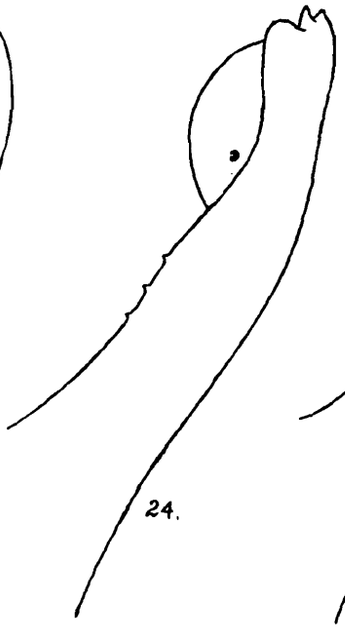
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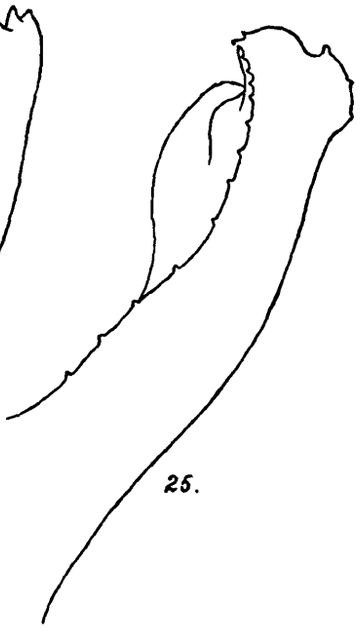
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LABOCHIRUS and HYPOCTONUS.

EXPLANATION OF PLATE III.

FIG. 26.—Anterior abdominal sterna of *Uroproctus assamensis*, ♂ × 4.

,, 27.—Anterior abdominal sterna of *Uroproctus assamensis*, ♀ × 4.

,, 28.—Anterior abdominal sterna of *Thelyphonus caudatus*, ♂ × 4.

,, 29.—Anterior abdominal sterna of *Thelyphonus caudatus*, ♀ × 4.

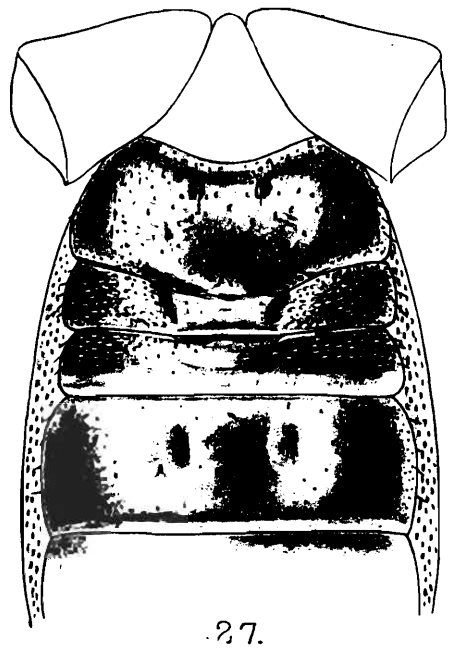
,, 30.—Anterior abdominal sterna of *Thelyphonus linganus*, ♂ × 4.

,, 31.—Anterior abdominal sterna of *Thelyphonus linganus*, ♀ × 4.

,, 32.—Anterior abdominal sterna of *Thelyphonus sucki*, ♂ × 4.

,, 33.—Anterior abdominal sterna of *Thelyphonus schimkewitschi*, ♂ × 4.

26.



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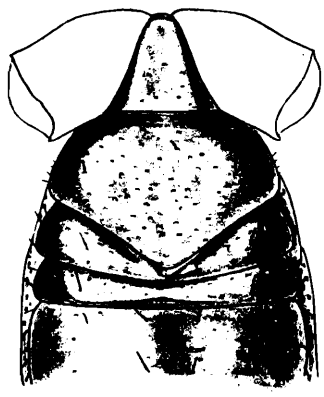

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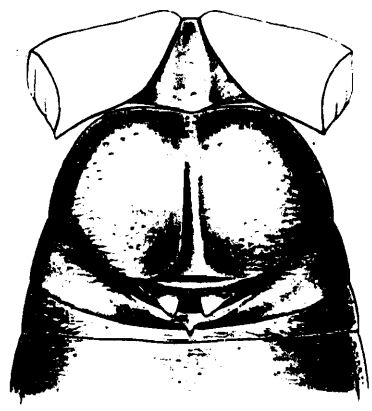

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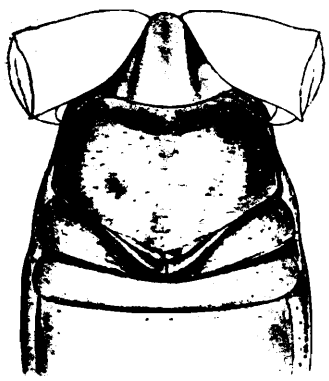

