XVI DESCRIPTIONS OF THREE MALE MUTILLIDS FROM INDIA

By G. R. DUTT, *B.A.*, *Assistant to the Imperial Entomologist.*

Mutilla dives, Sm. ♂

Head, thorax and legs black, abdomen varying from ferruginous to dark castaneous, the apical segments almost black; the joints of the flagellum and the tarsi castaneous.

Pubescence glittering silvery white, short and thick on the face, front, posterior margin of the prothorax, and propleurae; very dense and matted on the median segment; short and thin on the scape and the basal joints of the flagellum; on the apical joints of the abdominal segments it forms transverse bands which are entire on the two basal segments and abraded from the middle on the third and the following segments; long and erect hairs behind the vertex, on the sides of the thorax, on the legs and the basal abdominal segment.

Head coarsely punctate, punctures visible only on the portion between the eyes and the ocelli, front above the base of the antennae raised, face between the lower portions of the inner orbits and the sides of the clypeus scooped out; the clypeus above bearing two longitudinal keels which are blunt at the apex.

Mesonotum above deeply punctured, punctures with a tendency to run into longitudinal striae, the disc with a median longitudinal carina above and four parallel grooves, two on each side of it, those nearer to the carina running across the entire length of the mesonotum and the outer ones over the posterior half only.

Scutellum excavate at base, rising to a prominent tubercle posteriorly; median segment depressed below the surface of the postscutellum, somewhat flat above, only very slightly sloping towards the sides from the middle, which is consequently raised a little and appears like a medial longitudinal carina, apex truncate; metapleurae covered with large and shallow punctures. Abdomen above shining, sparsely punctured, punctures getting closer laterally.

Wings dark fuscous with a purple effulgence, basal third clear hyaline; there is a faint white streak in the first cubital, a sharper one in the second cubital, and a spot in the second discoidal cell of the forewing.

Length 12—15 mm. Expanse 18—23 mm.

Described from 10 specimens.

Hab. Punjab, Lyallpur (*G. R. Dutt and T B. Fletcher*); Bihar, Chapra (*Mackenzie*).

In the Pusa collection we had a few examples of this species from Chapra in the box of unidentified Mutillids. It could not be referred to any previously described species, but came very close to *Mutilla fumipennis*, described by Bingham in the *Journal of the Bombay Natural History Society*, Vol. XII, p. 118, pl. A, fig. 6. Mr. Fletcher brought a few more specimens of it from Lyallpur in August 1911. On referring to the Pusa collection again, I was struck with the fact that we had this undescribed male Mutillid only from localities from which we had *Mutilla dives* ♀ Later on in September 1911 when I went to Lyallpur I netted this species "in cop" with *Mutilla dives* ♀ and this settled the question definitely.

Mutilla lilliputiana, Andre. ♂

Head, thorax, legs, base of the first abdominal segment and the apical two segments black, the remaining segments red; the pubescence on the front, vertex, pronotum, sides of the scutellum, and the base of the median segment golden; on the face, sides of the clypeus, along the outer orbits of the eyes white, few erect hairs on the mesonotum, and the scutellum brownish, erect hairs forming somewhat ill-defined bands on the apical margins of the basal five segments, ferruginous.

Head, thorax, and abdomen punctured, punctures on the head, scutellum and abdomen fine, deep and coarse on the mesonotum, large and shallow on the median segment which appears consequently widely and strongly reticulate. On the clypeus a very distinct tubercle is noticeable. On the posterior half of the mesonotum there are two longitudinal grooves present, the second abdominal segment bears a prominent transversely compressed gibbosity above, the median segment is rounded posteriorly.

Wings fusco-violaceous, paler towards base; a white streak is visible in the first, second and third cubital cells and a spot in the second discoidal cell of the forewing.

Length 7—10 mm. Expanse 14—18 mm.

Described from one specimen.

Hab. Coorg, Pollibetta (*T. B. Fletcher*).

Mr. Fletcher captured two males "in cop" with *M. lilliputiana* females at Pollibetta in October 1915.

Mutilla agnata, Andre. ♂

Closely resembles *M lilliputiana*, Andre, with the difference that it is a bigger insect and has the pubescence on the posterior margin of the pronotum short and dense and richer in colour, the mesonotum bears a medial longitudinal carina in addition to the parallel grooves; the median segment is obliquely truncate, the basal portion very widely and strongly reticulate, bearing two parallel carinae in the middle, reaching up to the verge of the truncated portion of the segment; the clypeus without any tubercle, the basal portion of the third, fourth and fifth abdominal seg-

ments transversely aciculate; white streak in the 3rd cubital cell shorter in length.

Length 13 mm. Expanse 25 mm.

Described from a single specimen.

Hab. Coorg, Sidapur, 3,000 ft.

I have ascribed this male to this species with some hesitation, because it was not taken "in cop." There are only two points in favour of this conclusion; the first is that a few *M agnata* ♀ were found in the same locality about the same date; and the second is that this species looks very much like *Mutilla lilliputiana* ♂ And as the female *M agnata* very closely resembles the female *M. lilliputiana* (the resemblance has been noted by Bingham also; *vide Fauna India, Hymenoptera*, Vol. I, p. 11), it is possible that the male which looks so much like the male *M. lilliputiana* may be the male *M agnata.*

XVII DESCRIPTIONS OF INDIAN BEETLE LARVAE.—III.[1]

By F. H. GRAVELY, *D.Sc., Asst. Supdt., Zoological Survey of India.*

(With Plate XIV.)

In this paper Lamellicorn larvae only are dealt with. The Passalid larvae have been identified solely by their association with adults. In all other cases pupae or newly emerged adults with their cast larval skins have been examined.

PASSALIDAE.

For bibliography and descriptions of other larvae see Gravely, 1916, pp. 138–145, pl. xx, figs. 1–4.

The importance of the anus in the classification of Passalid larvae appears hitherto to have escaped attention. In the Aulacocyclinae (pl. xiv, fig. 1) and Leptaulacinae the lower margin is deeply cleft, and this appears to be the case in the Pseudacanthinae and Passalinae also, though different observers describe it in somewhat different terms. In the Macrolininae, on the other hand, both lips are as a rule entire (pl. xiv, fig. 3), the only exception known to me being *Macrolinus*; in this genus (pl. xiv, fig. 2) the cleft found in other subfamilies, though not actually present, is represented by a distinct suture.

Taeniocerus bicuspis, Kaup.

Pl. xiv, fig. 1.

Locality.—Assam: above Tura, Garo Hills, 3,500–3,900 ft. Four larvae, about 18–22 mm. long, collected by Mr. S. W Kemp.

The head bears a single hair behind each antenna. All three thoracic segments bear two hairs on each side, arising close together, one behind the other, at the level of the stigmata; and the first bears an additional hair about half way between these hairs and the stigma. The first nine abdominal segments all bear one hair on each side above the level of the stigmata, and a second is present above these on the last three or four segments and some-

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[1] I. "The Larvae and Pupae of some beetles from Cochin." *Rec. Ind. Mus.* XI, 1915, pp. 353–366, pl. xx–xxi.

II. "Some Lignicolous Beetle-Larvae from India and Borneo." *Rec. Ind. Mus.* XII, pp. 138–175, pl. xx–xxii.

times on segments further forward as well. The tenth abdominal segment bears three hairs on each side, one about on a level with the transverse portion of the anus, one above and one below this. No other hairs of any sort are present on any part of the body.

Ophrygonius cantori (Percheron) *s. str.*

Pl. xiv, fig. 3.

Localities.—Darjiling District: Pashok, 5,000 ft. and Sureil, 5,000 ft.

A number of larvae, varying in length from about 18 to 45 mm., have recently been collected. They are indistinguishable from those of the subsp. *convexifrons* previously described (Gravely, 1916, pp. 141–142); but the larger series shows that there are commonly 3 (not 2) dorsal hairs on all segments from the second thoracic to the ninth abdominal and that the pairs of ventral hairs on the thoracic segments are often undifferentiated from the hairs beside them.

LUCANIDAE.

I am unable to distinguish any of the following from the larvae of *Dorcus parallelopipedus*, Linnaeus, described by Schiødte (*Naturhist. Tidssk.* IX, 1874, pp. 345–349, pl. xvii, figs. 1–10, pl. xix, figs. 14–15), apart from the fact that in all the claws are spined, the tibiae are not bituberculate and the anterior margin of the clypeus is not concave.

Hemisodorcus nepalensis, Hope.

Locality.—Darjiling District: Sureil, 5,000 ft.

Numerous larvae about 20–80 mm. long, found in association with a macrognathous male pupa and larval exuvium. A female of *Dorcus hopei*, Saunders, was found in the same stump.

Eurytrachelus reichei, Hope.

Locality.—Darjiling District: Pashok, 5,000 ft.

Several larvae about 30–60 mm. long, found in association with a male pupa and larval exuvium and with adults, none macrognathous.

Eurytrachelus tityus, Hope.

Locality.—Darjiling District: Pashok, 5,500 ft.

One macrognathous male pupa and larval exuvium.

Gnapholoryx velutinus, Thomson.

Locality.—Darjiling District: Pashok, 5,000 ft.

Five larvae and two pupae, found in association with adults, two of which were found with their larval exuviae. An adult male

and female of *Eurytrachelus tityus* were present with them. The larvae vary in length from about 20–50 mm. The spines on the legs are somewhat less stout than in the three preceding species.

SCARABAEIDAE.

RUTELINAE.

Perris has given a key to a number of Lamellicorn genera, including *Adoretus* ("*Larves de Coléoptères*," Paris 1877, pp. 98–103, reprinted from *Ann. Soc. Linn. Lyon*, XXIII).

For Ohaus's account of the habits of American Rutelinae, with notes on larval structure, see *Stet. Ent. Zeit.* LX, 1899, pp. 230–245; LXI, 1900, pp. 175–202 and 267–273.

The larvae of the following Rutelinae have been described[1]. Works marked with an asterisk are not available in Calcutta.

Anisoplia austriaca, Herbst.

1908. *Krasiliscik, I. M. "Experimentelle Untersuchungen zur Erörterung der Frage über das Vermögen der *Microphtalma longifacies*, Rond., Larven des *Anisoplia austriaca* und einiger anderer Lamellicornia anzustecken." *Kisinev Trd. Obsc. jest.* I, 1904–1908, pp. 358–395.

1909. *Golovianko, Z. "Kurze Angaben über *Anisoplia austriaca* und deren Bekämpfung." *Lesn. zurn.* XXXIX, 1909, pp. 1340–1343.

1912. *Bragina, A. P. "Zur Biologie und Morphologie des Getreide-Laubkäfers." *Choziajstvo Kiev.* VII, 1912, pp. 303–310, 357–364.

Anisoplia deserticola, Fisch.

1909. *Golovianko, Z. "Die Lebensweise der Laubkäfer im Forst von Chrenov, Gouv. Woronest." *Trd. lesn. opyty. del Ross.* XXI, 1909, pp. 1–56 (*Anisoplia* larvae, pp. 33–35).

Anisoplia fruticola, Fabricius.

1909. *Golovianko, Z. "Kurze Angaben über *Anisoplia austriaca* und deren Bekampfung. *Lesn. zurn.* XXXIX, 1909, pp. 1340–1343.

1830. *Bouché, P. F. "Naturgeschichte der schaedlichen Garten-Insekten," 1830, p. 21.

Anisoplia segetum, Herbst.

1909. *Golovianko, Z. "Die Lebensweise der Laubkäfer in Forst von Chenov, Gouv. Woronest." *Trd. lesn. opyty. del Ross.* XXI, 1909, pp. 1–56 (*Anisoplia* larvae, pp. 33–35).

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[1] See also below, p. 270, note.

Anisoplia villica.

1892. *Xambeu. "Moeurs et Métamorphoses d'Insectes II." *Echange*, 1892, supplement, 46 pp. (p. 76).

Phyllopertha horticola, Linnaeus.

1830. *Bouché, P. F., "Naturgeschichte der schaedlichen Garten-Insekten," 1830, p. 19.
1837. *Kollar, V "Naturgeschichte der schaedlichen Insekten," 1837, p. 261.
1872. *? *Entomologist*, VI, p. 62.
1874. Schiødte, J C. "De Metamorphosi Eleutheratorum Observationes; Bidrag til Insekternes Udviklingshistorie." *Natur. Tidsskr.* IX, 1874, pp. 226–376, pl. viii–xix (*Phyllopertha horticola*, pp. 307–310 and 362, pl. xii, figs. 8–14, pl. xix, figs. 6–7).
1908. *Krasiliscik, I. M. "Experimentelle Utersuchungen zur Erörterung der Frage über das Vermögen der *Microphtalma longifacies*, Rond., Larven des *Anisoplia austriaca* und einiger anderer Lamellicornia anzustecken. *Kisinev Trd. Obsc. jest.*, I, 1904–1908, pp. 358–395.

Anomala frischii, Fabricius.

1736. Frisch, J L. "Vom Weinblat-Keper, oder Julius-Keper." *Beschreibung von allerley Insecten in Teutschland* IV, Berlin, 1736, pp. 28–30, pl. xiv, figs. 1–4.
1874. Schiødte, J C. "De Metamorphosi Eleutheratorun observationes: Bidrag til Insekternes Udviklingshistorie." *Natur. Tidsskr.* IX, 1874, pp. 226–376, pl. viii–xix (*Euchlora frischii*, pp. 304–307 and 361, pl. xii, figs. 1–7, pl. xix, fig. 5).

Anomala elata, Fabricius.

1910. Lefroy, H. M. "Life-Histories of Indian Insects—Coleoptera I." *Mem. Dep. Agric. Ind.* II, 1908–1912, pp. 139–163, pl. xiii–xix (*Anomala varians–elata*), pp. 143–146, pl. xiv.

