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DESCRIPTIONS OF INDIAN AND INDO-CHINESE TADPOLES.

By MALCOLM A. SMITH, *F.Z.S.*

(Plate VII).

Among a small collection of batrachians recently submitted to me by Dr. Nelson Annandale for determination are the tadpoles of two species as yet undescribed. Thanks to him also I am able to give a complete account of the tadpole of *Rana livida* (Blyth). I take this opportunity to describe the larvae of other Indian and Indo-Chinese batrachians.

Rana spinosa.

Rana spinosa, Boulenger, *Rec. Ind. Mus.*, XX, p. 74 (1920).

Description.—Tadpole of rather large size, head and body stout. Length of head and body $1\frac{1}{3}$ times its width, snout broadly rounded, nostrils midway between the eyes and the tip of the snout, the distance between them equal to the interocular width ; eyes supero-lateral.

Spiracle sinistral, looking upwards and backwards, nearer the eye than the vent ; anus dextral. Tail $2\frac{1}{2}$ times as long as high with obtusely pointed tip ; crests moderate, the upper higher than the lower and not extending on to the back.

Mouth subterminal, its width less than one-third the greatest body width ; a fringe at the sides and below beset with very short papillae ; beak broadly margined with black, with coarsely serrated edges.

Upper lip with 4 series of teeth, the uppermost long and continuous, the second also long but narrowly interrupted, the third and fourth rows broadly interrupted by the beak ; lower lip with 3 series, the uppermost long and narrowly interrupted, the lower two continuous and shorter in length.

Colour, olive above, tail thickly spotted with black.

Dimensions of a specimen with budding hind limbs :—

Total length 50 ; length of head and body 20 ; width of body 15 ; height of tail 11 mm.

These tadpoles agree almost exactly with the description of the larvae of *R. annandalii* Boulenger, from the eastern Himalayas, the two frogs being also closely related. *Rana spinosa* is found in the mountains of southern China and Tonkin.

My tadpoles were collected on the Peak at Hongkong in March 1923, together with numerous adult frogs. Under *R. kuhlii*, Annandale has described two immature tadpoles from the same locality which evidently belong to *spinosa* (*Mem. Asiat. Soc. Bengal*, 1917, VI. p. 147). Like Dr. Annandale I at first mistook my frogs for *R. kuhlii*, until the capture of an adult male with horny spines upon the chest and fingers settled the diagnosis.

Rana cubitalis.

"Rana cubitalis, Bouleng., *Rec. Ind. Mus.*, XX, p. 138 (1920).

Description.—Length of head and body 1½ times its breadth, not markedly depressed ; snout rounded ; nostrils midway between the eyes and the end of the snout, nearly as far apart as the interorbital space ; eyes supero-lateral.

Spiracle sinistral, pointing backwards and upwards, midway between the eye and the vent ; anus dextral. Tail about 3 times as long as high, the tip pointed ; crests full, subequal in depth, the upper just extending on to the back.

Mouth large, subterminal, its width nearly half that of the body ; a fringe with short papillae at the sides and below. Beak narrowly margined with black, with finely serrated edges ; upper lip with 2 long series of teeth, the lowest narrowly interrupted ; lower lip with 3 long uninterrupted series.

A patch of granular skin on each side of the back behind the eye.

Colour, above light brown with darker spots.

Dimensions of a specimen with well developed legs :—

Total length 38 ; length of head and body 14 ; breadth of body 9 ; height of tail 8 mm.

Described from tadpoles collected in the Nakon Sritamarat mountains, Peninsular Siam, in March 1922. With their granular patches of skin upon the body these larvae have affinities with those of *Rana chalconota* Schlegel, the mouth parts of which are also closely related.

Distribution of the species. Hills of Western Siam.

Rana sauteri johnsi.

Rana sauteri johnsi, Malcolm Smith, *P. Z. S. London,* 1921, p. 434.

Description.—Tadpoles of moderate size, head and body somewhat depressed, snout rounded. Length of head and body 1⅓ to 1½ times its breadth ; nostrils midway between the eyes and the end of the snout ; eyes supero-lateral, the distance between them greater than that between the nostrils.

Spiracle sinistral, looking upwards and backwards, a little nearer the eye than the vent ; anus dextral. Tail 3½ times as long as high, the tip pointed ; crests moderate, subequal in depth, that of the upper not extending on to the back.

Mouth subterminal, its greatest width more than one-third the greatest width of the body ; a fringe with short papillae at the sides and below. Beak edged with black, with finely serrated edges ; 5 series of teeth in the upper jaw, the first long and continuous, the second narrowly interrupted, the lower 3 broadly interrupted by the beak ; lower lip with 5 long series, the uppermost of which is narrowly interrupted.

Colour, olive brown above, membranes of the tail with minute dark specks.

Measurements of a specimen with well developed legs :—

Total length 46 ; length of head and body 17 ; breadth of body 12 ; height of tail 8·5 mm.

Described from tadpoles collected on the Langbian plateau, S. Annam, Indo-China, at an altitude of 1,000 metres, in March 1917,

Rana alticola.

(Pl. VII, fig. 5.)

Rana alticola, Annandale, *Rec. Ind. Mus.* VIII, p. 22 (1912).

Both Boulenger and Annandale have described and figured this tadpole but neither of them gives any idea of the huge size to which it attains in the mountain streams of peninsular Siam. My largest specimen is 96 mm. in total length, and this size is commonly reached. The young larvae show two distinct types of colouration. One is pale yellowish, semi-translucent, with black spots, the other is entirely black except the ocelli. The full grown tadpole is dark brown or jet black in colour,[1] with a single orange coloured ocellus near the base of the tail.

These large and conspicuous creatures haunt the bigger pools or open streams where the current is not too swift, and the immunity which they enjoy from the attacks of fish and other beasts is due no doubt to the secretion produced by their parotid glands.

Rana livida.

Rana livida, Boulenger, *Rec. Ind. Mus.* XX, p. 214 (1920).

The tadpole of this frog, for lack of sufficient material, has never yet been fully described. It closely resembles that of *Rana afghana* (Günther).

Description.—Tadpoles of fairly large size, head and body convex above, much flattened below. Snout broadly rounded. Nostrils nearer the eyes than the tip of the snout, the distance between them less than the interorbital width ; eyes looking upwards and outwards.

Spiracle sinistral, placed very low down on the side of the body looking almost directly backwards, nearer the eye than the vent.

Tail nearly twice the length of the head and body, tip obtusely pointed, muscular portion strongly developed in the anterior $\frac{2}{3}$, tapering suddenly in the posterior $\frac{1}{3}$. Upper crest deeper than lower, not reaching to the body, lower crest almost straight, commencing behind the level of the upper.

Ventral disc large, truncate anteriorly, where its margin is formed by the lower lip, free at the sides and posteriorly, its length together with the mouth more than half the length of the head and body. Beak stout, black, the upper mandible with a white spot in the mid-line above, giving the impression of a notch, and a minute tooth-like projection opposite it.

Dental formula 3 : 5+5/1+1 : 2.

Skin with a circular patch of glandular granules behind each eye, and a larger, oval patch on the hinder and lower part of the body near the base of the tail.

Colour. Olive above with darker markings, the granular patches brown. Dr. Annandale tells me these patches are black in life and are much more distinct than in the preserved specimen.

[1] So far as my experience goes the tadpoles are never black or even dark brown in the Khasi Hills.—*N. A.*

From the tadpole of *R. afghana* it differs in the white V-shaped notch on the upper mandible, and in the larger and more conspicuous glandular patches.

Measurements of a specimen with the hind limbs about half-developed:—Total length 59 mm.; length of head and body 21; breadth of body 13·5; depth of tail 10; length of ventral disc without mouth 8·5; breadth of disc 10.

Described from two specimens collected by Dr. S. W Kemp at Tura, in the Garo Hills, Assam.

Distribution of the species. From the eastern Himalayas to southern Yunnan and hills of southern Burma.

Micrixalus opisthorhodus.

(Pl. VII, fig. 2.)

Micrixalus opisthorhodus, Boulenger, *Fauna Brit. Ind., Rept. and Batr.*, p. 465.

Head and body nearly twice as long as broad, considerably depressed, snout rounded. Nostrils equidistant between the eyes and the tip of the snout, a little farther apart than the eyes. Eyes small, on the top of the head and placed far forwards.

Spiraculum small, sinistral, directed obliquely upwards and backwards, much nearer the eye than the vent. Anus dextral.

Tail long and slender, tapering gradually to an obtusely pointed tip. Muscular portion in the middle about half the total depth. Membranes shallow, the upper and lower about equal in depth.

Mouth subterminal; disc moderate, about half or a little less than the greatest body-width, transversely oval, sucker-like, the lip completely surrounding it except in the mid-line above, and fringed with several rows of shortish papillae. A single short row of poorly developed teeth in the upper jaw. Mandibles stout, entirely black, their margins finely serrated; neither of them deeply semilunar or V-shaped.

Colour. Brown above and on the sides, paler below.

Length of head and body 9; breadth of body 5·5; length of tail 20; depth 4 mm.

This description is drawn up from two poorly preserved specimens said to belong to *M. opisthorhodus*. Both larvae are young, there being no trace of budding hind limbs. A third example, completely developed as a perfect frog but with the tail unabsorbed, measures 42 mm. in total length; head and body 16.

Taken at Kotagiri, Nilgiris, at 6,000 feet.

Distribution of the species. Hills of Southern India.

Philautus vittatus.

(Pl. VII, fig. 4.)

Ixalus vittatus, Boulenger, *Fauna Brit. Ind., Rept. and Batr.*, p. 485.

Description.—Length of head and body $1\frac{2}{3}$ times its breadth; snout obtusely pointed; nostrils nearer the tip of the snout than the eye; eyes looking upwards and outwards, twice as far apart as the nostrils.

Spiraculum sinistral, nearer the eye than the vent ; anus dextral. Tail about $3\frac{1}{2}$ times as long as deep, tip pointed. Crests moderate, the upper nearly twice as high as the lower, not extending on to the back.

Mouth subterminal ; lips with short papillae at the sides and below, interrupted for a short distance in the mid-line ; beak edged with black. Upper lip with 4 or 5 series of teeth, the first two uninterrupted, the last 2 or 3 broadly interrupted, the 5th row when present very short ; lower lip with 3 long uninterrupted rows or the uppermost narrowly interrupted.

Colour. Light brown, thickly speckled with dark brown and gold, below whitish ; membranes almost colourless.

Another form has a dark band along each side of the head and body and continued along the muscular part of the tail, the posterior part of which is black.

Dimensions of a specimen with the hind limbs well developed. Total length 33 ; head and body 10 ; width of body 6·5 ; depth of tail 6·5 mm.

Philautus vittatus was originally described from Upper Burma, but the species has since been discovered in Siam and Cochin China. The actual tadpoles here described are from Ta Rua, near Bangkok, Siam.

This frog is one of the few species of the genus to be found at sea level. It frequents low bushes by the side of ponds, and makes a round frothy "nest" similar to that made by the common tree frog *Rhacophorus leucomystax* (Gravenh.). This is attached to some bough overhanging the pool and the larvae, as they hatch, are washed out of it by the rain, and dropping into the water below continue their development in the usual manner.

Microhyla inornata.

Microhyla inornata, Boulenger, *Fauna Malay Penin., Rept. and Batr.*, 1912, p. 259.

On two occasions, when rearing the tadpoles of what I believed to be *M. ornata* in Bangkok, I have found that some of them, on completing their metamorphosis, were actually those of *M. inornata*. Minute differences between the two larvae probably exist, but they were not sufficient for me to detect in the course of the usual examination given them during development.

Microhyla berdmorei.

(Pl. VII, fig. 1.)

Microhyla berdmorei, Boulenger, *Fauna Brit. Ind., Rept. and Batr.*, p. 492.

Head and body squarish, $1\frac{1}{3}$ to $1\frac{1}{4}$ times as long as broad. Mouth slightly superior, a portion of the lower lip being visible from above. Eyes perfectly lateral, eight times as far apart as the nostrils, which are equidistant between the mouth and a line drawn connecting the eyes. Tail not terminating in a filament, membranes well developed, subequal in depth. Spiracle median, opening below the centre of the gut.

Pale greyish brown above, partly translucent (speckled with minute dots under the glass) ; a dark patch between the eyes. Toes not fully webbed.

Dimensions of a well grown specimen :—Total length 23 mm., length of head and body 9 ; breadth of body 7 ; depth of tail 5.

The actual specimens here described were obtained at Daban (alt. 200 m.), Phan Rang province, S. Annam, in April 1918, but the species is common on hills throughout Burma, Siam, Indo-China and the Malay Peninsula.

Bufo latastii.

(Pl. VII, fig. 3.)

Bufo latastii, Boulenger, *Fauna Brit., Ind., Rept. and Batr.*, p. 503.

Tadpole of moderate size, head and body very stout, the length only about $1\frac{1}{4}$ times the breadth ; snout rounded. Nostrils close together, equidistant between the tip of the snout and the eyes ; eyes superolateral, the interocular width narrower than the distance between the nostrils. Spiraculum sinistral, short, directed upwards and backwards, a little nearer the eye than the vent. Anus median.

Mouth subterminal, rather small, the disc transversely oval, its width about one-third that of the greatest body width. A fringe of short papillae at the sides only. Dental formula 1:1+1/3, the lowest row of teeth on the lower lip a little shorter than the other two. Mandibles broadly edged with black, finely serrated, the lower one broadly V-shaped.

Tail well developed, the tip rounded ; the upper and lower crests about equal in depth.

Colour olive greyish, speckled with darker; below uniform greyish; membranes of the tail translucent.

Dimensions of a specimen with the hind legs well developed. Length of head and body 17 ; breadth of body 14 ; length of tail 26 ; depth of tail 10 mm.

Tadpoles of this toad together with fully developed young ones with the tail still unabsorbed were obtained in ponds at Ganderbal, Kashmir, at 6,00 0 feet, and also in ponds on the Ichabal—Martand road, Kashmir, in July 1921. The specimens with well developed hind limbs are easily identified by the double metatarsal tubercles.

Megalophrys boettgeri.

? *Megalophrys boettgeri*, Annandale, *Mem. Asiat. Soc. Bengal* VI, p. 155, pl. vi, fig. 111 (1917).

Annandale in 1917 described the tadpole of this toad with doubt, the specimens which he collected on the Peak at Hongkong being unaccompanied by any forms sufficiently mature to establish a diagnosis.

I am now able to confirm his opinion, having obtained both the larvae and adults in the same locality in March 1923.

My specimens are dark brown in colour, spotted all over, but more conspicuously above, with black. Tail about four times as long as high, the crests low and subequal in depth ; tip of the tail pointed.

At the time of my visit the male toads were calling vociferously and could be heard a long distance off. So securely, however, were they esconced among the rocks and boulders of the stream in which they lived, that in spite of the most diligent hunt I could only obtain two of them.

Distribution of the species: Southern China; and, if *M. kempi* Annandale is identical with *M. boettgeri*, to the eastern Himalayas.

EXPLANATION OF PLATE VII.

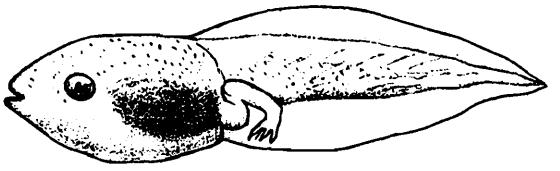
FIG. 1. *Microhyla berdmorei.*

„ 2.—*Micrixalus opisthorhodus.*

„ 3.—*Bufo latastii.*

„ 4.—*Philautus vittatus.*

„ 5.—*Rana alticola.*



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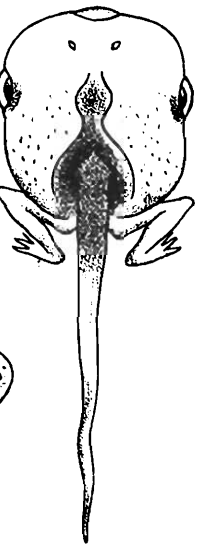

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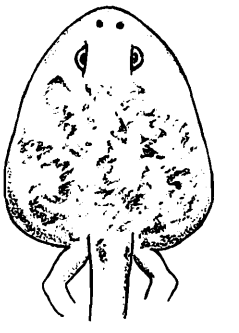

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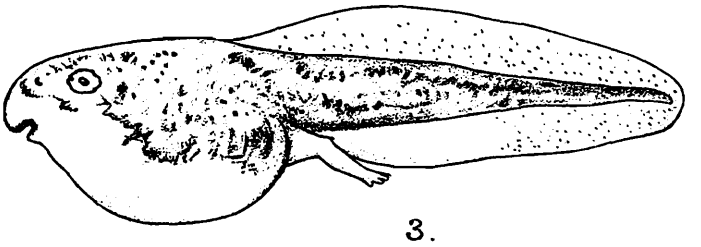

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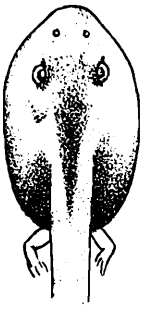

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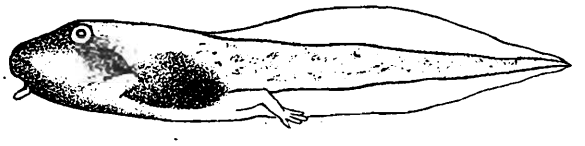

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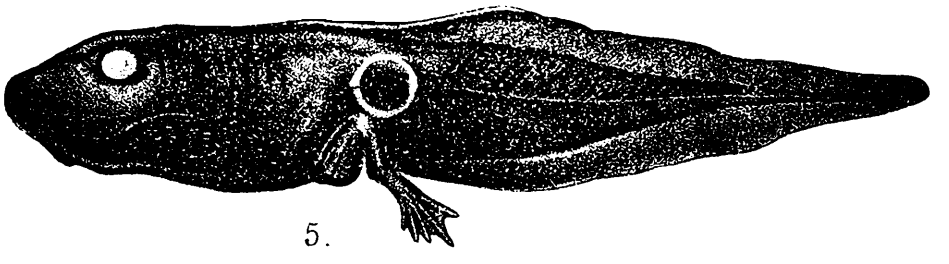

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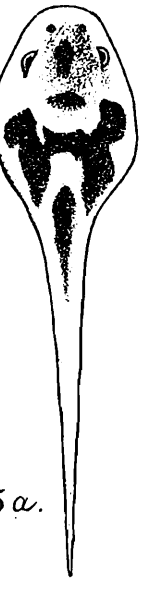

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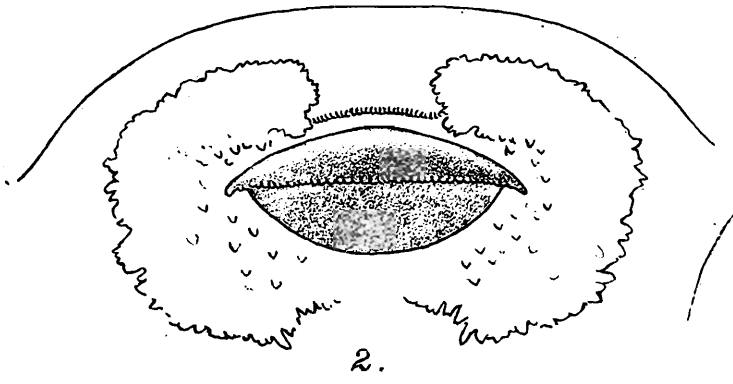

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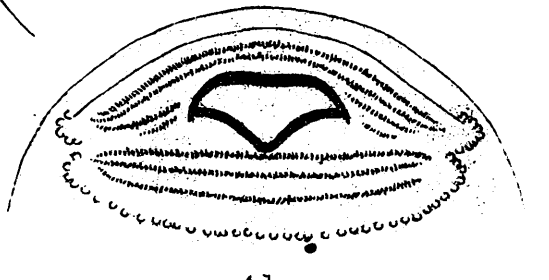

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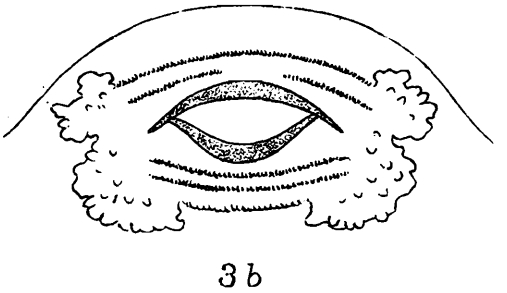

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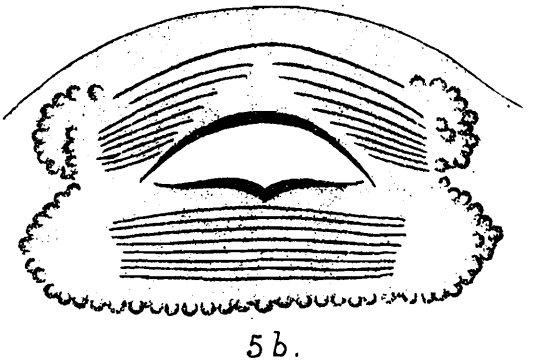

5b.