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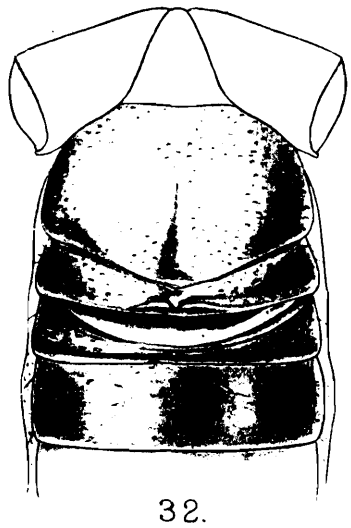

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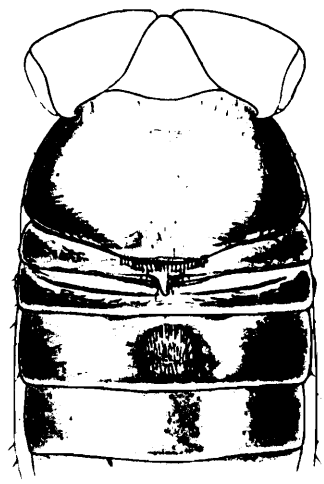

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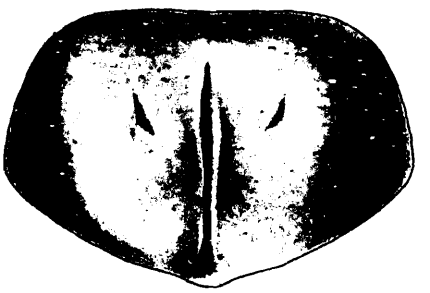
UROPROCTUS AND THELYPHONUS.

EXPLANATION OF PLATE IV

FIG. 34.—Genital sternum of *Thelyphonus doriae*, ♂ × 4.
,, 35.—Tibial apophysis of *Uroproctus assamensis*, ♂ × 4.
,, 36.— ,, ,, ,, ,, ,, ♀ × 4.
,, 37.—Arm and hand of *Thelyphonus caudatus*, ♂ × 4.
,, 38.— ,, ,, ,, ,, ,, ,, ♀ × 4.
,, 39.— ,, ,, ,, ,, ,, *linganus*, ♂ × 4.
,, 40.— ,, ,, ,, ,, ,, ,, ♀ × 4.
,, 41.— ,, ,, ,, ,, ,, *doriae*, ♂ × 4.
,, 42.— ,, ,, ,, ,, ,, *sucki*, ♂ × 4.
,, 43.— ,, ,, ,, ,, ,, *schimkewitschi*, ♂ × 4.

37.



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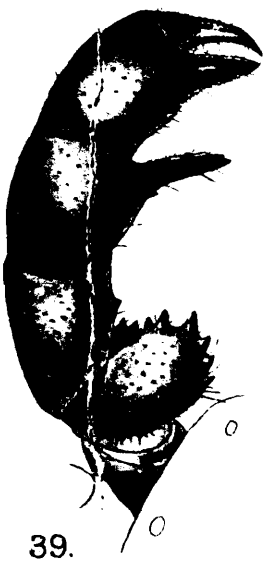

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UROPROCTUS AND THELYPHONUS.

VIII REPORT ON A SMALL COLLECTION OF MARINE MOLLUSCA DREDGED IN SHALLOW WATER IN THE ANDAMAN ISLANDS

By H. B. PRESTON, *F.Z.S.*

In dealing with the present small collection the exceedingly rich nature of the Andaman Islands Molluscan fauna is once more emphasized, several large collections, notably those of Nevill, Bouley, Wilmer and Warneford, made during more or less recent years having seemingly failed to exhaust it and there is little doubt that were systematic dredging, especially in from two to twenty fathoms, carried on at every available point round the islands large numbers of forms hitherto unknown to science would be revealed.

In the present paper the author is able to diagnose and figure seventeen species which appear to have up to now escaped notice, and also to place on record the occurrence of several quite unlooked for forms, thus very considerably extending their known range, while the material collected has, in addition, enabled him to provide drawings of two species (*Ethalia capillata*, Gould and *Eulima oxytata*, Watson) which, though duly described, have not before been figured.

Class GASTROPODA.

Order *PROSOBRANCHIA.*

Family PLEUROTOMIDAE.

Pleurotoma fusca, Hombron and Jacquinot.

Voy. Sud. Pole, Zool., Vol. V, p. 111, pl. xxv, figs. 19-20.

Brigade Creek, in 2-5 fathoms, on a bottom composed of decaying vegetation; Port Blair.

Mangilia gracilenta, Reeve.

Proc. Zool. Soc., 1843, p. 184; Tryon, *Man. Conch.*, Vol. VI, p. 251, pl. xxiii, figs. 98, 88; pl. xvii, fig. 11.

Port Blair.

Family NASSIDAE.

Nassa kempi, sp. n.

(Figs. 1, 1*a*.)

