XIII NOTES ON INDIAN ODONATA

By F. F. LAIDLAW.

Subfamily *AGRIONINAE*; Selys.

(= *Coenagrioninae*, Kirby).

Genus **Ischnura**, Charp.

Represented in the Indian Empire so far as is known by six species; one of these is possibly to be referred to a distinct genus when better known. Two species are of a wide distribution, the remainder probably have a restricted habitat.

The genus itself is a dominant member of the Agrionine group, and the Indian area therefore shows a high percentage of endemic species. *Ischnura* is one of the genera which appears to be poorly represented in equatorial regions, having a richer representation in tropical and especially N. temperate countries.

Ischnura senegalensis (Ramb.).

Micronympha senegalensis, Kirby, *Cat. Odonata*, p. 141 (1890).
Ischnura senegalensis, Ris, Katalog des Odonata von Südafrika, in L. Schultze, Forschungsreise im west. u. zent. Südafrica, Jena 1908, p. 310.
,, ,, Martin, *Mem. Soc. Zool. de France*, 1901, p. 246.
,, ,, Tillyard, *Proc. Linn. Soc. N. S. Wales*, 1912, XXXVII, 3, p. 451.

34 ♂♂; 10 ♀♀ (isochromatic); 12 ♀♀ (heterochromatic), No. $\frac{8327}{20}$.

The isochromatic females were all taken in Calcutta on July 27th, 1914. They can be distinguished from the males only by careful scrutiny. Eighteen males were taken with them.

2♂♂, 4♀♀ are from the salt lake below Chingrighatta, Calcutta, 12-ii-15 (*F. H. Gravely*), No. $\frac{100}{\text{H.I.}}$. 1♂ 1♀ Rangoon, No. $\frac{245}{\text{H.I.}}$. The remainder from Orissa, Puri District, Nos. $\frac{8213}{20}$, $\frac{8251}{20}$, $\frac{120}{\text{H.I.}}$; Sar Lake, No. $\frac{116}{\text{H.I.}}$.

The species breeds in the Museum tank in Calcutta, and probably in Lake Chilka. The African and Oriental representative of a group of closely allied species whose distribution is well-nigh cosmopolitan.

Ischnura forcipata, Morton.

I. forcipata, Morton, *Trans. Ent. Soc. Lond.*, 1907, p. 306, pl. xxiv, figs. 1, 2, 3.
I. gangetica, Laidlaw. *The Entomologist*, Aug. 1913, p. 235, text-fig.

Not represented in the Museum collection.

A green (or blue) and black species readily distinguished from the other similarly coloured Indian species (*I senegalensis*) by the pterostigma of the fore-wing which is much narrower in front than behind and has its hinder margin very strongly convex. In this respect it resembles *I. aurora*.

The female remains unknown. Length of abdomen ♂ 24 mm., hind-wing 15 mm. Recorded from Quetta (*Morton*) and Kumaon (*Laidlaw*).

Range probably restricted to the foot hills of the west and central Himalaya.

The type male of *I gangetica* is in the British Museum.

Ischnura rufostigma, Selys.

Micronympha rufostigma, Kirby, *Cat. Odonata*, p. 143 (1890).
Ischnura rufostigma, Morton, *Trans. Ent. Soc. Lond.*, 1907, p. 307 (?).
,, ,, Laidlaw, *Rec. Ind. Mus.*, VIII, 4, p. 344, pl. xvi, fig. 5.

2 ♂ ♂, 2 ♀ ♀, Calcutta, 4-i-15, No. $\frac{8329}{20}$.

The female has not been described (see note under *I. inarmata*).

Pterostigma dull gray.

Head, prothorax and thorax as in the male, but with a duller ground colour.

Abdomen rather stouter than in the male. Ground colour pale yellowish-brown, with a metallic black line on the dorsum of each of the segments, this line is moderately broad, pointed in front, and widening a little at the apex of each segment.

Range: Bengal, Assam, and doubtfully Kashmir (see note under *I inarmata*, Calvert).

Ischnura inarmata, Calvert.

Ischnura inarmata, Calvert, *Proc. Acad. Nat. Sci. Philadelphia*, 1898, pp. 147-148, text-figs. 1, 2.

2 ♂ ♂, 1 ♀ ?, Kashmir, 1915 (*H. T Pease*).

The female appears to have been taken at the same time and place with the males, and is in all probability con-specific.

It seems also to belong to the same species as 3 ♀ ♀ recorded by Morton from Kashmir (*Trans. Ent.-Soc. London*, 1907, p. 307).

These specimens were however regarded by him as being possibly examples of *I. rufostigma*, Selys.

Against this view is the fact that the undoubted examples of females of *I rufostigma* described in this paper are quite different in their colour characters, and also the probability that *I. rufostigma* has a more easterly distribution.

On the other hand Calvert describes a female specimen regarded by him as the female of *I inarmata*, which also is quite distinct in colouring from the specimen before me, whilst it does not agree with Morton's specimens; it may be added that his account of the

female is very incomplete, no mention is made of the thoracic colouring.

Possibly the species has dimorphic females. In the absence of clearer evidence I propose to take this view. But of course *I. rufostigma* may have dimorphic females. I tabulate these female forms below:—

A. 1 ♀ Indian Museum.
Head as in male *I. inarmata*, but ground colour orange instead of blue.
Prothorax orange, with small paired black spots.
Thorax orange.
Abdomen, segments 1—3 orange, apex of 3 marked with black, remaining segments metallic black above.

B. 3 ♀ ♀ (Morton's specimens). "Like *Pyrrhosoma tenellum* (Villers), but thorax paler" (identical with A. ?).

C. 3 ♀ ♀ (Calvert's specimens). Head coloured as in males.
Dorsum of abdominal segments 1—10 dark metallic green, the articulations with narrow, yellow, transverse rings.
This species is recorded from Kashmir only.

Ischnura aurora, Brauer.

Micronympha aurora, Kirby, *Cat. Odonata*, p. 143 (1890).
Ischnura delicata, Martin, *Mem. Soc. Zool. de France*, 1901, p. 246.
" " Tillyard, *Proc. Linn. Soc. N. S. Wales*, 1907, XXXII (2), p. 384 *seq.*

2 ♂ ♂ 1 ♀, Nagpur, C. P., 1000 ft., Oct. 1914 (*E. D'Abreu*). In bad condition.

Range: India to Ceylon; Australia, not recorded from intermediate territory so far as I know.

Apparently not very common though widely distributed in India.

Ischnura ? nursei, Morton.

Ischnura ? nursei, Morton, *Trans. Ent. Soc. Lond.*, 1907, p. 306, pl. xxiv, figs. 4, 5, 6.

A red and black species, unknown to me. The abdomen is described as being short and stout relative to that of other males of the genus; "segments 1—4 carmine, 5 lemon yellow, 6 yellowish in anterior half, remainder of abdomen metallic violet, posterior part of 10 and appendages reddish." The species differs from other *Ischnuras* in the absence of post-ocular spots and is referred by Morton to this genus with doubt. The pterostigma of the fore wing is diamond-shaped, bright carmine inwardly, paler exter-

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Ischnura immsi, Laidlaw, *The Entomologist*, Aug. 1913, p. 236. Mr. Morton has pointed out to me (*in litt.*) that this species is identical with *Enallagma? parvum*, Selys. My name is therefore merely a synonym of Selys' species to which I hope to refer in a later note.

nally that of the hind wings small, yellow. Length of hind-wing 12 mm., of abdomen 16½ mm.

Recorded from Deesa, Gujerat.

It is to be hoped that more examples of this very interesting species will be forthcoming before long.

Genus **Ceriagrion**, Selys.

Ceriagrion coromandelianum (Fabr.)

Ceriagrion coromandelianum, Kirby, *Cat. Odonata*, p. 154.
,, ,, Martin, *Odonat. Mission Pavie* (sep.), p. 18.
,, ,, Ris, *Abhandl. d. Senckenberg. Naturf. Gesellsch.*, XXXIX, p. 519.
,, ,, Morton, *Trans. Ent. Soc. London*, 1907, p. 308.
,, ,, Laidlaw, *Rec. Ind. Mus.*, VIII, p. 345, pl. xvi, figs. 8, 8*a*.

Many specimens, ♂ ♀ Kierpur, Purneah District, Bihar, 7—9-x-15 (*C. Paiva*). No. $\frac{854}{H.I.}$

Many specimens, ♂ ♀ Maidan, Calcutta.

♂ ♀ Ernakulam, Cochin State, 11—14-x-14 (*F. H. Gravely*). No. $\frac{8229}{20}$.

♂ ♀ Calcutta. Nos. $\frac{3460}{8}$, $\frac{8300}{+}$. } Labelled by de Selys.

♂ ♀ Sibsagar, Assam. Nos. $\frac{6325}{20}$, $\frac{6326}{20}$. } Labelled by de Selys.

Range: Ceylon, India, Burma, Indo-China (Sunda Islands, Celebes are also given as included in the range of the species by Martin, *loc. cit.*).