S.C. Mondul lith.

THE LARVA OF AN INDIAN CARABID BEETLE.

By B. CHOPRA, *D.Sc., Assistant Superintendent, Zoological Survey of India.*

The life-history of no Indian carabid has so far been studied in any detail, nor have the larvae of this family received sufficient attention at the hands of entomologists. This seems to be chiefly due to the fact that the larvae hide themselves in obscure places and are, therefore, rather rarely collected. Thus in the Indian Museum collection there are no carabid larvae except those that form the subject of study in the present paper.

Schiødte's[1] classical work on the beetle-larvae is by far the most important reference on the subject. The only Indian carabidae of which the early stages have been discussed are those figured by Bainbrigge Fletcher[2] in his "Second Hundred Notes on Indian Insects", but unfortunately he gives no structural details, and his figures, though excellent as general representations of the larvae and pupae, lack details of the various appendages, etc. They do not include any reference to the genus here considered. Gravely's[3] series of descriptions of beetle-larvae and Maxwell-Lefroy's[4] contributions to the same subject, though neither of these authors deals with carabid larvae, may also be consulted. The life-histories of a number of aquatic beetles have been figured and described superficially by Nowrojee.[5]

Dr. Annandale has recently brought back from Barkuda Island in the Chilka Lake a number of eggs and larvae of a carabid beetle of the genus *Omphra* together with two adult females found with them. As to the specific identity of these specimens Mr. H. E. Andrewes writes as follows:—"I am sorry to say this is one of the cases where I cannot guarantee a name, but the species is certainly not *Omphra hirta* F. I think it is very likely *O. atrata* Klug, and determined it doubtfully before for you—vide *Rec. Ind. Mus.* XXII, p. 346 (1921). There are seven described species. Of these I have seen the type of *hirta* F. at Copenhagen and *complanata* Reiche and *rotundicollis* Chaud. at Rennes. It is not any of these."

The beetles together with the eggs and larvae were found in a small pocket in the earth under a large stone, beneath a banian tree, the whole family being packed fairly tight in the pocket, with the adults on the top.

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[1] Schiødte, *Naturhist. Tidsschrift.* IV, pp. 473-496, pls. xvi, xvii (1866-1867).

[2] Bainbrigge Fletcher, *Bull. Agric. Research Inst., Pusa* No. 89, pp. 31-34, figs. 24-26.

[3] Gravely, *Rec. Ind. Mus.* XI, pp. 353-366, pls. xx, xxi (1915); *ibid.* XII, pp. 137-175, pls. xx-xxii (1916); *ibid.* XVI, pp. 263-270, pl. xiv (1919).

[4] Maxwell-Lefroy, *Mem. Dep. Agric. India (Entomol. Series)* II, pp. 139-165, pls. xiii-xix (1908-1912).

[5] Nowrojee, *Mem. Dep. Agric. India (Entomol. Series)* II, pp. 170-191, pls. xxi-xxvi (1908-1912).

When the adults were placed in a killing tube they filled it with a smoke-like vapour.

Andrewes[1] has already referred to eggs of this species which were collected by Dr. Gravely under stones, etc., at Barkuda. I have also examined these " oval whitish bodies, which show no structural characters, and which may be the eggs of the beetle,"[2] and on comparing them with the recently collected eggs find them similar, except that they are in an earlier stage of development.

EGGS.

Of the four eggs collected by Dr. Annandale the leathery covering membrane in one is partially ruptured along one of the longer sides, and the immature larva is seen to be protruding. The head and the posterior region of the larval abdomen are coming out of the membrane, in which they must originally have been lying against the ventral surface of the thorax, and the anterior part of the abdomen respectively. The part of the larva coming out of the egg is white in colour with the mandible and the other mouth-parts brown.

The eggs are oval in outline, with one of the longer sides slightly concave, so as to give the egg a somewhat kidney-shaped appearance. In spirit they are pale-yellowish in colour with a few minute darker spots irregularly scattered on the surface. Dr. Annandale tells me that they were quite white when he collected them.

Unlike the eggs of *O. atrata* described by Andrewes, those in the recent collection are not devoid of all structural characters. The anterior and the posterior ends can be easily distinguished by the presence of a pair of conspicuous dark spots placed one on each side of the body, and situated at a fourth from the anterior end. These are the eyes of the larva seen through the shell. A little behind the eyes the brownish mandibles and the other mouth-parts can be dimly made out. Near the posterior end two or three lines of demarcation between some of the posterior abdominal segments can also be seen faintly through the membrane. On the dorsal surface also the segmental lines can be made out.

The eggs are somewhat over 3 mm. in length and are about 1·8 mm. broad. They are at an advanced stage of maturity, as the larva in the ruptured egg seems to be almost fully developed.

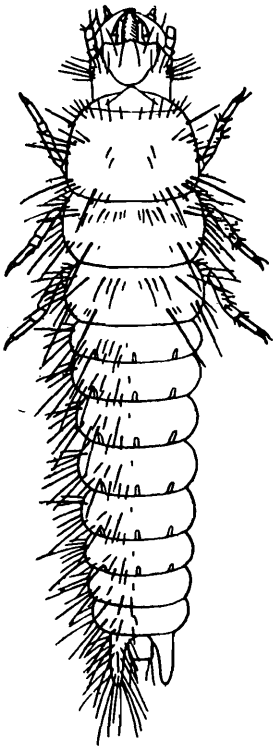
LARVAE.

The larvae, of which about a dozen have been preserved, are probably about half grown and represent a different litter from the eggs. They probably belonged to one of the two females taken with them, while the eggs belonged to the other. Dr. Annandale informs me that the larvae were active when disturbed, and that several escaped by running out of their pocket-like home. Like all other carabid larvae they are elongate creatures with strong exserted mandibles, and a pair of cirri and an anal

[1] Andrewes, *Rec. Ind. Mus.* XXII, p. 346 (1921).
[2] Andrewes, *op. cit.*, p. 346.

appendage at the posterior extremity—characters which readily distinguish carabid larvae from those of other beetles.

The specimens are on an average about 8 mm. long, though the largest is as much as 10 mm. long, and 2 mm. broad across the thorax. In spirit the dorsal surface is of an orange brown colour, with the first six abdominal tergites almost black or dark-brown. The intersegmental areas are much paler than the rest of the body ; the head, the cirri and the anal tube are as a rule slightly darker than the thorax or the last abdominal segments. A group of small black ocelli lie on each side about the middle of the length of the head. Ventrally the body is of a pale-yellowish colour, though in life this surface is quite white. The head with its appendages, the last abdominal segment with the cirri and the anal tube, and the tarsi of the thoracic legs are markedly darker than the rest of the body. On the first seven abdominal somites the chitinous plates, which are coloured brown or even black, are arranged in an elaborate pattern extending transversely from side to side of the segment. There is a pair of large squarish plates in the middle, one on each side of the median line. Outside these are placed a pair of small longitudinally elongated plates. Outside these again are two pairs of bracket-shaped (( )) plates, the inner of which is the broader of the two ; the outer is placed close to the segmental margin. A short transverse lens-shaped plate separates the adjacent series of plates described above. The lens-shaped plate does not extend from margin to margin, but lies only in the mid-ventral region extending on either side up to the small longitudinally elongated plate. The arrangement of the chitinous plates will be better understood from the accompanying illustration (text-fig. 2).

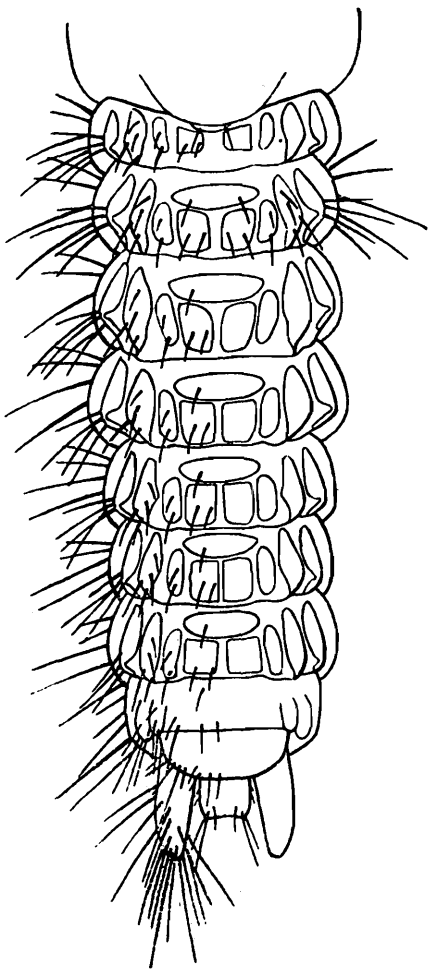


TEXT-FIG. 1.—Larva of *Omphra atrata*? Klug. Dorsal view. Setae of only one side shown : × 9.

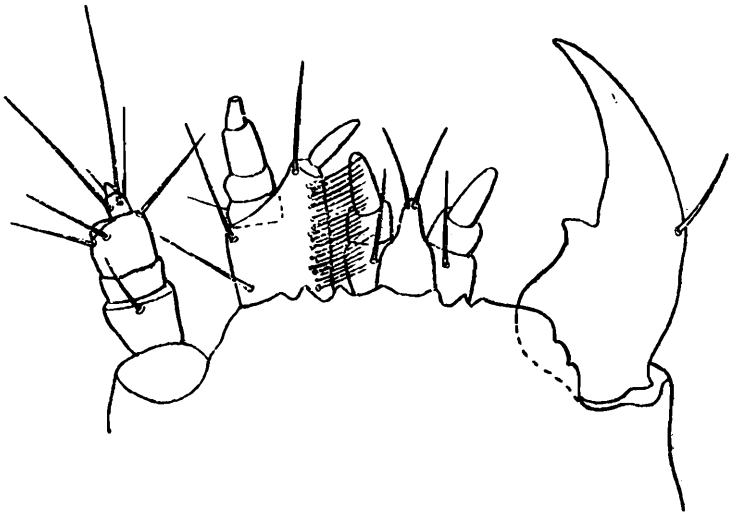
The dorsal surface of the head is not densely covered with hairs. Besides the irregularly scattered hairs there are some setae arranged more or less in two transverse rows behind the origin of the antennae. The margins are, however, somewhat densely setose, there being a large number of setae on each margin arranged uniformly behind the antennae.

On the dorsal surface of the thoracic somites the setae are somewhat irregularly scattered, but there are more of them near the margins than in the middle. There is also a more or less continuous row near the anterior margin of each somite, and another row, discontinuous about the middle, near the posterior margin. The lateral margins are also beset with numerous setae arranged in two or three well-formed groups along each segmental margin. In each group there are one or two setae longer and stouter than the rest. There appear to be no hairs on the ventral surface of the thorax, apart from those present on the legs.

The margins of the abdomen, like those of the thorax, are more or less densely beset with setae. There is only one group on each margin, consisting of about a dozen setae, of which one or two are longer than the rest. There are fewer hairs on the margins of some of the posterior segments. The cirri carry setae along both margins, and the anal appendage has a couple of long setae on each of its posterior angles besides a few minute ones along the posterior margin. On the dorsal surface there are two transverse rows of setae on each of the first eight segments, these being fewer and longer in the posterior row. A long marginal seta of the anterior row projects on each side of the segment. Besides these hairs there are on each of the first six somites three short blunt spines arising from the posterior margin. Of the three spines one is median, and two are arranged laterally. There are no such spines on the last three somites. Ventrally also there are two rows of setae on each of the first eight abdominal somites. The anterior row, which consists of two or three setae only, is situated on the lens-shaped chitinous plate, while the posterior row, which is formed of about a dozen setae, extends from margin to margin of the segment and has its setae placed on all the plates. Three long setae arising from the marginal chitinous plate described above project on each side of



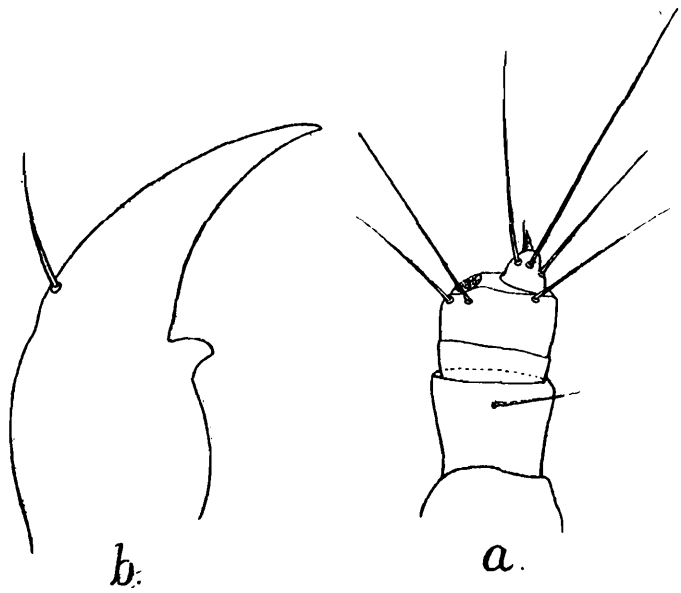
TEXT-FIG. 2.—Larva of *Omphra atrata* ? Klug. Ventral view of abdomen, showing the chitinous plates and ventral rows of setae: × 14.



TEXT-FIG. 3.—Larva of *Omphra atrata* ? Klug. Head, dorsal view, with right antenna, left mandible and right maxilla removed: × 40.

the segment. The last segment has a row of short setae near its posterior margin close to the origin of the anal tube.

The antennae are short and stout and are placed just in front of the ocelli. They are mounted on large prominences which look like basal segments. The first and the third true segments are subequal in size and are squarish in shape ; the second is small, being only about a third as long as the first. The third segment is distally truncate or even slightly convex anteriorly, and carries at its antero-internal corner the small, dome-shaped fourth segment. The latter bears three long setae near its anterior margin and is terminated by a pyramid-shaped process, which appears to be formed of two or three minute segments, and a fine spine-like seta. The third segment also carries two long setae near its antero-external and one at its antero-internal angle. Another long hair arises about the middle of the anterior margin of the first article, and probably two or three more below it.

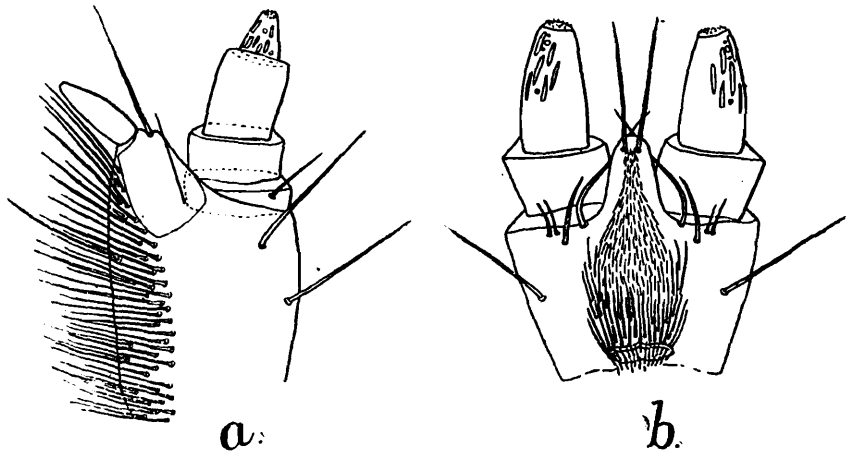


TEXT-FIG. 4.—Larva of *Omphra atrata* ? Klug.
a. antenna : ×66. *b*. mandible : ×66.

The mandibles are stout exserted structures, anteriorly meeting or even crossing one another in the middle line. They appear broad from in front, but very narrow from the side. They are convex in front and concave behind and are strongly arched distally. There is a single sharp apical tooth, while another molar tooth is placed more posteriorly. The latter consists of a single large cusp. There is a large stout spine about the middle of the outer margin. In one specimen there are two apical teeth on the mandible of one side, while on that of the other there is only one.

The maxilla has the usual shape and consists of the usual parts. There is a large spine on the outer margin of the lobe slightly below the middle, and another higher up near the origin of the palp. The inner margin is densely beset with stout hairs, which extend up to the anterior margin of the basal segment of the "outer malus" The latter is deeply sunk in the lobe and is formed of two segments, of which the basal is more than twice as broad as the distal. It bears a long seta at its antero-external angle and another near its base. The second segment is almost as long as the first and does not carry any hairs or

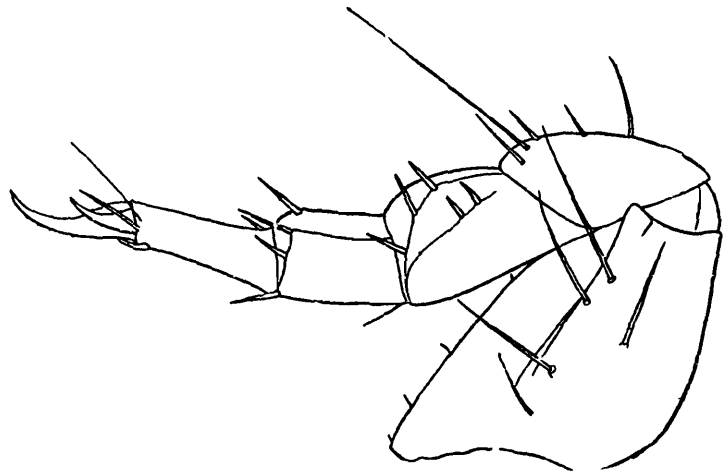
spines. The palp consists of four segments, the first two of which are much broader than long. The first segment, is the shortest, while the third, which is more than twice its length is the longest. The last segment is pyramid-shaped with its apex somewhat truncate. Its surface is covered with rounded and elongated pit-like structures, which may be of a sensory nature. The basal segment carries a single seta at its antero-external angle.