Shell small, ovately fusiform, whitish, shading on the last whorl to pale yellowish-brown, painted with two spiral bands of pale reddish-chestnut which increase to three on the last whorl; whorls 5, the first two smooth, polished, the last three sculptured with rather closely-set, transverse costulae; base of shell finely spirally sulcate; suture impressed, crenellated by the terminations of the

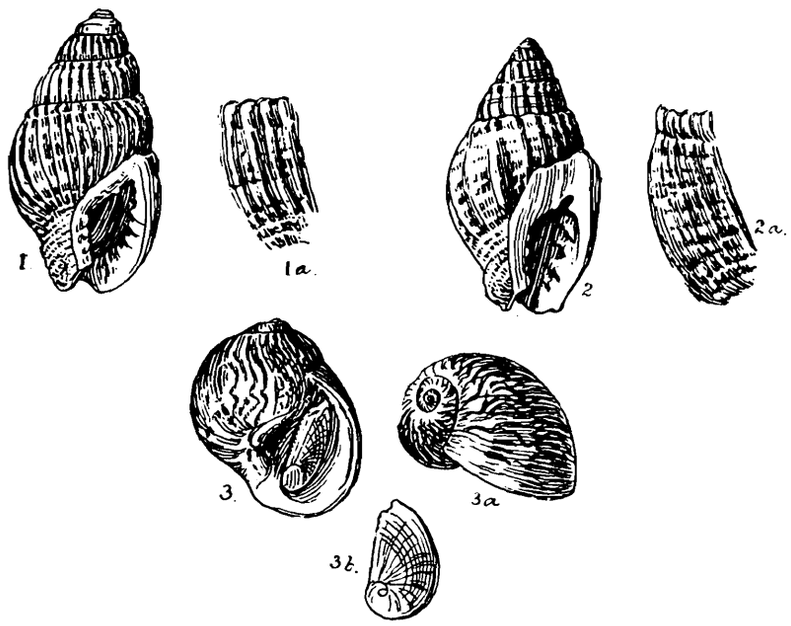

FIG. 1.—*Nassa kempi*, sp. n. × 6. FIG. 2.—*Nassa phoenicensis*, sp. n. × 4.
,, 1*a*.— *do.*, sculpture, × 8. ,, 2*a*.— *do.*, sculpture, × 4.
FIG. 3, 3*a*.—*Natica kempi*, sp. n. × 3.
,, 3*b*.— *do.*, operculum × 3.

transverse costulae; columella obliquely descending, narrowly and restrictedly outwardly calloused, the callus extending upward across the parietal region to meet the upper margin of the labrum and bearing eight denticle-like plaits of which the uppermost and the three basal ones are the coarsest; labrum white, acute, varicosely thickened behind, slightly projecting in front and somewhat sharply contracted near the base, bearing seven small, regular denticles just within the aperture; aperture ovate; canal short, rather broad.

Alt. 4·5, diam. maj. 2·5, diam. min. 2·25 mm.

Aperture: alt. 1·5, diam. ·5 mm.

Hab.—Semiramis Bay, Andaman Islands, in 2-6 fathoms, on a bottom of fine mud (*S. Kemp*).

Nassa phoenicensis, sp. n.

(Figs. 2, 2*a*, p. 88.)

Shell rather small, shortly fusiform, reddish-brown, painted with spiral bands of dark chocolate; whorls 6, flattish, regularly increasing, the last long, sculptured with slightly oblique, transverse costulae, crossed by fine, spiral lirae and a single groove a little below the sutural region, which transforms the terminations of the transverse costulae into a row of nodules; suture impressed; columella margin obliquely descending, bearing four plait-like denticles, livid whitish in colour, restricted and rather erectly calloused and extending above into a well defined, parietal callus which reaches to the upper margin of the labrum; labrum varicosely thickened with narrowly reflexed margin, obliquely backwardly sloping and sharply contracted to form a notch near its base, bearing seven denticles just within; aperture irregularly ovate, canal short.

Alt. 7, diam. maj. 3·75, diam. min. 3·25 mm.

Aperture: alt. 2·25, diam. 1 mm.

Hab.—Phoenix Bay, Andaman Islands, in 1-3 fathoms, on a bottom of muddy sand (*S. Kemp*).

Nassa (Hima) tindalli, Melvill.

Proc. Malac. Soc. London, Vol. VII, 1907, p. 29 (fig. in text).

Port Blair.

A single small and damaged specimen which the author refers with some hesitation to the above quoted species originally described from Baticaloa, Ceylon.

Nassa (Niotha) livescens, Phil.

Zeitschr. für Malak., 1848, p. 135 (as *Nassa*); Tryon, *Man. Conch.*, Ser. 1, Vol. IV, p. 54, pl. xvi, fig. 304.

Semiramis Bay, 2-6 fathoms, in fine mud.

A single dead and immature specimen.

Nassa (Arcularia) globosa (Quoy).

Quoy and Gaimard, *Zool. Voy. Astrolabe*, II, p. 448, pl. xxxii, figs. 25-27 (as *Buccinum*).

Phoenix Bay, in 1-3 fathoms, in muddy sand.