My figures of the anal appendages of the male are not satisfactory. They were drawn from a shrivelled specimen. Normally the inferior pair project directly backwards and slightly exceed the upper pair in length. Each member of a pair is curved inwards at its free extremity, the upper pair actually meeting in the middle line. The lower appendage has its free extremity more finely pointed than in the figure and tipped with black. Also when viewed directly from above the extremities of the lower pair can be seen projecting beyond the upper pair.

Ceriagrion rubiae, sp. nov.

2 ♂ ♂, 1 ♀ Chalakudi, Cochin State, 14-ix-14 (*F H. Gravely*). No. $\frac{8248}{20}$.

Length of abdomen: ♂ 26 mm., ♀ 27 mm.
,, hind-wing: ♂ 18 mm., ♀ 18·5 mm.

A small species in which the wing is petiolated to the level of the basal post-costal nerve; the wings are uncoloured, and the excision on the hinder margin of segment 10 of the male abdomen is small and rather bluntly angular.

Description: Post-costal nerves 10.

♂ Head rusty yellow, paler beneath; upper half of the eyes greenish-brown, lower half yellow.

Prothorax and thorax rusty yellow above, fading to pale yellow at the sides and underneath.

Abdomen entirely reddish-orange above and at the sides, yellow ventrally.

Legs yellow with black spines.

Anal appendages dark reddish-brown in colour, black at extremities. The upper pair are distant to each other and parallel, seen in profile they are a little narrowed basally so as to be somewhat club-shaped, each carries a fine black point distally, which is directed downwards. The lower pairs are larger, directed upwards and taper regularly to their apices. They lie internally to the upper pair. The excision on segment 10 is small and shallow, bluntly angular; barely one third as deep as the segment. The floor of the excision is formed by a shelf-like ridge which in the middle line has a small tongue-like projection directed backwards.

♀ Head greenish-brown above, paler below, eyes similarly coloured but of a greener tone.

Prothorax and thorax gray-green above, yellowish-white below.

Abdomen dull, greenish-brown above, paler below.

The species differs from the closely allied *C. erubescens*, Selys, chiefly as follows:—in colour; it is smaller, and the excision on segment 10 of the abdomen is bluntly angular, narrow, and its floor has the curious little tongue-like projection noted above. The anal appendages of the males of the two species differ in detail.

C. erubescens appears to be a more eastern species and I cannot find that it has been recorded from India. (See Ris, *Abhandl. d. Senckenberg. Naturf. Gesellsch.*, Bd. XXXIV, p. 519, taf. xxiii, figs. 13, 14).

The holotypes ♂ ♀ will be returned to the Indian Museum; paratype ♂ in my collection.

Ceriagrion olivaceum, Laidlaw.

Ceriagrion olivaceum, Laidlaw, *Rec. Ind.* Mus., VIII, 1914, p. 345 pl. xvi, fig. 9.

This is the largest of the four species recorded from the Indian Empire. It appears to be confined to Upper Burma and Assam.

A female specimen from Nurbong, Assam, sent to me by Mr. Stevens, has only 12 post-nodal nerves on the fore-wings.

Like the other Indian species it has the wings petiolated to the level of the basal post-costal nerve.

Ceriagrion cerinorubellum (Brauer).

Ceriagrion cerinorubellum, Kirby, *Cat. Odonata*, p. 154.
,, ,, Kruger, *Stettin Entomol. Zeit.*, 1898, p. 119.
,, ,, Ris, *loc. cit.*, p. 519.

9 ♂ ♂. Kierpur, Purneah District, Bihar, 19-ix-15 (*C. Paiva*) "resting on weed in stream." Nos. $\frac{852}{H.I.}$, $\frac{862}{H.I.}$.

The description given by de Selys of this insect scarcely does justice to its beautiful colouring which is well preserved in spirit specimens. The head, prothorax and thorax are a rich dark olive green above, passing on the sides to a beautiful shade of blue.

The first three segments of the abdomen and the last three are of a beautiful cherry red colour, the intermediate segments being intense black.

Range: Ceylon, India, Burma, Malay States, Sumatra, Borneo.

A number of the larvae of *C. coromandelianum* (Fabr.) were taken in the Museum tank, and were hatched out in the Museum (No. $\frac{6}{20}\frac{5}{9}\frac{9}{2}$). The larva shows, especially in the structure of the anal lamellae, considerable differences from the larva of such a genus as *Pseudagrion*. The following is a brief account:—

Body sandy yellow or brown in colour. Total length about 20 mm. including the anal lamellae.

Head broad, flat. I can find no indication of the transverse frontal ridge of the adult.

Mask when folded just reaching base of second pair of legs. Its outer margin carries about 6 or 7 short stout spines along its distal half. On either side of the middle line is an oblique row of 5 setae, diverging distally; the outermost being by far the largest. Anterior margin of mask bluntly angular. The palpi each bear 7 long setae in addition to the moveable hook (see fig. 1). The length of each of the middle pair of legs is about 7 mm.

FIG. 1.—Mask of larval form of *Ceriagrion coromandelianum* (Fabr.).

The abdomen is cylindrical and tapers very gradually backwards. Each of the segments has a ring of short blunt setae set around its hinder margin, and each of the last five segments has in addition a pair of similar setae dorsally, one on either side of the middle line near the end of the segment. The pair on segment 10 are much more remote from each other than those on the other segments.

The anal lamellae (gills) are leaf-like, ob-lanceolate; 4—5 mm. long, 1·5 mm. wide, in one or two individuals acuminate but more often irregularly rounded at the apex. They are not jointed nor marked with a transverse fold, but the basal half is stouter and more strongly chitinized than the apical part.

Each has two stout, main tracheal tubes forming as it were a mid-rib from which a large number of branches run outwards increasing the resemblance to a leaf.

In the lateral pair of lamellae the mid-rib lies nearer to the ventral than to the dorsal margin, in the central lamellae the reverse condition obtains.

In each lateral lamella the basal two-fifths of the mid-rib bears a row of chitinous teeth on its outer side. In the central

lamella there is a similar row of equal extent on both sides of the mid-rib.

Lastly, on the ventral margin of the outer pair, and on the dorsal margin of the central lamella there lies another row of teeth also extending from the base for about two-fifths of the total length of the lamella.

Subfamily *GOMPHINAE*, Rambur.

Genus **Davidius**, Selys.

Davidius aberrans (Selys).

Hagenius (?) aberrans, Selys, *Bull. Acad. Belg.*, (2) XXXVI, p. 506 (1873); Kirby, *Cat. Odonata*, p. 75.
Davidius ? zallorensis, Selys, *l.c.*, (2) XLVI, p. 667 (1878); Kirby, *l.c.*, p. 75.
Davidius aberrans, *D. zallorensis*, Williamson, *Proc. U. S. Nat. Mus.*, XXXIII, 1907, pp. 286-287.
See also Selys, *Ann. de la Soc. Entom. de Belgique*, XXXVIII, 1894, p. 175.

1 ♀ Binyar, Kumaon, 7700 ft., 24-v-1912 (*A. D. Imms*) For. Zool. Mus.

I have compared this specimen with the descriptions of *D. aberrans* and of *D. zallorensis* and can find no grounds for separating the two species. In the specimen before me the triangle of the left fore-wing is free, that of the right is crossed by a single nerve. Both hind-wings have the triangle crossed.

Davidius davidi, Selys, subsp. **assamensis**, nov.

Davidius davidii, Selys, *Bull. Acad. Belg.*, (2) XLVI, 1878, p. 671.

1 ♂, 2 ♀ ♀ Gopal, Assam, 1914 (*H. Stevens*).
Length of abdomen ♂ 31 mm., ♀ 28 mm.
,, hind-wing ♂ 26 mm., ♀ 28·5 mm.

Distinguished from the type by its smaller size (*D. davidi* type: abdomen ♀ 34·35 mm., hind-wing 32·33 mm. Selys, *loc. cit.*), and absence of isolated superior antehumeral spots of cuneiform shape which occur in the type. The basal black band on the frons is not large.

The male differs from the female so far as colouring goes chiefly in having only the lower third of the mid-dorsal carina of the thorax coloured, and in having lateral spots on the first three segments only of the abdomen.

Anal appendages of male: Upper pair slender and rather horn-like, each with a stout downwardly curved, rounded, hook-like process projecting from near its base, scarcely visible in profile. The appendage itself is longer than the tenth segment. The lower appendage is shorter than the upper pair, triangular and deeply cleft in the middle line (see fig. 2*a*).

The male has the triangle of the left hind-wing crossed, the remaining triangle free.

The females have the triangles of the hind-wing crossed in every case. Those of the front-wing free except in the case of the left fore-wing of the paratype where the triangle is crossed. The

FIG. 2.—*Davidius davidi assamensis*, subsp. nov.
a. Anal appendages ♂ : *b*. Lateral view of genital structures on abdominal segment, 2 ♂

genus *Davidius* ranges from China and Japan to N. India, Assam and Tonkin. The two species noted above are the only forms recorded from the Indian Empire.

The holotypes ♂ ♀ will be deposited in the Indian Museum.