Text-fig. 5.—Larva of *Omphra atrata* ? Klug.
a. maxilla: ×66. *b.* labium: ×66.

The labium is large and broad and is slightly narrower at its base than anteriorly. There is a large spine arising near the middle of each margin, and there are four more spines on each side close behind the anterior margin. One of these is very long and curving behind the ligula projects near its anterior end. The labial palps are two segmented; the basal segment is much broader than long, while the distal, which is anteriorly truncate, is one and a half times longer than broad. Like the terminal segment of the maxillary palp the second segment of the labial palp also has rounded and elongated (probably sensory) pits on its surface.

The ligula is broadly rounded and bears two long setae near its tip. The mentum is densely hairy.



Text-fig. 6.—Larva of *Omphra atrata* ? Klug. Third leg: ×50.

The legs are rather short and their segments are markedly grooved below, especially in the last two pairs. The caxa is large and somewhat flattened; it bears only a few minute hairs on its lower margin

besides four or five long spines on the lower surface. The trochanter is small and triangular, and carries five or six spines, one of which, near the trochanto-femur joint, is very long. The femur is deeply grooved and bears about half a dozen spines, chiefly along the margins of the groove. The tibia is shorter than the femur, and is also deeply grooved below. It bears one spine on the upper surface near its joint with the femur, and about five or six short and thick spines at its distal end. The tarsus is long and cylindrical and is terminated by two long unequal claws besides a spine and a short hair.

There are no abdominal appendages except the cirri and the anal tube. The former are long and stout, and are pointed at their extremities. They have long radiating hairs along whole of the outer margin, and the distal half of the inner margin. The terminal abdominal segment is almost completely hidden from dorsal view and is prolonged into a prominent anal tube, at the posterior extremity of which the large rounded anus is placed. The margins of the anal aperture are fringed with very fine hairs, and there are a couple of long setae near each postero-lateral margin of the tube. There are a few hairs on the ventral surface of the tube also.

MICRODON APIFORMIS BRUN., RENAMED.

By E. Brunetti.

In my third volume in the *Fauna of British India* (*Syrphidae*, etc.), a new species of *Microdon*, *M. apiformis* is described (p. 314). As this name is preoccupied by Degeer in 1776 for a European species, I propose *apidiformis* in its place.

NOTES ON FISHES IN THE INDIAN MUSEUM.

VI. On a New Genus of Gobioid Fishes (Subfamily Trypaucheninae) with notes on related forms.

By Sunder Lal Hora, *D.Sc., Assistant Superintendent, Zoological Survey of India.*

In February last the Indian Museum received a small collection of zoological material from the officers of the pilot vessel S.S. "Fraser." The collection was made at the Sandheads off the mouth of the river Hughli at a depth of about 20 fathoms. Dr. Kemp[1] has already contributed a paper on some of the more interesting Decapod Crustacea, and in the present communication I have described a new genus of fish[2] (*Amblyotrypauchen*) in the subfamily Trypaucheninae. These fishes live in mud and are liable to be overlooked by collectors and it is probably on this account that they have hitherto been very little known, and that great confusion prevails regarding the specific and generic limits of several species. I was fortunate in having before me some other rare forms, such as *Trypauchenichthys typus* Bleeker, in Dr. Annandale's collection from the Talé Sap, Siam. It was the examination of this material, indeed, that made it possible for me to assign the new genus to its proper place in the system.

Before I take up the description of my new genus I propose to review and amend our present knowledge of the eel-like Gobioid fishes.

Jordan[3] in his paper entitled "A Classification of Fishes" recently published has grouped the Amblyopodiformes of Bleeker[4] into two distinct families, *viz.*, Gobioididae and Trypauchenidae. From the lists of the genera, which the author has referred to each of these families, it is evident that an exact diagnosis of the two families would be difficult if not impossible, for the distinctive characteristics of the genera form a regular complex. Certain characters, which seem to me to be of primary importance, are common to all of them, for example the peculiar elongate compressed facies, the minute eyes, the degenerate scales, the long vertical fins and the oblique mouth. If we consider individual characters of the different genera we find that neither in the "Gobioididae" nor the "Trypauchenidae" is there any one of primary importance which is peculiar to either and not common to both. Indeed, the only feature on which they could be separated is the existence of a cavity on each side of the head in the opercular region in *Trypauchen* and its allies and

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[1] Kemp, *Rec. Ind. Mus.* XXV, pp. 405-409, pl. x (1923).

[2] Other fishes represented in the same collection are :—*Fistularia serrata, Therapon theraps, Pterois russelli, Minous monodactylus, Muraena* (*Gymnothorax*) *meleagris* and *Tetraodon lunaris.*

[3] Jordan, *A Classification of Fishes*, p. 227 (Stanford University, California ;1923).

[4] Bleeker, *Arch. Néerl. Sc. Nat.* IX, p. 328 (1874).

its absence in *Taenioides* and its allies. This character is not utilized by Jordan in separating his two families and does not seem to me of sufficient importance to justify family separation, though perhaps it may be used in separating two subfamilies.

We may consider the two chief characters, which seem to have been used to separate these groups, in detail under the following headings :—

Number of Vertebrae.—Günther[1] in his catalogue separated the group Amblyopina from Trypauchenina chiefly by the number of tail vertebrae, which he gave as 17 in the former and 24 in the latter. Subsequently, when erecting his genus *Tyntlastes*,[2] which he evidently assigned to the group Amblyopina, he had before him a form with 20 tail vertebrae. Weber[3] in his report on the fishes of the Siboga Expedition has described another form (*Taenioides coccus*), which he has rightly referred to the genus *Taenioides*, with 24 tail vertebrae and has ably discussed the futility of this characteristic in separating the *Trypauchen* group from the *Taenioides* group. I have myself examined two young specimens of "*Taenioides*" *chilkensis*[4] which had been made transparent by glycerine treatment and had been partially dissected to expose the vertebral column. In both of them I have counted 20 vertebrae in the tail region.

Teeth.—As a rule the fishes of the *Taenioides* group are provided with well-developed canine teeth, while those of the *Trypauchen* group are distinguished by the absence of canines. Probably this character led both Volz and Franz to refer their genera *Trypauchenopsis*[5] and *Trypauchenophrys*[6] to the latter group. Both of these genera lack the blind sac-shaped depressions over the opercular region which are so characteristic of *Trypauchen* and its allies. Among the genera included by Jordan in his family "Gobioididae" at least two genera, *viz.*, *Tyntlastes* and *Brachyamblyopus* are not provided with canines.

Only three genera with the pouch character well-marked have hitherto been known and all of these have been characterized by the absence of canines, but quite recently an interesting specimen has been received in the Indian Museum from the mouth of the Hughli river which possesses the characteristic pouches but is at the same time provided with well-developed canines. On this and several other important characters I have described the new genus *Amblyotrypauchen* in this paper.

From the facts adduced above it is clear that Jordan's grouping of the Amblyopodiformes of Bleeker is not satisfactory. In my opinion the families "Gobioididae" and "Trypauchenidae" should be united into a single family which may be designated Taenioididae, and that the genera of this family may be divided into two subfamilies, *viz.*, Taenioininae and Trypaucheninae. The two subfamilies are to be chiefly distinguished on the pouch character.

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[1] Günther, *Cat. Fish. Brit. Mus.* III, pp. 133-138 (1861).
[2] Günther, *Proc. Zool. Soc. London*, p. 194 (1862).
[3] Weber, *Fische Siboga-Exped.*, p. 486 (1913).
[4] Hora, *Mem. Ind. Mus.* V, p. 757, fig. 34 (1923).
[5] Volz, *Zool. Anz.* XXVI, p. 555 (1903).
[6] Franz, *München Abh. Ak. Wiss. Math.-Phys. Kl.* Suppl.-Bd. IV, p. 68 (1910).

Family TAENIOIDIDAE.

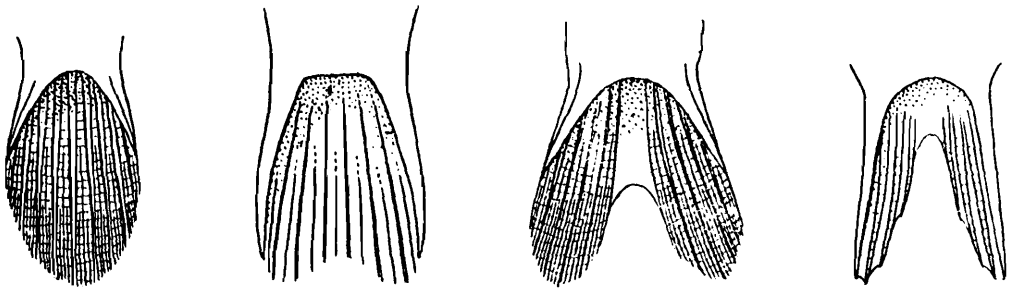
This family comprises elongated, eel-shaped Gobioid fishes in which the soft dorsal and anal are long and are either united with the caudal or are closely approximated to it. The two dorsal fins are united together. The body is somewhat compressed and is naked or covered wholly or partially with small, cycloid, rounded scales. Eyes small or indistinct, sometimes represented by orbital fossae. Teeth small, sharp and pointed and distributed in several series (except in *Tyntlastes*); those of the outer series slightly enlarged and in some genera distinct fang-like canines present. The mouth large, oblique, with the lower jaw projecting and almost vertically directed upwards. The gill-openings moderate, vertical and mainly restricted to the sides. The ventrals either united completely to form a disc or wholly or partially separated.

The two sub-families may be distinguished thus :—

Two pouch-like cavities present in the opercular region, one on each side of the head (eye minute, usually present at the side of an orbital pit ; ventrals small ; scales small, cycloid but well-developed ; teeth small, slender and rarely forming canines)	Trypaucheninae.
Pouch-like cavities absent [eye small, scarcely visible, orbital depressions usually absent ; ventrals relatively larger ; scales minute or absent ; teeth in several series (except in *Tyntlastes*), those of the outer series greatly enlarged, forming canines in some genera]	Taenioninae.

Subfamily *TRYPAUCHENINAE.*

As has been pointed out above there are altogether three known genera which can be definitely referred to this subfamily. Of these



TEXT-FIG. 1.—Ventral fins of the genera of the subfamily Trypaucheninae.
a. Trypauchen ; b. Ctenotrypauchen ; c. Amblyotrypauchen ; d. Trypauchenichthys.
The figure for the ventral fins of *Ctenotrypauchen* has been copied from Steindachner's illustration of the same structure.

Ctenotrypauchen[1] Steind. has been considered both by Bleeker[2] and Jordan[3] to be a synonym of *Trypauchenichthys*[4] Blkr. In Dr. Annandale's collection from the Talé Sap there are two specimens which

[1] Steindachner, *Sitzb. Akad. Wiss. Wien*, LV, p. 530 (1867).
[2] Bleeker, *Arch. Néerl. Sc. Nat.* IX, p. 331 (1874).
[3] Jordan, *The Genera of Fishes*, part iii, p. 348 (Stanford University, California : 1919).
[4] Bleeker, *Act. Soc. Sci. Indo-Neerl.* VIII, p. 63 (1860).

I have been able to identify as *Trypauchenichthys typus* Blkr. I have carefully compared these examples with Steindachner's description and figures of *Ctenotrypauchen chinensis* and am of opinion that the two species differ generically and that both *Ctenotrypauchen* and *Trypauchenichthys* are valid genera.

The new genus *Abmblyotrypauchen* is unique among the subfamily in so far as it possesses definite canine teeth. The four genera may be distinguished by the following key :—

a. Ventrals completely united forming a funnel-shaped disc (teeth slender in several series, those of the outer series somewhat enlarged) .. .. *Trypauchen.*

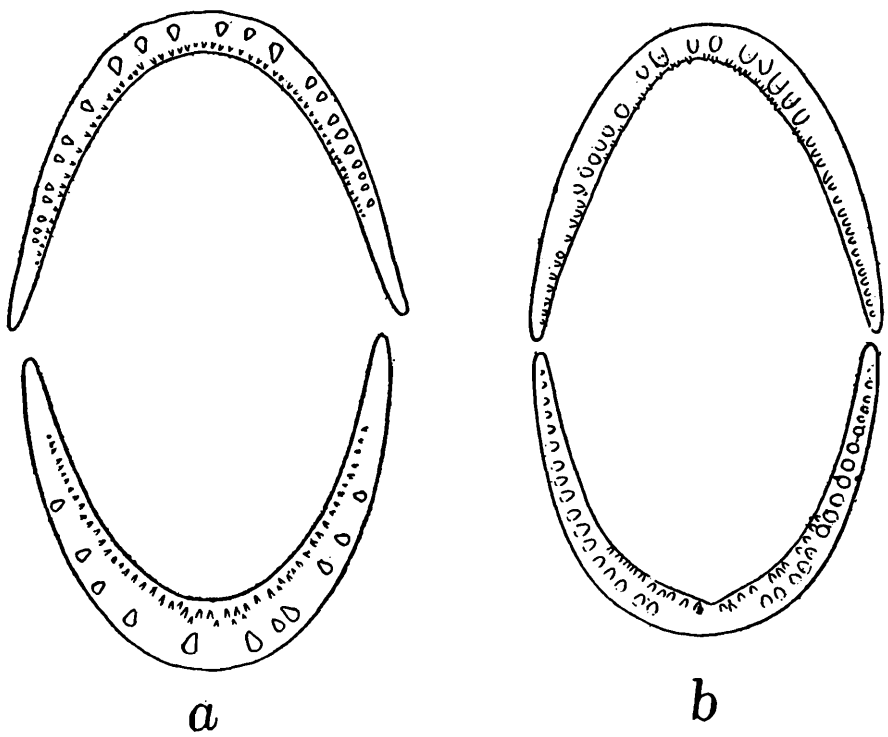
b. Ventrals not completely united, either emarginate posteriorly or separated to the base.

1. Ventrals separated to the base (teeth as in *Trypauchen*) .. .. *Trypauchenichthys.*
2. Ventrals united but emarginate posteriorly.
   - α. Canines absent .. .. *Ctenotrypauchen.*
   - β. Canines present .. .. .. *Amblyotrypauchen.*

Trypauchen Cuv. Val.

Trypauchen, Cuvier and Valenciennes, *Hist. Nat. Poissons* XII, p. 152 (1837).
Trypauchen, Günther, *Cat. Fish. Brit. Mus.* III, p. 137 (1861).

Trypauchen vagina (Bloch) is the only species which I can definitely refer to this genus. In the old collection of the Indian Museum there are three specimens of this species, including the original of Day's figure



Text-fig. 2.—Tooth-bands of *Trypauchen* and *Trypauchenichthys*.
a. Trypauchen vagina. b. Trypauchenichthys typus.

in the *Fishes of India*; recently we have received a fourth specimen from the mouth of the river Hughli. There is also a specimen from the Mekran coast (sent by Mr. Townsend) which looks different, but in view of the great confusion regarding the specific limits of the species I have

decided to keep it as *T. vagina* for the present. *T vagina* is widely distributed and likely to exhibit a certain amount of variation at different localities. It is found all along the coasts of India and the Malay Archipelago and its range extends as far east as China.

Trypauchen vagina is provided with a band of sharp, pointed teeth in each jaw, those of the outer series being somewhat enlarged. It possesses big orbital depressions with minute eyes, which are hardly distinguishable in some specimens. The head is scaleless, but the whole of the body and tail is provided with small, cycloid scales, which are more or less rounded anteriorly. Posteriorly the scales become larger and somewhat elongate in the longitudinal axis of the fish. Anteriorly the scales are set apart from one another but posteriorly they become imbricate. The ventrals are fully united to form a disc and lack spines; they are adherent to the body for a short distance.

Trypauchenichthys Blkr.

Trypauchenichthys, Bleeker, *Act. Soc. Sc. Indo-Neerl.* VIII, p. 63 (1860).
Trypauchenichthys, Günther, *Cat. Fish. Brit. Mus.* III, p. 137. (1861).
Trypauchenichthys, Bleeker (in part), *Arch. Néer. Sc. Nat.* IX, p. 331 (1874).

Bleeker distinguished this genus from *Trypauchen* chiefly by the form and structure of the ventral fins. In *Trypauchenichthys* the ventrals are more or less completely separated; the outermost ray in each is a broad and flat spine which is not shorter than the two next flexible rays. There are altogether four soft rays in each fin, the two innermost are very small and rudimentary and are sometimes hardly distinguishable (in my specimens from the Talé Sap there are only 3 soft rays). Moreover, the spine and the fin-rays are placed near together and are connected by a narrow membrane. On the whole the ventral fins of this genus closely resemble those of the Blenioid fishes. Another character in which this genus differs from *Trypauchen* is the relatively larger size of the scales. In all other respects the two genera are very similar.

In 1874 Bleeker considered *Ctenotrypauchen* Steind. as a synonym of his *Trypauchenichthys* and thus modified the definition of the genus with regard to the form of the ventral fins, "Ventralis incisura profunda subbipartita." Jordan in his genera of fishes has concurred with Bleeker, but in my opinion the two genera must be regarded as distinct, if any importance is to be attached to the form of the ventrals. Steindachner's figure of the ventral fins of his *Ctenotrypauchen chinensis* shows a structure totally different from what I have myself examined in Bleeker's *Trypauchenichthys typus*.

The genus *Trypauchenichthys* is so far known from a single species, which was originally described by Bleeker from Borneo (Sungi-duri, in aquis fluvio-marinis). Dr. Annandale has recently obtained two fine examples of the same species in the Talé Sap, Siam.

Ctenotrypauchen Steind.

Ctenotrypauchen, Steindachner, *Sitzb. Akad. Wiss. Wien* LV, p. 530 (1867).

This genus is closely allied to *Trypauchenichthys* Blkr., but differs from it in having the ventrals united together to form a funnel-shaped

disc. The disc is deeply or slightly emarginate at the posterior end. The genus *Ctenotrypauchen* is thus a connecting link between *Trypauchen* and *Trypauchenichthys*.

Besides Steidachner's species of *Ctenotrypauchen* I refer "*Trypauchen microcephalus*" Blkr.[1] and "*Trypauchen wakae*" Jordan and Snyder[2] to this genus. In the last two species the lepidosis is somewhat different from *C. chinensis*, but otherwise, judging from the description of their ventral fins, all the three seem to me to be congeneric. *C. chinensis* is provided with scales all over the body and on a portion of the head, while the other two lack scales on the belly and on the anterior region of the body immediately behind the head. The ventral fins are small and the scales in this genus are relatively larger than those in *Trypauchen*.

The members of this genus are so far known from Borneo (*microcephalus*), Japan (*wakae*) and China (*chinensis*).

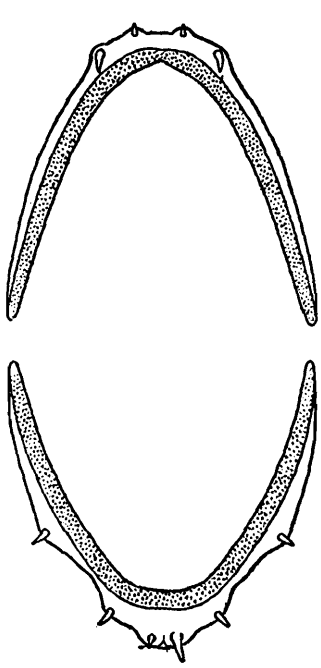
Amblyotrypauchen, gen. nov.