Anomala vitis, Fabricius.

1869. *Mulsant, E. & Mayet, V "Description des Métamorphoses de l'Anomala vitis." *Ann. Soc. Linn. Lyon* (*n.s.*) XVI, pp. 277–281.

Parastasia confluens, Westwood.

1874 Schiødte, J C. "De Metamorphosi Eleutheratorum Observationes: Bidrag til Insekternes Udviklingshistorie."

Natur. Tidsskr. IX, 1874, pp. 226–376, pl. viii–xix (*P. confluens*, pp. 294–296 and 261, pl. x, figs. 1–10, pl. xix, fig. 3).

Pelidonota punctata, Linnaeus.

1870. *Riley, C. V., "Insects Injurious to the Grape Vine." *Amer. Ent. & Bot.* V (2), 1870, p. 295, fig. 185.

Cotalpa lanigera, Linnaeus.

1869. Lockwood, S. "The Goldsmith Beetle and its Habits." *Amer. Nat.* II, 1869, pp. 186–192, figs. 1–2.

1870. Lockwood, S. "Destructiveness of the Larva of the Goldsmith Beetle." *Amer. Nat.* III, 1870, pp. 49–50.

1879. *Saunders, W *Canad. Ent.* XI, pp. 21–22.

Anoplognathus analis, Boisduval, and **A. porosus**, Dalman.

1901. Froggatt, W. W. "Cockchafer (*Anoplognathus*) Grubs destroying Strawberry Plants." *Agric. Gaz. N. S. W.*, XII, 1901 (1902), pp. 473–476, 5 text-figs.

Adoretus vestitus, Boheman.

1915. [1]*Friederichs, R. "Ueber *Adoretus vestitus*, Boh., als Schädling im Samoa und seine früheren Stände." *Zeitschr. Wiss. Insbiol.* X, pp. 41–47, figs.

Adoretus lacustris, Arrow.

Pl. xiv, figs. 5–6.

Locality.—Salt Lakes near Durgapur, Calcutta. Three larvae varying from about 30–40 mm. in length, and a number of pupae and adults with cast larval skins. They were found about a foot above the water's edge in lumps of firm clayey soil that were falling away from a narrow banked-up footpath separating two pieces of brackish water. One of the larvae was found among roots of *Acanthus ilicifolius* in very wet, and doubtless salt, mud at the water's edge, but no others and no pupae or adults were found at this level.

The larvae closely resemble those of *Adoretus vestitus* described by Friederichs, and those of *Anomala frischii* and *Phyllopertha horticola* described by Schiødte in their general characters. They are greyish in colour.

The head resembles that of *Phyllopertha horticola*, having hair-bearing punctures sparsely scattered all over it. The antennae are slenderer than in that species, the basal joint being spherical, the second (first of Schiødte) three times, the third five times and the

[1] Kindly lent by the Imperial Entomologist, Pusa.

fourth three times as long as broad. The fourth joint is prolonged distally on the posterior or inner side into a slender conical process. The fifth joint is slightly shorter than the fourth, broadest a little beyond the middle, bluntly pointed distally. A pair of pigmented ocelli is present immediately behind the antennae.

The mandibles 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 are three terminal teeth on the left side and two on the right, the most ventrally situated being apical in each case. The left molar tooth is a large hollowed cusp with two transverse ridges, the distal of these uniting with the anterior margin to form a distinct denticle and the proximal uniting to form a large spine. The anterior margin of the cusp is very strongly elevated. The right molar tooth consists of two distinct cusps, of which the distal is triangular with the angles raised into small denticles and the proximal is broadly L-shaped, its most proximal portion being very strongly produced in the same plane as the mandible.

The lobe of the maxilla bears a stout and somewhat conical terminal spine with two similar but smaller spines, united at the base, in a line with it on the inner side. The inner margin bears a row of strong spines, followed on the dorsal surface by others which become weaker and disappear towards the base on the outer side. The ventral surface bears two rows of spines distally between the rows on the inner and outer margins, the distal spine alone being specially stout in the outer row, and the distal and penultimate in the inner row. The stridulatory spines are ⌰-shaped. The maxillary palps are mounted on a broad protuberance and are four-jointed. The first joint is short and broad, more or less transverse. The second is narrower, and perhaps a little more than twice as long as broad. The third resembles the second but is perhaps a little shorter. The fourth is about as long as the second but tapers slightly at both ends.

The labial palps are two jointed, each joint being about twice as long as broad. The labium is set with long spines in front of the palps and bears a pair of very long hairs between them. There is a pair of similar hairs on the membrane between the labium and the mentum. There is a spine on each side of the mentum near the posterior margin.

The legs bear long and slender spines below, which tend to be more or less filamentous on the proximal joints but stronger on the distal ones. There are a few long hairs, not very definitely arranged, between the anterior legs; there is also a line of them between the legs on each of the two remaining thoracic segments and across the lower surface of each of first nine abdominal segments, becoming sparser behind.

The thoracic segments are each divided into three transverse ridges above, and each of these ridges bears a line of long hairs.

The first abdominal segment is undivided above, and bears a line of similar hairs mixed with slender spines of a darker colour.

The next five segments are divided into three ridges above, each ridge bearing a broad band of these hairs and spines.

The seventh abdominal segment consists above of an anterior ridge resembling in all respects the ridges of preceding segments, and an extensive posterior flattened area divided across the middle by a somewhat indistinct groove, and more or less covered with hair which is longest in two places, in front of and behind this groove respectively.

The eighth and ninth abdominal segments resemble the seventh, except that the anterior ridge is absent, and that the groove dividing the flattened area is distinct, especially in the eighth segment.

The tenth abdominal segment bears a large oval hairless area above, bounded by a fine dark line which is incomplete behind, and surrounded by dense and moderately long hair (pl. xiv, fig. 5). Ventrally the posterior border is set with long erect spines, bent over backwards at the tip. This border is terminated on each side by a small patch of slender hairs, and there are a few scattered spines and hairs further back.

The eleventh abdominal segment is hairless and scarcely exposed above; below it is covered with long erect spines bent over backwards at the tip, the lower margin of the anus bearing a line of long slender hairs.

Adoretus versutus, Harold.

Pl. xiv, fig. 4.

Locality.—Museum compound, Calcutta.

Numerous larvae, about 7–30 mm. long. They were found, together with pupae and adults with larval exuviae, in flower-pots in which cannas were growing.

The larvae of *A. versutus* resemble those of *A. lacustris* in general appearance, except that they are of a pale yellowish colour.

The head is much less hairy than in larvae of *A. lacustris*, especially towards the vertex, and the clypeus is somewhat deeper. The antennae are somewhat shorter, and the distal prolongation of the fourth joint is blunter.

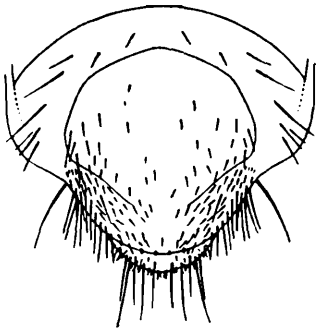
The mandibles resemble those of *A. lacustris* in their general structure, but the distal denticle of the triangular cusp on the right mandible is very weak, and the second cusp, though strongly elevated, is not strongly produced proximally, being in consequence less distinctly L-shaped and more or less transverse to the mandible. The rest of the mouthparts closely resemble those of *A. lacustris*, but the palps are somewhat shorter and stouter.

The legs and body up to the ninth abdominal segment closely resemble those of *A. lacustris*, except that the hair and spines on the dorsal surface are weaker and less numerous. The tenth abdominal segment resembles that of *A. lacustris* below, except that the spines are much shorter. It is sparsely hairy all over above, the hairs being most numerous and mixed with small spines near the

posterior margin (pl. xiv, fig. 4). The eleventh abdominal segment resembles that of *A. lacustris* in form. Its ventral spines resemble those on the preceding segment. The anus is bordered below by a line of hairs as in *A. lacustris* and is bordered above by a line of small spines such as are found on the dorsal surface of the preceding segment.

The larva of this species appears to be particularly close to that of *A. vestitus* and, in the absence of specimens of the latter, I am unable to distinguish between them. Both appear to be separated from *A. lacustris* by the structure of the right mandible and by the vesture of the ninth and tenth abdominal segments.

Note.—Since the above was written illustrations of the life-histories of *Anomala biharenis*, Arrow and *Adoretus caliginosus*, Burmeister, have been published by Mr. Bainbrigge Fletcher (*Sci. Rep. Agr. Res. Inst., Pusa*, 1917 18, pl. x-xi), who has lent me a specimen of the latter larva for examination. Apart, possibly, from the mouth parts, which are not exposed, this larva closely resembles



TEXT-FIG.—*Adoretus caliginosus*, tenth and eleventh abdominal segments of larva from above.

that of *A. versutus*. The chief difference is found on the dorsal surface of the tenth abdominal segment (see text-fig.). The fine line separating the mid-dorsal area of this segment from the rest is very distinct, as in *A lacustris*, but it is abruptly bent inwards on each side behind as in *A versutus* and the area is distinctly transverse. The tuft of spines situated on each side obliquely behind this line are slightly denser and longer than *A. versutus*.

EXPLANATION OF PLATE XIV.

FIG. 1.—*Taeniocerus bicuspis*, Kaup; larval anus.

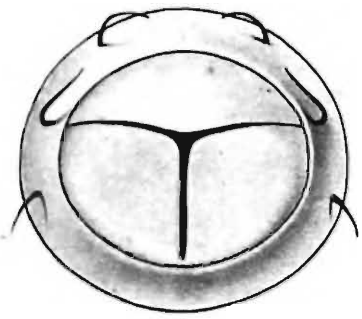
,, 2.—*Macrolinus andamanensis* (Stoliczka); larval anus.

,, 3.—*Ophrygonius cantori* (Percheron); larval anus

,, 4.—*Adoretus versutus*, Harold; posterior end of larva from above.

,, 5.—*Adoretus lacustris*, Arrow; posterior end of larva from above.

,, 6.—*Adoretus lacustris*, Arrow; larval mouth-parts, with mandibles forced wide apart to show structure more clearly.



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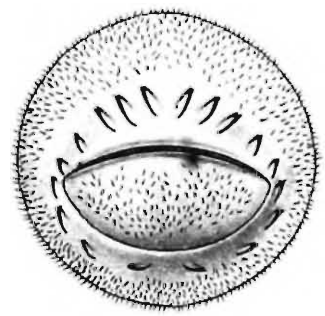

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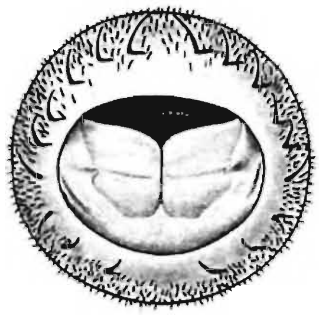

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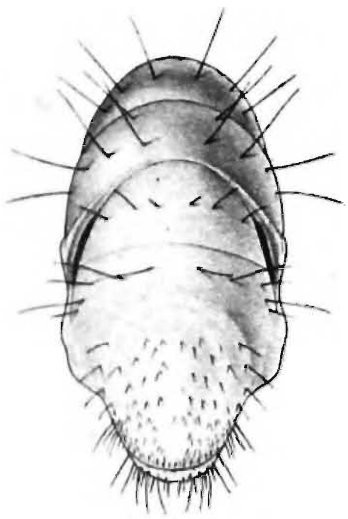

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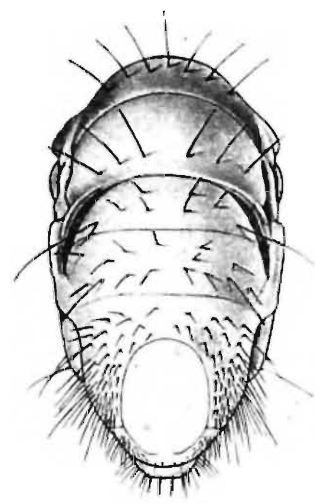

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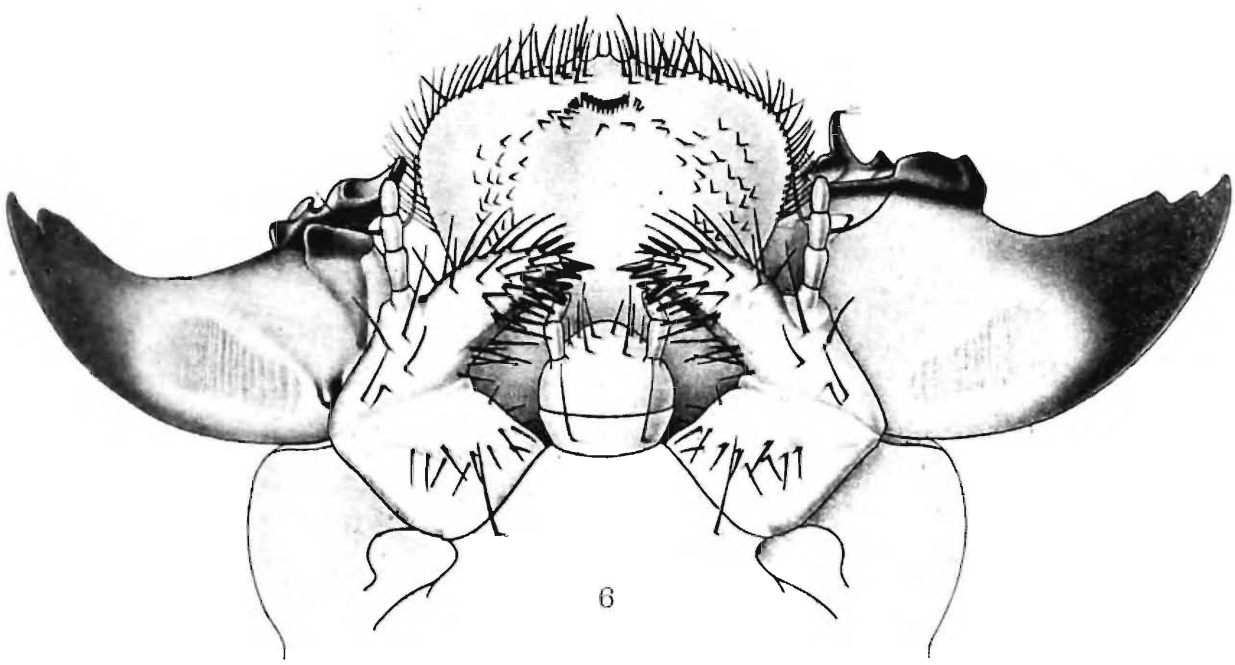

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D Bagchi *del.*

Photogravure, Survey of India Offices, Calcutta, 1919

INDIAN BEETLE LARVÆ.