XIV SOME LIGNICOLOUS BEETLE-LARVAE FROM INDIA AND BORNEO.

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

(Plates XX—XXII.)

While hunting for insects in dead wood my attention has from time to time been attracted by stages in the life-histories of various beetles. Often the determination of the adult form into which a particular kind of larva will develop is a matter only to be determined by breeding. At other times the association of larvae, possessing definite family characteristics, with adults of the same family all belonging to one species, indicates the identity of the larvae with a high degree of probability. And when larvae and adults are associated with pupae, shown by their accompanying exuviae to have been derived from the former and by their form to be about to give rise to the latter, the probability becomes a certainty.

By one or other of the above means, the identity of various beetle larvae recently added to the Indian Museum collection has been established. The Bornean Passalid larvae described below were collected by Mr. J. C. Moulton, many of the South Indian Passalid larvae by Mr. T. Bainbrigge Fletcher, the Andaman Passalid larvae by Mr. M. C. Bonig and Mr. S. W. Kemp, and two species of the Lucanid larvae by Mr. S. W. Kemp. The rest were collected by myself. Whenever possible the specimens have been hardened before being placed in spirit by immersion either for a few minutes in boiling water, or (better) for an hour or two in Carnoy's fluid [1], as this helps to prevent blackening and collapse of the tissues.

I have thought it best to refrain at present from attempting to prepare an account of the Longicorn larvae, since I have as yet been unable to consult the part of Xambeu's "Moeurs et Métamorphoses d'Insectes" dealing with this group.[2]

PASSALIDAE.

The collection of material for the study of the development of Passalid beetles is rendered particularly simple by the close association which appears to exist between adults and their young. This association has been investigated in the case of American forms by Ohaus (*Stett. Ent. Zeit.*, Jahrg. LXI, 1900, pp. 164-172

[1] Absolute alcohol 6 parts, chloroform 3 parts, glacial acetic acid 1 part.
[2] Published as a Supplement to "*Echange*". (Lyon, 1892-1897).

and Jahrg. LXX, 1909, pp. 23-25 and 29-32). It is doubtful whether the association is quite so close in Indian forms as in American ones (Gravely, *Rec. Ind. Mus.*, XI, 1915, p. 496), although the structure of the mandibles is the same as in American larvae, and seems equally unsuited for the mastication of unprepared wood; but it is sufficient to allow of the collection of whole groups of insects in various stages all belonging to one species. Larvae of the following species have already been described [1] :—

"Passalus"? punctiger, Lepeletier and Serville.[2]

1835. Percheron, A. "Monographie des Passales" (Paris, 1835), pp. 17-18, pl. i, figs 13-14.

"Passalus" cornutus, Fabricius.

1847. Burmeister, H. "Handbuch der Entomologie", V (Berlin, 1847), pp. 454-459.

1872. Riley, C. V "The Horned Passalus." *Ann. Rep. Ins. Missouri*, IV, 1872, pp. 139-141, text-fig. 62 *a-d.*

1874. Schiødte, J C. "De metamorphosi Eleutheratorum observationes: Bidrag til Insekternes Udviklingshistorie." *Naturhist. Tids.*, XI, 1874 ("*Passalus*," pp. 356-359, pl. xv, fig 16; pl. xviii, figs. 12-19; pl. xix, fig 17).

"Passalus" distinctus, Weber.

1853. Chapuis, F. and Candèze, E. "Catalogue des Larves des Coléoptères connues jusqu'a ce jour avec la description de plusieurs espèces nouvelles," pp. 343-653, 9 pls. *Mem. Soc. R. Sci. Liège*, VIII, 1853 ("*Passalus*," pp. 467-468, pl. iv, figs. 5-5*c*).

1861. Candèze, E. "Histoire des Métamorphoses de quelques Coléoptères exotiques." *Mem. Soc. R. Sci. Liège*, XVI, 1861 ("*Passalus*," pp. 343-344).

Aulacocyclus kaupi, MacLeay.

1893. Froggatt, W W "On the Life-Histories of Australian Coleoptera I." *Proc. Linn. Soc. N S. Wales*, VIII, 1894 (*Aulacocyclus*, p. 41).

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[1] The synonymy of the American genera, to which most of these belong, is at present so confused that it seems best to refer to all under the single generic name "*Passalus*" which is applied to them by the authors here referred to. Only in the case of Indo-Australian species is the genus given according to modern definitions. Madam Mérian's larva can no longer be regarded as a Passalid.

[2] The plate bears the legend "*P. interruptus*"; but this does not apply to the larva and pupa figured which are probably, according to Percheron, those of *P. punctiger.*

Leptaulax bicolor (Fabricius).

1861. Candèze, E. "Histoire des Métamorphoses de quelques Coléoptères exotiques." *Mem. Soc. R. Sci. Liège*, XVI, 1861 ("*Passalus*," pp. 343-344).

Passalid larvae are all much alike, and Schiødte's elaborate description of the larva of "*Passalus cornutus*" will probably be found to apply to all so far as general structure is concerned. Only specific differences, therefore, will be described here. Candèze was unable to detect any definite differences between the species before him, beyond slight ones in the position of the stigmata.

In Oriental forms specific differences are found in the arrangement and nature of the large hairs, and in the manner in which, if at all, pile is developed on the body.

Among the larvae I have examined all those with definite pile belong to the *Pleurarius*, *Aceraius* and *Macrolinus* groups, and in the first of these it is confined to the later stages while in the second it is absent in one species. Probably, therefore, the development of pile is a departure from the primitive type of larva. In this connection it is noteworthy that the larva of the *Aceraius* group from which it is absent—*Episphenus neelgherriensis*—is that of the most primitive beetle of this group whose larva I have seen; also that the larvae of the two Bornean species of *Aceraius* examined have the pile better developed than those of the two from continental Asia, although one of the latter is the northern race of the highly specialized dominant species of the genus (compare *Journ. As. Soc. Bengal*, [n.s.] X, pp. 201-210, pl. xxiv; or *Mem. Ind. Mus.* III, pp. 311-313, text-fig. 7, p. 314).

The manner in which the larger hairs are distributed appears to be derived by the suppression or multiplication of particular hairs from the following generalized plan.[1] A short row (usually five) behind each antenna on the head; a short row (usually three including the lateral hair) bordering each of the anterior angles of the first thoracic segment; one pair of dorsal hairs on each segment in front of the tenth abdominal; one pair of lateral hairs situated obliquely above and behind the stigmata, and directly below but somewhat further away from the dorsal pair of hairs on each of these segments; one pair of ventral hairs in the same vertical plane but situated obliquely behind and below the stigmata on each of these segments after the first two thoracic, and especially on the ninth abdominal; a circumanal ring, usually of about seven pairs of hairs, on the tenth abdominal segment.

It is noteworthy that, in these characters also, *Episphenus neelgherriensis* approaches the generalized type more nearly than do any of the more highly specialized members of the *Aceraius* group that I have examined; and that in this and some other species

[1] Only in certain species of the highly specialized genus *Aceraius* are hairs produced in an entirely fresh place, namely on the frons.

this generalized type is approached more closely by young than by old larvae. Only in *Leptaulax bicolor* is the reverse the case, and here only as regards the small dorsal thoracic hairs which do not develop at all in *L. bicolor* var. *vicinus*.

Passalid pupae all appear to resemble in general form that of "*Passalus*" *cornutus* figured by Riley (*loc. cit.*), differing mainly in the structure of the head, which reveals more or less distinctly the characteristic features of the head of the developing beetle. They will not be further described here.

Pleurarius brachyphyllus, Stoliczka.

(Pl. xx, figs. 1-3.)

Localities.—Cochin State: 10th-14th mile of State Forest Tramway *ca.* 0-300 ft; Kavalai, *ca.* 1300-3000 ft.

Larvae of this species are remarkable for the change which takes place in the structure of their hairs when the insects are about 25 mm. long. In young larvae these hairs are all long, tapering and filiform as in other species. In old ones only those on the head (missing in all our full grown specimens, but present in a number somewhat more than 25 mm. long), the ventral pair on the ninth abdominal segment, and the circumanal ring on the tenth retain this form, the rest being short, stout and clavate.

Full grown larvae may be at least 50 mm. in length. In the Indian Museum collection there are several of about this size, and a large number of from about 14-30 mm. long. Unfortunately there are none between 30 and 50 mm.

The head would apparently be covered all over with fine hair was it not worn down to the roots in places—*e.g.*, on the dorsal surface—till only the points of origin remain. Two long hairs are present behind the antennae. Of these the dorsal is the stouter and may be more or less ribbon-like. Three hairs are present in the anterior angles of the first thoracic segment of larvae not old enough to have developed clavate hairs. In others, on this as on other segments up to the second abdominal only the single lateral pair of hairs is present. A single pair of dorsal hairs is present in addition on the next seven segments. On the last of these (the ninth abdominal) the ventral pair is also present. The tenth abdominal segment bears the usual circumanal ring of hairs.