Nassa (Arcularia) cancellata, Adams.

Proc. Zool. Soc., 1851, p. 99; Tryon, *Man. Conch.*, Ser. 1, Vol. IV, p. 26, pl. viii, fig. 35.

Bamboo Flat Bay, 1-4 fathoms, in muddy sand.

Nassa (Alectrion) unicolor, Hombron and Jacquinot.

Voy. Astrol. et Zel., 1853, V, p. 76, pl. xxi, figs. 13-15.

Semiramis Bay, 2-6 fathoms, in fine mud; Port Blair.
A single juvenile example from each locality.

Family Capulidae.

Calyptraea pellucida, Reeve.

Conch. Icon. (*Trochita*), sp. 2, pl. i, figs. 2*a-b*.

A single specimen on the inner side of a valve of *Tellina viator*, Preston, from Port Blair.

Family Naticidae.

Natica kempi, sp. n.

(Figs. 3, 3*a*, 3*b*, p. 88.)

Shell small, solid, ovate, of a yellowish ground colour, painted with rather fine, closely-set, transverse, zig-zag, chestnut markings and irregularly, broadly, spirally banded with pale reddish-chestnut; whorls 4, the first three small, the last large, convex, finely, transversely striate; sutures so lightly impressed as to be almost linear; umbilicus deep, sealed, but for a comparatively narrow opening, by a heavy convex callus which is stained with dark livid purple; columella margin obliquely descending, spreading above into a well defined, parietal callus which is so thickened as to take on almost the appearance of a nodule near its junction with the upper margin of the labrum; labrum sub-acute above and in front where it is stained with a livid tinge, slightly dilated below and considerably thickened where it merges into the base of the columella margin; aperture ovate; operculum thick, shelly, polished shining, semi-transparent, but marked with opaque, radiating bands of milk white, two-whorled, with eccentric nucleus and strongly spirally striate.

Alt. 7·5, diam. maj. 5·75, diam. min. 4·75 mm.
Aperture: alt. 4, diam. 2·25 mm.
Hab.—Port Blair, Andaman Islands (*S. Kemp*).

Sigaretus (Eunaticina) calaraphe, sp. n.

(Figs. 4, 4*a*.)

Shell small, moderately solid, yellowish-white; whorls 4, the first two small, the last two rapidly increasing, the last large, long, sculptured with fine, but rather irregular, slightly wavy, incised spiral striae; suture canaliculate; umbilicus moderately narrow, deep, partly concealed by the outward expansion of the calloused columella margin; columella margin obliquely descending, curved below, outwardly expanded, the expansion appearing as a wing-

like projection above and much contracted in the median part; labrum continuous with the columella callus, acute, somewhat projecting in front; aperture pyriform; interior of shell white, porcellaneous.

Alt. 8·5, diam. maj. 5·5, diam. min. 4 25 mm.

Aperture: alt. 6, diam. 3 mm.

Hab.—Semiramis Bay, Andaman Is., in 2-6 fathoms, on a bottom of fine sand (*S. Kemp*).

Family SCALIDAE.

Epitonium robillardi (Sowerby).

Proc. Malac. Soc., London, I, p. 42, pl. iv, fig. 5 (as *Scalaria*).

Bamboo Flat Bay, 1-4 fathoms, in muddy sand.

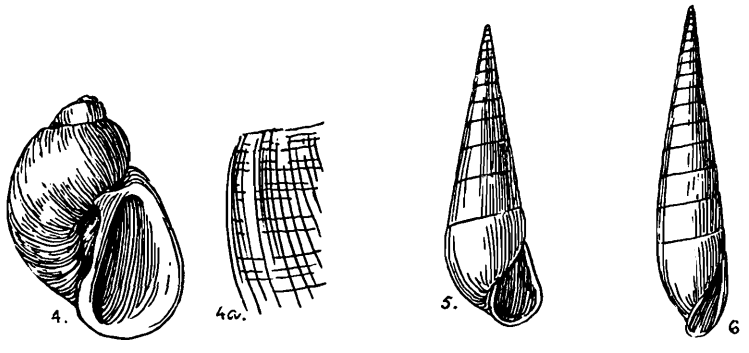

FIG. 4.—*Sigaretus (Eunaticina) calaraphe*, sp. n. × 4.
,, 4*a*.— *do.* sculpture, × 4.
,, 5.—*Eulima oxytata*, Watson × 6.
,, 6.—*Eulima rossinsulae*, sp. n. × 3.

Family EULIMIDAE.

Eulima oxytata, Watson.

(Fig. 5.)

J. Linn. Soc., 1883, Vol. XVII, p. 117 (unfigured).

Bamboo Flat Bay, 1-4 fathoms, in muddy sand.

The author has been unable to trace the existence of any figure of this pretty little species, hence the figure now given.

Eulima rossinsulae, sp. n.

(Fig. 6.)

Shell elongately subulate, semi-opaque, white; whorls 17, flattened, not convex, smooth, polished, shining; suture linear; columella margin oblique; labrum acute, slightly bent inwards over the aperture; aperture slightly oblique, narrowly and somewhat elongately triangular.