The new genus differs from the remaining three genera of the subfamily Trypaucheninae in the possession of well-marked canines in both jaws and a relatively larger ventral fin. The disc formed by the ventrals is deeply incised posteriorly. Each ventral fin is provided with one spine and 5 branched rays ; the spine is shorter than the branched rays.

Amblyotrypauchen fraseri, sp. nov.

D. 7/40 ; A. 1/38 ; P. 17 ; V. 1/5 ; C. 19.

This is an elongated Gobioid fish in which both the dorsal and the ventral profiles are almost straight and horizontal throughout. From the forehead forwards there is a regular decline in the profile to the tip of the snout. The body gradually tapers posteriorly. The head and a part of the body in front of the dorsal are provided with a keel-like prominence probably homologous with the comb-shaped structure described by Steindachner for his *Ctenotrypauchen chinensis*. The length of the head is contained 5·1 times in the total length without the caudal; its height at the occiput is 3/4 its length and its breadth is 3/5 of the length. The greatest height of the body is almost equal to the height of the head. The eyes are not visible but their position is indicated by orbital depressions. The longitudinal slit of the pouch-like cavity is much longer than the orbital depression.

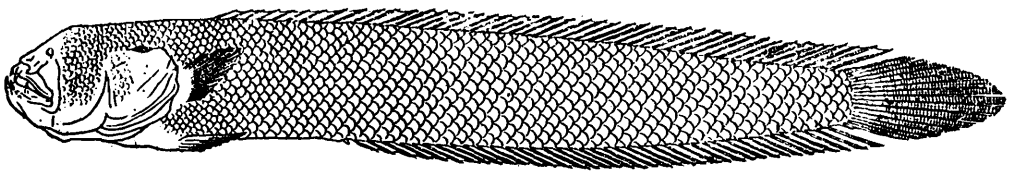


TEXT-FIG. 3.—Tooth-bands of *Amblyotrypauchen fraseri*, sp. nov.

The mouth is of moderate width and is slightly oblique. There is a band of small,

[1] Bleeker, *Act. Soc. Sci. Indo-Neerl.* VIII, p. 62 (1860).
[2] Jordan and Snyder, *Proc. U. S. Nat. Mus.* XXIV, p. 127, fig. 32 (1902).

pointed teeth internally and a number of canines in each jaw. In the lower jaw there are three canine teeth on each side, while in the upper jaw there are only four canines, which are symmetrically disposed. The gill-openings are vertical and restricted to the sides. The scales are small, cycloid and deciduous ; they cover the whole of the body and a part of the head between the eyes and the angle of the mouth on the one hand and the operculum on the other. A few scales, embedded in the skin, are also visible along the anterior border of the operculum. The scales are almost circular in outline and are provided with a number of fine circular striae. The nucleus is eccentric and from it radiate a large number of radii to the apex and none to the base.



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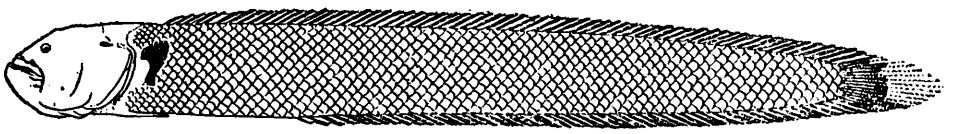

b

Text-fig. 4.—Lateral views of *Amblyotrypauchen* and *Trypauchenichthys*. *a. Amblyotrypauchen fraseri*, sp. nov. *b. Trypauchenichthys typus* Bleeker.

The dorsal fin commences in the beginning of the second-fourth of the distance between the tip of the snout and the base of the candal fin; it posseses 7 spines and 40 branched rays and is separated from the caudal by a short distance. The branched rays increase in length posteriorly and the last one is much longer than the depth of the body immediately below it. The anal is similar to the dorsal and commences immediately below the 4th branched ray of the dorsal. It is provided with one spine and 38 branched rays, the latter increase in length posteriorly. The last branched ray is slightly shorter than the longest ray in the dorsal fin. The anal fin is separated from the caudal by a short distance. The caudal is provided with a short spine on either extremity and 17 rays, the middle rays are the longest and are contained 5·5 times in the length of the fish without the caudal. The pectoral is small and peculiarly formed, it possesses about 17 rays of which two or three upper ones are greatly elongated. The ventrals are well formed and are united to form a disc-like structure, which is partly adherent to the body. It possesses one spine and 5 branched rays. The disc of the ventrals is deeply incised posteriorly and the emargination is as deep as half the length of the fin itself. The spine is considerably shorter than the succeeding branched rays.

The colour in spirit is pale-olivaceous all over and the fish is not provided with any definite markings.

Locality.—Sandheads off the mouth of the river Hughli. The specimen was obtained at a depth of about 20 fathoms in February 1923 by the officers of the Pilot ship S.S. "Fraser," which is stationed at that point.

The type specimen is preserved in the collection of the Zoological Survey of India.

Measurements in millimetres.

Total length excluding length of caudal	110·0
Length of head	21·5
Height of head near occiput	16·9
Breadth of head	13·0
Height of body	16·6
Longest ray of pectoral	7·8
Longest ray of dorsal	9·7
Longest ray of anal	8·2
Length of ventral	11·5
Length of caudal	20·0

Subfamily *TAENIONINAE.*

To this subfamily I assign all the genera included by Jordan in his family "Gobioididae" and also *Trypauchenopsis* Volz and *Trypauchenophrys* Franz. The exact diagnosis of some of the genera of this subfamily is rather difficult, but it seems quite probable that an analysis can be effected on the character of the ventrals and the teeth. For instance, *Paragobioides* Kendall and Goldsborough[1] is readily distinguished in the bipartite condition of its ventrals and in its larger eyes; *Tyntlastes* Günther[2] possesses a single series of teeth in each jaw. Of the other genera *Gobioides*, *Plecopodus*, *Gymnurus*, *Amblyopus*, *Psilosomus*, *Ognichodes*, *Odontoamblyopus* and *Cayennia* are probably synonyms of *Taenioides* Lacépède and are all characterized by the possession of well-marked canine teeth in both jaws. The remaining genera, *Brachyamblyopus*, *Trypauchenopsis* and *Trypauchenophrys* lack canines in their jaws. In view of the great similarity in form and of the absence of sufficient material of these fishes in the collection of the Indian Museum, I do not propose to enter into discussion regarding the status of these genera. It may, however, be pointed out that any narrow limits assigned to them are liable to cause more confusion, for example Jordan and Evermann[3] have separated *Gobioides* from *Taenioides* "by the absence of barbels, the presence of scales, and by the much smaller number of rays in its vertical fins." Weber in his report on the Fishes of the Siboga Expedition (p. 485) has very ably refuted these points and has shown that it is difficult to recognise *Gobioides* as a separate genus from *Taenioides*.

I have to say a few words about the systemetic position of a species of this group recently described by me from the Chilka Lake, namely,

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[1] Kendall and Goldsborough, *Mem. Mus. Comp. Zool. Harvard Coll.* XXVI, p. 324 (1911).

[2] Günther, *Proc. Zool. Soc. London*, p. 194 (1862).

[3] Jordan and Evermann, *Bull. U. S. Nat. Mus.* No. 47, part III, p. 2263 (1898).

"*Taenioides*" *chilkensis.* In this species there are no canines and the teeth are arranged on each jaw in several series. The body is almost entirely naked except in the tail region, where indications of scales can be made out by peeling off the skin and subjecting it to a high magnification. The absence of canines at once removes this species from the genus *Taenioides.* I now, therefore, place it provisionally in the genus *Trypauchenophrys* Franz,[1] which was hitherto known only from Japan.

[1] Franz, *München Abh. Ak. Wiss. Math.-Phys. Kl.* Suppl.-Bd. IV, p. 68 (1910).

THE FAUNA OF AN ISLAND IN THE CHILKA LAKE.[1]

THE DERMAPTERA AND ORTHOPTERA OF BARKUDA ISLAND.

By L. CHOPARD, *D.Sc.*

INTRODUCTORY NOTE.

[Dr. Chopard in his introduction to this paper has referred to the absence of Phasmids, to the comparative scarcity of Mantids and to the relatively large number of Blattids and Gryllids in our collection from Barkuda. The additional collections of the last two years have confirmed these points as actual facts in the fauna. I have found, indeed, few species which seemed to me different from those sent to Dr. Chopard.

The absence of Phasmids is probably to be accounted for by the peculiarities of the vegetation,[2] which includes very few plants with leaves which are neither hard nor leathery nor with milky juice. This peculiarity also accounts for the scarcity of many forms of Phasgonuridae, but the Pseudophyllids seem to be an exception. They are evidently able when adult to feed on the leathery leaves of such shrubs as *Glycosmis* and are also largely insectivorous in their immature stages, which they spend on the ground and low bushes. An interesting piece of evidence in confirmation of this view is to be found in the very occasional occurrence of the Acridid genus *Aularches* on the island. In Peninsular India this genus feeds almost exclusively on the wooly leaves and twigs of the Asclepiad shrub *Calotropis*, the juice of which is milky and obnoxious to most insects. As a rule this shrub does not occur in Barkuda, though it is common on the neighbouring mainland; but an occasional plant grows up on the shore from a stray seed. The leaves are left untouched by the Orthoptera of the island, but sooner or later *Aularches* appears, singly or in numbers, and devours them.

The scanty growth of grasses and other herbaceous plants on the island accounts for the absence of many Acridids, but the Tettiginae, which feed mainly on the algae that grow on damp stones, etc., have abundant food in the wet season.

The scarcity of Mantidae is probably correlated indirectly with the type of vegetation and due directly to the scarcity of small insects among shrubs and bushes. There is, indeed, very little prey for insectivorous species in this position.

In the dry season the Phasgonuridae, Acrididae and Mantidae almost completely disappear and even in the rainy season of a dry year individuals are scarce. In the summer of 1923, in which the rains did not begin until very late indeed on Barkuda, even the small Gryllids (*Tridactylus*, etc.) and Tettigines which usually fly to light in large numbers were scarce.

The insect fauna of the island as a whole is poor except in forms which conceal themselves under stones or in dead leaves. The fact of the comparative abundance of crickets and cockroaches is thus characteristic. I believe that the fact is due not to the dampness of the climate, as Dr. Chopard has suggested to me, but to the alteration of dampness and dryness and to the lack of humidity for long periods.

I agree with Dr. Chopard that very few of the species found in termite-mounds or with ants are actually termitophilous or myrmecophilous. Certain ants (for example *Acropyga acutiventris* and *Ponera tesserinoda*) are usually found under stones and with them various small millipedes, isopod crustacea, beetles, etc., occur occasionally which are also found in other places. The number of true myrmecophilous species in all groups is, however, small. Similarly the garden-chambers in termite-mounds which have been deserted by the termites are favourite hiding-places for all kinds of hygrophilous insects, because moisture is abundant in them long after the outside of the mound is quite dry. Prof. Silvestri notes, moreover, that a large proportion of the species I have sent him as termitophilous, that is to say as found with the living termites in mounds, are merely chance visitors. It is only those species which live actually in the fungus-combs which can be regarded as true termitophils.

The physical and floral conditions of the island are thus unsuitable for a rich fauna of leaf-eating or fruit-eating insects. It is too remote from any great desert region for the immigration of desert forms, for which the wet season would be unsuitable, and too small and too little isolated for the evolution of endemic species. The Orthopterous fauna probably represents a selection from that of the central parts of Peninsular India rather than a peculiar island fauna. The smaller species of Orthoptera, especially those of

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[1] For previous papers in this series see *Rec. Ind. Mus.*, XXII, pp. 313—422 (1921); XXIV, pp. 289—311 (1922); XXV, pp. 221—263 (1923).

[2] Annandale, *Mem. Asiat. Soc. Bengal*, VII, p. 274 (1922).

cryptic habits, have as yet been very little collected in this region. The small number of species on Barkuda as compared with that found in Trichinopoly is probably a fact and mainly due to the small area of the island and to the local conditions of vegetation, climate, etc.—*N. Annandale.*]

Dr. Annandale has sent me for examination a rather large number of Orthoptera collected by himself and his collaborators during the years 1919-20 on Barkuda Island. Although it cannot be maintained that the whole of the orthopterological fauna of the island is represented in this collection, we may admit that most of the common forms have been collected. Consequently an attempt can be made to analyze the composition of this fauna and to discuss its relations with the fauna of continental India. The first striking point is the poverty of the island in Orthoptera compared with the neighbouring regions. In fact Dr. Annandale has only collected 80 species whereas Bolivar in his essay on the Orthoptera of Trichinopoly records as many as 275 species. Among these 80 species, we find 5 Dermaptera, 17 Blattidae, 4 Mantidae, 10 Phasgonuridae, 21 Gryllidae and 23 Acrididae; those figures are interesting to compare with those recorded by Bolivar which are: 14 Dermaptera, 27 Blattidae, 23 Mantidae, 50 Phasgonuridae, 35 Gryllidae, 100 Acrididae and 26 Phasmidae. We can notice at once that the last family seems quite absent in Barkuda and that the Blattids and Gryllids are relatively much more abundant than the other families. As to the Phasmids, Dr. Annandale himself called my attention to this point; yet, owing to their way of living, it is possible that some of these insects have escaped his investigations; anyhow they must be very scarce on the island.

The scarcity of Mantids is remarkable and may be due also to the climate. Among the Acridids, as could be expected, the Tettiginae prove comparatively very abundant.

Finally a special notice can be made concerning termitophilous and myrmecophilous species which have been carefully searched for by the collectors. I believe that none of the species found in the termite-mounds are truly termitophilous species although there is among them a very interesting new form which I have placed with doubt in the genus *Mogoplistes*. As to the myrmecophilous ones, they are represented only by species of the genus *Myrmecophila* and perhaps a remarkable small *Ornebius* which would be the first species of the genus known as living with ants. I believe that all the other Blattids or Gryllids found in termite-mounds or with ants are merely hygrophilous species which find there a retreat.

As a whole the fauna of the island does not present very special characters; it can only be noticed that hygrophilous species seem more common than in neighbouring regions, while xerophilous species seem very scarce.

DERMAPTERA.

Family FORFICULIDAE.

1. **Pyge ophtalmica** Dohrn.

Barkuda, one immature male, viii-17 (*N. A.*).

Dr. A. Borelli, of Torino, had the kindness to identify this immature specimen.

2. **Diplatys flavobrunnea,** sp. nov.

(Fig. 1.)

Barkuda, one female (*type*), viii-19 (*F. H. G.*).

♀. Small and slender; general colour pale testaceous with head, apical half of the elytra and apex of abdomen blackish. Antennae yellow with 15 ? segments, first long, darkened, second very short, fourth shorter than the third as is usual in the genus. Head of a very dark brown colour, slightly tumid between the eyes; palpi pale at apex. Pronotum longer than broad, slightly narrowing posteriorly, posterior margin rounded; surface bearing a few long bristles. Scutellum rather large, yellow as the pronotum. Elytra yellow in their basal half, blackish in the apical one, ample, with a few stiff bristles on the shoulders; wings long, yellow. Abdomen yellowish, the two apical segments darkened; last dorsal segments sloping, truncated posteriorly; penultimate ventral segment slightly concave; last ventral segment angulate posteriorly. Forceps cylindrico-conical, rather slender, straight. Legs long and slender; femora yellow, tibiae darkened, tarsi very pale; anterior femora armed on each inferior margin with 5-6 long bristles.

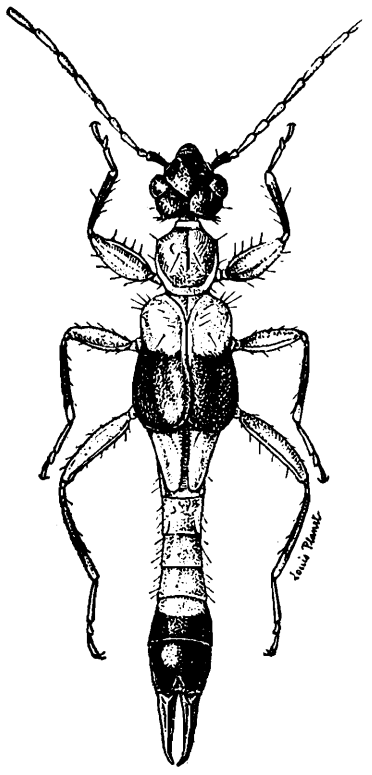

FIG. 1. *Diplatys flavobrunnea,* n. sp., ♀ ×7.

Length of body 10 mm.; forceps 1·5 mm.; elytra 2·5 mm.; wings 1·1 mm.

3. **Forcipula quadrispinosa** Dohrn.

Barkuda, numerous examples of both sexes and at different stages of development, 25-vii-4-viii-17 and 15-22-vii-16 (under stones on shore of island).
(This and the following species are the only common earwigs on Barkuda. They are both abundant under stones on the shore, but scarce in the interior of the island. *N. A.*).

A common species in India.

4. **Labidura riparia** var. **inermis** Br.

Barkuda, 2♂, 7 ♀, 25-vii—4-viii-17 and 15—22-vii-16.

A widely distributed species.

5. **Anisolabis annulipes** Luc.

Barkuda, Aug. 19, 1 ♀ (*F. H. G.*).

A cosmopolitan species. (Occasionally taken at light).

ORTHOPTERA.

Family BLATTIDAE.

6. **Theganopteryx parvula** Walk.

Barkuda, 4—19-x-19, 1 ♀ at light (*F. H. G.*).

A species known only from India.

7. **Ischnoptera fulvastra,** sp. nov.

Barkuda, ix-19, 1 ♂, 1 ♀ *types* (*F. H. G.*); Aug. 19 (*F. H. G.*), 2 ♀; 15—22-vii-16, (*F. H. G.*), 2 ♀; 27-x-20 and 20-vi-20 (*N. A.*), several females with egg-case, at light; 21-viii-20 (*N. A.*), 2 ♀; 9-vi-20 (corner of room), 1 ♂, 1 ♀.

Large species, of a rufo-testaceous uniform colouration. Eyes very approximated chiefly in the ♂; ocelliform spots large, round, yellow; forehead presenting a brown band between the eyes; face long, triangular, rufous; maxillary palpi testaceous, darkened at apex, with 4th and 5th joints short. Pronotum slightly convex, with anterior and lateral margins much rounded, almost semicircular; posterior margin subangulate. Legs testaceous; anterior femora armed on their infero-internal margin, besides 2 apical spurs, with 13 spines disposed as follows: 4 rather long ones, 2 little shorter, 3 slightly shorter, 1 very short, 3 equalling the 3 preceding ones. Elytra testaceous yellow, shining, with about 20 costal veins; discoidal sectors longitudinal; wings with ulnar vein showing 10 sectors, 3 of which are towards the apex and 7 joining the anal vein; apical triangle almost imperceptible.

♂. Abdomen yellow; 7th tergite presenting at base two big, rounded tubercles before a glandular depression; supraanal plate a little projecting, subtruncated (fig. 2), subgenital plate large, a little asymmetrical, with two short, cylindrical styles, inserted near the apex (fig. 3).