XVIII REPORT ON A SMALL COLLECTION OF FISH FROM PUTAO (HKAMTI LONG) ON THE NORTHERN FRONTIER OF BURMA

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(With Plate XXII.)

The fish described or discussed in this paper were recently collected by Dr. Murray Stuart of the Geological Survey of India. The collection though small and not including any specimens of large size is of considerable interest. No fish has hitherto been reported from the extreme northern corner of Burma, and several interesting new forms are represented, the most remarkable of which is an undescribed species of the genus *Channa*, which, though known from both Ceylon and China, has not hitherto been discovered in the eastern parts of the Indian Empire.

In Dr. Stuart's collection there are altogether twenty-one specimens, all from mountain streams in the Putao Plains (Hkamti Long of the old maps) on the northern Frontier of Upper Burma. These plains are entirely separated by very high mountain ranges from the watersheds of the Brahmaputra system (including the Dihang and the Lohit) of the Assam and Tibetan Frontiers on the west and the Mekong system (Yunnan) on the east. The Sen-Ben-Ti, the Nam-Yak and the Nam-Ti-Sang mentioned in the text belong to the Irrawaddy system.

The twenty-one specimens examined belong to twelve species, which fall into eleven genera representing five different families. Except in three or four instances all the species, belonging to quite unrelated families, have developed some kind of adhesive or sucking apparatus—an interesting instance of convergence or plasticity in the formation of specialized organs of a similar nature in a restricted environment.

LIST OF SPECIES OBTAINED.

Sub-order OSTARIOPHYSI.

Division *SILUROIDEA*.

Family SISORIDAE.

Amblyceps murray-stuarti, Chaudhuri, sp. nov.

,, *mangois* (Hamilton Buchanan).

Erethistes asperus (M'Clelland).
Exostoma vinciguerrae, Regan.
Pseudecheneis sulcatus (M'Clelland).

Division *CYPRINOIDEA.*

Family Cobitidae.

Aborichthys kempi, Chaudhuri.
Nemacheilus botia (Hamilton Buchanan).

Family Cyprinidae.

Sub-family *CYPRININAE.*

Semiplotus cirrhosus, Chaudhuri, sp. nov.
Barbus stoliczkanus, Day.

Sub-family *RASBORINAE.*

Danio aequipinnatus (M'Clelland).

Sub-order PERCESOCES.

Family Ophicephalidae.

Channa burmanica, Chaudhuri, sp. nov.

Sub-order ACANTHOPTERYGII.

Division *PERCIFORMES.*

Family Nandidae.

Badis badis (Hamilton Buchanan).

Description of species.

Genus **Amblyceps**, Blyth.

Amblyceps murray-stuarti, sp. nov.

(Plate XXII, figs. 1, 1*a*, 1*b*.)

The family Sisoridae[1] consists of small cat-fishes found in swift mountain streams in Northern India, Burma, Tibet and China. In most of the genera (e.g. *Pseudecheneis*, etc.) a sucking-disk, made up of folds or plates of skin, is formed on the region of the chest. The disk enables these fishes to resist the force of the water. In some genera plates or lobes of skin about the mouth serve the purpose of a sucking organ. The following Indian genera are included in this family:—

Amblyceps, Olyra, Akysis, Chimarrichthys, Exostoma, Parex-

[1] Jordan, *A Guide to the Study of Fishes*, Vol. II, p. 184.

ostoma, *Erethistes*, *Glyptosternon*, *Euglyptosternum*, *Pseudecheneis* and *Sisor*.

The generic character "caudal fin being forked" of the genus *Amblyceps* has to be modified. The genus was orginally founded on a single species (*A. mangois*) with a forked tail-fin. In the new species, however, as well as in *A. marginatus*, Günther,[1] from mountain streams running into the Min River, in the province of Sze-chuen, China, the caudal fin is square-cut. Nor is the generic character "no adhesive thoracic surface" strictly true of this new species as there appears to be about thirteen loose folds of skin over the posterior part of the chest continued to the anterior portion of the abdominal region. These folds are likely to possess some adhesive function. Instead of founding a new genus on these slight differences it is considered reasonable to extend the definition of *Amblyceps* so as to include these three closely related species in the genus, which the author very graphically alluded[2] to as "cobitis looking siluroid."

The head, which is depressed and is broader than high, slopes rapidly down to a spatulate snout. The dorsal profile is almost straight from the point of orign of the rayed dorsal fin, which is small and slender, to the anterior end of the low and long adipose dorsal fin; the ventral profile is, however, straight throughout. The body is broad and round from behind the head to the anal opening, posterior to which it is highly compressed. The eyes and the head are covered with soft skin; the eyes are very small and are placed in the anterior part of the head with two parts of its length in front and three parts behind, the interorbital distance being contained about five times in the length of the head. There are two nostrils on each side quite close to each other, the posterior one almost reaching the front of the eye and having a barbel attached to the front wall. The mouth is wide and anterior and the opening is horizontal, the upper jaw being slightly longer than the lower. The teeth on the jaws are villiform, arranged in the upper jaw in a broad crescentic band and in the lower jaw in a straight narrow band. The margins of the lips are slightly fringed in both.

There are altogether eight barbels. The maxillary barbels have flat and expanded roots with loose dilated flaps and are as long as the head. The nasal and the outer mandibular barbels are equal to each other, and are two-thirds the length of the head. The inner mandibular barbels are about half as long as the head.

The gill openings are wide and continue up to one-third of the depth of the body on the dorsal side all the way from the notch below the chin in the ventral aspect; the gill membranes from two sides unite in front of a slender gular plate-like structrue at the middle point between the two roots of the outer mandibular

[1] Pratt, *To the Snows of Tibet Through China*, p. 245, pl. ii, fig. A.
[2] Blyth, *Proc. Asiat. Soc. Bengal*, XXVII, p. 282.

barbels. The number of branchiostegal rays is twelve; they are concealed under soft thick skin.

The pectoral and the pelvic fins are low, small and narrow, covered with soft skin. The pectoral fins, which are situated immediately behind the gill openings, are very low and are on a level with the ventral surface. The small pelvic fins are on the ventral surface and arise slightly anterior to and enclose the anal opening which is placed on a slightly raised cushion, the fins reaching beyond it. Immediately behind the cushion of the anal opening there is a deep fossa inside which is the slender anal papilla so common among the siluroids. At about the middle of the interval on the ventral surface, between the roots of the pectoral and pelvic fins, the loose skin appears to be folded into twelve or thirteen corrugations which may be considered as a rudimentary structure analogous to the adhesive disks found in some of the genera (e.g. *Pseudecheneis*, *Glyptosternon*, *Euglyptosterum*, etc.) belonging to this family. The pelvic fins reach beyond the fossa behind the anal opening, but do not reach the anal fin which is high and long. The caudal fin is flat and well spread out, but is sub-truncated. Some very short and compact fin-rays continue round the caudal peduncle to a slight extent along both the ventral and dorsal edges.

The colour in spirit is brownish-black above and lighter below. The maxillary barbels are white-tipped and the nasal and the inner mandibular barbels are dusky white.

The measurements of the specimen in hundredths of total length without the caudal fin are as follows:—

Length of body in millimeters	81
Depth of body expressed in hundredths of length ...	14·8
Depth of caudal peduncle ,, ,, ,, ,, ...	13·5
Length of head ,, ,, ,, ,, ...	18·5
Depth of head at occiput ,, ,, ,, ,, ...	10
Width of head ,, ,, ,, ,, ...	13·5
Width of interorbital space ,, ,, ,, ,, ...	5
Length of snout ,, ,, ,, ,, ...	6
Distance from end of snout to dorsal fin ,, ,, ...	22
Distance from end of snout to root of pectoral fin ,, ...	17·3
Distance from end of snout to root of pelvic fin in hundredths of length	44·5
Distance from end of snout to anterior root of anal fin in hundredths of length	63
Distance from last anal ray to root of caudal fin in hundredths of length	22
Height of longest dorsal ray in hundredths of length ...	11
Height of longest anal ray ,, ,, ,, ,, ...	11
Length of caudal fin ,, ,, ,, ,, ...	14·8
Length of pectoral fin ,, ,, ,, ,, ...	12·3
Length of pelvic fin ,, ,, ,, ,, ...	7·4
Length of adipose fin ,, ,, ,, ,, ...	31·2
Depth of adipose fin ,, ,, ,, ,, ...	4
Base of anal fin ,, ,, ,, ,, ...	18·5
Number of rays in dorsal fin	15
Number of rays in anal fin	13
Number of rays in pectoral fin	17
Number of rays in pelvic fin	7
Number of long rays in caudal fin	20

The single spines of the dorsal and of the pelvic fins are round, smooth and hyaline, but that of the pectoral fin is flat and striated.

The species superficially resembles *Amblyceps marginatus* Günther, collected by Mr. Pratt in mountain streams running into the Mīn River in the province of Sze-chuen in China, but it differs in possessing a shorter head, in being of a lesser depth, in having the upper jaw longer instead of shorter than the lower jaw, in having a longer adipose dorsal and shorter barbels, in having corrugated folds of skin on the ventral side, and also in the position of the fins and in proportions. The colouration is also different; in particular the new species does not possess the broad whitish border round the margins of all the fins. It resembles *A. marginatus* in having a subtruncated caudal, and a short pelvic fin not reaching the anal. The widely distributed Indian species *Amblyceps mangois* (H.B.)—hitherto the sole representative of the genus in the continent of India—differs from the new species in having a prominent lower jaw, a divided caudal fin, longer barbels with non-dilated roots, a smooth ventral surface, a shorter and higher adipose fin and in the number of fin-rays as well as in proportions.

The type specimen is 81 mm. in length without the caudal fin and is entered in the register of the Zoological Survey of India under No. 9736/1. It was collected by Dr. Murray-Stuart of the Geological Survey of India from a mountain stream in the Putao Plains on the northern Frontier of Upper Burma in the month of February, 1918.

Amblyceps mangois (Hamilton Buchanan).

1822. *Pimelodus mangois*, Hamilton Buchanan, *Fish. Ganges*, pp. 199 and 379.
1842. *Pimelodus anisurus*, M'Clelland, *Calcutta Journ. Nat. Hist. Art Sci.*, II, p. 583.
1842. *Pimelodus indicus*, *Id.*, *ibid.*, p. 584.
1853. *Pimelodus mangois*, Bleeker, *Verh. Batavia Gen.*, XXV, p. 58.
1858. *Amblyceps caecutiens*, Blyth, *Proc. Asiat. Soc. Bengal*, XXVII, p. 282.
1860. *Amblyceps tenuispenis*, *Id.*, *ibid.*, XXIX, p. 153.
1864. *Amblyceps caecutiens*, Günther, *Cat. Fish. Brit. Mus.*, V p. 190.
1864. *Amblyceps tenuispinis*, *Id.*, *ibid.*
1864. *Amblyceps mangois*, *Id.*, *ibid.*
1869. *Amblyceps mangois*, Day, *Proc. Zool. Soc.*, p. 524.
1871. *Akysis kurzii*, Day, *ibid.*, p. 704.
1877. *The Mangoi*, Hamilton Buchanan, *Stat. Act. Bengal*, XX, p. 60.
1877. *Amblyceps mangois*, Day, *Fish. Ind.*, p. 490, pl. cii, fig. 6, and pl. cxvii, fig. 1.
1889. *Amblyceps mangois*, *Id.*, *Faun. Brit. Ind. Fish.*, I, p. 123, fig. 52.
1890. *Amblyceps mangois*, Vinciguerra, *Ann. Mus. civ. Stor. Nat. Genova* (ser. 2), IX, p. 196.
1893. *Amblyceps mangois*, Boulenger, *Ann. Mag. Nat. Hist.*, (ser. 6), XII, p. 200.
1913. *Amblyceps mangois*, Chaudhuri, *Rec. Ind. Mus.*, VIII, p. 252.

Two figures, one in outline from above and the other a side view in colour, are in existence on plate ix of Hamilton Buchanan's

Manuscript Drawings[1] now in the possession of the Asiatic Society of Bengal. The name "*Pimelodes Manggoi*" appears on the back of this plate in Hamilton Buchanan's handwriting. Subsequently he said of this very fish, "The Mangoi is a small very ugly Pimelode"[2] in his manuscript reports on the statistical enquiry of Bengal districts in which he was engaged from 1807 to 1813. As the type of his *P. mangois* has been lost, or at least cannot be traced, and as the description in the *Fishes of the Ganges* is not illustrated, this manuscript drawing is of additional value, as it is the protograph of the species. The type specimens were found in tanks in Northern Bihar and also probably in the R. Kusi near Nathpur.