Alt. 11, diam. maj. 2·25 mm.
Aperture: alt. 1-5, diam. ·75 mm.
Hab.—Off Ross Island, Andaman Is., 2-10 fathoms, on a bottom of sand, stones and coral (*S. Kemp*).

Family NERITIDAE.

Theodoxus oualanensis, Lesson.

Lesson in Duperey, *Voy. Coquille, Zool.*, Vol. II, 1830, p. 379.
Reeve, *Conch. Icon.*, sp. 168, pl. xxxvi, fig. 168 (as *Neritina*).

Bamboo Flat Bay, 1-4 fathoms, in muddy sand.
A single small specimen; the species though originally described from the Pacific appears to have a very wide range, the author having taken quite typical specimens some years ago at Baticaloa on the east coast of Ceylon.

FIG. 7, 7*a*, 7*b*.—*Ethalia capillata*, Gould, × 4.
,, 8. 8*a*.—*Cylichnella syngenes*, sp. n. × 8.

Family TROCHIDAE.

Ethalia capillata, Gould.

(Figs. 7, 7*a*, 7*b*.)

Proc. Bost. Soc. Nat. Hist., 1861, Vol. VIII, p. 17.

Off Ross I., in 2-10 fathoms, on a bottom of sand, stones and coral.
A very beautiful species which appears hitherto to have escaped being figured.

Order *OPISTHOBRANCHIA.*

Family SCAPHANDRIDAE.

Cylichnella syngenes, sp. n.

(Figs. 8, 8*a*.)

Shell allied to *Cylichna cylindracea*,[1] Pennant, a common European form, but differing from that species in the wider apical

[1] *Brit. Zool.*, Ed. 4, Vol. IV p. 117, pl. lxx, fig. 35 (as *Bulla*).

umbilicus, in its coarser revolving striae and more cylindrical and truncate form.

Alt. 5·25, diam. 2 mm.

Aperture : alt. 5·25, diam. 25 mm.

Hab.—Port Blair, Andaman Is. (*S. Kemp*).

Family APLUSTRIDAE.

Micromelo undatum (Bruguière).

Brug., *Encycl. Méth.*, I, p. 380 (as *Bulla*) ; Tryon, *Man. Conch.*, Vol. XV, p. 392, pl. lix, figs. 20-24.

Off Ross I., in 2-10 fathoms, on a bottom of sand, stones and coral.

A single very brightly coloured example which is inseparable from the West Indian shells in the British Museum.

Class PELECYPODA.

Order *TETRABRANCHIA.*

Sub-order *MYTILACEA.*

Family MYTILIDAE.

Mytilus curvatus, Dunker.

Proc. Zool. Soc., 1856, p. 361 ; Reeve, *Conch. Icon.*, sp. 53, pl. xi, fig. 53.

Brigade Creek, in 2-5 fathoms, on a bottom composed of decaying vegetation.

Sub-order *ARCACEA.*

Family ARCIDAE.

Arca (Anadena) holoserica, Reeve.

Proc. Zool. Soc., 1844, p. 39 (as *Arca*) ; Reeve, *Conch. Icon.*, sp. 11, pl. ii.

A young specimen from Semiramis Bay, in 2-6 fathoms, in fine mud.

Family NUCULIDAE.

Nucula semiramisensis, sp. n.

(Figs. 9, 9*a*, 9*b*.)

Shell tumid, ovately rhomboidal, covered with a thin, pale reddish-brown periostracum, polished, shining, minutely, obsoletely, transversely striate, and marked with concentric growth lines; umbones pearly, not prominent; dorsal margin arched in the median part, anteriorly sinuous, posteriorly bulging; ventral margin rounded ; anterior side sharply angled above, obliquely sloping below ; posterior side rather slightly produced, sharply rounded ; hinge plate bearing on right valve five erect, sharp-pointed,

anterior and sixteen posterior lateral teeth, and on the left valve six anterior and seventeen posterior lateral teeth. Interior of shell pale bluish, nacreous.

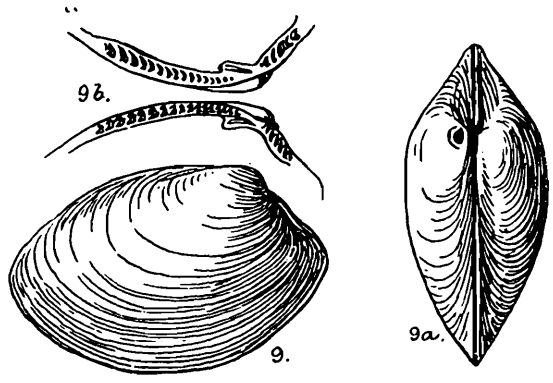

FIG. 9, 9*a*.—*Nucula semiramisensis*, sp. n. × 3.
,, 9*b*.— *do.*, hinge, × 3.

Long. 7·75, lat. 11·75 mm.