♀. Abdomen with two longitudinal brown stripes; supraanal plate very short triangular, subgenital plate large, rounded at apex.

Length of body 12—13 mm.; pronot. 3·5 mm.; elytra 14—15 mm. This species has the same nervation as *I. himalayica* Br. to which it seems very close, but the forehead shows a distinct brown band.

The egg-case is 9 millimetres in length, with a very finely crenulated suture; it contains about 50 larvae, quite near hatching, disposed in three rows.

8. **Mareta acutiventris,** sp. nov.

Barkuda, 2 ♀ (*types*), 8 and 11-ix-20 (*N. A.*), in empty nests of spiders on leaves of *Glycosmis pentaphylla*; July 20, 1 ♀ (*N. A.*); 11—16-xii-19, 1 ♂ *type* (*N. A.* and *F. H. G.*).

Rather large, rufo-testaceous species. Occiput exposed; forehead a little flattened, rufous. Eyes moderately approximated; occelliform spots yellow, feebly marked. Face long, rufous; antennae and palpi testaceous; maxillary palpi slender, with 3rd and 4th articles very long, 5th short (fig. 4). Pronotum wide, with disk rufous, lateral margins very widely translucid without any marking. Abdomen yellow, somewhat darkened above; cerci long, yellowish, composed of 12 articles. Legs testaceous; anterior femora armed with 2 apical

spurs and one subapical spine on the infero-internal margin, which is also provided with about 25 very short bristles and sometimes a small basal spine. Elytra very wide, extending little beyond the apex of abdomen, testaceous ; anterior area as wide as posterior one ; humeral vein with 10 sectors, the 2 last of which furcate ; discoidal sectors oblique. Wings with anterior margin darkened, ulnar vein with 5 sectors ; apical triangle almost imperceptible.

♂. Supraanal plate triangular, notched at apex (fig. 5) ; subgenital plate notched at apex, forming two lobes somewhat irregular, with styli short, slightly flattened, inserted near the apex (fig. 6).

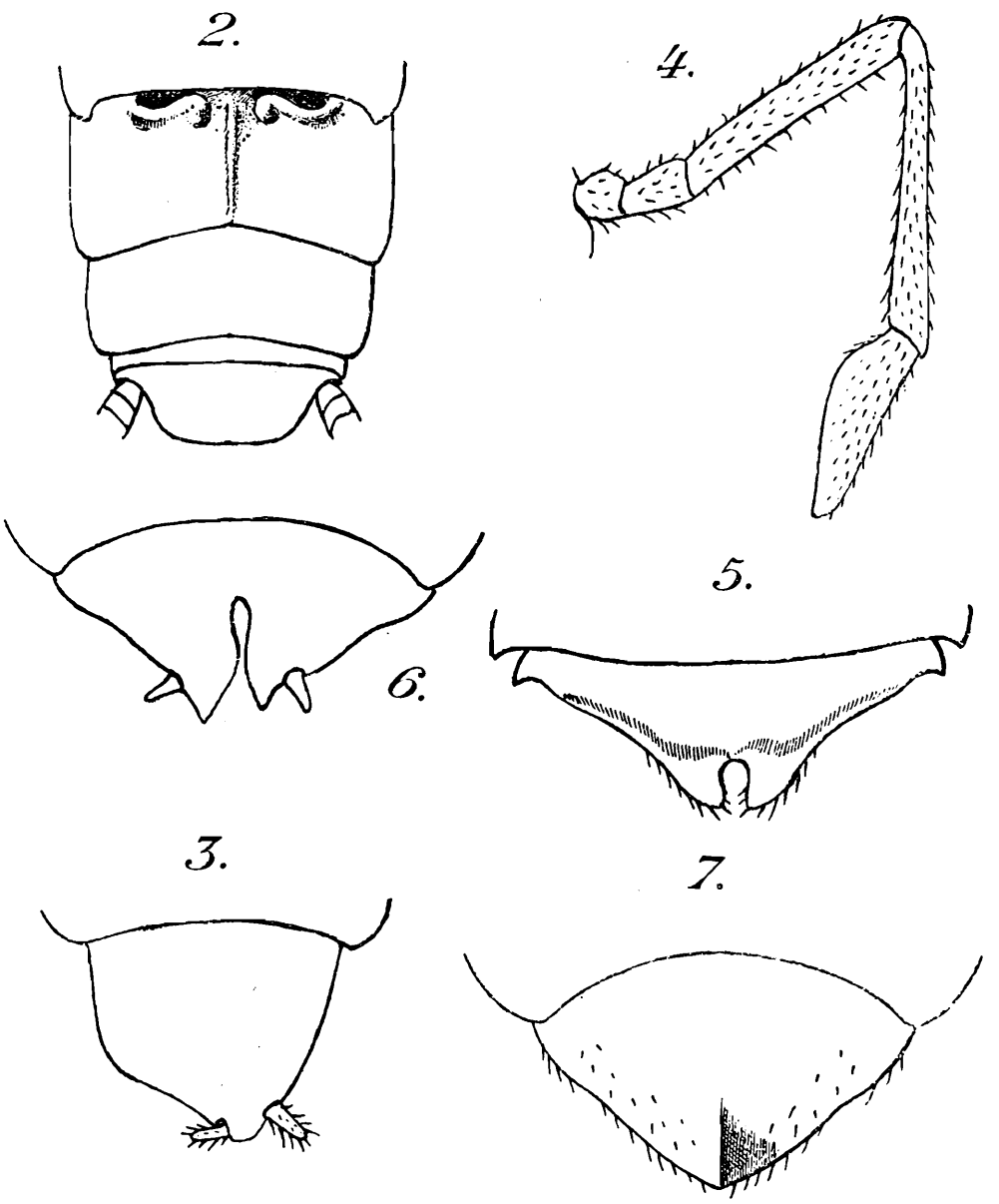

FIG. 2. *Ischnoptera fulvastra*, n. sp. Apex of abdomen of ♂, dorsal view, ×10 ;—fig. 3. *Id.* Subgenital plate of ♂ , ×10 ;—fig. 4. *Mareta acutiventris*, n. sp. Maxillary palpus, ×18 ;—fig. 5. *Id.* Supraanal plate of ♂, ×10 ;—fig. 6. *Id.* Subgenital plate of ♂, ×10 ;—fig. 7. *Id.* Subgenital plate of ♀ , ×10.

♀. Supraanal plate as in ♂ ; subgenital plate large, somewhat carinate in its posterior part and ending in a subacute angle (fig. 7).

Length of body 14 mm.; pronot. 3·5 mm.; elytra 12 mm.

This species seems closely related to *Blattella* (?) *ferruginea* Br. but it has much shorter elytra and wings.

9. **Mareta similis,** sp. nov.

Barkuda, 1 ♀, Aug. 19 (*F. H. G.*), among foliage at edge of well.

Very close to the preceding species, but smaller; forehead presenting a yellowish, indistinct band, with four punctiform impressions; ocelliform spots little visible; maxillary palpi with 4th article much shorter than 3rd, equal to 5th (fig. 8). Pronotum with disk rufous, sides widely translucid. Abdomen yellow above, with a large basal brown spot, yellowish beneath, finely punctured with brown and tinged with bluish on the sides; supraanal plate triangular, rather widely but not deeply notched at apex; subgenital plate large, subacute apically. Cerci long and rather slender, formed of 12 articles. Legs testaceous. Elytra wide, testaceous, with humeral vein bearing 12 plain branches and 2 apical ones very much ramified; ulnar vein of wing with 5 branches.

Length of body 10·5 mm.; pronot 2·8 mm.; elytra 10·5 mm.

This species looks very much like the preceding but the shape of the maxillary palpi is quite different.

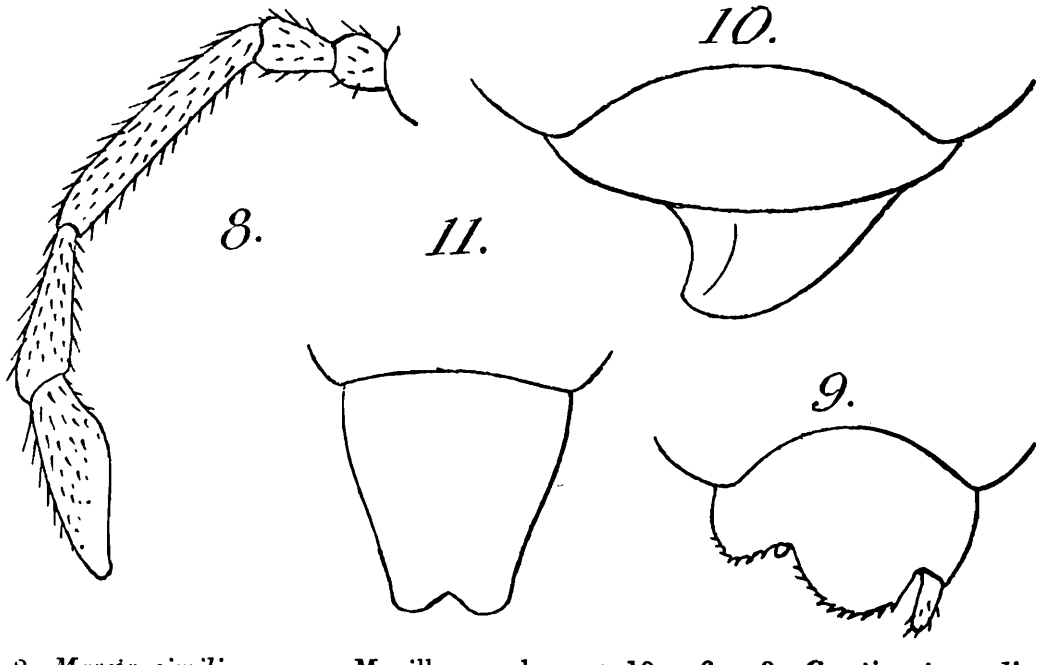

FIG. 8. *Mareta similis*, n. sp. Maxillary palpus, ×19;—fig. 9. *Ceratinoptera dispar* n. sp. Subgenital plate of ♂, ×10;—fig. 10. *Pycnoscelus tenebrigerus* Walk. Last sternites of abdomen of ♂, ×10;—fig. 11. *Amytta delicatula*, n. sp. Subgenital plate of ♀, ×10.

10. **Margattea** sp.

Barkuda, 14-x-20 (*N. A.*), in nest of *Acropyga acutiventris* Roger, several very young specimens.

These larvae, practically undeterminable, have a pale testaceous thorax, with two longitudinal brown bands extending to the apex of metanotum, abdomen fuscous,

I doubt very much whether this Blattid is myrmecophilous, I suppose that they were found accidentally with the ants as is often the case with hygrophilous insects. (I agree. *N. A.*).

11. **Margattea** sp.

Barkuda, 30-x-20 (*N. A.*), in galleries of deserted termite mound, 1 young ♀.

Although this young example is much older than the preceding ones, I have been unable to identify it specifically ; it is very finely coloured, the thorax testaceous with 2 wide longitudinal black bands, the abdomen black with angles of the tergites yellow, 6th tergite bordered with yellow, 7th tergite and supraanal plate spotted with yellow.

12. **Ceratinoptera dispar,** sp. nov.

Barkuda, 28-x-20 (*N. A.*), 1 ♂, 1 ♀ (*types*), among dead leaves on sandy shore of E. side of island.

♂. Size medium, colouration pale testaceous ; head rounded, vertex exposed ; face brown except the labrum which is yellow with two brown spots ; palpi yellow, last joint of maxillary palpi brown. Antennae yellow, darkened towards the apex. Eyes very wide apart ; ocelliform spots large, as distant one from the other as the eyes. Pronotum with anterior margin very little convex, testaceous yellow with sides widely translucid, presenting a brown spot forming two wide irregular bands joining widely anteriorly and narrowly posteriorly. Abdomen pale yellow with a small brown spot laterally on each tergite ; supraanal plate triangular ; subgenital plate with posterior margin irregularly trilobate, the median lobe finely denticulate, bearing a big cylindrical style on the right and a very small one on the left (fig. 9). Cerci formed of 10 articles, pale yellow above, brown beneath. Legs testaceous with apex of tibiae a little darkened ; anterior femora with 2 apical spurs and a row of 10 spines of which 4 long ones and 6 very short on the infero-internal margin ; intermediate and posterior femora with 5 or 6 rather strong spines on each inferior margin. Arolia present between the tarsal claws. Elytra attaining to the apex of abdomen, testaceous, darkened towards the sutural margin ; humeral vein bifurcate and sending 12 branches to the coast ; discoidal sectors longitudinal. Wings hyaline with anterior margin whitish, apical triangle visible, ulnar vein trifurcate.

♀. Larger than ♂. Elytra truncated, not extending over the apex of 1st abdominal tergite. Head and pronotum offering the same ornamentation as in the ♂ ; abdomen dark brown, each tergite with its sides yellow and presenting 2 pale long markings near median line and a very small one on each side ; supraanal plate rather large, triangular, rounded at apex, yellowish ; cerci brown at base. Legs as in the ♂. Elytra with few veins visible, the anal vein ending in the internal angle, apical margin truncated, a little concave and very slightly oblique.

Length of body ♂ 7 mm., ♀ 8 mm. ; pronot ♂ 1·8 mm., ♀ 2 mm. ; elytra ♂ 6 mm., ♀ 2·2 mm.

The female of this species seems closely related to *Ceratinoptera* (*Temnopteryx*) *martini* Bol. but the elytra of the male extend to the apex of abdomen.

13. **Temnopteryx obliquetruncata,** sp. nov.

Barkuda, 28-x-20 (*N. A.*), 1 ♀ *type*; Aug. 19 (*F. H. G.*), 2 ♀; 17-viii-20 (*C. D.*), 1 ♀; 24-ix-20 (*N. A.* and *B. P.*) 1 ♀ from a dead termite mound.

A species rather large for the genus. Head almost hidden by the pronotum; occiput testaceous, much rounded; face shining, brown; palpi testaceous, with last joint brown except at apex. Eyes very distant one from the other. Pronotum shining, rather convex, dark brown with a lighter, badly defined spot in the middle and a wide, irregular, yellowish stripe along the anterior and lateral margins; posterior margin feebly convex. Meso- and metanotum rufous brown with a large rounded light spot on each side. Abdomen very dark brown above with sides of each tergite spotted with yellow and two round yellowish spots on the second tergite; supraanal plate rounded at apex

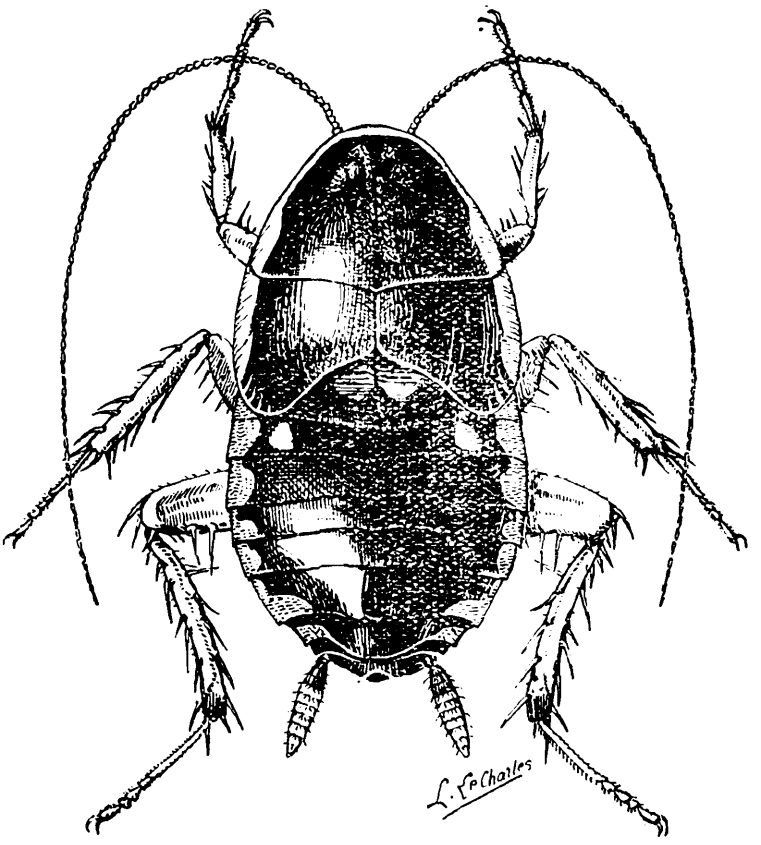

FIG. 12. *Temnopteryx obliquetruncata,* n. sp., ♀ ×6.

subgenital plate large, very slightly notched at apex. Cerci rather long, of 10 articles with the 4 basal ones brown, the rest yellow. Legs wholly rufotestaceous with apex of the tibiae and insertion of the spines slightly marked with brown; anterior femora armed with two long apical spurs and 10 spines on their infero-internal margin, these spines being rather strong, somewhat curved and decreasing very little in length from base to apex; intermediate and posterior femora armed with 5 or 6 rather strong and regular spines on each inferior margin; posterior tarsi slender with metatarsus very long; arolia present between the tarsal claws. Elytra thick with indistinct veins, colouration translucid brown with an external yellow stripe prolonging the lateral stripes of the pronotum; external margin a little convex, extending

to the apex of the metanotum, internal margin almost straight, scarcely exceeding the mesonotum; apical margin oblique, a little concave.

Length of body 11·5 mm.; pronot. 3·5 mm.; elytra 3·5 mm.

This species is close to *T. alca* Bol. but its size is much larger and the markings on the abdomen are different.

One of the females has the colour more extensive on the cerci and shows distinct light markings on the supraanal plate.

14. **Blatta orientalis** L.

Barkuda, 20-ix-19 (*N. A.*), 1 young ♀ found crushed in bungalow.

A cosmopolitan species.

(Probably introduced with furniture or stores. *N. A.*).

15. **Periplaneta americana** L.

Barkuda, Aug. 19 (*F. H. G.*), 1 ♂.

A very large specimen (length of body 30 mm., elytra 35 mm.) with pronotum very neatly marked with yellow; the genitalia are exactly similar to those of other examples of this very common and cosmopolitan species.

(Probably introduced with furniture or stores. *N. A.*).

16. **Periplaneta** sp.

Barkuda, 30-x-20 (*N. A.*), from galleries of deserted termite mound; a few young examples.

These Blattids are black with rufous head; they seem to belong to a species of *Periplaneta* rather than to *Blatta*, although their elytral cases are but little developed.

17. **Corydia nuptialis** Gerst.

Barkuda, Aug. 19 (*F. H. G.*), 1 ♂, 5 ♀; ix-x-19 (*N. A.*), 3 ♂, 1 ♀.

This species is found in India only; the female does not seem to have been described and is very similar to the male, the antennae being not quite so strongly thickened and the general shape being wider, more oval. The yellow markings are disposed as in the male but they seem rather variable, the one near the apex of the elytra being usually very small.

The egg-case is rather large (11 mm. in length, 4·7 mm. in height), weakly curved, the suture smooth, each side showing 8 longitudinal ridges.