There are only two specimens in the collection. They measure 41 mm. and 38 mm. in length. Both were secured from hill streams in the Putao Plains.

Distribution.—Fresh waters of India and Burma usually on or near the hills, including the Himalayas from Kangra to Darjiling, Ludhiana, the Jumna (for some considerable distance from the hills), Bihar districts, a stream south of Yembung (Abor country), Nampandet (Southern Shan States), Pegu and Moulmein; also the Cabul River at Jelellabad.

Genus **Erethistes**, Muller and Troschel.

Erethistes asperus (M'Clelland).

(Plate XXII, figs. 2, 2*a*, 2*b*).

1844. *Pimelodus asperus*, M'Clelland, *Calcutta Journ. Nat. Hist. Art. Sci.*, IV p. 404. pl. xxiv, fig. 2.
1864. *Hara aspera*, Günther, *Cat. Fish. Brit. Mus.*, V, p. 189.
1873. *Hara aspera*, Bleeker, *Ned. Tijdschr. Dierk.*, IV p. 125.

It was Günther who first pointed out that the genus was allied to *Sisor*.[3] The original description of the species by M'Clelland is very defective, and his figures even more so. M'Clelland also miscalculated the number of barbels, mentioning only six in place of eight, probably disregarding the nasal barbels which are not very conspicuous. Günther's corrections and additions, though not of great importance, enable one to recognize the species. Any attempt at redescription, however, should be postponed till specimens can be obtained from the neighbourhood of Chusan. M'Clelland also made a mistake in assigning this freshwater fish to estuaries.[4] The species has not been found previously within Indian limits.

Two specimens were obtained from Tanja, measuring 33 mm. and 31 mm. respectively. The smaller one is, however, damaged. Three figures of the larger specimen are supplied and the actual

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[1] Chaudhuri, *Mem. Ind. Mus.*, V, p. 444 and foot-note.
[2] Hunter, *A Statistical Account of Bengal*, XX, p. 60.
[3] Günther, *Cat. Fish. Brit. Mus.*, V, p. 293.
[4] M'Clelland, *Calcutta Journ. Nat. Hist. Art. Sci.*, IV, p. 395.

measurements of both specimens are given below for reference. The mouth is inferior. The lip is lobate and reflected and spreads continuously round the mouth so as to form a broad flat sucker. The teeth in the jaws are villiform in broad bands. The bases of the maxillary barbels are dilated; the mandibular barbels are short, round and thick, the surface of these barbels being studded with closely set tubules. The posterior nostril is slit-like, while the anterior one is round and terminates in a funnel-like structure. There are four or five bony tubercles in a horizontal line on each side near the gill-opening below the dorsal spine. The chest is coriaceous with slight corrugations. The body is dark brown in colour, with two white broad transverse stripes made up of white blotches. The anterior band is at the end of the dorsal fin, and the posterior one nearer to the root of the caudal. The pectoral and the pelvic fins are grey marked with black blotches; the caudal fin is greyish-brown. The maxillary barbels are annulated in white and brown while the mandibular barbels are white.

Measurements of specimens:—

Total length (without caudal fin) in millimeters	...	33	31
Length of head including opercular flap ,,	...	10	10
Depth of body ,,	...	10	9
Depth of caudal peduncle ,,	...	4	3·5
Length of snout ,,		6	5·5
Depth of head at occiput ,,	...	6	6
Width of head ,,	...	8·5	8
Width of interorbital space ,,	...	4	3·5
From tip of snout to anterior limit of dorsal fin ,,	...	10	10
Height of dorsal spine ,,	...	6	5
,, of longest dorsal ray ,,	...	8	8
Length of pectoral fin ,,	...	11	10
,, of pelvic fin ,,	...	6	6
Base of anal fin ,,	...	4·5	4·5
Height of anal fin ,,	...	6	6
From tip of snout to root of pectoral fin ,,	...	8	8
From tip of snout to root of pelvic fin ,,	...	18	17
From tip of snout to anterior end of anal fin ,,	...	22	22
From tip of snout to anal opening ,,	...	21	21
Number of rays in the dorsal fin ...	...	11·5	11·5
,, ,, ,, pectoral fin ...	...	1·7	1·7
,, ,, ,, pelvic fin ...	...	8	8
,, ,, ,, anal fin ...	...	1·9	1·9

Distribution.—Upper Burma (N. Frontier); China (Chusan).

Genus **Exostoma**, Blyth.

Exostoma vinciguerrae, Regan.

1890. *Exostoma labiatum* (*non* M'Clelland), Vinciguerra, *Ann. Mus. civ. Stor. Nat. Genova* (ser. 2), IX, p. 252.
1905. *Exostoma vinciguerrae*, Regan, *Ann. Mag. Nat. Hist.* (ser. 7), XV p. 184.

There are two specimens in the collection, one measuring 56 mm., from the Putao Plains and another measuring 45 mm. from the Nam-Yak river at Tanja. The smaller specimen is damaged and distorted. From the measurements, etc. of the bigger specimen

it appears to be *Exostoma vinciguerrae*, a species (a single specimen) which was first collected by the late Leonardo Fea in the Khakhyen (Kachin) Hills, Upper Burma, but was wrongly identified by Vinciguerra as *E. labiatum* (M'Clelland). Vinciguerra mistakenly thought that it extended the distribution of *E. labiatum*, which was known only from Upper Assam (Mishmi). The type of M'Clelland's *E. labiatum* is in the British Museum (Griffith's collection).

In both the specimens the under surface of the flat spines of the pectoral and pelvic fins is finely striated, suggesting adhesive properties.

Distribution.—Upper Burma: Khakhyen Hills and Putao Plains.

Genus **Pseudecheneis**, Blyth.

Pseudecheneis sulcatus (M'Clelland).

1842. *Glyptosternon sulcatus*, M'Clelland, *Calcutta Journ. Nat. Hist.*, II, p. 587, pl. vi, figs. 1, 2 and 3.
1860. *Pseudecheneis sulcatus*, Blyth, *Proc. Asiat. Soc. Bengal*, p. 134.
1864. *Pseudecheneis sulcatus*, Günther, *Cat. Fish. Brit. Mus.*, III, p. 264.
1877. *Pseudecheneis sulcatus*, Day, *Fish. Ind.*, p. 500, pl. cxvi, fig. 1.
1889. *Pseudecheneis sulcatus*, *Id.*, *Faun. Brit. Ind. Fish.*, I, p. 107, fig. 44.
1890. *Pseudecheneis sulcatus*, Vinciguerra, *Ann. Mus. Civ. Stor. Nat. Genova* (ser. 2), IX, p. 252.
1913. *Pseudecheneis sulcatus*, Chaudhuri, *Rec. Ind. Mus.*, VIII, p. 255.

There is one specimen from the Putao Plains measuring 93 mm. in length without the caudal fin. The barbels on the ventral side are short and thick and their surface is broken up into tubules. The lips are lobulated and expanded with a suctorial mouth. The spines of the pectoral and the pelvic fins are flat and expanded and are covered with thick skin. The under surface of these flat spines is finely striated, converting these fins also into an additional adhesive apparatus. The conspicuous adhesive disk on the chest is oval and is made up of sixteen thick and broad transverse folds with a broad margin; posterior to this apparatus the skin over the anterior portion of the abdomen is loose and corrugated in finer folds. The gill-opening is not entirely confined to the dorsal side as in *Exostoma*, but continues just a little on the ventral surface to the border of the transverse folds.

Distribution.— Darjeeling; Khasi Hills; Yembung (Abor country); and Khakhyen (Kachin) Hills, Upper Burma.

Genus **Aborichthys**, Chaudhuri.

Aborichthys kempi, Chaudhuri.

1913. *Aborichthys kempi*, Chaudhuri, *Rec. Ind. Mus.*, VIII, p. 245, pl. vii, figs. 1, 1*a* and 1*b*,

There are two specimens in the collection, measuring 82 mm. and 80 mm. in length, obtained from hill streams near Tanja. The two specimens differ slightly from one another and from the

type in colouration and some other particulars. The ground colour of the body of the longer fish is greyish-white. The obliquely transverse dark bands anterior to the dorsal fin are very narrow, but those below the fin are broader and posterior to the dorsal fin the stripes are replaced by irregular blotches. The ocellus at the upper corner of the root of the caudal fin is intensely black. The colour of the two limiting bands of alternate black and white round the free border of the caudal fin is somewhat diffused. In the smaller specimen the colour of the upper side of the head is not marbled, as is usually the case in the species, but is of a uniform dark brown, and the ground colour of the body is dirty brown to black. There are no transverse stripes on the sides in front of the dorsal fin. Below the dorsal fin and in front of the pelvic fins there are some dark but faint transverse stripes, very narrow and of diffused colouration. There are no transverse stripes behind the dorsal fin. The caudal fin has two bright white bands, both broad, one at the root and the other just interior to the terminal black band round the free end of the fin. The ocellus at the upper corner of the root of the caudal fin is just as in the longer fish. The dorsal fins in both the specimens bear three black bands made up of black dots. This fish may belong to a distinct race if not a new species.

Distribution.—Egar stream, between Renging and Rotung, the Dihang River near Yembung and the Sirpo River near Renging in the Abor country; mountain streams in the Garo Hills, Assam; and similar streams near Tanja, Putao, in Upper Burma.

Genus **Nemacheilus**, Hasselt.

Nemacheilus botia (Hamilton Buchanan).

1822. *Cobitis botia*, Hamilton Buchanan, *Acct. Fish. Ganges*, pp. 350, 394.
1822. *Cobitis bilturio*, *Id.*, *ibid.*, pp. 358 and 395.
1846. *Cobitis bilturio*, Cuvier and Valenciennes, *Hist. Nat. Poiss.*, XVIII, p. 35.
1846. *Cobitis botia*, *Id.*, *ibid.*, p. 72.
1839. *Cobitis bimucronata*, M'Clelland, *Asiat. Researches*, XIX, pp. 304 and 433, pl. li, fig. 4.
1839. *Cobitis scaturigina*, *Id.*, *ibid.*, pp. 308 and 443, pl. liii, fig. 6.
1839. *Cobitis ocellata*, *Id.*, *ibid.*, p. 436, pl. li, fig. 6.
1839. *Somileptes unispina*, Swainson, *Lardner's Cab. Cyclop. Nat. Hist.* (*Fish. Amph. Rep.*), II, p. 311.
1841. *Cobites mooreh*, Sykes, *Trans. Zool. Soc.*, II, p. 366.
1853. *Cobitis botia*, Bleeker, *Verh. Bat. Gen.*, XXV p. 70.
1853. *Cobitis bilturio*, *Id.*, *ibid.*
1863. *Cobitis botia*, Bleeker, *Versl. Akad*, *Amsterdam*, XV, p. 42.
1868. *Nemachilus urophthalmus*, Günther, *Cat. Fish. Brit. Mus.*, VII, p. 348.
1868. *Nemachilus botia*, *Id.*, *ibid.*, p. 349.
1869. *Nemacheilus botia*, Day, *Proc. Zool. Soc.*, p. 382.
1877. *Nemacheilus botia*, Day, *Fish. Ind.*, p. 614, pl. clvi, fig. 5.
1877. *Nemacheilus aureus* (var.), *Id.*, *ibid.*, p. 614, pl. clvi, fig. 4.
1889. *Nemachilus botius*, *Id.*, *Faun. Brit. India*, *Fish.*, I, p. 227.
1893. *Nemachilus botia*, Boulenger, *Ann. Mag. Nat. Hist.* (ser. 6), XII, p. 203.
1918. *Nemachilus botia*, Annandale, *Rec. Ind. Mus.*, XIV, p. 35.

There is only one specimen measuring 72 mm. in length without the caudal fin, collected from a stream near Tanja. The preorbital has no projection wholly free and movable nor is it entirely concealed by the skin, but there is a narrow concave slit or groove just underneath it, commencing from below the middle of the eye and reaching to about the middle of the snout. The eyes are in the middle of the head and the anterior root of the dorsal fin is equidistant from the tip of the snout and the root of the caudal fin. The distance of the vent from the snout is sixty-one in hundredths of its length without the caudal fin. The caudal fin is almost square-cut and slightly emarginate. The ground colour of the body is dull grey or dirty white with fourteen broken-up transverse bands of dark brown above the lateral line and seven or eight wedge-shaped transverse markings below it, alternating with the bands above. There are four transverse dark brown bands on the caudal fin instead of five, and these bands are rather wavy and not at all oblique or > shaped as is usual in the species. It approaches nearer to the variety *N. aureus*, Day than to the typical form. M'Clelland's figures, *viz.* figs. 4 and 6 of plate li and fig. 6 of plate liii, are only imperfect reproductions of three figures in plates numbered 49, 50 and 53 of the manuscript drawings of Hamilton Buchanan.[1] These figures are labelled *Cobitis bilturi*, *Cobitis botya*, and *Cobitis scaturigina* in Buchanan's handwriting. The name on plate 53 of the collection of MSS. drawings in the possession of Asiatic Society of Bengal, however, has been inadvertently cut off by the binder. Günther considered *N. scaturigina* to be a doubtful species of the genus.[2]

Distribution.—Punjab; Sind; Poona; Madras, as far south as the R. Kistna; Orissa; Bihar; Bengal; Assam; Burma, Southern Shan States and North-Eastern frontier; Ceylon.

Genus **Semiplotus**, Bleeker.

Semiplotus cirrhosus, Chaudhuri, sp. n.