Hab.—Semiramis Bay, Andaman Is., in 2-6 fathoms, in fine mud (*S. Kemp*).

Allied to *N bengalensis*, Smith[1], from deep water in the Bay of Bengal. The present species is however of smaller dimensions and greater convexity for its size, the anterior side is also much more angular than is the case in that species.

Yoldia tenella, Hinds.

Proc. Zool. Soc., 1843, p. 99; Reeve, *Conch. Icon.*, sp. 2, pl ii.

Semiramis Bay, in 2-6 fathoms, in fine mud; Port Blair.

Sub-order *CARDIACEA*.

Family CARDIDAE.

Fulvia papyracea, Chem.

Conch., Cab., Vol. VI, p. 190, pl. xviii, fig. 184; Sowerby, *Conch. Illust.*, fig. 56 (non fig. 55); Reeve, *Conch. Icon.*, sp. 9, pl. ii (as *Cardium*).

Bamboo Flat Bay, in 1-4 fathoms, on a bottom of muddy sand (young specimens only).

Sub-order *CONCHACEA*.

Family VENERIDAE.

Dosinia laminata, Reeve.

Venus, No. 34 Schröter, *Einleit*, iii, p. 167, pl. x, fig. 3?; *V. excavata*, Gmel. *Syst.*, p. 3269, No. 83?; *cf.* Römer, *Krit. Unters.*, p. 26; Reeve, *Conch. Icon.*, sp. 41, pl. vii.

Port Blair.

A number of small specimens measuring about 13 millimetres in height and breadth.

Pitaria sp.? Juv.

Phoenix Bay, in 1-3 fathoms, on a bottom of muddy sand; Port Blair.

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[1] *Ann. Mag. Nat. Hist.*, Ser. 6, Vol. XVI, 1895, p. 257, pl. ii, fig. 9.

Anaitis calophylla, Hanley.

Cat. Rec. Biv. Shells, Appendix, p. 361, pl. xvi, fig. 26 (as *Venus*).

Port Blair.

Anaitis sp.? Juv.

Semiramis Bay, 2-6 fathoms, in fine mud.

A single very beautiful specimen, which the author has been unable to satisfactorily determine, it is obviously in a very youthful state.

Tapes textrix, Chem.

Conch. Cab., VII, p. 48, pl. xlii, fig. 442 (as *Venus*).

Port Blair. Two young examples.

Family SOLENIDAE.

Solen sp.? Juv.

Bamboo Flat Bay, 1-4 fathoms, in muddy sand; only extremely juvenile specimens obtained.

Order *DIBRANCHIA*

Sub-order *LUCINACEA.*

Family LUCINIDAE.

Lucina semperiana, Issel.

Savigny, *Descript. de l'Egypte Coq.*, pl. viii, fig. 12 Issel, *Mal. del Mar. Rosso*, 1869, p. 82.

Semiramis Bay, 2-6 fathoms, in fine mud.

Sub-order *TELLINACEA.*

Family TELLINIDAE.

Tellina bertiniana, sp. n.

(Figs. 10, 10*a*, p. 96.)

Shell trigonally ovate, somewhat convex, white, opaque, slightly polished, smooth but for concentric growth lines which are more closely-set and more apparent near the margins; umbones moderately small and inwardly curved, marked with rather distant growth ridges; dorsal margin arched; ventral margin gently rounded, very slightly contracted posteriorly; anterior side rounded; posterior side angularly rounded.

Long. 7·5, lat. 9·25 mm.

Hab.—Bamboo Flat Bay, Andaman Islands, in 1-4 fathoms, on a bottom of muddy sand (*S. Kemp*).

Dedicated to M. Victor Bertin in recognition of assistance received from his valuable work on the Tellinidae.[1]

[1] *Nouv. Arch. Mus. Paris,* 2nd Ser., I, pp 202-361, pls. viii, ix.

Tellina innocens, sp. n.

(Fig. 11.)

Shell small, ovately and broadly auriform, thin, semi-transparent, white, both valves finely concentrically striate; umbones small, a little prominent; dorsal margin anteriorly sloping, posteriorly sharply sloping and a little excavated; ventral margin rounded; anterior side also rounded; posterior side shortly and obtusely rostrate, abruptly rounded at its extremity.

Long. 4, lat. 5 mm.

Hab.—Phoenix Bay, Andaman Is., in 1-3 fathoms, on a bottom of muddy sand (*S. Kemp*).

Tellina micans, Hanley.

Proc. Zool. Soc., 1844, p. 72; Sowerby, *Thes. Conch.*, fig. 106.

Port Blair (several specimens).