Dr. N. Annandale states in a letter "that this cockroach, as a rule, conceals itself at the roots of fig-trees or in other corners. The small hairs on its elytra retain sufficient dust to conceal it, or at any rate to render it inconspicuous, when not on the wing. It does not take to flight readily, but when it does rise it flies high and strongly. On more than one occasion, I have mistaken it for a moth and also for a blister beetle of the genus *Mylabris*. I have often seen it on the wing by daylight."

18. **Polyphaga indica** Walk. ?

Barkuda, 15—22-viii-16 (*F. H. G.*), several young specimens two ♀ of which nearly adult; Aug. 19 (*F. H. G.*), 6 very young examples; 30-x-20 (*N. A.*), 2 young ♀ in galleries of deserted termite mound.

All these Blattids belong very likely to *P. indica* Walk. although the supraanal plate is more or less distinctly notched, its posterior margin being almost regularly rounded. The species, which is known only from the female, seems rather near to *P. aegyptiaca* L., but the pronotum is unicolourous blackish, the supraanal plate different, the antennae are whitish at apex.

19. **Polyphaga** sp.

Barkuda, Aug. 19 (*F. H. G.*), 1 ♂, 1 ♀ both immature.

This species seems very interesting and very likely new; it belongs to the *ursina* Burm. group but it is absolutely impossible to describe it from immature specimens.

20. **Pycnoscelus surinamensis** L.

Barkuda, Aug. 19 (*F. H. G.*), 1 ♀ with short elytra and wings; 20-viii-20 (*F. H. G.*), 1 ♀ with long elytra and wings.

A very common and cosmopolitan species.

21. **Pycnoscelus tenebrigerus** Walk.

Barkuda, Aug. 19 (*F. H. G.*), 1 ♂; 20-vi-20 (*N. A.*) 1 ♂ at light; 13—18-iv-14 (*N. A.*), 1 young ♀.

This species differs from the preceding, besides its larger size and darker colouration, by the 9th sternite being visible in the male (fig. 10, p. 170) and the eyes as distant as the ocellar spots; the length of the body is 20 mm., of the elytra 20 mm.

22. **Stilpnoblatta bengalensis** Sauss.

Barkuda, Aug. 19 (*F. H. G.*) 4 ♀, 3 young examples; 30-x-20 (*N.A.*) from galleries of deserted termite mound, 3 ♀.

One of the females was carrying its egg-case, containing the young larvae almost ready for hatching; like many species of Blattidae (chiefly Panchlorinae) this species must be viviparous.

The characters of this Blattid seem to me much more related to the Panchlorinae than to the Panesthinae, where the genus is usually included; the shape of the head and of the legs is absolutely similar to that of a *Pycnoscelus*. In the tube containing the 3 adult females mentioned above was included a great number of young individuals at different stages of development; these were very much like young *Pycnoscelus*, very wide with anterior part of abdomen shining, posterior part granulated. If these larvae really belong to *Stilpnoblatta*, as they probably do, there is no doubt that the genus has to be included in the subfamily Panchlorinae.

The species has been recorded from India only.

Family MANTIDAE.

23. **Humbertiella indica** Sauss.

Barkuda, 25-vii—4-viii-17 (*N. A.*), 1 ♂ at light; 28-x-20 (*N. A.*), 1 ♂; 18-iv-20 (*N. A.*) 1 ♂; 16—20-ix-19 (*E. B.*), 1 ♂.

(Not uncommon on tree trunks. *N. A.*).

24. **Hierodula membranacea** Burm.

Barkuda, August 17 (*N.A.*), 1♀; 27th June 1920 (*N.A.*), 1♀.

One of these two specimens is of a very large size (length of body 88 mm.); the species is much diffused in India, Ceylon, China, Java, etc. (Scarce, like all the bigger mantids, on Barkuda. *N.A.*).

25. **Hierodula doveri,** sp. nov.

Barkuda, 25th April 1920 (*C.D.*) at dusk, 1♀ *type.*

♀ Size rather large, green coloured. Anterior coxae armed with 5 to 6 rather short spines, a little flattened, rounded at apex. Prothorax slender; pronotum with a lateral brown spot on each side near the posterior margin; prosternum presenting near its posterior margin 4 rounded brown spots and a small median stripe of the same colour. Anterior legs with no internal marking; anterior tarsi marked with black at apex of the internal face. Elytra a little longer than the abdomen.

Length of body 65 mm.; pronot. 22·5 mm.; elytra 47 mm.

This species recalls *H. ventralis* Giglio-Tos by the armature of the anterior coxae, but the markings on the thorax are those of a *Parhierodula.*

26. **Parathespis humbertiana** Sauss.

Barkuda, 4th—19th October 1919 (*F.H.G.*), 1♂ at light; 1st October 1919 (*N.A.*), 2♂ at light; 25th October 1919 (*N.A.*), 1♀; 13th August 1920 (*S.R.*), 1 young ♀ at edge of pond.

The males of this species here recorded are somewhat larger than the typical specimen (length 38 mm.) but they agree quite well with the description in any other respect. It seems necessary to specify the armature of the anterior legs: the femora are armed with 4 discoidal spines of which the 2 first are short, the 3rd very long, the 4th very small and distant from the preceding; 5 external spines including a small genicular one, the 2 median being a little longer than the other two; 14 internal spines of which 3 short, 1 long, 1 short, 1 long, 1 short, 1 long, 3 short, 1 long and a small genicular one.

Family PHASGONURIDAE.

27. **Holochlora indica** Kirby.

Barkuda, August 1919 (*F.H.G.*), 1♂.

This species has already been recorded from India by Brunner (under the name of *biloba*) and by Bolivar.

28. **Trigonocorypha crenulata** Thunb.

Barkuda, 15th—22nd July 1916 (*F.G.H.*), 1 ♀; 4th—9th October 1919 (*F.H.G.*), 3 ♀; April 1920 and September 1920 (*N.A.*), 1 ♂, 1 ♀; 29th June 1922 (*N.A.*) 1 ♀ which laid its eggs during the night.

The eggs are laid all round the edge of the leathery leaves of *Glycosmis pentaphylla*, inserted into little pockets between the outer and the inner layer (fig. 13).

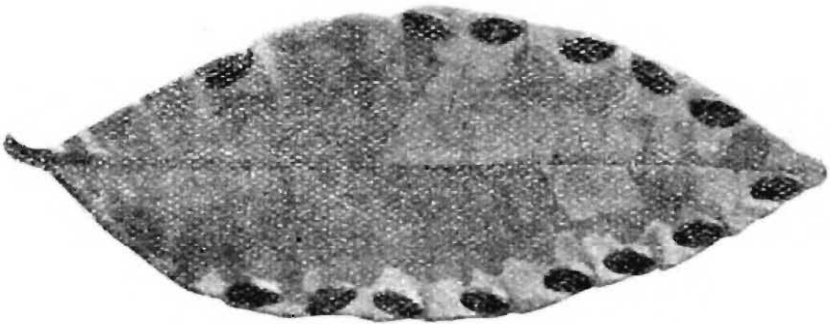

FIG. 13. Eggs of *Trigonocorypha crenulata* Thunb. laid all round the edge of a leaf of *Glycosmis pentaphylla*.

Dr. Annandale states that the species is nocturnal in habits, remaining concealed in the day time among the leaves of trees and shrubs. It only becomes active at sunset and does not lay its eggs until late at night. The male utters a monotonous, long-continued chirp—cherr'k—cherr'k-cherr'k, but does not begin till it is dark.

A certain number of young Phaneropterinae, which belong perhaps to this species, are interesting for their so-called mimicry. Dr. N. Annandale, who observed them in nature, gives the following peculiarities in a letter.

"Perhaps the most interesting member of this family (Phasgonuridae), however, is one in which the young bear an extraordinary resemblance to ants, both in movements and in general appearance. I have put a note on specimens sent you. What I believe to be the adult of this species is a much larger but still wingless form, of which you also have specimens. It bears a generalized resemblance, specially in movements, to certain Hymenoptera and also to beetles of the genus *Neocollyris* (Cicindelidae), but I have been able to find no resemblance that is specific. This insect feeds chiefly on small caterpillars."

The note accompanying the specimens states that "they were running about in damp weather on the plinth of the house. When undisturbed their movements were very ant-like; but when alarmed they betrayed themselves by leaping. They were not actually accompanied by ants but the specimen with them was captured at the same spot a few minutes later."

It is evident that the second form to which Dr. Annandale refers is not the adult but an older larval stage of the species. It is again a case of what Urarov calls "transformative deceptive resemblance"[1]; these cases seem more common than one could think among Phaneropterinae

[1] *Trans. Ent. Soc. London*, 1922, p. 269.

and, although they are very interesting, we must keep from anthropomorphism when trying to explain them.

29. **Isopsera pedunculata** Br.

Barkuda, 19th September 1919 (*E.B.*), 1♂ ; 14th August 1920 (*S.R.*), 1 ♀ ; August 1919 (*F.H.G.*), 2 ♀ at light ; September 1920 (*N.A.*), 2 ♂, 1♀.

This species lays its eggs in the same manner as the preceding ; in both species the eggs are flattened, ovoidal, black, but those of *Trigonocorypha* are a little larger and their surface is finely shagreened and not smooth as in *Isopsera*.

30. **Pyrrhicia inflata** Br.

Barkuda, 3rd—19th August 1919 (*F.H.G.*), 2♂, 2♀ ; 17th August 1920 (*C.D.*), 1 ♂.

This species has been recorded by Bolivar from Trichinopoly.

31. **Amytta delicatula,** sp. nov.

Barkuda, September 1920 (*N.A.*), 1♀ *type*.

♀. Long and slender, pale green with elytra translucent. Head short, frontal rostrum very narrow, neatly furrowed in the middle ; face wide, smooth ; maxillary palpi long, slender, with 5th article a little shorter than the two preceding, very slender at base, rather bluntly dilated at apex. Antennae long, very thin, testaceous. Eyes rather big, globulose, prominent. Pronotum smooth, rather strongly projecting backwards in an angular, translucent process ; lateral lobes high, their inferior margin subangulate. Abdomen slender, green ; subgenital plate rather long, with its posterior margin a little thickened and feebly notched (fig. 11, p. 170). Ovipositor almost straight, smooth, each valve ending in a very short diverging point. Legs slender ; anterior coxae with a long spine, tibiae perforated, armed beneath with 5 spines on each side ; intermediate tibiae a little dilated near their base, presenting the same armature as the anterior ones. Posterior femora rather strongly dilated at base, very slender at apex ; tibiae a little longer than the femora, their superior margins armed on their whole length with small spines. Elytra long and very narrow, subacute at apex ; mediastine vein distinct ; humeral (radial) vein straight, triramose ; discoidal (anterior ulnar) vein parallel with the humeral, furcate near the middle ; ulnar (posterior ulnar) vein furcate very near the base, its anterior branch long and parallel with the other veins.

Length of body 11 mm.; pronot. 4 mm.; elytra 19 mm.; post fem. 11·5 mm.; post. tib. 12 mm.; ovipos. 8 mm.

This interesting species seems rather near to *A. pellucida* Karsch from East Africa ; the shape of the subgenital plate is quite different.

32. **Mecopoda elongata** L.

Barkuda, 4th—19th October 1919 (*F.H.G.*), 1 ♂ ; April 20th (*N.A.*), 1 brown ♀, 1 green ♀ taken on *Glycosmis pentaphylla*.

A species very common in the Oriental Region. Rare on Barkuda. It is nocturnal in habits and lives amongst undergrowth. When dis-

turbed it takes immense leaps. The male utters a very loud, harsh chirp at night. *N. A.*)

33. **Euconocephalus incertus** Walk.

Barkuda, August 1919 (*F.H.G.*), 2 ♀; 13th September 1920 (*N.A.*), 2 ♂.

This species has been recorded from Borneo and Singapore.

34. **Sathrophyllia carinata,** sp. nov.

Barkuda, one female (*type*), 4th—19th October 1919 (*F.H.G.*).

♀. Large and fine species, pale brownish yellow, marbled with darker brown.

Head marked above with small brown spots; vertex a little shorter than the first antennal joint, presenting two small lateral tubercles at base of rostrum which is slightly incised at tip. Eyes globular, prominent; ocelli yellow, big, the lateral ones placed under the tubercles of the rostrum. Face pale, yellowish, punctured. Antennae yellowish with numerous brown rings.

Pronotum flattened anteriorly, but very strongly elevated posteriorly in a compressed crest; surface presenting a few ridges and tubercles; anterior margin rather prominent, truncated and bituberculate in the middle; posterior margin rounded, presenting a tubercle on each side of the median crest. Prosternum unarmed.

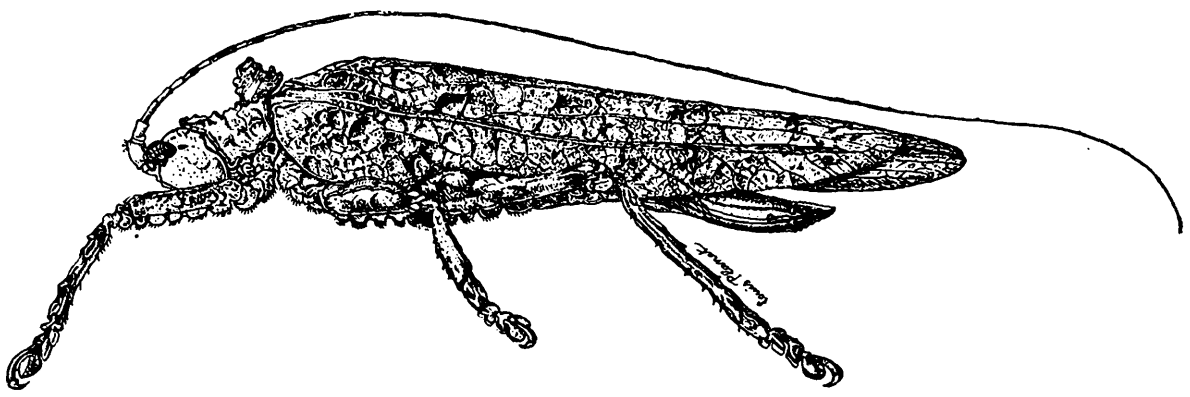

Fig. 14. *Sathrophyllia carinata,* n. sp. ♀ ×1·5.

Abdomen blackish above, yellowish beneath; supraanal plate projecting, oval, swollen at base, notched at apex; subgenital plate subtriangular, very slightly notched at tip. Cerci a little longer than the supraanal plate, curved, yellow. Ovipositor strong, straight, broad, the upper margin almost straight, finelly crenulate, lower one somewhat convex.

Legs concolourous; anterior femora compressed with superior margin straight, inferior one lobate; anterior tibiae prismatic, their upper surface presenting two tubercles, their inferior margins bearing 5—7 very small spines; intermediate femora much compressed and widened, with inferior margin lobulate and hairy, superior margin distinctly undulated; intermediate tibiae compressed, widened in the middle. Posterior femora rather narrow, with inferior margin lobulate.

Tegmina with anterior margin convex, very feebly crenulated; marginal field a little wider than half the width of posterior one; apex not very rounded. Wings reaching beyond the tip of tegmina, with apical part of the same colour as these, the remaining part hyaline, with transverse veins brownish.

Length of body 37 mm.; pronot. 8 mm.; elytra 50 mm.; post. fem. 16 mm.; ovipos. 15 mm.

This species seems very near to *Sathrophyllia rugosa L.*, but it can be readily distinguished by its intermediate femora with undulated upper margin; the elytra are also wider than in that species. There is but very little difference in the shape of the carina of intermediate femora in the new species and in the genus *Cymotamera*.

35. **Gryllacris hieroglyphicoides,** sp. nov.

Barkuda, April 1920 (*N.A.*), under dead tree trunks and branches lying in the jungle; sometimes found in deserted burrows of *Xylocopa*; 1 ♂, 1 ♀ *types*, 7 ♀, 2 young ♂, 5 young ♀ co-*types*.

♂. Large, ferrugineous. Head very wide, orbicular; occiput high, rounded; frontal rostrum almost twice as wide as the first joint of antennae, its margins forming two small keels; face a little depressed, presenting two impressions above the clypeus. Antennae and palpi testaceous. Eyes small, presenting a small white spot at their internal angle; ocelli yellow, the lateral ones very small, anterior one large, oval. Pronotum testaceous, anterior margin a little convex, posterior

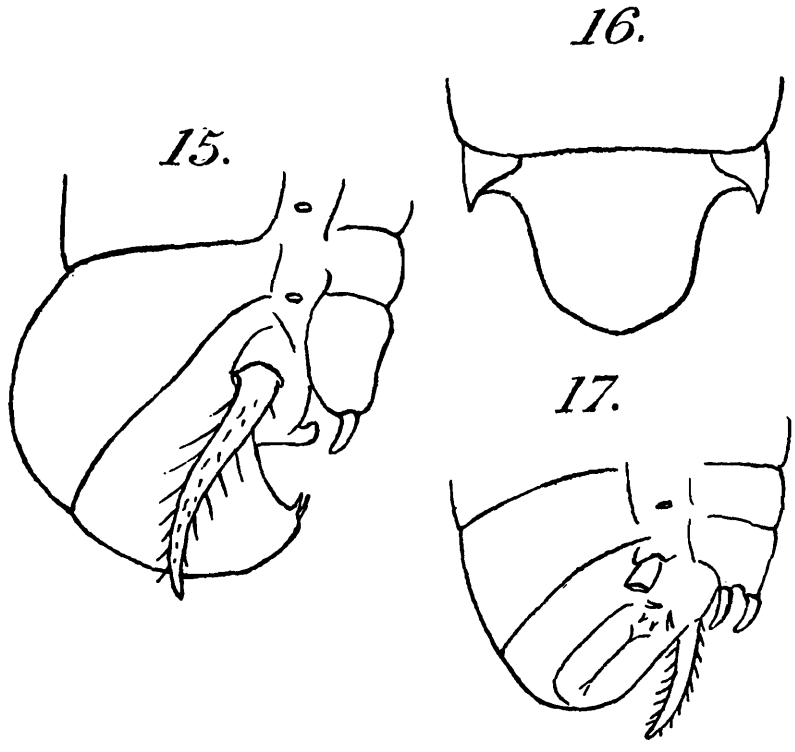

FIG. 15. *Gryllacris hieroglyphicoides*, n. sp. Apex of abdomen of ♂, lateral view, ×6;—fig. 16. *Id.* Subgenital plate of ♀, ×6;—fig. 17. *Gryllacris barkudensis*, n. sp. Apex of abdomen of ♂, lateral view, ×6.

margin straight, lateral lobes rather high, with inferior margin straight, humeral sinus pretty well marked; disk adorned with fine brown lines

and spots : 1 median line, 1 curved and forwardly diverging line on each side, 3 more or less confluent points on each side anteriorly, 1 spot near each posterior angle. Elytra and wings hyaline, with veins yellowish and veinlets narrowly and neatly marked with fuscous. Legs testaceous ; anterior femora rather short, armed with 3 or 4 internal spines and 5 or 6 external ones.

♂. Anal segment swollen, its inferior part truncated with 2 small spines (fig. 15).

♀. Ovipositor rather slender, a little curved, acute at apex ; subgenital plate shield-shaped, punctured (fig. 16).

Length of body ♂ 35, ♀ 44 mm.; pronot. ♂ 7·5, ♀ 9 mm.; elytra ♂ 39, ♀ 42 mm.; post. fem. ♂ 16·5, ♀ 18·5 mm.; ovipos. 19 mm.