(Plate XXII, figs. 3, 3*a*.)

Bleeker, who founded the genus *Semiplotus* on a single Assamese species, *Cyprinus semiplotus*, M'Clelland, attributed to the genus among several other characters the possession of a knob at the symphysis and the absence of barbels. The new species, however, has two maxillary barbels and is without any knob at the symphysis of the lower jaw. In all other respects it so very naturally fits into the genus that it would be going against all sound principles not to include it. The practice of multiplying the number of genera should, as far as possible, be discouraged, as it only makes the path of systematic study unnecessarily difficult.

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[1] Chaudhuri, *Mem. Ind. Mus.*, V, p. 444 (foot-hote).
[2] Günther, *Cat. Fish. Brit. Mus.*, VII, p. 347.

The fish is broad and deep with a round belly and thick head. The dorsal profile is highly convex: from the anterior root of the dorsal fin it suddenly slopes towards the snout, which is broad, blunt and moderately round and thick; the posterior portion of the dorsal profile runs in a more gentle curve to the caudal peduncle where, about the middle of the peduncle, it is slightly concave. Beyond this the curvature is again convex to the upper corner of the root of the caudal fin. The ventral profile, with its lowest point at the root of the pelvic fin, nearly corresponds to the curvature of the dorsal profile but with less abruptness in the frontal portion from the root of the pelvic fin towards the lower jaw. The curvature from this point is still less convex than the dorsal profile, towards the caudal peduncle.

The mouth is terminal and inferior, and its opening is wide; the upper jaw is thick and deep with a movable upper lip; the lower jaw is extremely thin with a horny or cartilaginous plate with a little prominence in the middle. On the broad and obtuse snout there is a row of open pores four in number, two on each side. The maxillary extends nearly to below the front of the eye and there are two maxillary barbels. On each side below the preorbital there is a narrow slit. The eye is nearly in the middle of the head and the diameter of the orbit is contained nearly three times in the length of the head. The latter is contained three and two-third times in the total length without the caudal fin. The length of the barbel is equal to that of the snout, which is slightly less than the length of the orbit. The gill openings are almost restricted to the sides and the gill membranes are confluent with the skin of the isthmus; the surface underneath the lower jaw and below the neck from the chin to the isthmus appears to be in part corrugated; immediately below the lower jaw it is somewhat fleshy and spongy probably with adhesive function.

The height (the greatest depth at the anterior root of the dorsal fin) is contained two and four-fifth times in the total length without the caudal fin and the least depth of the caudal peduncle is contained nearly seven times in that length.

The anterior end of the dorsal fin, though nearly equidistant from the tip of the snout and the root of the caudal fin, is slightly nearer to the snout. There are thirteen scales in front of the dorsal fin and ten between the last ray at its posterior end and the root of the caudal fin. There are three spines, all entire, and twenty-five branched and divided rays. The length of the longest dorsal ray is contained about four times in the total length. The distance between the tip of the snout and the superior root of the pectoral fin is contained three and a half times and the length of the fin about four times; there are altogether fifteen rays in the fin which almost reaches the root of that of the pelvic.

The tip of the snout and the root of the caudal fin are nearly equidistant from the root of the pelvic fin which has nine rays; the length of the rays is contained five times in the total length

and they reach as far as the vent; the ends of these rays are soft, thin, slender and almost silky. The anal fin has two spines and nine rays and there are seven scales betwen the last anal ray and the root of the caudal fin; the height of the anal fin is contained seven times in the total length. The caudal fin is deeply lobed and contains twenty long rays; the length of the longest rays of the borders is contained three times and that of the short middle rays seven times in the total length; the lobes of the caudal fin are equal.

The scales are fairly large and are nondeciduous. There are thirty-three perforated scales in the lateral line, which is complete and runs concave to the dorsal profile from the gill opening to below the end of the dorsal fin and thence straight about the middle of the fish to the root of the caudal fin. Below the anterior root of the dorsal fin there are seven transverse rows of scales above the lateral line and five transverse rows between the lateral line and the mid-ventral line. There are four rows of scales between the lateral line and the pelvic fin. The number of scales round the narrowest part of the caudal peduncle is eleven.

Measurements in hundredths of total length without caudal fin :—

Depth of body	36·5
Depth of caudal peduncle	14·3
Length of head	26·8
Depth of head	24·6
Width of head	17
Length of snout	7·3
Diameter of orbit	9·7
Width of interorbital space	12·2
Width of mouth	12·2
Length of maxillary	7·3
Length of barbel	7·3
Distance from tip of snout to anterior root of dorsal fin	48·78
Height of longest dorsal rays	24·6
Distance from tip of snout to root of pectoral fin	29·27
Length of pectoral fin	24·6
Distance from tip of snout to root of pelvic fin	51·2
Length of pelvic fin	19·5
Distance from tip of snout to vent	68·3
Distance from tip of snout to anterior root of anal fin	73·2
Height of longest anal rays	17
Length of caudal peduncle	17
Width of root of caudal fin	18
Length of longest rays of caudal fin	34·1
Length of shortest middle rays of divided caudal fin	14·6
Total length without caudal fin in mm.	41

The colour of the body of the fish in spirit is steel blue, but lighter in the belly. The upper edge of the orbit is black and the dorsal edge and the upper side of the head are dark; the fins are dull white with dark edges.

There are only two other species belonging to the genus: *S. semiplotus* (M'Clelland) from Assam and Burma and *S. modestus*, Day, from the hill ranges near Akyab. The new species differs considerably from both of them in possessing barbels, and in not being provided with a knob at the symphysis of the lower jaw—two characters which originally were thought to be of generic im-

portance as already noticed. The species agrees with *S. semiplotus* in having the last osseous spine smooth and entire, and differs in this respect from *S. modestus*, in which the last spine is serrated; on the other hand it agrees with the latter in having the lateral line concave to the dorsal profile and not almost straight as in *S semiplotus*. It has on the snout a row of pores like *S. semiplotus*, but the number of pores is four in place of eight in *S. semiplotus*. There are differences in proportion and colouration also. Both the previously known species are denizens of hilly tracts, though examples of *S. semiplotus* have been found as far down as Goalpara in the valley of the Brahmaputra. Griffith, however, observes that smaller examples of *S. semiplotus* are usually found near rapids. The adhesive apparatus below the chin, and further posteriorly down to the isthmus, is very interesting and significant of the habits of the new species if not of the genus.

There is only one specimen, the holotype, collected by Dr. Murray Stuart in February 1918, from a hill stream in the Putao Plains (Hkamti Long of the old maps), Upper Burma. It is entered in the register of the Zoological Survey of India under No. 9747/1.

Genus **Barbus**, Cuvier.

Barbus stoliczkanus, Day.

1869. *Barbus m'clellandi*, Day, *Proc. Zool. Soc.*, p. 619.
1871. *Barbus (Puntius) stoliczkanus, Id., Journ. Asiat. Soc. Bengal*, XL., p. 328.
1877. *Barbus stoliczkanus, Id., Fish. India*, p. 577, pl. cxliv, fig. 8.
1889. *Barbus stoliczkanus, Id., Faun. Brit. Ind. Fish.*, p. 326.
1893. *Barbus stoliczkanus*, Boulenger, *Ann. Mag. Nat. Hist.* (ser. 6), XII, p. 202.
1918. *Barbus stoliczkanus*, Annandale, *Rec. Ind. Mus.*, XIV, p. 35.

There is only one specimen measuring 38 mm. collected in a hill stream near Tanja. The anal fin is rolled on itself and looks like a tuft at the free-end. The colouration is very well preserved.

The first name cited above is preoccupied.[1]

Distribution.— Burma (Pegu, Moulmein, Shan States and Putao Plains).

Genus **Danio**, Hamilton Buchanan.

Danio aequipinnatus (M'Clelland).

1839. *Perilampus aequipinnatus*, M'Clelland, *Asiat. Researches*, XIX., p. 393, pl. lx, fig. 1.
1853. *Leuciscus aequipinnatus*, Bleeker, *Verh. Bat. Gen.*, XXV, p. 66.
1858. *Leuciscus lineolatus*, Blyth, *Journ. Asiat. Soc. Bengal*, p. 219.
1860. *Perilampus affinis, Id., ibid.*, p. 163.
1868. *Danio micronema*, Günther, *Cat. Fish. Brit. Mus.*, VII, p. 282.
1868. *Pteropsarion aequipinnatus, Id., ibid.*, p. 285.
1877. *Danio aequipinnatus*, Day, *Fish. Ind.*, p. 596. pl. cl, fig. 6.
1889. *Danio aequipinnatus, Id., Faun. Brit. Ind., Fish.*, I, p. 356, fig. 111.
1890. *Danio aequipinnatus*, Vinciguera, *Ann. Mus. Civic. Stor. Nat. Genova* (ser. 2), IX, p. 304.

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[1] Cuvier and Valenciennes, *Hist. Nat. Poiss.*, XVI (1842), p. 390.

1893. *Danio aequipinnatus*, Boulenger, *Ann. Mag. Nat. Hist.* (ser. 6), XII, p. 203.
1913. *Danio aequipinnatus*, Chaudhuri, *Rec. Ind. Mus.*, VIII, p. 252.
1917. *Danio aequipinnatus*, Annandale, *Note on Fisheries Inlé Lake*, p. 3.
1918. *Danio aequipinnatus*, *Id.*, *Rec. Ind. Mus.*, XIV, pp. 35, 211.

There is only one specimen, from a hill stream in the Putao Plains, measuring 56 mm. There are a series of rows of small wart-like beads on and around the chin and below the neck. The body is more dusky than usual; the colour appears to have faded though some of the longitudinal stripes are conspicuous. There is a round white blotch on the upper anterior corner of the opercle.

Distribution.— The Himalayas (Darjiling); Assam (Garo Hills, Naga Hills, Sadiya, Yembung); Burma (Tenasserim, Shan States); Deccan; and Ceylon.

Genus **Channa**, Gronovius.

Channa burmanica, Chaudhuri, sp. n.

(Plate XXII, figs. 4, 4*a*, 4*b*).

The body is round in front but is very much compressed behind the vent, which is situated about the middle. The dorsal profile from the anterior root of the dorsal fin slopes gently to the snout. The ventral profile, which is more convex in the region of the lower jaw than the upper, continues parallel to the dorsal profile as far as the vent, behind which both profiles continue in a straight line but converge towards the caudal peduncle, about the middle of which there is a slight concavity in both.

The height of the body at the anterior end of the dorsal fin is contained six and a half times in the total length without the caudal fin, and the width at the same region six and one-fourth times; the height about the middle of the caudal peduncle is contained ten and a half times and the width at the same part twenty-six and a half times in the total length.

The head is wide and is greatly depressed; its length is contained nearly four times in the total length without the caudal fin. The depth at the occiput is eight times and the width of the head six and one-third times in the total length. The opening of the mouth continues behind the orbit; the length of the maxillary is contained ten and three-fifth times and the width of the mouth eight and five-sixth times in the total length. The eyes are placed far forward: the diameter of the orbit is equal to the length of the snout and is contained five and three-fifth times in the length of the head. The interorbital space is very flat and its width is twice as long as the length of the snout. There are two nasal tubes over the tip of the snout, slightly longer than half the diameter of the orbit. The gular plate is rather long and narrow, rounded in front and notched behind, its length being contained six and a half times in the total length and its breadth five times in the width of the head. Round the gular plate on the margin of the gill membranes, which continue close to the chin,

there is a series of openings of mucuous glands, the largest of which is far forward and is directly under the chin. The surface of the posterior portion of the gular plate has slight corrugations which may possess some adhesive function; in places on it, as well as on the edge of the gill membrane round it, there are coriaceous patches which probably help the fish to stick against the force of the current.

There are fifteen scales in front of the dorsal fin (*i.e.* from the snout to the anterior end of that fin), and six scales between the hind margin of the orbit and the pre-opercle; there are the same number of scales between the last ray of the dorsal fin and the root of the caudal. The number of rays in the dorsal fin is thirty-eight, none of which are divided; the height of the longest ray (which is the seventh from the last) is contained eight times in the total length. The distance between the tip of the snout and the root of the pectoral fin is contained three and a half times in the total length, and the length of the pectoral fin five times. The latter has twelve flat rays. The anal fin commences one scale behind the vent and has twenty-eight undivided rays; the seventh ray from behind being the highest—nearly as high as the highest ray in the dorsal fin. The length of the caudal peduncle is equal to its height; there are nine scales between the last ray of the anal and the root of the caudal and eighteen scales round the caudal peduncle. The caudal fin is fan-shaped and consists of twelve rays; the middle rays are the longest; their length is contained nearly six times in the total length and they are just twice as long as the height of the root of the caudal fin.

There are fifty-one scales in the lateral line of which fifty scales are perforated; the line bends down after twelve scales and then, with one unperforated scale intervening, continues to the root of the caudal with thirty-seven perforated scales. In the transverse series there are three rows of scales above the anterior twelve perforated scales and seven rows below this and above the mid-ventral line. In the posterior portion of the lateral line there are four transverse rows above and five and half rows below. There are twenty scales in the mid-ventral line between the posterior end of the gular plate and the vent.