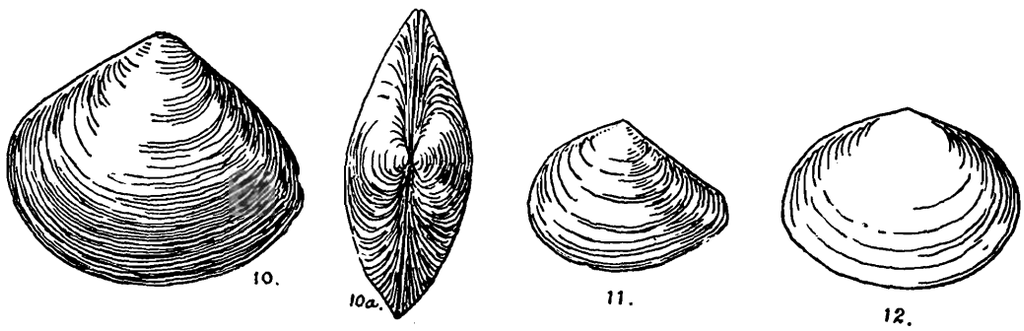

FIG. 10, 10*a*.—*Tellina bertiniana*, sp. n. × 3.
,, 11.—*Tellina innocens*, sp. n. × 4.
,, 12.—*Tellina persimplex*, sp. n. ×3.

Tellina persimplex, sp. n.

(Fig. 12.)

Shell oval, thin, semi-transparent, whitish, both valves having the upper portion smooth, while the lower portions are marked with fine, concentric ridges which become coarser on the posterior side; umbones small, not prominent; dorsal margin gently sloping both anteriorly and posteriorly; ventral margin rounded; anterior and posterior sides bluntly rounded.

Long. 6, lat. 8 mm.

Hab.—Port Blair, Andaman Is. (*S. Kemp*).

Tellina pervitrea, sp. n.

(Fig. 13.)

Shell small, ovately cuneiform, exceedingly thin and almost transparent, smooth, polished, shining, marked only with fine, concentric growth lines; umbones small, not prominent; dorsal

margin anteriorly gently arched, markedly excavated in the ligamental region and sloping posteriorly; ventral margin scarcely rounded; anterior side rounded; posterior side comparatively short, abruptly descending, rounded below.

Long. 4·75, lat. 8·25 mm.

Hab.—Semiramis Bay, Andaman Is., in 2-6 fathoms, on a bottom of fine mud (*S. Kemp*).

Tellina phoenicensis, sp. n.

(Figs. 14, 14*a*.)

Shell small, ovately cuneiform, milk white, both valves sculptured with moderately fine, concentric ridges which stand out somewhat along the upper portion of the posterior, dorsal margin, the interstices being occupied by very fine, miscroscopic, concentric striae; umbones small, rather prominent; dorsal margin

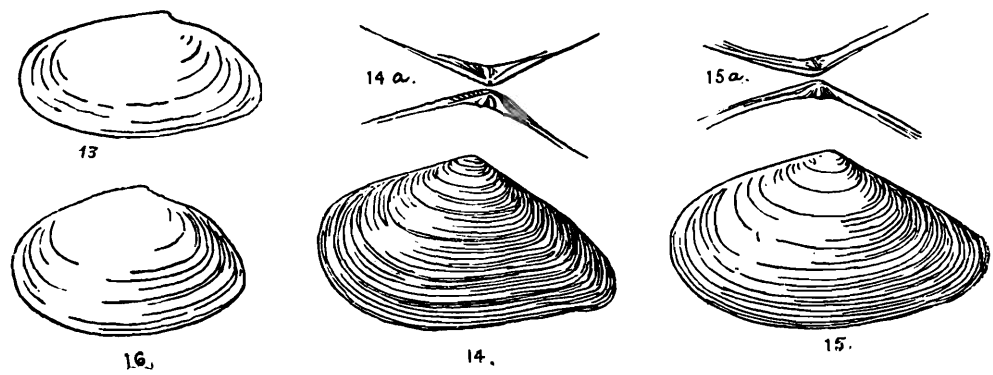

FIG. 13.—*Tellina pervitrea*, sp. n. × 3.
,, 14.—*Tellina phoenicensis*, sp. n. × 4.
,, 14*a*.— *do.*, hinge, × 4.
FIG. 15.—*Tellina soror*, sp. n. × 3.
,, 15*a*.— *do.*, hinge, × 3.
,, 16.—*Tellina unguis*, sp. n. × 4.

anteriorly, very slightly sloping, posteriorly sloping, faintly excavated above then a little bulging; ventral margin rounded anteriorly, contracted posteriorly, anterior side bluntly rounded; posterior side produced, subrostrate, sharply rounded.

Long. 5, lat. 8 5 mm.

Hab.—Phoenix Bay, Andaman Islands, in 1-3 fathoms, on a muddy bottom (*S. Kemp*).

Tellina soror, sp. n.

(Figs. 15, 15*a*.)

Shell allied to *T phoenicensis* but larger and of a thinner and semi-transparent texture, the concentric ridges are lacking and are replaced by very fine and closely-set striae only; the ventral margin is not posteriorly contracted; the anterior side is still more obtusely rounded, and the posterior side is neither unduly produced nor rostrate.

Long. 6·75, lat. 21·25 mm.

Hab.—Port Blair, Andaman Islands (*S Kemp*).

Tellina unguis, sp. n.

(Fig. 16, p. 97.)