This species is very close to *G. hieroglyphica* Br., from Ceylon, but its posterior femora are shorter, the ovipositor is also shorter, acute at apex and the shape of the subgenital plate of the female is quite different.

[Though sometimes found under dead logs, this species is much more common in dead branches still attached to trees of *Ficus bengalensis*, *F. obtusa* and *F. infectoria*. I have also found it in a dead branch of *Euphorbia neriifolia*. It eats the dead wood, which its powerful jaws enable it to masticate readily. Sometimes it occupies the deserted burrow of a carpenter bee (*Xylocopa*), but more frequently makes its own. The burrow runs parallel to the length of the branch and is of irregular shape. It is often occupied by more than one individual, sometimes by an adult with one or more half-grown young. *G. hieroglyphicoides* is the only Indian Gryllacrid except *Schizodactylus* I have seen in large numbers. It is abundant on Barkuda. *N.A.*]

36. **Gryllacris barkudensis,** sp. nov.

Barkuda, 22nd June 1920 (*N.A.*), 1 ♂ *type* captured by digging wasp ; 1 young ♂ among foliage of *Glycosmis pentaphylla*.

♂. Medium size, rufo-testaceous. Head a little wider than the pronotum, testaceous with two brown spots on the occiput ; frontal rostrum a little wider than the first joint of antennae, slightly spotted with brown on each side ; face long, yellow, ocellae large, yellow. Antennae testaceous. Pronotum a little wider than long, with anterior margin a little convex, posterior margin straight, lateral lobes ascending anteriorly, humeral sinus distinct ; disk presenting a transverse furrow near the anterior margin and a median longitudinal impression ; 2 brown spots near the anterior margin and 2 oblique lines extending on the lateral lobes. Abdomen with 8th tergite rather large, 9th short, flattened, forming two little concave facets and bearing 4 little spines (fig. 17) ; subgenital plate wide, styli wide apart. Legs testaceous ; anterior tibiae, posterior femora and tibiae presenting a wide black ring ; posterior femora short, armed with 4—5 internal spines and 6—7 external ones. Elytra and wings light rufo-testaceous, almost transparent, with veins and veinlets paler than the ground colour.

Length of body 29·5 mm.; pronot. 5 mm.; post. fem. 14·5 mm.; elytra 34·5 mm.

This species seems close to *G. dubia* Le Guill. and *G. oceanica* Le Guill. but differs from both by its larger size and by the different markings on the legs. The young individual is recognizable by these markings although they are not so neat as in the adult.

[I believe that this species fastens together the leaves of shrubs with a silky secretion to form a nest. At any rate I once disturbed a *Gryllacris* in such a nest on Barkuda and it seemed to be exactly like *G. barkudensis*. Unfortunately it escaped. *N.A.*]

Family GRYLLIDAE.

37. **Tridactylus thoracicus** Guér.

Barkuda, 4th—19th October 1919 (*F.H.G.*), numerous examples of both sexes at light.

These specimens are very pale in colour, though showing exactly the same features as given in Saussure's description; in both sexes the last ventral segment, before the subgenital plate, presents a straight and narrowly lined with black posterior margin.

I consider *T inflatus* Br., as a synonym of this species.

38. **Tridactylus riparius** Sauss.

Barkuda, 19th August 1919 (*F.H.G.*); 17th August 1920 (*C.D.*), at edge of island, among masses of damp rotten algae; 9th September 1920 (*N.A.*), on damp mud at edge of small pool of rain water, several examples of both sexes; 13th August 1920 (*S.R.*), 1 ♀ at light.

Those examples present a very constant dark colouration with few yellowish spots; the size is rather variable, from 6 to 7 millimeters and even one very small male is only 5 mm. long and could almost be taken for *T pulex* from Java. The wings are very variable in length; in some individuals scarcely exceeding the elytra, in others attaining as far as the apex of the abdomen.

39. **Tridactylus savignyi** Guér.

Barkuda, August 1919 (*F.H.G.*), 1♀; 23rd September 1920 and 21st October 1920 (*N.A* .and *B.P.*), 3 ♂ 2 ♀ at light.

These specimens present a very dark colouration for the species.

40. **Gryllotalpa africana** Beauv.

Barkuda, 25th July—4th August 1917 (*N.A.*), 1 ♂; 8th October 1920 (*N.A.*), 1 ♀ at light.

A very common species spread all over Africa and the south part of Asia.

[This species is almost amphibious in habits. It lives in very damp earth or sand at the edge of water. I have even dug it up from below water-level at the edge of brackish water. It flies to light at night commonly, but never in large numbers. *N.A.*]

41. **Pteronemobius histrio** Sauss.

Barkuda, 4th—19th October 1919 and 8th October 1920 (*F.H.G.* and *N.A.*), at light, numerous examples ♂ and ♀; 16th—20th September 1919 (*E.B.*), 1 ♀.

All these specimens belong to the macropterous form of the species already recorded by Bolivar (*Ann. Soc. ent. Fr.*, 1900, p. 793) from the Philippines.

It seems necessary to add the following precisions to Saussure's description. Maxillary palpi with 3 first joints fuscous, 4th and 5th whitish, the last one brownish at apex. Cerci with a narrow whitish ring in the middle. Elytra of male with well defined speculum, present-

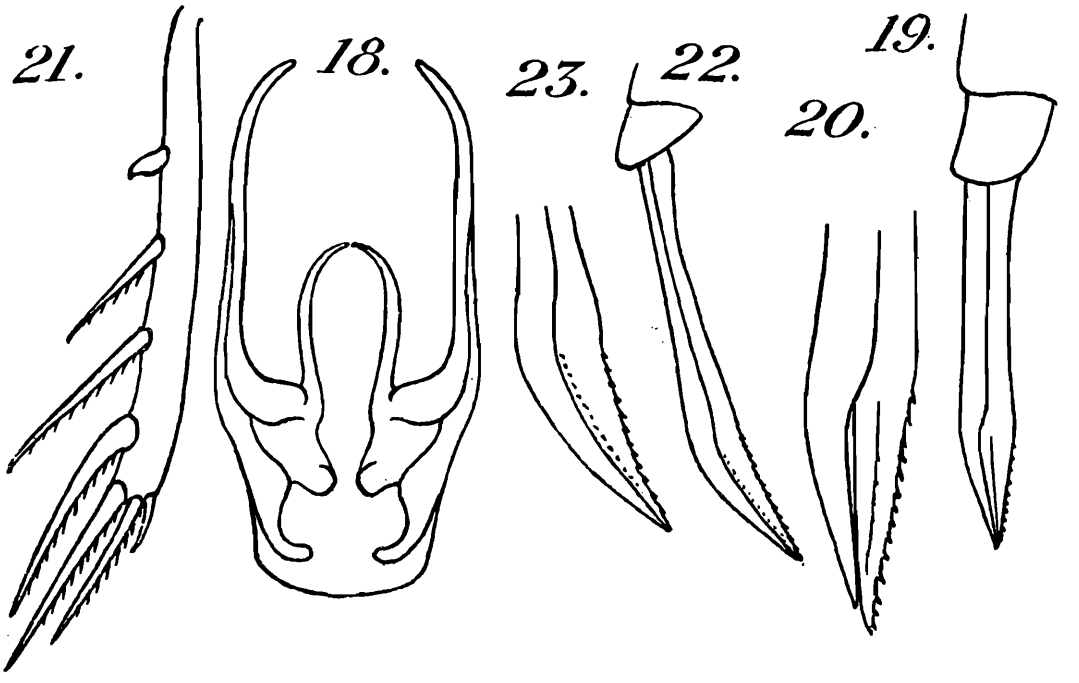

FIG. 18. *Pteronemobius histrio* Sauss. Genitalia of ♂, ×25; —fig. 19. *Id.* Ovipositor of ♀, ×19; —fig. 20. *Id.* Apex of the same, ×38; —fig. 21. *Pteronemobius gravelyi*, n sp. Posterior tibia of ♂, internal face, ×10; —fig. 22. *Id.* Ovipositor of ♀, ×19; —fig. 23. *Id.* Apex of the same, ×38.

ing two small apical cells (1st type of Saussure). Posterior tibiae with 3 external and 4 internal spines, the 1st internal short, tuberculiform, whitish; ♀ with only 3 spines on each margin of posterior tibiae. Genitalia presenting a large rounded superior piece and a forceps tuberculate at base (fig. 18); ovipositor (figs. 19 and 20) very short and straight, its apical superior valves bearing about 15 rather strong denticulations directed backwards (length of body 5 mm.; ovipos. 2 mm.).

42. **Pteronemobius javanus** Sauss.

Barkuda, 4th—19th October 1919 and 8th October 1920 (*F.H.G.* and *N.A.*), numerous examples of both sexes, at light.

I consider this species as being the macropterous form of *P. infernalis* Sauss.; it presents, as that species does, a very distinct colouration with lateral lobes of pronotum almost black, the last joint of maxillary palpi black, the elytra of male spotted with brown. The spines of posterior tibiae are 3 on each margin in the female, 3 external and 4 internal in the male.

43. **Pteronemobius gravelyi,** sp. nov.

Barkuda, 4th—19th October 1919 (*F.H.G.*), 1 ♂, 1 ♀ *types*, 2♂ 4♀ *co-types*, at light; October 1920 (*N.A.*), 1♂, 3♀ at light.

♂. Small, light testaceous brown, almost unicolourous. Head presenting only a few, little distinct, light stripes on the vertex; palpi unicolourous, testaceous. Pronotum very transverse, scarcely narrowing anteriorly, with lateral lobes a little darker. Abdomen testaceous; cerci fuscous. Legs testaceous, rather slender; posterior tibiae armed with 4 spines on each margin, these spines long, slender, concolourous, the 1st one short, thick, but ending in a small point, the last one curved at its base (fig. 21); inferior spurs unequal in length. Elytra attaining the apex of abdomen, a little narrowing posteriorly, testaceous, unicolourous; speculum small, divided in its posterior part into two small, equal cells, the internal one occupying only half of the length of the internal margin of the speculum (1st type of DE SAUSSURE); chordae a little curved, the 2 internal united up to the middle; lateral lobes with 4 veins.

♀. Same shape and colour as the male; posterior tibiae with 4 slender spines on each margin; elytra with dorsal field presenting 4 longitudinal veins. Ovipositor (figs. 22 and 23) rather long, almost straight, with apical valves long, their inferior margin very convex, their superior one almost concave, very finely crenulated.

Length of body 5 mm.; length with wings 10 mm.; fem. post. 4 mm.; ovipos. 2·5 mm.

This species is very close to *P. tartarus* Sauss., but it is smaller, with pronotum more transversal, scarcely narrowing forwards, the internal cell of speculum of male not extending to the angle; in the ♀ the ovipositor is a little longer with apical valves very long.

44. **Gryllus chinensis** Web.

Barkuda, 1st October 1910 (*N.A.*), 1 ♂ at light; 3rd—19th August 1919 (*F.H.G.*), 1 ♂, 2 ♀ at light.

45. **Gryllus consobrinus** Sauss.

Barkuda, July 1920 (*N.A.*), 1 ♂.

46. **Gryllus brunner** Sélys.

Barkuda, 1st October 1910 (*N.A.*), 2 ♀ at light.

47. **Gryllus mitratus** Burm.

Barkuda, 4th—19th October 1919 (*F.H.G.*), 1 ♀ at light.

This species, as well as the three preceding, is common in the Oriental Region.

48. **Gryllodes sigillatus** Walk.

Barkuda, 15th—22nd July 1916 (*F.H.G.*), 2 ♂ emerging at dusk from holes in termite mound; 1st October 1910 (*N.A.*), 1 ♂ at light; August 1919 (*F.H.G.*) 3 ♂, 4 ♀, some of them immature; July 1920 (*N.A.*), 1 young ♂; 27th June 1920 (*N.A.*), 2 ♀ in a crevice in the woodwork of a door.

This species is almost cosmopolitan, being found in all the tropical and subtropical countries of the world.

Dr. Annandale states that it was common in holes in a bungalow.

49. **Scapsipedus hastatus** Sauss.

Barkuda, 15th—22nd July 1916 (*N. A.* and *F. H. G.*), 1 immature ♂.

50. **Myrmecophila albicincta,** sp. nov.

Barkuda, (*N. A.*), 1 ♀ *type*, 3 ♀ co-*types*, found with ants (*Camponotus mitis*) in box of books in bungallow; 4th—19th October 1919 (*F. H. G.*), 1 ♀, with ants.

♀. Shape wide, dark brown with a very neat light band on the meso-notum. Palpi very pale yellow, 4th joint very short, 5th long, little widening at apex (fig. 24). Eyes small, formed of 14 big ommatidies. Posterior femora very short and thick; posterior tibiae armed with 3 internal

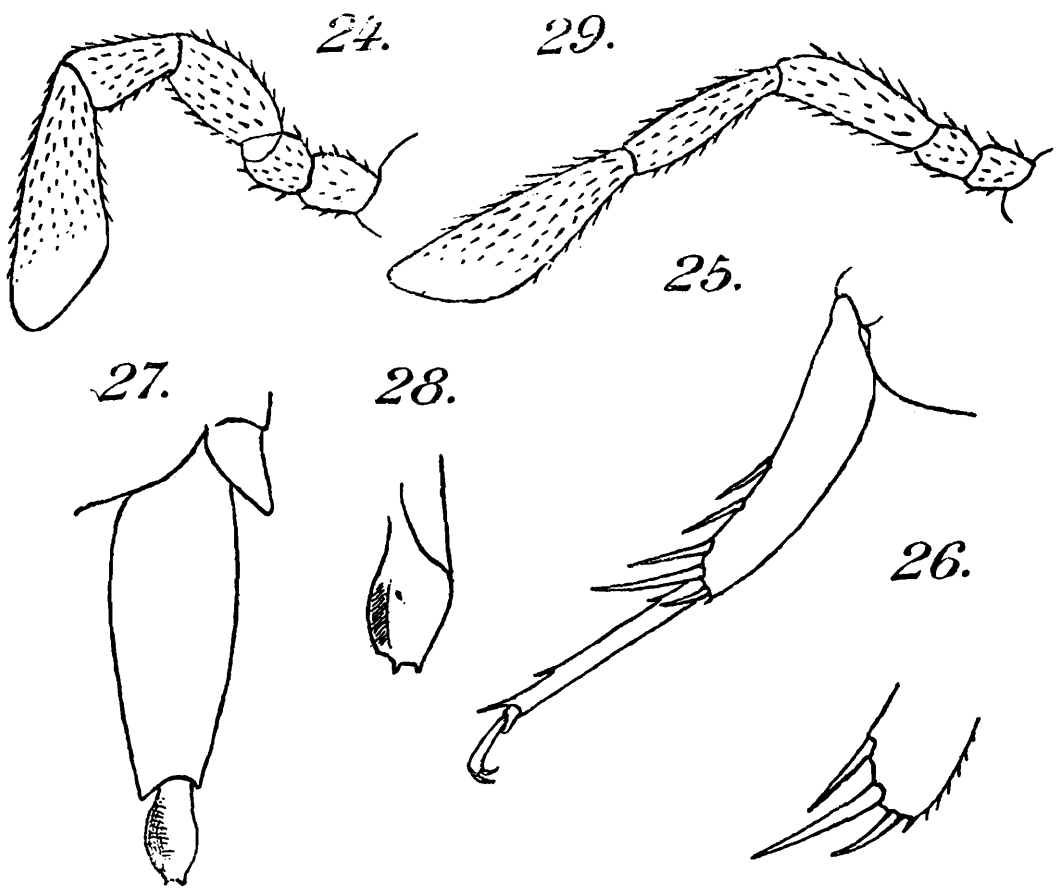

FIG. 24. *Myrmecophila albicincta*, n. sp. Maxillary palpus, ×80;—fig. 25. *Id.* Posterior tibia and tarsus, internal face, ×25;—fig. 26. *Id.* Apex of the posterior tibia, ×38;—fig. 27. *Id.* Ovipositor, ×38;—fig. 28. *Id.* Apex of the same, ×60;—fig. 29. *Myrmecophila graclipes*, n. sp. Maxillary palpus, ×80.

spines only, their inferior spurs very short (figs. 25 and 26). Superior anal valve triangular, subacute at apex. Ovipositor (fig. 27 and 28) very short, thick, the superior valves a little longer than the inferior ones, diverging, ending in the shape of an oval spatula, presenting two small points near the apex.

Length of body 3·5 mm.; ovipos. 1·3 mm.; cerci 1·6 mm.

This species has almost the same size and shape as *M. acervorum* but it differs very much from it by the shape of its ovipositor and the number of spines on the posterior tibiae; besides there is much more contrast in the colouration.

51. **Myrmecophila gracilipes,** sp. nov.

Barkuda, 17th October 1920 (*N. A.*), from nest of ant (*Acropyga acutiventris* Roger)[1]; under stone with ants (*Pheidole* sp.); 1 ♀ *type* and numerous ♀ co-*types*.

♀. Size and general habitus of *M. acervorum*, slightly more elongate, narrower. Eyes small; antennae rather thin, whitish; maxillary palpi whitish, rather long, their 4th joint as long as the 3rd, 5th feebly dilated at apex (fig. 29). Thoracic segments somewhat darkened posteriorly.

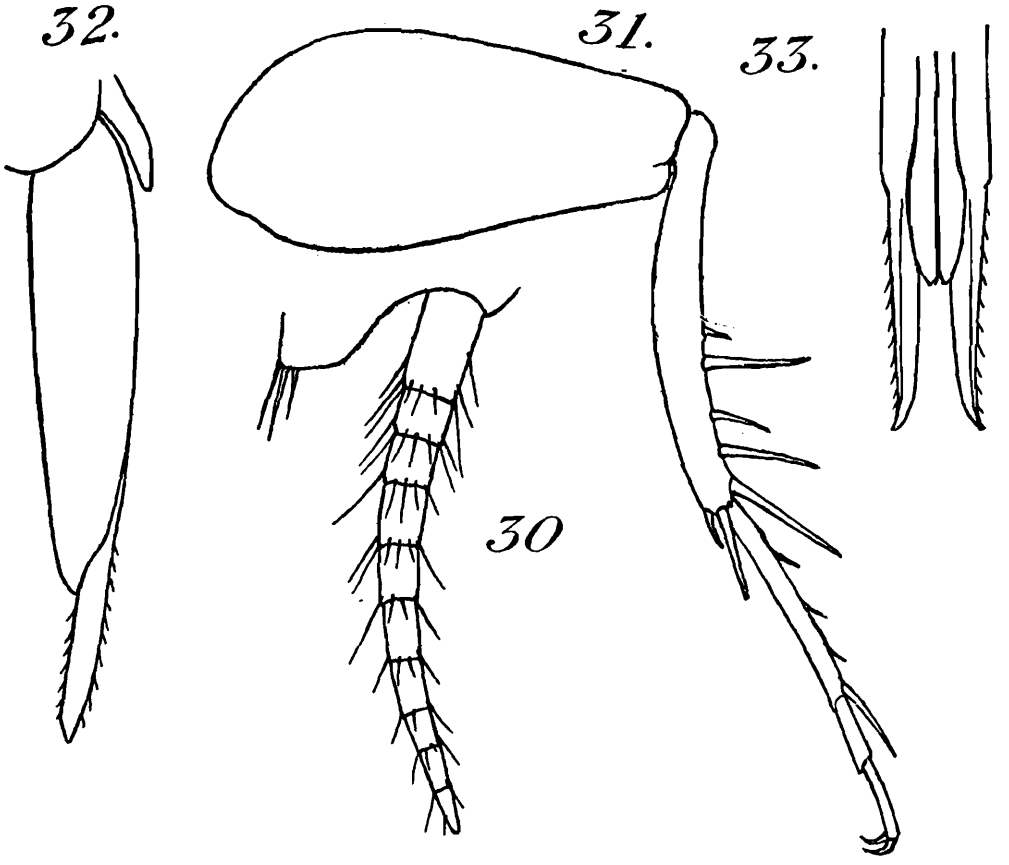

FIG. 30. *Myrmecophila gracilipes*, n. sp. Apex of 10th tergite and left cercus, ×38;—fig. 31. *Id.* Posterior leg, internal face, ×25;—fig. 32. *Id.* Ovipositor, ×38;—fig. 33. *Id.* Apex of the same, ventral view, ×38.

