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

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(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.

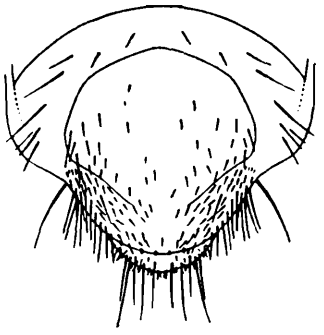
The mandibles resemble those of *A. lacustris* in their general structure, but the distal denticle of the triangular cusp on the right mandible is very weak, and the second cusp, though strongly elevated, is not strongly produced proximally, being in consequence less distinctly L-shaped and more or less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