Measurements in hundredths of total length without caudal fin:—

Depth of body	15
Depth of caudal peduncle	10·3
Length of head	26·4
Depth of head	13·2
Width of head	18·8
Length of snout	4·7
Diameter of orbit	4·7
Width of interorbital space	9·4
Distance from tip of snout to anterior root of dorsal fin	35
Height of longest dorsal rays	12·2
Distance from tip of snout to root of pectoral fin	28·3
Length of pectoral fin	17
Distance from tip of snout to vent	49
Distance from tip of snout to anterior root of anal fin	50·94
Height of longest anal rays	11·3

Length of caudal peduncle	...	...	... 10·38
Width of caudal peduncle	...	...	... 3·8
Length of longest rays of caudal fin	...	...	... 17
Height of root of caudal fin	...	...	... 8·5
Total length without caudal fin in mm.		...	... 106

The colour of the head and of the sides is dark brown; the ventral surface is dull white. In the young there are transversely oblique stripes of a deeper shade on the light brown or grey colour on the sides of the body. The pectoral fin is alternately variegated in bright white and black broad bands with an annular white zone round the black root of the fin; the caudal fin is alternately banded in white and black in their transverse stripes. There is no ocellus in the upper corner of the root of the caudal fin; the extreme ends of all the rays of the dorsal and anal fins are tipped with pure white.

This is the first time that any fish belonging to the genus *Channa* is reported from the Indian continent. The only species hitherto known from the Indian Region is *Channa orientalis*, Bloch and Schneider,[1] which is found in Ceylon and China. Two other names in the same genus (*C. ocellata*, Peters[2] and *C. formosana*, Jordan and Evermann[3]) are in all probability synonyms of one another and priority decides for *C. ocellata*. *Ophicephalus apus*, Canestrini,[4] is in reality a *Channa* and differs very little from *C. orientalis*. *Channa burmanica* differs widely from these two hitherto known species in proportions, in the number of rays in the fins, in the arrangement and number of scales in the lateral line and other parts, as well as in colouration.

There are altogether four specimens in the collection, two of which, measuring 106 mm. and 79 mm. in length, are from the bed of the Sen-Bin-Ti, which further down becomes the Nam-Ti-Sang; the other two measure 45 mm. and 43 mm. in length; one is from a hill stream in the Putao Plains (Hkamti Long). The larger of these two is very much damaged. The specimen 106 mm. long from the river Sen-Bin-Ti is the holotype, and is entered in the register of the Zoological Survey of India under No. F 9755/1.

Genus **Badis**, Bleeker.

Badis badis (Hamilton Buchanan).

1822. *Labrus badis*, Hamilton Buchanan, *Acct. Fish. Ganges*, pp 70 and 368, pl. xxv, fig. 23.
1853. *Badis buchanani*, Bleeker, *Verh. Bat. Gen*, XXV, p. 106, pl. ii, fig. 3.
1861. *Badis buchanani*, Günther, *Cat. Fish. Brit. Mus.*, III, p. 367.
1875. *Badis buchanani*, Day, *Fish. Ind.*, p. 128, pl. xxxi, fig. 6.
1876. *Badis buchanani*, Bleeker, *Arch. Neerl. Sc. Nat.*, XI, p. 318.
1877. *Galpuri* (*Labrus badis*), Hamilton Buchanan, *Stat. Acct. Bengal* XX, p. 40.

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[1] Bloch and Schneider, *Syst. Ich.*, p. 496, pl. xc, fig. 2 (1801).
[2] Peters, *Monat. Preuss. Akad. Wissen. Berlin*, 1864, p. 392 (1865).
[3] Jordon and Evermann, *Proc. U.S. Nat. Mus.*, XXV, pp. 316, 331 and 332, fig. 11 (1903).
[4] Canestrini, *Archiv. Zool. Anat. Fisiol. Genova*, I, p. 77, pl. iv, fig. 7 (1861).

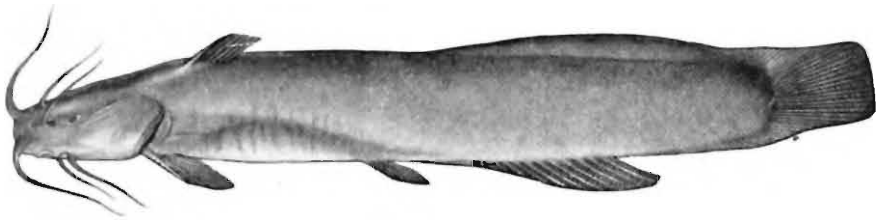
1877. *Dhalo* (*Labrus badis*), *Id.*, *ibid.*, pp. 87 and 97.
1889. *Badis buchanani*, Day, *Faun. Brit. Ind. Fish*, II, p. 80, fig. 38.
1890. *Badis buchanani*, Vinciguerra, *Ann. Mus. Civic. Stor. Nat. Genova* (ser. 2), IX, p. 166.
1912. *Badis badis*, Sewell and Chaudhuri, *Ind. Fish. Prov. Util.*, p. 12, fig. 6.
1913. *Badis badis*, Chaudhuri, *Rec. Ind. Mus.*, VIII, p. 256.

There are only three specimens in the collection, two of which are damaged. Their lengths without the caudal fin are 25, 26 and 29 mm. They were collected from hill streams in the Putao Plains.

Distribution.—Fresh water of the hills and plains of India and Burma.

EXPLANATION OF PLATE XXII.

FIG. 1.—*Amblyceps murray-stuarti*, Chaudhuri, sp. nov.
,, 1*a*. ,, ,, dorsal view of head.
,, 1*b*. ,, ,, ventral view of body.
,, 2.—*Erethistes asperus* (M'Clelland).
,, 2*a*. ,, ,, ventral view of head and body.
,, 2*b*. ,, ,, upper and lower jaws, × 4.
,, 3.—*Semiplotus cirrhosus*, Chaudhuri, sp. nov.
,, 3*a*. ,, ,, ventral view of head and chest, × 2.
, 4.—*Channa burmanica*, Chaudhuri, sp. nov., × $\frac{2}{3}$.
,, 4*a*. ,, ,, dorsal view of head, × $\frac{2}{3}$.
,, 4*b*. ,, ,, ventral view of head and body, × $\frac{2}{3}$.



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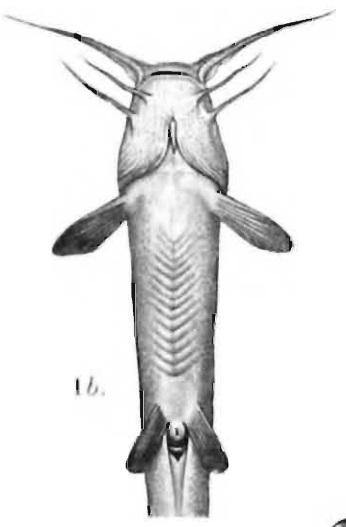

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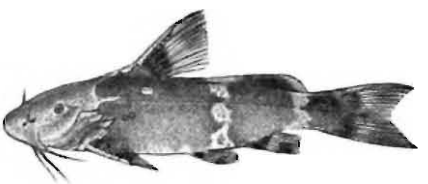
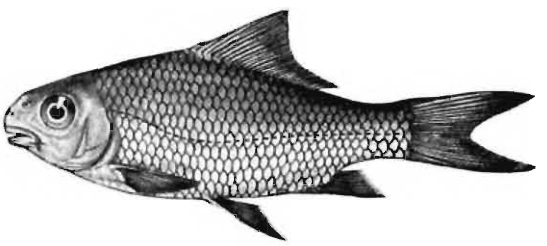


2.

1a.



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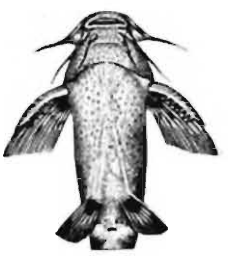

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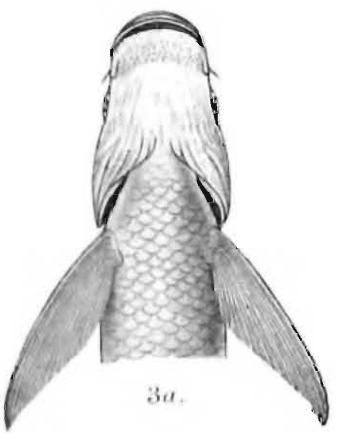
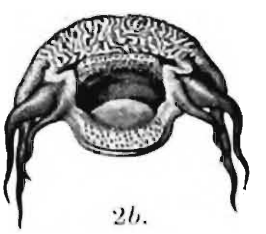


3a.

4a.



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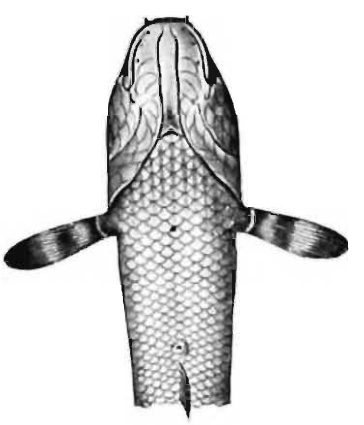

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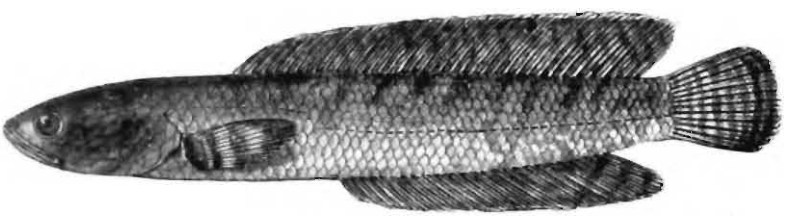

4.

FISH FROM PUTAO (HKAMTI LONG).

A. Chowdhary *del.* Photo.-engraved & printed at the Offices of the Survey of India, Calcutta, 1919

XIX STUDIES ON THE ANATOMY OF INDIAN MOLLUSCA

3. The soft parts of some Indian Unionidae.

By B. Prashad, *D.Sc., Officiating Director of Fisheries, Bengal, Bihar and Orissa, Calcutta.*

Ortmann [1] writing in 1911 about the glochidia of the Unionidae summed up in the following sentence, "I have no doubt that this finally will be a very important systematic criterion, but unfortunately we do not know the glochidia of a single Asiatic species." Since then I have in two papers [2] described the structure of the marsupia and glochidia of the Indian genera *Physunio*, *Parreyssia*, *Lamellidens* and *Indonaia*. The results of my work have amply justified Ortmann's criticism [3] of Simpson's classification,[4] in which shell-characters alone were utilised to a large extent for the classification of the Naiades. On studying the soft parts of the animals of the genera *Physunio*, *Lamellidens*, *Parreyssia* and *Pseudodon* it was found that the position assigned to those genera, from shell-characters only, was quite wrong, while two new genera *Indonaia* and *Balwantia* had to be established for the Indian species hitherto included in the genera *Nodularia* and *Solenaia* respectively.

In my second paper I included a description of the soft parts of the animal of *Indonaia*, but refrained from discussing these in the other genera as Dr. Ekendranath Ghosh was engaged in a study of the comparative anatomy of some of the forms. His results, however, which were published in a recent paper,[5] are far from complete from the point of view of the systematist and many important details are neither mentioned in the text nor shown in the figures. In the present communication I have, therefore, tried to ratify these omissions for the genera dealt with by Ghosh, and have in addition given descriptions of the animals of the genera *Parreyssia* and *Pseudodon*. In dealing with the various genera I have discussed their position in both Simpson's and Ortmann's classifications, and at the end of the paper I have given a key for the identification of these genera based on the soft parts of the animals.

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[1] *Ann. Carnegie Mus.*, VIII, p. 239 (1911-12).

[2] *Rec. Ind. Mus.*, XIV, pp. 183-185, pl. xxii (1918), and *ibid.*, XV, pp. 143-149 (1918).

[3] *Mem. Carnegie Mus.*, IV, pp. 279-347, pls. lxxxvii-lxxxix (1911).

[4] *Proc. U.S. Nat. Mus.*, XXII, pp. 501-1075 (1900).

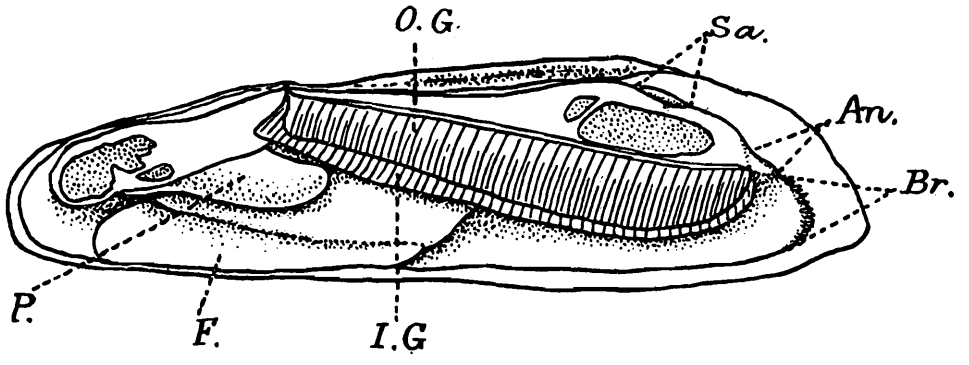
[5] *Rec. Ind. Mus.*, XV, pp. 109-123, pl. xvi (1918).

Balwantia, gen. nov.

Ghosh (*loc. cit.*) has recently described the gross anatomy of the species *Solenaia soleniformis* (Benson) in a comparative way only. Godwin-Austin and Annandale [1] have since added valuable notes on the habits and burrows of the animal and this discussion of the habits has brought out interesting facts about the use of the very large and well-developed foot. On comparison of the anatomy of the Indian species with that of the other known species of the genus *Solenaia*, Conrad, it was found that the former differs materially from the others and must be separated as a distinct genus. The question of the name of this genus is discussed at length below.

Animal:—In accordance with the greatly elongated condition of the shell, the animal (fig. 1) also is drawn out in the antero-posterior axis, as are organs like the gills, palps, foot, etc.