Abdomen narrowing backwards; 10th tergite forming two small tubercles with 3 bristles on each. Cerci comparatively narrower and longer than in other species of the genus, very neatly jointed (fig. 30). Ovipositor (figs. 32 and 33) rather long, narrow; superior valves much longer than inferior ones, very narrow, acute at apex, with superior margin subdenticulate; subgenital plate rather large. Legs paler than the body; posterior femora not so wide as in *M. acervorum*; tibiae (fig. 31) slender, curved, armed with rather long spines of which 4 internal, the 2nd and 4th much the longer, and one external; 6 apical spurs, the inferior ones very short. Posterior tarsi long and slender, the metatarsus armed with 2 long apical spurs and 3 small spines, 2nd joint rather long.

Length of body 7 mm.; post. fem. 2 mm.; ovipos. 1·6 mm.; cerci 1·45 mm.

Although looking very much like *M. acervorum*, this species is remarkable by its more slender stature and by the shape of its posterior legs.

Dr. Annandale states about the specimens found under a stone that, when the stone was lifted, one of the crickets strayed away; it was seized

[1] Dr. F. Santschi had the kindness to name this species of ant.

by a worker ant, which carried it back towards the nest. This cricket leaps less readily than the one found with *Camponotus mitis* and not so far.[1] It is however very active and eludes pursuit with great skill.

52. **Ornebius leucopygus,** sp. nov.

Barkuda, 24th September 1919 (*N. A.*), 1♀ *type* from a big termite-mound (*Odontotermes obesus*).

♀. General colour and habitus of *Mogoplistes brunneus* Serv., but larger. Head a little narrower than pronotum; frontal protuberance short, much wider than the 1st antennal joint; palpi almost black, very pubescent, the maxillary palpi (fig. 35) with 4th article longer than the 3rd

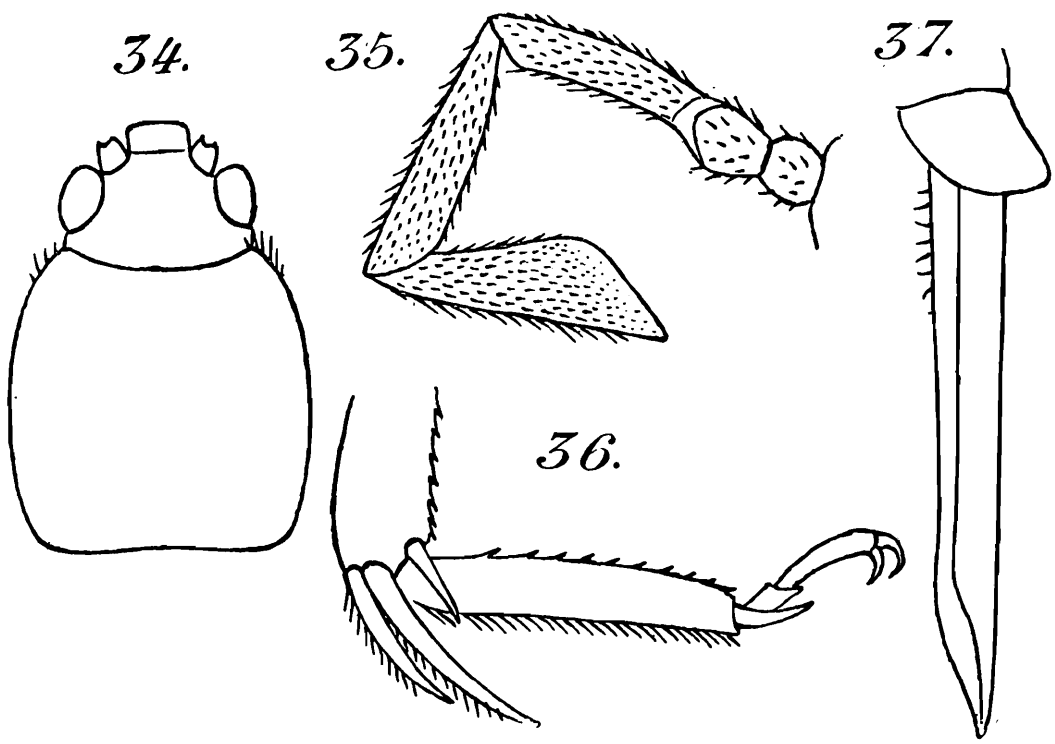

Fig. 34. *Ornebius leucopygus*, n. sp. Head and pronotum, dorsal view, ×10;—fig. 35. *Id.* Maxillary palpus, ×25;—fig. 36. *Id.* Apex of posterior tibia and tarsus, ×25;—fig. 37. *Id.* Ovipositor, ×18.

and the 5th, the last one triangular with internal angle a little rounded. Pronotum (fig. 34) a little wider than long, scarcely narrowing forwards and backwards; anterior margin concave, posterior one straight, sides weakly convex. Abdomen rather long; 10th tergite and supraanal valve forming a triangular, white plate, contrasting with the dark colour of the abdomen; subgenital plate very small. Cerci testaceous. Ovipositor rather short (fig. 37), straight, its apical valves narrow, lanceolate, acute. Anterior and intermediate femora testaceous with silvered scales, darkened at apex, with a few rufous erected bristles; tibiae brown with grey scales; anterior tibiae armed with 2 apical inferior spurs, the external of which very short, and presenting a very small round drum at its internal face near the base; intermediate tibiae armed with 3 apical spurs, the 2 inferior ones subequal in length and a supero-interal one a little shorter. Posterior femora thick, rather strongly dilated; tibiae short and a little curved, armed with fine denticles all the length

[1] This fact agrees perfectly well with the morphological difference between both species, *M. gracilipes* showing much less developed posterior femora than *M. albicincta*

of their superior margins; external spurs short, the median a little longer than the other two; medio-internal spur long, at least twice as long as the superior which is a little shorter than the inferior one (fig. 36); metatarsi long, armed with 2 apical spurs and about 10 denticles on each superior margin.

Length of body 10·5 mm.; pronot. 3 mm.; fem. post. 6·3 mm.; tib. post. 4·8 mm.; ovipos. 3·5 mm.

This species has very much the aspect of a *Mogoplistes*, but it differs from the species of this genus in its perforated anterior tibiae.

53. **Ornebius annandalei,** sp. nov.

Barkuda, 11th October 1920 (*N. A.*), 1♀ *type* with the ant *Acropyga acutiventris* Roger (= *flava* Mayr), from galleries in dead tree-trunk.

♀. Very small, yellowish, covered with silvered grey scales, forming on the legs somewhat darker stripes. Head (figs. 38 and 39) big; front

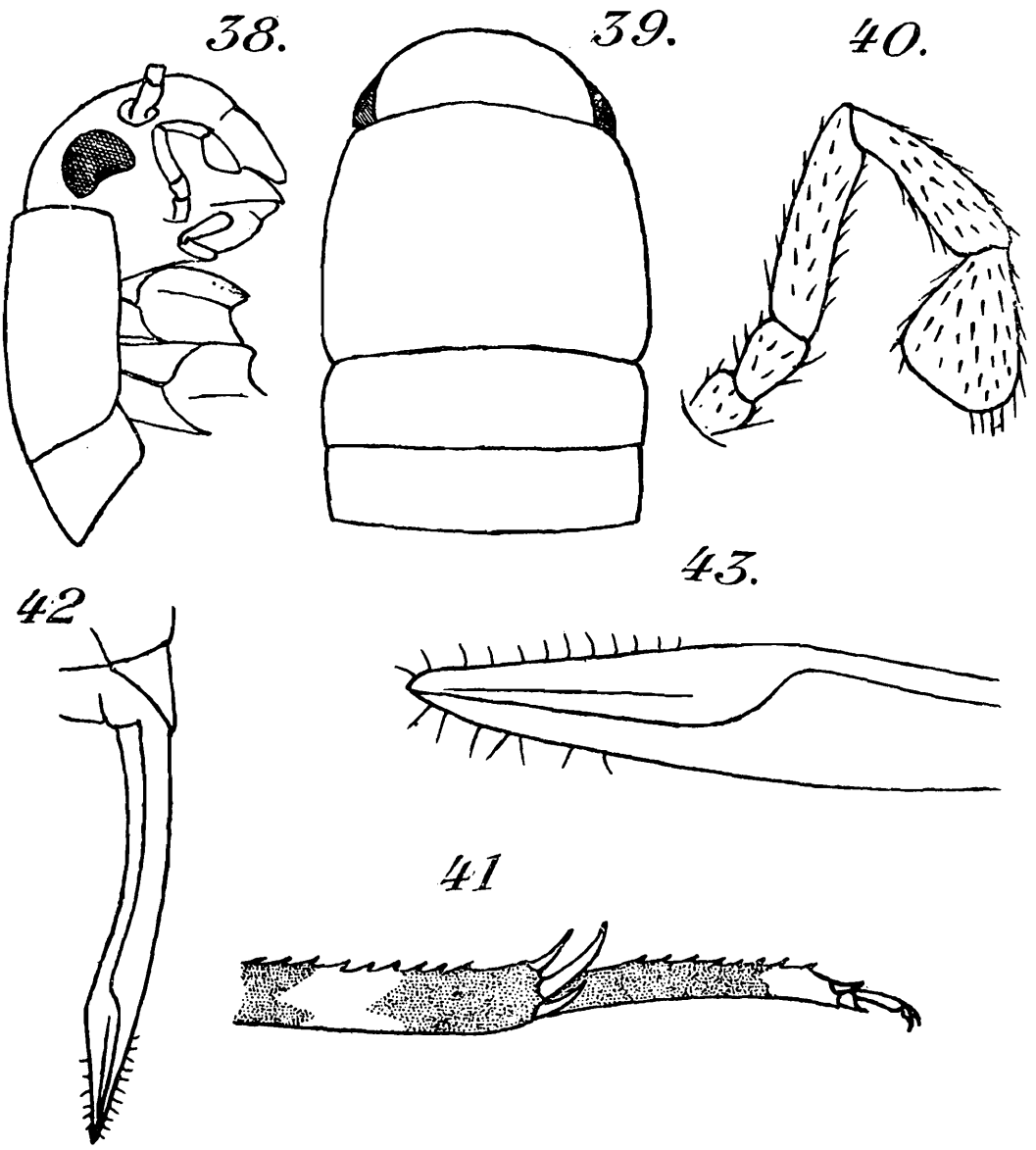

FIG. 38. *Ornebius annandalei,* n. sp. Head and thorax, lateral view, ×25;—fig. 39. *Id.* Head and thorax, dorsal view, ×25;—fig. 40. *Id.* Maxillary palpus, ×100;—fig. 41. *Id.* Apex of posterior tibia and tarsus, ×58;—fig. 42. *Id.* Ovipositor, ×38;—fig. 43. *Id.* Apex of the same, ×80.

very convex and very wide between the eyes; these are large enough, formed of big facets; frontal protuberance moderately projecting, not

divided, separated from the front by a small furrow; palpi greyish, last joint of maxillary palpi very short and wide (fig. 40). Pronotum convex with anterior and posterior margins straight, sides slightly convex near the middle; lateral lobes little high, inferior margin straight. Abdomen very little dilated in the middle; 10th tergite short, supraanal valve triangular, rounded; subgenital plate very large, triangular, subacute and translucent at apex. Cerci wanting? Ovipositor (figs. 42 and 43) short, very slightly curved upwards, its apical valves scarcely enlarged, smooth, little acute at apex. Legs indistinctly striped with brown; anterior tibiae provided with a large round tympanum near the base almost on the upper surface; tarsi rather short, the metatarsus equalling the other joints together. Posterior femora very wide, short; tibiae brown with two yellowish stripes, slightly curved; superior margins armed with very small denticles; apex with 6 very short, whitish spurs, the internal ones somewhat longer than the external, the median spur longer than the two others on each side (fig. 41); tarsi rather long, the metatarsus very long, greyish except at apex, with two rows of small denticles above and two short apical spurs; 2nd and 3rd joints very short and slender.

Length of body 4 mm.; post. fem. 2·5 mm.; ovipos. 1·4 mm.

Although this species has been found with ants, I do not think it is a true myrmecophilous species. [The ant with which it was found is subterranean in habits and only strays into dead logs. *N. A.*]

54. **Metioche humbertiana** Sauss.

Barkuda, 19th August (*F. H. G.*), 2♂, 4♀ at light.

All these specimens belong to the macropterous form. The species has been recorded from Ceylon and Trichinopoly but it seems rather common in India and in the Malay Archipelago.

55. **Anaxipha longipennis** Serv.

Barkuda, 7th—19th October 1919 (*F. H. G.*), 1♂, 3♀ at light; 23rd October 1919 (*N. A.*), 1♂, 2♀ in verandah of house.

This species has never been recorded from the Oriental Region, yet the specimens from Barkuda are quite similar to those from Madagascar. The male presents a very long speculum, extending much backwards on the elytra.

56. **Madasumma marmorata** Haan.

Barkuda, August 1919 (*F. H. G.*), 1 ♀ on lower side of Ficus branch; 26th June 1920 (*N. A.*), 1 ♀.

This species is known from Japan, Java, Singapore.

57. **Euscyrtus concinnus** Haan.

Barkuda, 23rd October 1919 (*N. A.*), 1♂, 1♀ caught in verandah of house; 4th—19th October 1919 and 11th—16th December 1919 (*F. H. G.* and *N. A.*), several examples of both sexes at light.

This species is common and widely distributed in the Oriental Region. Most of the specimens collected at Barkuda belong to the var. A of DE SAUSSURE with the brown ornaments very much reduced.

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58. **Acanthalobus inornatus** Walk.

Barkuda, December 1919 (*N. A.*), 1 ♂, 2 ♀ at light.

59. **Mazarredia cristulata** Bol.

Barkuda, September 1919 and September 1920 (*N. A.*), 4 ♂.

These specimens differ from the type of the species by their shorter pronotum, which scarcely exceeds the apex of abdomen.

60. **Euparatettix scabripes** Bol.

Barkuda, 4th—19th October 1919 and December 1919 (*F. H. G.* and *N. A*) numerous individuals at light.

61. **Paratettix variabilis** Bol.

Barkuda, 4th—19th October 1919 and December 1919 (*F. H. G.* and *N. A.*), several specimens at light.

62. **Paratettix indicus** Bol.

Barkuda, August 1919 (*F. H. G.*), 1 ♂, 2 ♀; September 1919 (*N. A.*) 1 ♀.

63. **Paratettix scaber** Thunb.

Barkuda, December 1919 and July 1920 (*N. A.*), several specimens of both sexes at light.

64. **Coptotettix testaceus** Bol.

Barkuda, July and September 1920 (*N. A.*), 1 ♂, 2 ♀, 1 young example.

This species has been described from Ceylon; the specimens from Barkuda which I refer to it differ from the type in the pronotum, which is not longer than the abdomen.

65. **Aeolopus affinis** Bol.

Barkuda, August and September 1920 (*N. A.*, *C. D.* and *S. R.*), 3 ♂, 2 ♀.

66. **Pternoscirta bimaculata** Thunb.

Barkuda, August—September 1920 (*N. A.*), common on ground among low herbage.

This species has been recorded from Kodaikanal by Bolivar with the name *P. humbertiana* Sauss. The specimens from Barkuda often show dark green shades, chiefly the females.

67. **Morphacris citrina** Kirby.

Barkuda, 7th September 1920 (*N. A.*), on dead leaves on shore of lake, 1 ♂, 1 ♀.

68. **Trilophidia cristella** Stål

Barkuda, August 1919 (*F. H. G.*), 1 ♂

69. **Trilophidia turpis** Walk.

Barkuda, September 1919 (*N. A.*), 1 ♂.

70. **Trilophidia annulata** Thunb.

Barkuda, September 1919 (*F. H. G.*), 1♀; September 1920 (*C. D.*), 1♂, 2 ♀.

71. **Acrotylus inficita** Walk.

Barkuda, 25th August 1919 (*N. A.*), 2♀; 4th—19th October 1919 (*F. H. G.*), 1♀

72. **Chrotogonus saussurei** Bol.

Barkuda, August 1919 (*F. H. G.*), 1♀, 1♂ in copula; 16th—20th September 1919 (*E. B.*), 1 ♂.

73. **Chrotogonus brachypterus** Blanch.

Barkuda, August—September 1920 (*N. A.*, *F. H. G.* and *S. R.*), common on stony soil with a sparse covering of grass.

74. **Atractomorpha crenulata** F.

Barkuda, July—September 1920 (*N. A.*, *F. H. G.*), common on the leguminous plants *Tephrosia* and *Crotalaria.*

Dr. Annandale states that the colour of this insect alive is " uniform bright green, dorsal surface of abdomen tinged with rose-pink, sides of head and pronotum edged with shining white granules, a few similar granules on sides of mesonotum; eyes mottled."

75. **Aularches miliaris** L.

Barkuda, 4th—19th October 1919 (*F. H. G.*), 1♀.

[As I have stated in my introductory note, the chief if not the only food of this genus is the leaves and twigs of the common shrub *Calotropis*, of which several allied species are common in the drier parts of India. This is also the habitual food of the allied genus *Poecilocercus*. *N. A.*]

76. **Aularches punctatus** Drury.

Barkuda, September 1920 (*N. A.*), 1♀.

According to Dr. Annandale's observations, the natural colouration of this species is brownish with spots (*i.e.*, bands across sides of the thorax and face and callous spots on sides of second segment) pure white.

77. **Catantops indicus** Bol.

Barkuda, August and September 1919 (*N. A.*, *F. H. G.* and *E. B.*), numerous individuals of both sexes.

This species is common in Ceylon, in India and in China.

78. **Catantops karnyi** Kirby.

Barkuda, 16th—20th September 1919 (*E. B.*), 1 ♂.

79. **Oxya velox** F.

Barkuda, September 1920 (*N. A.*), common on *Tephrosia* and *Crotalaria.*

80. **Euprepocnemis pulchra** Bol.

Barkuda, July 1920 (*N. A.* and *F. H. G.*), 3 ♂, 4 ♀.

This beautiful species has been described by Bolivar from Kodaikanal.

[This is mainly a jungle species, usually found on bushes. The discrepancy in size between the male and the female is very striking. *N. A.*]

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