In larvae which are not old enough to have developed clavate hairs the general surface of the body is smooth, apart from scattered specks which appear to represent sparse and undeveloped pile. In older larvae there are tufts of pile above each leg, one in front and one behind, and tufts on the lateral margins of each tergum. The tergal tufts are united by dorsal bands on the first and second thoracic segments, and on the posterior border of the ninth and the whole of the tenth abdominal segments.

Episphenus neelgherriensis (Percheron).

Localities.—Nilgiri Hills: Ootacamund, 7500 ft.
Mysore Bababudin Hills, 4000-5000 ft.
Cochin State: Kavalai, *ca.* 1300-3000 ft.

The lengths of the various larvae in the collection vary from 11-35 mm.

The head is almost devoid of any indication of hairs on the dorsal surface except for about 5-7 long ones in a row behind each antenna, 5 being apparently the normal number.

The arrangement of the hairs on the thorax and abdomen seems to be less constant than is usual. The tenth abdominal segment always bears a circumanal ring. In the smallest specimens each segment in front of it bears dorsal and lateral pairs of hairs, of which the former are much the strongest; and the first thoracic segment bears in addition a line of about three hairs in each anterior angle. All these hairs may be retained in large larvae; but more usually the first thoracic segment bears only two hairs situated laterally side by side, being without dorsal hairs, the second thoracic segment bears none at all, the third thoracic and first abdominal segments each bear the dorsal pair only, and the second to ninth abdominal segments bear both dorsal and lateral pairs. The whole body is smooth as in young larvae of the preceding species.

Episphenus indicus (Stoliczka).

Localities.—Mysore: Bababudin Hills, 4000-5000 ft.
Anamalai Hills, 5000 ft.,
Cochin State: Kavalai, *ca.* 1300-3000 ft.

The lengths of all the larvae of this species that I have before me are about 35-50 mm. There are no really small specimens among them. The head is more uniformly covered with fine hair than is that of the preceding species, which it resembles as regards the hairs behind the antennae. The thorax and abdomen are more or less covered with moderately long pile, especially laterally; but there are no definite tufts as in large larvae of *Pleurarius brachyphyllus*. The thorax is without prominent hairs. The first seven abdominal segments each bear two hairs (abnormally one or three) situated dorsally rather close together one below the other. The eighth and ninth abdominal segments bear none. The tenth bears the usual circumanal ring.

Ophrygonius cantori, Percheron, subsp. **convexifrons**, Zang.

Locality.—Assam: Shillong, Khasi Hills, 5500-6400 ft.

Four specimens, all about 22 mm. long. Both head and body are covered, except near the mid-ventral line of most of the abdominal segments, with somewhat thickly scattered coarse hairs, but there is no true pile. Longer and thicker hairs are present on the head in a row behind the antennae in the lateral angles of the frons. On

the first thoracic segment such hairs form a row behind the anterior margin, one or two similar dorsal and one lateral hair being present on each side behind them. On the second and third thoracic segments there are two dorsal and two lateral hairs on each side, the dorsal ones being situated as usual one on the outer side of the other, and the lateral ones one behind the other. There are moderately long hairs above the legs on all segments, and a ventral pair of hairs between them ; on the third segment there are about three very long hairs, resembling in size and position the ventral hairs of the abdominal segments. On the first seven abdominal segments there are two pairs of dorsal hairs, one pair of lateral hairs, two or one pairs of ventral hairs, and one pair of weaker hairs nearer the middle of the ventral surface than the last named. The hairs on the eighth and ninth abdominal segments resemble those on the segments in front of them, except that there are three instead of two dorsal ones. The tenth abdominal segment bears the usual circumanal ring, and has short hairs scattered all across the ventral surface instead of having a mid-ventral hairless band like the preceding segments.

Aceraius grandis, Burmeister, subsp. **hirsutus,** Kuwert.

Locality.—Darjiling District: Pashok, *ca.* 2000 ft.

The lengths of the larvae before me vary from 38-50 mm. The largest larvae have jaws and labrum of about the same size as those of cast larval skins belonging to pupae found with these larvae, so presumably they are full grown. The beetles found with them are all about 40 mm. long. Doubtless the size of full-grown larvae varies like that of the adult beetles. The head resembles that of *Episphenus indicus*, except for the presence of a group of two or three well marked hairs in the lateral angles of the frons. The body is covered with pile as in that species, but this is inclined to be densest mid-dorsally instead of laterally. The thorax is without special hairs as a rule, but one or two pairs of rather small dorsal ones are present on the third segment in some specimens; these and the three pairs which are present on each of the first six abdominal segments, form a series of transverse dorsal lines. The seventh, eighth and ninth abdominal segments are without hairs. The tenth bears the usual circumanal ring.

Aceraius kuwerti, Zang.

(Pl. xx, fig. 4.)

Locality.—Sarawak: Kinabalu, 4500 ft.

Two specimens 46 and 68 mm. long respectively. The head resembles that of the preceding species except that the long hairs are more numerous, both in the lateral angles of the clypeus and behind the antennae. In the larger of the two specimens there are also a few long hairs among the shorter ones that border the frons and fill its posterior angle. The thoracic and first seven abdominal segments each bears a transverse dorsal line of 5-7

hairs, which are weakest and least numerous in the first and last segments, the seventh (counting from the middle line) being identical, at least in position, with the lateral hairs of other species. On the eighth and ninth abdominal segments these hairs are all so small as to be scarcely noticeable among the well-developed pile with which the body is covered. The pile is associated with minute spinules, of which one is situated immediately in front of the base of each of the fine hairs of which the pile is composed. In front of the lateral ends of each line of long hairs the pile is less dense and the spines are relatively large and sharply pointed. In the smaller of the two specimens part of this area is entirely without hairs and spines. The tenth abdominal segment bears the usual circumanal ring.

Aceraius pilifer (Percheron).

Locality.—Sarawak : Kinabalu, 4500 ft.

Two specimens 30 and 37 mm. long respectively. The head resembles that of the larger of the two specimens of the preceding species. The pile on the thorax and abdomen is much longer than in that species, and is accompanied by somewhat finer spinules; otherwise the thorax and abdomen resemble those of that species.

Aceraius helferi, Kuwert.

Locality.—Tenasserim : Misty Hollow to Sukli, Dawna Hills, *ca.* 2100-2500 ft.

Four specimens, each about 38 mm. long. The head resembles that of *A. grandis* subsp. *hirsutus*. The pairs of dorsal hairs are three in number as in that species, but are present on the thoracic as well as on the abdominal segments, and are accompanied on each of these segments by a pair of lateral hairs. On the first thoracic segment they are also accompanied by a few long hairs in the anterior angles, and on the ninth abdominal by a pair of well developed ventral hairs. The tenth abdominal segment bears the usual circumanal ring. The pile is short as in *A grandis* subsp. *hirsutus*.

Macrolinus andamanensis (Stoliczka).

Localities.—Andamans : Port Blair; Bom lungta (from Popita tree).

Four specimens, all about 30-32 mm. long. The head is covered with fine hair, but bears no long hairs either behind the antennae or elsewhere. The body is covered somewhat closely with short pile. The thoracic and seventh to ninth abdominal segments are without hairs. The first six abdominal segments have two pairs of dorsal hairs as in *Episphenus indicus*, from which species the present one may be distinguished by the

absence of hairs behind the antennae and by the somewhat shorter pile on the body. There are no lateral hairs. The tenth abdominal segment bears the usual circumanal ring.

Leptaulax dentatus (Fabricius).

Localities.—Abor Country: Rotung, 1300 ft.
Tenasserim: Kawkareik, Amherst District.

Four specimens, 18-25 mm. long. The head is practically hairless above, and is entirely without long hairs. The body is practically without pile and has only a single pair of dorsal hairs on the first eight (? sometimes six or seven only) abdominal segments.

Leptaulax bicolor (Fabricius).

The two somewhat imperfectly separated varieties into which, at most, the adults of this species seem at present to be divisible, are associated in the single collection of each before me with slightly different larvae. Although it is impossible to be certain, from these two collections only, that this implies that the separation referred to has been on right lines, it will be convenient to accept this hypothesis in describing them.

I. L. BICOLOR (Fabricius) *s. str.*

Locality.—Cochin State: Kavalai, *ca.* 2000-2500 ft.

Several specimens varying from 12-31 mm. in length. The adults with which they are associated are about 29 mm. in length. The whole larva is practically without pile. In the smallest specimens there is a single long hair in a row of small ones behind the antennae; but this disappears later, apparently when the larva is about 15 mm. long. In the smallest larvae the thorax bears three long hairs in the anterior angles of the first segment, a cluster of much shorter ones above the base of each of the first two pairs of legs, and a single pair of ventral hairs behind the third pair of legs. In a specimen a little over 15 mm. the hairs above the legs are quite weak, and a single pair of rather small dorsal hairs has appeared on each thoracic segment. In larger larvae the hairs above the legs completely disappear. Each of the first nine segments of the abdomen bears two pairs of well developed dorsal hairs, and one pair of much smaller dorsally directed ventral hairs; on the ninth segment there is in addition a pair of ventrally directed ventral hairs resembling those which are dorsally directed and situated slightly below them; the ventral hairs on the eighth and ninth segments are duplicated in one very small specimen; the ventral hairs are easily seen in very small specimens but are quite small in large ones. The tenth abdominal segment bears the usual circumanal ring of hairs.