The gills are eight to ten times as long as broad, the inner pair being a little wider than the outer. The inner lamellae of



TEXT-FIG. 1.—Animal of *Balwantia soleniformis*. *An.* = anal aperture; *Br.* = branchial aperture; *F.* = foot; *I.G.* = inner gill; *O.G.* = outer gill; *P.* = palp; *Sa.* = supra-anal.

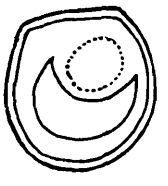
the inner pair are attached to the abdominal sac along more than half of their anterior portion; posteriorly the lamellae of the two sides unite with one another to form the diaphragm, which extends on either side up to a ridge of the mantle that separates the branchial from the anal aperture. Other attachments of the gills are the same as in some of the more primitive genera, *viz.* the outer lamellae of the outer pair of gills are attached to the mantle of either side, while the inner lamellae of the outer pair are attached to the outer lamellae of the inner pair. All the four gills are marsupial and are used for the development of the glochidia. The free margins of the gills do not swell up when the gills are filled with glochidia. The water-tubes are simple, formed of 17-20 gill-filaments each; the number in each gill, however, is variable. The placentae are of the shape of inverted triangles. The palpi are very large elongate-elliptical in outline; the axis of

[1] *Rec. Ind. Mus* XVI, pp. 204-206 (1919).

attachment is rather short. The foot is very large and has a well developed musculature. The mantle has a very much thickened entire margin; near the branchial aperture it has a few papillae developed on its edge. The branchial aperture is large, with two to three rows of large conical papillae; its margin is of a yellowish-brown colour. The anal aperture is about half the size of the branchial; it is quite smooth and much lighter in colour. Separating the branchial from the anal is a well-developed ridge of the mantle; in the living animal the ridges of the opposite sides, meeting each other in the middle, would form a continuation of the diaphragm and completely separate the branchial from the anal aperture. The supra-anal is slightly larger than the anal, while the mantle connection between it and the anal is much larger than either.

The glochidium (fig. 2) may be said to be suboval in outline, with a nearly straight hinge line. It measures ·26 mm. × ·21 mm.

Systematic position:—The species was originally described by Benson [1] as *Anodonta soleniformis*. Lea [2] considered it to be a *Margaron* and redescribed it as *M.* (*Unio*) *bensoni*. Hanley and Theobald,[3] differing from both authors, included it in the African genus *Spatha*. Fischer,[4] after an elaborate discussion of the whole situation, assigned it to the genus *Mycetopus*. Simpson [5] in his monograph separated it from the genus *Mycetopus* and included it, with a number of species from China, Siam, South Eastern Asia and a doubtful one from Australia, in the genus *Solenaia*. Preston [6] has, following Simpson, described it as *S. soleniformis* (Benson); some of his references to the previous works, however, are incorrectly cited. The animal of the Indian species is quite different from that of a species of *Solenaia* described by Fischer (*loc. cit.*, p. 11). I have, therefore, found it necessary to separate the only known Indian species as a new genus, for which the name *Balwantia* is proposed.



TEXT-FIG. 2.—Glochidium of *Balwantia soleniformis*, × 75.

Simpson was right in including the species in the sub-family Unioninae and in the group Exobranchiae, but made a mistake in assigning it to the subgroup Homogenae, because, as has been described above, this species carries the glochidia in all the four gills and should be placed amongst the Tetragenae. Following the later and more natural classification of Ortmann (*loc. cit.*, pp. 224-225) the genus will be placed in the family Unionidae, Swainson, as restricted by Ortmann, and in the sub-family Unioninae.

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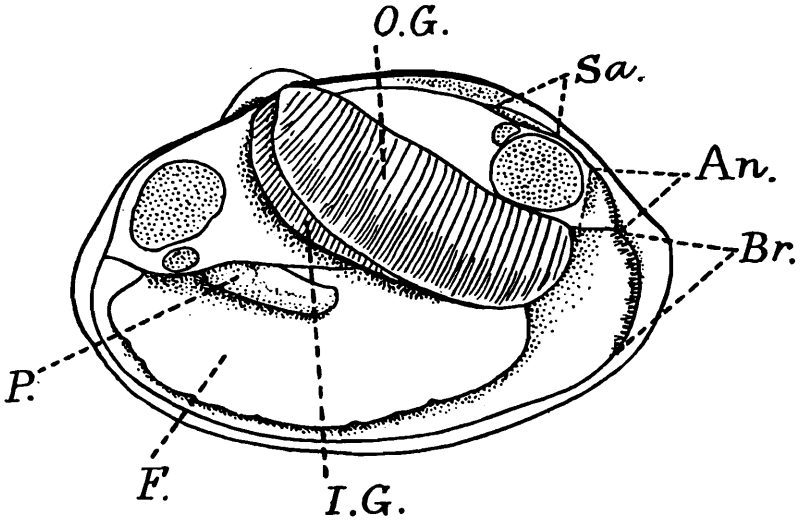
[1] *Journ. Asiat. Soc. Bengal*, V, p. 750 (1836).
[2] Lea, *Syn.*, p. 57 (1870).
[3] *Conch. Ind.*, p. 5, pl. ix, fig. 1 (1876).
[4] *Journ. Conchyliol.*, XXXVIII, pp. 11, 94 (1890).
[5] *Proc. U.S. Nat. Mus.*, XXII, p. 656 (1900).
[6] *Faun. Brit. Ind., Mollusca*, pp. 132-134 (1915).

Parreyssia, Conrad.

Ortmann [1] has described the animals of this genus and of *Lamellidens*. I have unfortunately not been able to see the original papers but have consulted his later publication,[2] in which he has given a fairly complete résumé of his first paper.

The animal (fig. 3) may be described as follows :—The gills are three to five times as long as broad. Anteriorly the outer pair of gills is a little shorter than the inner, so that the margin of the latter projects beyond that of the former. The inner lamellae of the inner pair of gills are connected along more than three fourths of their length to the abdominal sac; the posterior one fourth part unites with the lamella of the opposite side to form the diaphragm ; other connections of the gills are the same as in *Balwantia* described already. All the four gills are marsupial. The margin of



TEXT-FIG. 3.—Animal of *Parreyssia favidens*, reference lettering same as in fig. 1.

the gills, even when full of glochidia, is quite sharp. The water-tubes are simple and the placentae are slightly compressed, elongate structures. The palpi are well developed, sub-triangular with a broad base, along which they are attached to the abdominal mass and have the free outer angle rounded. The mantle has a slightly thickened entire margin. The foot is very large, occupying about half of the shell cavity. The branchial aperture is large with three rows of small pointed papillae of a light brown colour. The anal is less than half the size of the branchial and is marked off from it by a feebly developed ridge of the mantle. The supra-anal is of the same size or a little larger than the mantle connection between it and the anal.

The glochidia [3] are semi-circular or semi-elliptic.

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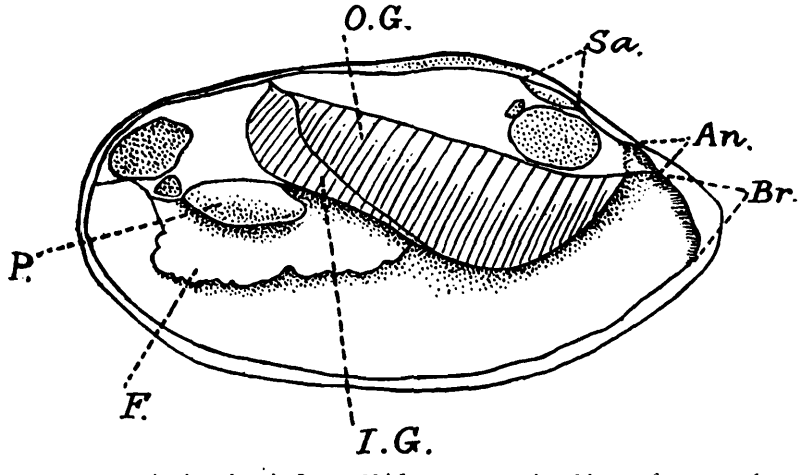
[1] *Nautilus*, XXIII, pp. 139-142 (1910) and XXIV pp. 103-108 (1911).
[2] *Ann. Carnegie Mus.*, VII, pp. 222-365 (1911-12).
[3] *Rec. Ind. Mus.*, XV pp. 145-146 (1918), may be consulted for details.

Lamellidens, Simpson.

The animal (fig. 4) may be described as follows :—The gills are much broader in the posterior than in the anterior half of their length, and the inner pair is broader than the outer throughout. The inner lamellae of the inner pair of gills are attached to the abdominal mass along more than half of their length anteriorly, and posteriorly they are united with one another to form the diaphragm. Only the outer pair of gills are marsupial,[1] the entire length of the gills being filled up with glochidia and the margin of the gills remaining sharp even when they are quite full of glochidia. The water-tubes are simple, and the placentulae are flat elliptic plates, thick and broad above, thin and tapering below. The palpi are rhomboidal with the angles rounded, and are attached along one of the longer sides. The margin of the mantle is entire and slightly thickened beyond the pallial con-



TEXT-FIG. 4.—Animal of *Lamellidens marginalis*, reference lettering same as in fig. 1.

nection. The foot, which is elongate, is not very large. The branchial aperture is comparatively large with two to three rows of well-developed pointed papillae, and is of a brownish colour. The anal is very much smaller than the branchial and has a row of small papillae along the margin. In continuation of the attachment of the diaphragm to the mantle of each side is a feebly developed ridge separating the branchial from the anal aperture. The supra-anal is a little larger than the anal and of about the same size as the mantle connection between the two apertures.

The glochidia are semi-elliptic in outline.

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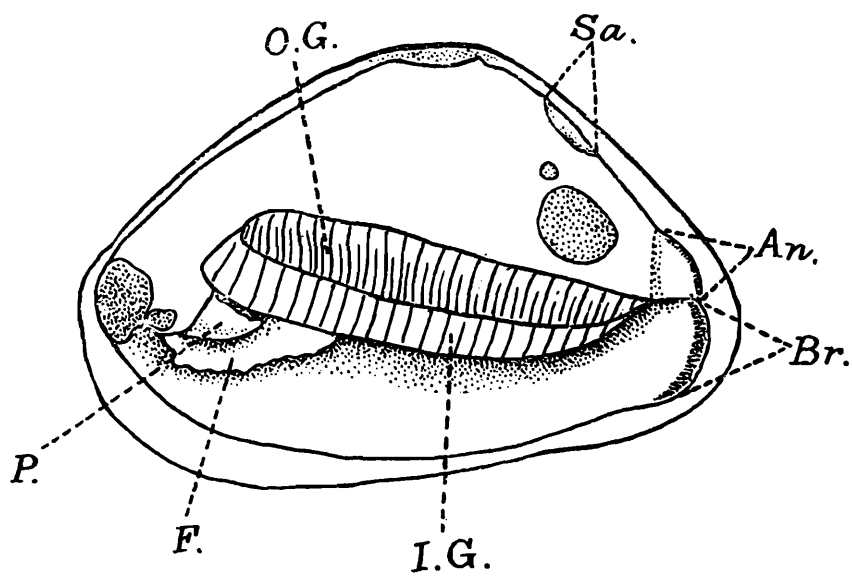
[1] For further details about the marsupium and glochidia see p. 145 of my second paper (*Rec. Ind. Mus.*, XV). Unfortunately there is a typographical error in the statement about the margins of the gills, which reads sharp and distended ' instead of sharp and not distended.'

Physunio, Simpson.

Ghosh (*loc. cit.*, p. 112) has described the gills of the animals of two species of this genus, but the structures are variable.

The animal (fig. 5) may be described as follows :—The gills are much broader in the anterior than the posterior half and the outer pair is much smaller in breadth than the inner, so that the latter projects below it all along. The attachments of the gills are similar to those in *Parreyssia* and *Lamellidens*, except that the portion of the inner lamellae of the inner pair of gills, which is attached to the abdominal sac, is much less than half their length. Only a portion of the outer pair of gills is marsupial, a small anterior and a much larger posterior portion of them remaining unmodified for respiratory purposes; the marsupial part is formed by 11-17 simple water-tubes. The free margin of the marsupial part of the gills in this genus also remains sharp.[1] The outlines of the placentulae



TEXT-FIG. 5.—Animal of *Physunio ferrugineus*, reference lettering same as in fig. 1.

cannot be definitely described, as the glochidial membranes are very loosely attached to one another and a compact structure is not formed. The palpi are triangular with the apex rounded and attached by a broad base. The margin of the mantle is feebly thickened and is entire. The foot is comparatively small in preserved specimens, though it is an important organ for burrowing in the mud.[2] Dr. Annandale tells me that it is capable in life of considerable expansion. The branchial aperture is about one and a half times as large as the anal, and its margin has three rows of elongated tubercles. The mantle ridge separating the branchial from the anal aperture is well developed, but small, owing to the diaphragm extending to very near the margin. The mantle con-

[1] Detailed description of the marsupium, etc., is given in my paper *Rec. Ind. Mus.*, XIV, pp. 183-185 (1918).

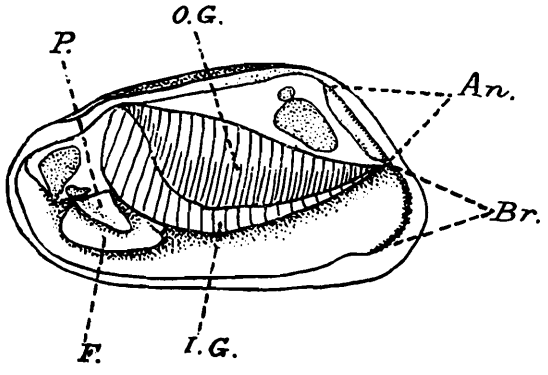
[2] See Annandale, *Rec. Ind. Mus.*, XIV p. 141 (1918).

nection between the anal and supra-anal is of about the same size as the anal and the supra-anal also is not much larger.