Shell rather elongately ovate, thin, transparent, yellowish-white, shining, polished, smooth but for exceedingly fine growth lines; umbones small, scarcely prominent; dorsal margin arched, posteriorly excavated for a short distance; ventral margin very gently rounded; anterior side produced, rounded; posterior side obliquely sloping above, very obtusely rostrate below.

Long. 4·75, lat. 7·25 mm.

Hab.—Bamboo Flat Bay, Andaman Is., in 1-4 fathoms, on a bottom of muddy sand (*S. Kemp*).

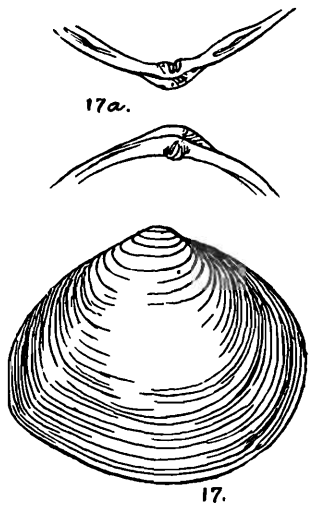

FIG. 17.—*Tellina vadorum*, sp. n. × 4.
,, 17*a*.— *do.*, hinge, × 4.

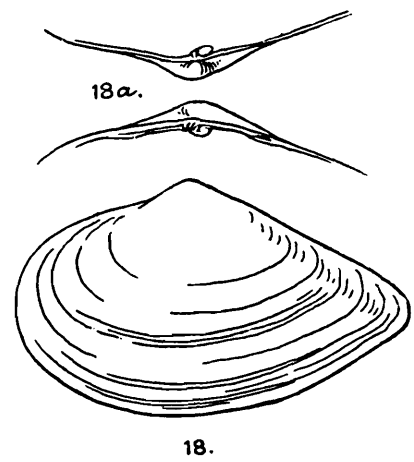

FIG. 18.—*Theora hindsiana*, sp. n. ×3.
,, 18*a*.— *do.*, hinge, × 3.

Tellina vadorum, sp. n.

(Figs. 17, 17*a*.)

Shell rather roundly ovate, thin, white, both valves sculptured with fine, regular, concentric ridges which become more closely crowded towards the ventral, anterior and posterior margins; umbones small, a little prominent; dorsal margin arched; ventral margin rounded; anterior side also rounded; posterior side very obtusely and roundedly rostrate.

Long. 6·5, lat. 8 mm.

Hab.—Bamboo Flat Bay, Andaman Islands in 1-4 fathoms, on a bottom of muddy sand (*S. Kemp*).

Tellina vestalis, Hanley.

Proc. Zool. Soc., 1844, p. 141 Reeve, *Conch. Icon.*, sp. 230, pl. xl.

Port Blair (young only).

Tellina viator, Preston.

Ann. Mag. Nat. Hist., Ser. 8, Vol. XVI, 1915, p. 84, fig. in text.

Port Blair.

A number of specimens of this very delicate species which are inseparable from the type which is of New Caledonian origin.

Family SCROBICULARIIDAE.

Theora hindsiana, sp. n.

(Figs. 18, 18*a*, p. 98.)

Shell allied to *T. opalina*, Hinds[1], but differing from that species in its more tumid form, anteriorly excavated and posteriorly sloping dorsal margin, broader and more obtusely rounded anterior side and more rostrate posterior side.

Long. 8·25, lat. 13 mm.

Hab.—Phoenix Bay, Andaman Islands, in 1·3 fathoms, on a bottom of muddy sand.

Named in honour of the late Mr. R. B. Hinds, to whose researches are due a large proportion of the known members of the group.

Sub-order *ANATINACEA.*

Family CUSPIDARIIDAE.

Cardiomya andamanica, sp. n.

(Figs. 19, 19*a*.)

Shell small, convex, pyriform, pure white, sculptured with seven minute anterior, eleven coarse median, and three fine posterior radiate riblets, a considerable smooth gap intervening between the two last; umbones small, not prominent; dorsal margin anteriorly sloping towards the umbones, posteriorly gently curving upwards towards the posterior side; ventral margin rounded, posteriorly contracted; anterior side steeply sloping above, rounded below; posterior side produced, rostrate, sharply rounded at its extremity.

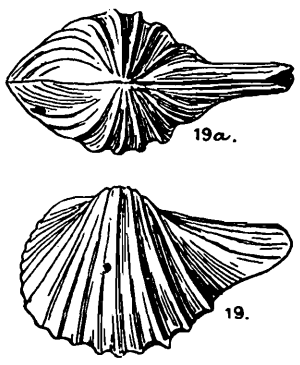

FIG. 19, 19*a*.—*Cardiomya andamanica*, sp. n. × 6.

Long. 3, lat. 5 (nearly) mm.

Hab.—Semiramis Bay, Andaman Is., in 2-6 fathoms, on a bottom of fine mud (*S. Kemp*).

[1] *Proc. Zool. Soc.*, 1843, p. 78.