2. L. BICOLOR var. VICINUS (Percheron).

Locality.—Andamans: Port Blair.

Several specimens, varying from about 14-28 mm. in length. The smallest specimen resembles the smallest of the preceding form, except that the single long hair behind each antennae is much shorter, though relatively stout, and is associated with a cluster of small spinules or bacilli. Large larvae differ from this specimen only in the loss of the hairs above the two front pairs of legs (though these do not appear to be lost so quickly as in the preceding form), and in the replacement of the pair of hairs behind the last pair of legs and of all the ventral pairs of hairs on the abdomen by short bacilli. The hairs and groups of spinules behind the antennae are not lost, and the dorsal pairs of hairs on the thoracic segments are not developed.

LUCANIDAE.

Several descriptions of Lucanid larvae have appeared since the publication of Chapuis and Candèze's catalogue (*Mem. Soc. R. Sci. Liège*, VIII, 1853, Lucanidae, pp. 468-470). In the following list of the references I have been able to trace those not available in Calcutta are marked with an asterisk (*), as I have not been able to use them.

Lucanus cervus, Linnaeus.

? *Albrecht. *Acta Acad. nat. Cur.* (series ?) IV, pl. 5.

1746. *Rossel von Rosenhof, A. J. *Ins. Belust.*, II (1), 1746, pl. iv, fig 3.

1790. *Herbst, J F. W. "Natursystem aller bekannten in- und ausländischen Insekten," III (Berlin, 1790), p. 289, pl. F, figs 1-6.

1804. *Posselt, C. F. "Beyträge zur Anatomie der Insekten", etc., (Tübingen, 1804), pl. ii, fig 1.

1823. *Blot. *Mem. Soc. Linn. Calvados*, I, 1823.

1839. Ratzeburg, J T. C. "Die Forst-Insecten," 2nd. ed., I (Berlin, 1839), pp. 105-106.

Westwood, J O. "Introduction to the Modern Classification of Insects," I (London, 1839), pp. 187-188.

1848. *Erichson, W. F. "Naturgeschichte der Insekten Deutschlands," (Berlin, 1848), p. 938.

1874. Schiødte, J. C. "De metamorphosi Eleutheratorum observationes: Bidrag til Insekternes Udviklingshistorie." *Naturhist. Tids.*, IX, 1874 (*Lucanus*, pp. 341-345, pl. xviii, figs. 12-19, pl. xix, fig. 17).

"Lucanus" alces.

1836. *Haan, W de. "Mémoires sur les Métamorphoses des Coléoptères," I (Paris, 1836), p. 25, pl. iii, fig. 6.

"Lucanus" saiga.

1836. *Haan, W de. "Mémoires sur les Métamorphoses des Coléoptères," I (Paris, 1836), p. 24, pl. iii, fig. 7.

Dorcus parallelopipedus, Linnaeus.

1833. Bree, C. R. "Remarks on the Fall of an aged Ash Tree." *Mag. Nat. Hist.*, VI, 1833, pp. 327-335, text-figs. 43-44.

1839. Ratzeburg, J T. C. "Die Forst-Insecten." 2nd ed., I (Berlin, 1839), pp. 105-106, pl. iii, fig. 19.

1842. Dufour, L. "Histoire comparative des métamorphoses et de l'anatomie des *Cetonia aurata* et *Dorcus parallelipipedus*." *Ann. Sci. Nat.*, (2) XVIII, 1842, pp. 162-181, pl. iv-v.

*Mulsant, M. E. and Rey, C. "Histoire Naturelle des Coléoptères de France, Lamellicornes." (Paris and Lyon, 1842), p. 281, pl. i, figs. 18*a-c*.

1848. *Erichson, W. F "Naturgeschichte der Insekten Deutschlands." (Berlin, 1848), p. 491.

1874. Schiφdte, J C. "De metamorphosi Eleutheratorum observationes: Bidrag til Insekternes Udviklingshistorie." *Naturhist. Tids.*, IX, 1874 (*Dorcus*, pp. 345-349, pl. xvii, figs. 1-10, pl. xix, figs. 14-15).

1890. *Planet, L. *Naturaliste*, XII, 1890, p. 156.

Platycerus caraboides, Linnaeus.

1842. *Mulsant, M. E. and Rey, C. "Histoire Naturelle des Coléoptères de France, Lamellicornes." (Paris and Lyon, 1842), p. 597.

1874. Schiφdte, J C. "De metamorphosi Eleutheratorum observationes: Bidrag til Insekternes Udviklingshistorie." *Naturhist. Tids.*, IX, 1874 (*Platycerus*, pp. 349-352, pl. xvii, figs. 11-21).

Figulus striatus, Fabricius.

1845. *Blanchard, C. E. "Histoire des Insectes," I, 1845 p. 268, pl. viii, figs. 2-3.

Ceruchus tarandus, Panzer.

1842. *Mulsant, M. E. and Rey, C. "Histoire Naturelle des Coléoptères de France, Lamellicornes." (Paris and Lyon, 1842), p. 593, pl. iii, figs. 6*a-c*.

Ceratognathus froggatti, Blackburn.

1894. Froggatt, W. W. "On the Life-Histories of Australian Coleoptera," II. *Proc. Linn. Soc. N. S. Wales*, (2) IX, 1894 (1894-5), pp. 120-121.

Mitophyllus irroratus, Parry.

1881. Brown, T. "On the Larva and Pupa of *Ceratognathus irroratus*." *Trans. N. Z. Inst.*, XIII, 1880 (1881), pp. 230-231.

Aesalus scarabaeoides, Fabricius.

1842. *Mulsant, M. E. and Rey, C. "Histoire Naturelle des Coléoptères de France, Lamellicornes." (Paris and Lyon, 1842), p. 604.

Sinodendron cylindricum, Linnaeus.

1839. Westwood, J. O. "Introduction to the Modern Classification of Insects," I (London, 1839), p. 189, text-fig. 18 (p. 185), 11-13.

1842. *Mulsant, M. E. and Rey, C. Histoire Naturelle des Coléoptères de France, Lamellicornes." (Paris and Lyon, 1842), p. 600, pl. iii, figs. 10*a-b*.

1874. Schiφdte, J. C. "De metamorphosi Eleutheratorum observationes: Bidrag til Insekternes Udviklingshistorie." *Naturhist. Tids.*, IX, 1874 (*Sinodendron*, pp. 352-356, pl. xviii, figs. 1-10, pl. xix, fig. 16).

The Lucanid larvae described below were found in wood together with adults of the species to which I have referred them. In no case were any pupae found.

Aegus roepstorffi, Waterhouse.

(Pl. xxi, figs. 8-11.)

Locality.—Andamans: Port Blair (in rotten wood).

Two larvae about 25 and 30 mm. long respectively, accompanied by two mesodont males of slightly dissimilar development. The larvae are of the usual curved clavate form.

The head is polished and obscurely rugose. It bears a few long slender hairs in a line behind the clypeo-frontal suture and the antennae, as in *Dorcus parallelopipedus*. The sutures bounding the frons latero-posteriorly, though distinct, are very weak. The clypeus is somewhat or much broader than long in front; behind it is quite twice as broad as long. The labrum is about twice as broad as long behind, and somewhat broader in front; its anterior margin and angles are rounded; it is lightly elevated in the middle line in front, between a pair of marginal or submarginal depressions.

The antennae resemble those of *Dorcus parallelopipedus*, but have the last of the two long joints scarcely longer than the first. I would regard these antennae, and those of other Lucanids, as apparently 5-jointed and really 4-jointed; not apparently 4-jointed and really 3-jointed as does Schiφdte. Both mandibles have three teeth at the apex, of which the ventral is situated in front of the middle one, and the middle one in front of the dorsal. In the right

mandible there is one and in the left there are two smaller teeth on the dorsal margin behind these, as in *Lucanus cervus*[1] and *Dorcus parallelopipedus*. The molar tooth of the right mandible consists of a low anterior transverse ridge followed by a somewhat higher hollowed L-shaped cusp; that of the left mandible consists of a very strongly elevated anterior transverse ridge, longitudinally grooved in front and more elaborately marked behind, followed by a low hollowed cusp of considerable size. The maxillae resemble those of *Dorcus parallelopipedus*. As with the antennae I would regard the basal piece ("stipes palpiger" of Schiødte) as a basal joint. The labial palps are 2-jointed, the proximal joint being about as long as broad, and the distal about three times as long as broad and about twice as long as the proximal.

The legs resemble those of *Dorcus parallelopipedus* in structure and proportions except that each joint—judging from Schiødte's figure of the third leg of that species—is slenderer, and that the stridulating joint of the third leg is more sharply pointed distally as in *Platycerus caraboides* The stridulating surface on the middle leg resembles that of the former species; the tubercles are very fine and closely set. The second, third and fourth joints of all legs, when not modified for stridulation, are thickened ventrally near the distal end. The projections thus formed bear clusters of stout spiniferous tubercles and are strongest on the third joint of each, and especially of the second, leg.