The glochidia are semi-circular.

Pseudodon (Pseudodon), Gould.

Deshayes and Julien[1] published a fairly good figure of the animal of *P. moreleti*, Crosse and Fischer, but gave no description; the figure also, owing to its being drawn from the lower surface, does not show some important details. Simpson from this figure described (*loc. cit.*, p. 834) the animal as follows: "Animal having the branchiae wide and rounded behind, becoming narrow in front; palpi enormously long, apparently slender, pointed behind where they project free for some distance, mantle thin with slightly thickened border, faintly papillose behind, there seeming to be but little distinction between anal and branchial openings; anal opening apparently smooth." Unfortunately no more in-



TEXT-FIG. 6.—Animal of *Pseudodon salvenianus*, reference lettering same as in fig. 1.

formation can be got from Deshayes and Julien's figure and such important points as the presence or absence of a supra-anal, the mantle connection between the anal and supra-anal and even the distinction between the anal and branchial apertures cannot be made out. Simpson placed *P. moreleti* in the section *Pseudodon*, but the animal of *P. salvenianus* described below differs materially from that of the other known species of this section, and as *P. salvenianus* is the type-species of the section *Pseudodon*, it seems that the whole grouping requires revision.

In Simpson's classification the genus is included amongst the Endobranchiae, but the marsupium in *P. salvenianus*, at any rate, is formed by all the four gills and hence it should be included amongst the Exobranchiae, Homogenae. In Ortmann's classification it will be included in the family Unionidae and the sub-family Unioninae.

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[1] *Nouv. Arch. du Mus.*, X, pl. v, fig. 3 (1874).

The following description of the animal (fig. 6) is based on a few small spirit specimens in the collection of the Zoological Survey of India, collected by Dr. A. R S. Anderson in the year 1898 at Ye-Bu, Tenasserim, Burma.

The gills are rather broad; the inner pair being all along broader than the outer, more so in the anterior half than in the posterior. The inner lamellae of the inner pair of gills are attached to the abdominal sac along the anterior third only; posteriorly they are united with one another to form an elongated diaphragm extending to very nearly the margin of the mantle. The marsupium is formed by all the four gills, which have a sharp free margin. The water-tubes are simple and the placentae elliptical. The triangular palpi are not very large. The free margin of the mantle is entire and only slightly thickened. The foot is comparatively small. The branchial opening is large with well developed papillae. The anal aperture, owing to the absence of a mantle connection, is very large and extends to the point where the supra-anal would be; it is papillose only in the lower one-fourth of its extent. The ridge of the mantle separating the branchial from the anal is very small and poorly developed.

TEXT-FIG. 7.—Glochidium of *Pseudodon salvenianus*, × 75.

The glochidia (fig. 7) are sub-circular, measuring ·19 mm. × ·18 mm.

SYNOPTIC TABLE FOR THE VARIOUS GENERA.

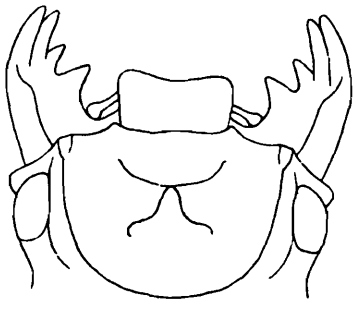
A. No supra-anal aperture ... ... *Pseudodon.*
B. A distinct supra-anal separated from the anal by a mantle connection
  I. Marsupium formed by all the four gills.
    a. Gills 8-10 times as long as broad .. .. *Balwantia.*
    b. Gills not more than 5 times as long as broad.
      1. Inner pair of gills much broader than outer throughout their length ... ... *Indonaia* [1].
      2. Inner pair of gills nearly as broad as the outer except in the anterior part ... ... *Parreyssia.*
  II. Marsupium formed by the outer pair of gills only.
    a. Entire length of the outer pair of gills marsupial ... *Lamellidens.*
    b. Gills modified for marsupial function only near the middle of the outer pair ... ... *Physunio.*

[1] See also Ortmann, *Nautilus*, XXXI, pp. 128-131 (1918). I have been able to consult all original papers by Ortmann since this paper was sent to press.

XX ON THE OCCURRENCE OF A SYMMETRICAL SPECIES OF *EPISPHENUS* (PASSALID COLEOPTERA) IN ANNAM

By F. H. GRAVELY, *D.Sc., Asst. Supdt., Zoological Survey of Indïa.*

Of the four species of *Episphenus* already described, *E. moorei* is symmetrical and appears to be confined to Ceylon, where it is not very abundant. *E. comptoni* is slightly asymmetrical and is much more abundant in Ceylon, to which island it also appears to be confined. *E. neelgherriensis* and *E. indicus* are more markedly asymmetrical, and appear to be confined to the Indian Peninsula, where both are abundant. In Annam, as in other parts of tropical Continental Asia, east of the Gangetic delta, *Episphenus* is replaced by the allied genera *Ophrygonius* and *Aceraius*, in whose most highly specialized forms asymmetry is even more pro-



Head of *Episphenus annamensis* (× 4).

nounced. The occurrence of a symmetrical species of *Episphenus* in Annam is therefore somewhat remarkable. An almost symmetrical species of *Ophrygonius* has, it is true, recently been described[1] from Tonkin, but the hair on the sides of its elytra and its horizontally divided left anterior lower tooth, as well as traces of asymmetry, clearly show that it has been derived from one of the highly asymmetrical species transitional between the more typical species of *Ophrygonius* and the genus *Aceraius*, and not from a primtive symmetrical species like *Episphenus moorei* and the species which I have now to describe.

Episphenus annamensis, n. sp.

Four specimens collected by Mr. C. Boden Kloss in Southern Annam in 1918, and presented by him to the Indian Museum.

Length 33–37 mm.

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[1] *O. aequalis, Mem. Ind. Mus.* VII, 1918, p. 88, fig. xi (1).

This species differs from *E. moorei*, the only other symmetrical species of the genus known, in having six instead of five well-developed antennal lamellae, all somewhat short and stout. The cephalic ridges between and in front of the frontal tubercles are absent. The frontal tubercles are situated as in *Episphenus*, not as in *Tiberiodes* (also symmetrical) from Assam and adjoining the hills. The central tubercle is more strongly elevated than in *E. moorei*, with shorter parietal ridges. The punctures and hair on the lower surface of the prothorax are very feebly developed. The large punctures on the posterior intermediate areas of the metasternum are somewhat shallower than in *E. moorei*, and the puncturing of the grooves on the elytra is less coarse.

XXI DESCRIPTIONS OF TWO NEW SPECIES OF DIPTERA FROM SEISTAN, EASTERN PERSIA

By E. BRUNETTI.

In a small collection of Diptera made in Seistan by Dr. N. Annandale and Mr. S. W Kemp in November and December, 1918, there are two undescribed species of which the material justifies the publication of diagnoses. These two species are here described at the request of Dr. Annandale, in order that he may refer to them in a forthcoming report on the aquatic fauna of Seistan.

Family SYRPHIDAE.

(?) Didea annandalei, sp. nov.

Seistan, E. Persia. Long. 8 mm.

Almost intermediate between *Didea* and *Syrphus*.

Head. Frons and face bright chrome yellow; former with short stiff black pubescence, latter with softer pale yellow hairs; antennae orange, upper side brownish; arista orange; mouth border brownish. Eyes quite bare; occiput black, entire margin with fringe of whitish hairs; vertex with stiff black hairs; ocelli ruby red.

Thorax shining black; dorsum without trace of median grey stripes on anterior margin, wholly with quite whitish pubescence; side margins distinctly yellowish; pleurae mainly shining black, with whitish pubescence; mesopleura aeneous with yellowish pubescence. Scutellum wholly rather dull yellow with all yellowish pubescence.

Abdomen with yellow spots as in *D. fasciata*, Macq., except that the fifth segment is wholly orange yellow except at middle of base. Belly yellowish; an indistinct black mark about middle of each segment.

Legs, except the black coxae, wholly yellow.

Wings with 3rd longitudinal vein barely dipped.

Described from a single ♂ from Nasratabad, Consulate Garden, Seistan. The specimen is in the collection of the Indian Museum.

The present specimen possesses two out of the three characters which may be regarded as typical of *Didea*, namely the general *facies* due to the shape and size of the abdominal spots, and the ridged edge to the abdomen, but it lacks the third and equally important character of the considerably dipped third vein,

as in *annandalei* it is barely as much dipped as in *Syrphus annulipes*, Zett. of Europe. This latter species has hairy eyes.

Didea is supposed to have almost but not quite bare eyes, and wholly black antennae, both characters appearing to me weak as generic ones. The present species differs from *fasciata* by the nearly wholly orange fifth abdominal segment, the entirely yellow legs (excepting the coxae), the absence of greyish stripes on the thoracic dorsum and by its yellowish side margins, the whitish pubescence on the thorax and pale yellowish on the scutellum.

Family EPHYDRIDAE.

Halmopota viridescens, sp. nov.

Seistan, E. Persia. Long. about 3¼ mm.

Head broad, transverse, a little broader than thorax. Frons and face extremely broad, occupying, seen from the front, fully three fifths of the head; frons very flattened, face strongly projecting, seen from above almost semicircular; cheeks broad, forming a conspicuous hind angle to lower part of head in profile; the whole head sharply cut off horizontally at the mouth border. Proboscis with large labella, appearing like a large lower lip, the whole mouth exceedingly frog-like. Eyes comparatively small, bare. Frons greenish-grey, shining; ocellar triangle barely elevated, yellowish, with a weak upper pair of erect bristles and a much stronger lower, proclinate pair. Vertical bristles long and strong, inner pair convergent, outer pair divergent; post vertical bristles absent. Three pairs of strong fronto-orbital bristles, placed near eye-margins, with a weaker bristle above the 1st and between 1st and 2nd (making five in all) nearly equidistant. A linear depression on frons and face near eye-margins, making the eyes appear a trifle bulging. Antennae short, ash grey; 1st joint very short, 2nd thick, bluntly triangular, 3rd as long as 2nd, bluntly conical; arista bare, moderately long, black, distinctly plumose on upper side only. Face ash grey, with a row of distinct bristles from side to side, a little below eyes and antennae, following the curvature of these organs; a second row of similar bristles, though longer ones, on mouth border, dwindling in point of size towards sides. Entire face with minute black stiff hairs; a slight greenish-grey tinge to extreme upper part of face immediately below antennae. Proboscis and labella brownish-grey; occiput grey with short pale pubescence.

Thorax subquadrate, a trifle longer than broad, moderately arched, greenish-grey, a little shining, with whitish dust. Five pairs of dorso-central bristles, long and strong; two humeral (perhaps three) of unequal size; two notopleural; apparently three supra-alar. A perpendicular row of stiff hairs, directed backwards, on hind margin of mesopleura. Scutellum with one bristle towards middle of side margin and one long apical one.

Abdomen greenish-grey with short stiff black pubescence.

Legs. Coxae and femora black, grey dusted; tips of latter narrowly, and remainder of legs brownish-orange; stiff black hairs on tarsi. Pubescence of legs black, meagre.

Wings greyish, a little yellowish at base; halteres dull orange.

Described from 3 specimens, apparently ♂ ♂ (two in indifferent condition), taken on the surface of a watercourse, Chilling, Seistan, 20-xii-18 (*Annandale* and *Kemp*). These specimens are in the collection of the Indian Museum.

The present species does not quite fulfil the generic characters of *Halmopota*, owing to the presence of the row of very conspicuous bristles directed downwards from the lower edge of the mouth border, and which Becker distinctly states should not be present. There is also no prominent bristle on each side of the face near the lower angle of the eye. Apart from these points *viridescens* agrees remarkably closely with Becker's figure of the head in profile.[1]

Specifically the present species differs from the European *salinarum*, Bouché, by the greenish (not velvet black) frons and abdomen and also by the blackish (not reddish) femora.

From the only other known species, *mediterranea*, Lw., it principally differs (in addition to the above two characters) by the third and fourth veins not being convergent towards the tip. It is rather smaller than both the known species.

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[1] *Berl. Ent. Zeits.* XLI, pl. v, 4 (1896).

MISCELLANEA

BATRACHIA.

The tadpoles of *Nyctibatrachus pygmaeus* and *Ixalus variabilis*: a correction.

In a recent number of the "Records of the Indian Museum" (Vol. XV, p. 21, pl. i, figs. 5, 5*a*) I described and figured a tadpole which I believed to be that of *Nyctibatrachus pygmaeus*. I was, however, led astray by a break in my series of specimens, and while the young frog to which I referred was undoubtedly a *Nyctibatrachus*, those tadpoles in which the characteristic structure of the mouth remained were larvae of *Ixalus variabilis*. I have been able to substantiate this fact by a recent examination of a large number of fresh specimens in the Nilgiri Hills. The posterior part of the tail in this tadpole is often quite black, while the anterior part is dull yellow more or less spotted with black. The colouration is, however, variable. The larva of *Ixalus variabilis* is the commonest Ranid tadpole in hill-streams round Coonoor and Kotagiri in April.

The true tadpole of *Nyctibatrachus*, of which I have now obtained specimens, is, curiously enough, very like that of *Rana semipalmata* (*op. cit.*, p. 20), which it resembles in having no horny teeth on its mouth-disk. I am sending my specimens, with those of a number of other species, to Dr. G. A. Boulenger for description, having been forced by stress of other work to give up all herpetological studies for the present.

N. ANNANDALE.