Only the thoracic and first two abdominal segments are distinctly divided transversely by a groove above. All segments as far as the sixth abdominal are sparsely covered above with short hairs, and have a posterior line of long hairs. Further back the short hairs disappear, and from about this point backwards long hairs are found on the anterior as well as the posterior parts of each segment. Each segment up to and including the ninth abdominal bears a large tubercle on each side in the posterior angles of the tergum. The terminal segment resembles that of *Dorcus parallelopipedus*, as do also the stigmata.

The larva of this species closely resembles that of its ally *Dorcus parallelopipedus*, the chief differences being found in the structure of the molar teeth and the greater slenderness of the legs.

Nigidius dawnae, Gravely.

(Pl. xxi, figs. 12-13.)

Locality.—Tenasserim: near Sukli, eastern side of Dawna Hills, Amherst District, *ca.* 2200 ft. (in hard dry wood).

Several larvae about 20-35 mm long (all but one of about the latter size) were found in association with the well developed

[1] Schiødte speaks of the right mandible as tridentate only in these species but the extra denticle is clearly shown in the right mandible of the latter species, which he figures (*loc. cit.*, pl. xvii, figs. 3 and 4).

males and females which formed part of the material from which the species was originally described (*Rec. Ind. Mus.*, XI, pp. 427-429, pl. xxix, fig. 7). They are curved and more or less clavate, but are slenderer than the larvae of the preceding species.

The head closely resembles that of the preceding species but bears fewer hairs, and has a somewhat narrower clypeus and a labrum with less distinct anterior marginal depressions.

The second of the two long joints of the antennae is somewhat shorter than in the preceding species; it is much, instead of scarcely, shorter than the first. The right mandible has only two terminal teeth as in *Platycerus caraboides* and *Sinodendron cylindricum*, the ventral being much the larger of the two; but beneath these a rudiment of the third terminal tooth is recognizable. The left mandible has three large teeth arranged like the apical teeth of *Dorcus parallelopipedus*, with a small denticle a little behind each of the two outermost of the three. Except for the presence of the small dorsal denticle the termination of this mandible is also very like that of *Sinodendron cylindricum*. The molar teeth of both mandibles closely resemble those of this species. The maxillae and labium resemble those of *Aegus roepstorffi*—the former at least are very like those of *Dorcus* and *Sinodendron*. The legs resemble those of *Aegus roepstorffi* in general structure, but are without the ventral projections and spiniferous tubercles found on the second, third and fourth joints in that species. The stridulatory tubercles on the coxae of the second legs are all small and scattered. The corresponding ridges on the second joint of the third legs are weak.

The stigmata and the integuments of the thorax and abdomen resemble those of the preceding species.

The only larva previously described belonging to the subfamily Figulinae is that of *Figulus striatus*. Unfortunately I have not been able to refer to this description. Of the larvae described by Schiødte, the nearest to that of *Nigidius dawnae* appears to be *Sinodendron cylindricum*, but the latter has not got transversely striate stigmata like those of *Dorcus*, etc., in general form it is not even faintly clavate, and its stridulating organs appear to be slightly different.

Nigidius impressicollis, Boileau.

(Pl. xxi, figs. 14-17.)

Locality.—Assam: Maflong, Khasi Hills, 5900 ft. (in damp and thoroughly decayed wood).

Two larvae, about 27 and 31 mm. long respectively, found in association with adults of various sizes. They are scarcely as slender as larvae of *N. dawnae*, but are much slenderer than larvae of *Aegus roepstorffi*.

The head is very like that of *A. roepstorffi* but has a somewhat shorter clypeus and less distinct anterior marginal depressions. The antennae resemble those of *N. dawnae*. The man-

dibles resemble those of *N. dawnae*, except that the right one is distinctly tridentate at its apex, the lowest terminal tooth being, however, a little weaker than the uppermost; the middle terminal tooth is the strongest of the three.

The maxillae and labium resemble those of *N dawnae*. The legs resemble those of *N dawnae*, except in the structure of the stridulating organ, which is transitional between those found in *A. roepstorffi* and *N. dawnae*. The ridges on the second joint of the third leg are weak as in the latter species; but there is a row of special tubercles, as in the former, on the basal joint of the second leg. Similar but stronger tubercles are found in *Aegus roepstorffi*, but they are absent in *Nigidius dawnae*. Small tubercles are present on both sides of them in the present species, however, and on one side of them only in *Aegus roepstorffi*. The stigmata and integuments of the thorax and abdomen resemble those of *N. dawnae* and *A. roepstorffi*.

This larva is not unlike the last—the only larva of its genus known—but the stridulating organ is more highly specialized along the same lines as, but to a less extent than, the stridulating organs of *Dorcus*, *Aegus*, etc.

CUCUJIDAE.

A list of the Cucujid larvae hitherto described will be found at the end of the account of the development of *Uleiota indica*, Arrow (*Rec. Ind. Mus.*, XI, pp. 353-358, pl. xxi, figs. 13-19).[1] None of these larvae bear any resemblance to the larva of *Hectarthrum trigeminum* now to be described. The larvae of *Hectarthrum* were found in decaying wood with all stages of a weevil belonging to the genus *Mecistocerus*.[2] Often they were found in a cavity of the wood with a larva or pupa of this insect, and sometimes with the remains of such. Other Cucujid larvae, although found under the bark of trees, have the appearance of actively predaceous insects. These have rather the appearance of lignophagous larvae. But in view of the circumstances under which they were found, and of the structure of their mandibles, there can, I think, be little doubt that the reduction of legs and mouthparts which gives rise to this appearance is due not to their having adapted themselves to a diet of wood, but to their having become parasitic rather than predaceous.[3] They must, however, move about in search of their victims, for the weevil larvae and pupae are not much larger than they are when full grown, and it cannot be supposed that one weevil larva affords all the food needed for complete development.

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[1] To this list may now be added Herrick's account of the habits and development of *Silvanus surinamensis* in "Insects Injurious to the Household and Annoying to Man" (New York, 1914), pp. 236-239, text-figs. 70-71.

[2] Mr. G. A. K. Marshall, to whom I am indebted for this identification, informs me that this weevil is near and perhaps identical with *M. corticeus*, Faust.

[3] Compare Wadsworth's figures of the mouthparts of the endoparasitic Staphylinid larva, *Aleochara bilineata*, *Journ. Ec. Biol.* X, pl. ii, figs. 14-18.

Hectarthrum trigeminum, Newman.[1]

(Pl. xxii, figs. 18-22.)

Locality.—E. Himalayas: Kalimpong, *ca.* 2500 ft., Darjiling District (in decaying wood with all stages of *Mecistocerus* sp.).

Several larvae and pupae, the former 4·0-15·6 mm. long, the latter 9·0-12·0 mm., found together with adults. The pupae and adults clearly belong to one and the same species; a cast larval skin secured with one of the pupae establishes the identity of the latter with the larvae, while in the largest of these larvae the skin is wrinkled and the spines of the pupa are clearly visible beneath it dorsally and laterally.

The larva is a white fleshy and almost hairless grub. Its abdomen is somewhat barrel-shaped, being thickest at about the fourth segment. The thorax is conical, and slenderer than the abdomen, tapering away to the base of the small semicircular head, which bears a few minute hairs on its dorsal surface.

The form of the head is shown in figs. 18 and 21 (pl. xxii). Each antenna arises from a low lateral convexity just behind the mandible; it is unjointed but is biramous, a small pointed branch being situated immediately below a stouter and slightly longer rounded one (pl. xxii, fig. 20). The mandibles are small and concave; they do not appear suitable for grinding fragments of wood. Their outer surface is whitish near the base, but they are narrowly bordered and extensively tipped with dark brown. They are tridentate at the tip (pl. xxii, figs. 19 and 21), the middle one of the three teeth being much longer than the other two, of which the dorsal is much broader than the ventral; there are no other teeth on the dorsal margin of the mandible, but the ventral terminal tooth is followed by another tooth of about the same shape and size, and this is followed by a strong convexity of the raised margin (pl. xxii, fig. 19). The maxillae and labium (pl. xxii, fig. 22) are rudimentary like the antennae. The blade and palp of the maxillae are imperfectly separated; the former is broader but no longer than the latter, and each is tipped with a cluster of small spines. The labium is a bilobed structure, with a papilla mounted on each lobe, tipped with small spines and doubtless representing a palp.

The legs are short, stout and conical; they have two well-marked white fleshy joints and a stout terminal claw; as seen from the outer side there appears to be a third joint at the base, but it is not clearly marked off from the body on the inner side. The second thoracic segment, and each abdominal segment except the ninth (anal), bears a pair of circular stigmata a little behind the anterior margin; but the last pair is much smaller than the others. The anal segment bears a pair of black forwardly curved hooks on the posterior margin of its dorsal surface.

[1] I am indebted to M. A. Grouvelle for this identification.

BUPRESTIDAE.

The habits and metamorphoses of Buprestid beetles form the subject of a monograph published by Xambeu in 1892-3 ("Moeurs et Métamorphoses d'Insectes III—Buprestides." *Rev. d'Ent.* XI, 1892, pp. 202-252; XII, 1893, pp. 54-126). This work contains an excellent bibliography which may now, however, be supplemented. In the following list of supplementary references the species are arranged in the order adopted by Kerremans in the *Genera Insectorum.*

Julodis onopordi, Fabricius.

Julodis albopilosa, Chevrolat.

1893. Herculais, J Künckel d' *Bull. Soc. ent. France*, 1893, pp. cxii-cxv, 7 figs.

1898. Lesne, P. "Description de la larve adulte du *Julodis albopilosa*, Chevr., et remarques sur divers caractères des larves de Buprestides." *Bull. Soc. ent. France*, 1898, pp. 69-75, 7 text-figs.

Polycesta californica, Leconte.

Polycesta elata, Leconte.

1891. Angell, G. W J "Larva of *Polycesta elata*, Lec." *Ent. News*, 1891, pp. 106-107, text-figs.

Acmaeodera adspersula, Illiger.

1900. Seurat, L. G. "Observations biologiques sur les parasites des chênes de la Tunisie." *Ann. Sci. Nat., Zool.* (8) XI, 1900, pp. 1-34, 10 text-figs. (*Acmaeodera*, pp. 22-26, text-figs. 9-10).

Chrysochroa (Megaloxantha *nec* **Catoxantha) bicolor**, Fabricius, var. **gigantea**, Shallerr.

1901. Zehntner, L. *Bull. Proefstation voor Cacao te Salatiga.* No. 1, 10 pp.

Chalcophora ? virginiensis, Drury.

Chalcophora virginiaca, Gmelin.

1883. Packard, A. S. "Descriptions of the Larvae of Injurious Forest Insects." *Rep. U. S. Ent. Comm.*, III, pp. 252-262, pl. vi-xv (*Chalcophora ? virginiensis*, pp. 252-253, pl. vi, fig. 1).

Sphenoptera lamellata.

1880. Lamey. *Nouv. et Faits*, II, p. 113.

Sphenoptera ? neglecta, Klug.

? *Sphenoptera gossypii*, Cotes.

1911. King, Harold H. "The Cotton Stem-borer." *Rep. Wellcome Trop. Res. Labs.*, IV, pp. 134-137, pl. vii, figs. 1-6.

Sphenoptera gossypii, Cotes.

1906. Lefroy, H. M. "Indian Insect Pests" (Calcutta, 1906), pp. 100-103, text-figs. 114-119.

1909. Lefroy, H. M. "Indian Insect Life" (Calcutta, 1909), pl. xx. (No description).

1914. Fletcher, T. B. "Some South Indian Insects" (Madras, 1914), p. 298, pl. viii.

Sphenoptera arachidis, Fletcher.

1914. Fletcher, T. B. "Some South Indian Insects" (Madras, 1914), pp. 298-299, text-figs. 141-142.

Dicerca divaricata, Say.

1881. Packard, A. S. "Insects injurious to Forest and Shade Trees." *Bull. U. S. Ent. Comm.*, no. 7, 275 pp., 100 text-figs. (*Dicerca divaricata*, p. 108).

1883. Packard, A. S. "Descriptions of the Larvae of Injurious Forest Insects" *Rep. U. S. Ent. Comm.*, III, pp. 251-262, pl. vi-xv (*Dicerca divaricata*, p. 255, pl. vi, fig. 2).

Lampra solieri, Castelnau and Gory.

Poecilonota solieri, Castelnau and Gory.

1908. Escalera, M. de la. "Observaciones sobre la ninfosis de *Poecilonota solieri*, Cast." *Boll. Soc. Esp. Hist. Nat.*, 1908, pp. 269-271.

Lampra rutilans, Fabricius.

1881. Altum, B. "Forstzoologie, III (1) Allgemeines und Käfer" (Berlin, 1881), pp. 1-380 (*Lampra rutilans*, pp. 121-123, text-fig. 7.)

Buprestis douei, Lucas.

Ancylocheira douei, Lucas.

1896. Xambeu. "Moeurs et Métamorphoses d'Insectes V." *Ann. Soc. Linn. Lyon*, XLII, pp. 53-100 and 123-188 (*Ancyclocheira douei*, p. 83).

Melobasis cupriceps, Kirby.

Melobasis iridescens, Castelnau and Gory.

1895. Froggatt, W W. "Life-Histories of Australian Coleoptera III." *Proc. Linn. Soc. N. W Wales*, (2) X, 1895 (1895-6), pp. 325-336 (*Melobasis*, pp. 332-333).

Melanophila sp.

1883. Packard, A. S. "Descriptions of the Larvae of Injurious Forest Insects." *Rep. U. S. Ent. Comm.*, III, pp. 252-262, pl. vi–xv (*Melanophila* sp., pp. 253-354, pl. vi, fig. 4, pl. xii, fig. 1).

Anthaxia umbellatarum, Fabricius.

Anthaxia inculta, Germar.

1895. Xambeu. "Moeurs et Métamorphoses d'Insectes VI." *Echange*, 1895, supplement (*Anthaxia inculta*, p. 84).

Chrysobothris dentipes, Germar.

1881. Packard, A. S. "Insects Injurious to Forest and Shade Trees." *Bull. U. S. Ent. Comm.*, No. 7, 275 pp., 100 text-figs. (*Chrysobothris dentipes*, pp. 12-15, fig. 1).

Chrysobothris femorata, Olivier.

1881. Packard, A. S. "Insects Injurious to Forest and Shade Trees." *Bull. U. S. Ent. Comm.*, No. 7, 275 pp., 100 text-figs. (*Chrysobothris femorata*, pp. 16-20, figs 2-3).

1883. Packard, A. S. "Descriptions of the Larvae of Injurious Forest Insects." *Rep. U. S. Ent. Comm.*, III, pp. 251-262 (*Chrysobothris femorata*, pp. 251-252).

Chrysobothris affinis, Fabricius.

1881. Altum, B. "Forstzoologie, III (1) Allgemeines und Käfer" (Berlin, 1881), 380 pp., 55 text-figs. (*Chrysobothris affinis*, pp. 124-128, text-fig. 8).

Stigmodera rufipennis, Kirby.

1893. Froggatt, W. W "On the Life-Histories of Australian Coleoptera I." *Proc. Linn. Soc. N S. Wales*, (2) VIII, 1893 (1893-4), pp. 27-42 (*Stigmodera rufipennis*, p. 36).

Coraebus bifasciatus, Olivier.

1881. Altum, B. "Forstzoologie, III (1) Allgemeines und Käfer" (Berlin, 1881), 380 pp., 55 text-figs. (*Coraebus bifasciatus*, pp. 128-130, text-fig. 9).

Agrilus ruficollis, Fabricius.

1870. Wielandy. *Amer. Ent.*, II, pp. 128 and 133, figs. 68, 69 and 90.

Agrilus granulatus, Say.

1884. Burrill. *Rep. Ins. Illinois*, XII, pp. 121-122.

Agrilus anxius, Gory.

1898. Chittenden, F. H. "A destructive Borer Enemy of Birch Trees, with Notes on Related Species." *Bull. U. S. Dept. Agric. Div. Ent.*, (n. s.) No. 18, pp. 44-51, text-figs. 15-17.

Agrilus auricollis, Kiesenwetter.

1888. Wachtl, F. A. "Ein Lindenverwüster." *Wien. Ent. Zeit.*, VII, 1888, pp. 293-297, pl. iii.

Paracephala cyaneipennis, Blackburn.

1894. Froggatt, W. W. "On the Life-Histories of Australian Coleoptera." *Proc. Linn. Soc. N. S. Wales*, IX, 1894 (1894-5), pp. 113-125 (*Paracephala cyaneipennis*, p. 122).

Aphanisticus krugeri, Ritsema.

1889. Ritsema. *Tijdschr. Ent.*, XXXIII, 1889-90, pp. xxii-xxiii, 1 text-fig.

1897. Zehntner, L. "De Mineerlarven van het Suikerriet op Java II-III." *Med. Proefstation Ost Java*, (n. s.) No. 42, 1897, 14 pp., 1 pl.

Aphanisticus consanguineus, Ritsema.

1897. Zehntner, L. "De Mineerlarven van het Suikerriet op Java II-III." *Med. Proefstation Ost Java*, (n. s.) No. 42, 1897, 14 pp., 1 pl.

Pachyschelus sp.

1908. Friebrig, K. "Eine Schaum bildende Käferlarve." *Zeitschr. wiss. Insektenbiol.*, IV, 1908, pp. 333-339 and 353-363.

Brachys aeruginosa, Gory.

1881. Packard, A. S. "Insects Injurious to Forest and Shade Trees." *Bull. U. S. Ent. Comm.*, No. 7, 275 pp., 100 text-figs. (*Brachys aeruginosa*, p. 130, fig. 60½).

The Indian Museum collection contains larvae of *Sphenoptera gossypii* from the material from which this species was originally

described, and larvae found with pupae and adults in a tree probably belonging to the genus *Swietenia* on the Calcutta Maidan. There can be little doubt, from the state of the tree when it was cut down, that these larvae, together with many others of the same species, were responsible for its death. The adults agree closely with Théry's description of *Cardiaspis pisciformis* from Mysore (*Bull. Soc. ent. France*, 1904, pp. 73-74, text-fig. 2), the only apparent differences being that the sides of the pronotum are practically parallel in their latter half, and that the posterior tibiae are straight except in one specimen and are almost imperceptibly curved in this. Equally great differences exist, however, between Théry's figure of *C. mouhoti*, Saunders, and our specimens of this species, and I have no hesitation in referring the specimens from *? Swietenia* to Théry's species. Their larvae may now be described.

Cardiaspis pisciformis, Théry.

(Pl. xxii, figs. 23-28.)

Locality.—Calcutta (? in *Swietenia* sp.).

Four specimens varying in length from 23-33 mm.

The clypeus is about 5 times as wide as long and bears a small but deep and clearly defined puncture on either side of the middle line, which is more or less faintly keeled between and behind them. The anterior margin is lightly concave and the anterior border strongly depressed laterally, the depressions being bounded behind by keels.

The labrum is mounted on a membraneous peduncle. The labrum and peduncle are each fully as wide as the clypeus is long, and are together fully as long as wide, the labrum being about twice as long as the peduncle. The anterior and lateral margins of the labrum are lightly convex, the angles are rounded; the surface is grooved in the middle line in front, this groove being surrounded by a semicircular or more or less **V**-shaped groove which crosses the middle line behind it. The peduncle is depressed or grooved in the middle line.

The antennae are three-jointed. The basal joint is large and fleshy, almost white in colour. The second joint is smaller and harder, much yellower in colour, obliquely truncate and fringed with short close hair distally, the truncation facing downwards. The terminal joint is much smaller still, the distal fringe being indeed its most conspicuous part; as it is set on the oblique distal face of the second joint it is directed downwards. A (? sensory) hair arises dorsally at the base of the terminal joint; whether this hair arises from the middle or terminal joint I have been unable to determine. The mandibles are small, tridentate distally, and very hard. The maxillae are weak; the blade of each is cylindrical, and is rounded and unarmed distally; the palp is two-jointed, the basal joint is as large as the blade and not unlike it in shape, the terminal joint conical, slightly longer than it is broad at the base and scarcely half as long as the basal joint. The labium is even less

well developed than are the maxillae. It consists of a pair of whitish pilose fleshy convex lobes, each about twice as long as broad, with a pair of brown rudimentary palps, the former being fused with, and the latter closely apposed to, the surface of the highly polished, densely fringed but otherwise hairless hypopharynx, which fills up the space between the maxillae. The strongly chitinized ventral plate behind the mouth parts is much shorter than the clypeus ; it bears a pair of longitudinal grooves close to the middle-line, and its anterior margin is lightly concave as a whole.

Both the dorsal and ventral plates of the prothorax are dull as a whole, owing to an even and almost microscopically fine granulation; but the median ventral groove with a strongly fan-shaped area in front of it, and the dorsal **V** with a less expanded area in front of it, are polished. The rest of the body is dull except for the posterior end which is polished.

This larva closely resembles larvae of the allied genus *Dicerca*, as these are defined in Xambeu's key to the genera of Buprestid larvae.

TENEBRIONIDAE.

A key to the genera of Tenebrionid larvae was published by Schiφdte (*Nat. Tidsskr.*, XI, 1877-1878, pp. 491-522). This has been republished by Kiesenwetter and Seidlitz, who also give a new key (*Naturg. Ins. Deutschl.*, Coleoptera V [1], pp. 210-216).

The following is a list of the references I have been able to find to descriptions of Tenebrionid larvae. Those not available in Calcutta are marked with an asterisk.

TENTYRIINAE.

Pachychile servillei, Soc.

1898. *Xambeu. "Moeurs et Métamorphoses des Insectes VII (1)." *Ann. Soc. Linn. Lyon*, XLV, pp. 9-66 (? 197).

Tentyria interrupta.

1877. Perris, E. "Larves de Coléoptères" (Paris, 1877), 590 pp., 14 pl. (*T interrupta*, pp. 253-255), reprinted from *Ann. Soc. Linn. Lyon*, (n. s.) XXIII, pp. 1-430 (*T interrupta*, p. 94).

Tentyria mucronata, Steven.

1877. Perris, E. *Loc. cit.*, p. 255.

ELENOPHORINAE.

Elenophorus collaris, L.

1856. Mulsant, E. and Mulsant, V. "Description de la larve de l'*Elenophorus collaris*, coléoptère de la tribe Latigènes."

Opusc. Ent., VII, 1856, pp. 133-134 (? reprinted from *Ann. Soc. Linn. Lyon*, 1856, II, 3, p. 133).

ASIDINAE.

Asida corsica, Cast.

1877. Perris, E. *Loc. cit.*, pp. 256-57 and 96 respectively.

Asida dejeani, Sol.

1887. *Rey, C. "Essai d'études sur certaines larves de Coléoptères et descriptions de quelques espèces inédites ou peu connus." *Ann. Soc. Linn. Lyon*, (n. s.) XXXIII, pp. 131-259, pls. i and ii (*Asida dejeani*, p. 223, pl. ii, fig. 23).

Asida jurinei, Sol.

Asida bigorrensis, Sol.

1877. Perris, E. *Loc. cit.*, pp. 257 and 97 respectively.
1893. *Xambeu. "Moeurs et métamorphoses d'insectes." *Ann. Soc. Linn. Lyon*, XL, 1893, pp. 1-52, and 101-185 (*Asida jurinei*, p. 28).

Asida sericea, Ol.

1887. *Rey, C. "Essai d'études sur certaines larves de Coléoptères et descriptions de quelques espèces inédites ou peu connus." *Ann. Soc. Linn. Lyon*, (n. s.) XXXIII, pp. 131-259, pls. i and ii (*Asida sericea*, p. 224).

MOLURINAE.

Psammodes reichei, Sol.

1909. *Mally, C. W. "The Tok-Tokje (*Psammodes*) as a grain pest." *Cape Town Agricult. J.*, 1909, text-figs.

AKIDINAE.

Akis bacarozzo, Schrank.

Akis reflexa, Ol.

Akis punctata, Thunb.

1844 *Mulsant, E. *Mem. Soc. Linn. Lyon*, I, 1844.
1877-8. Schiødte, J C. "Le metamorphosi Eleutheratorum observationes." *Natur. Tidsskr.*, XI, pp. 479-598 (*Akis bacarozzo*, pp. 507, 508, 529-531, pl. v, figs. 12-21).
1898. Kiesenwetter, H. v., and Seidlitz, G. "Tenebrionidae." *Naturg. Ins. Deutschl.* (Berlin, 1898), V, p. 213 (foot note).

SCAURINAE.

Scaurus atratus, F.

1877-8. Schiødte, J. C. *Loc. cit.*, pp. 526-29, pl. vi, figs. 14-20.

? **Scaurus tristis,** Ol.

1854. *Mulsant, E. "Histoire naturelle des Coléoptères de France, Latigenes," (Paris & Lyon, 1854), pp. x, 396 (*Scaurus tristis*, p. 51). See also Perris, 1877, *loc. cit.*, p. 252.

PIMELIINAE.

Pimelia bipunctata, F.

1877. Perris, E. *Loc. cit.*, p. 259.

Pimelia boyeri, Sol.

1898. *Xambeu. "Moeurs et métamorphoses des Insectes" VII (1). *Ann. Soc. Linn. Lyon*, XLV, pp. 9-66 (*Pimelia boyeri*, p. 59).

Pimelia grossa, F.

Pimelia inflata, Herbst.

1877-8. Schiødte, J. C. *Loc. cit.*, p. 523, pl. v, figs. 1-11.

Pimelia pilifera, Sén.

1898. *Xambeu. "Moeurs et métamorphoses des Insectes" VII (1). *Ann. Soc. Linn. Lyon*, XLV, pp. 9-66 (*Pimelia pilifera*, p. 57).

Pimelia sardea, Sol.

1877. Perris, E. *Loc. cit.*, pp. 258 and 98 respectively.

BLAPTINAE.

Blaps gigas, Linn.

1872. *Mulsant. *Mem. Acad. Lyon*, XIX, 1872, pp. 340-342.
1873. Mulsant, E., and Mayet, V. "Histoire des métamorphoses de diverses espèces de Coléoptères." *Opusc. Ent.*, XIV, 1873, pp. 65-100 (*Blaps gigas*, pp. 92-96).
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, pp. 245, 246.

Blaps lethifera, Marsh.

Blaps fatidica, Sturm.

1843. *Letzner. *Uebers. Schles.*, 1843, p. 4.
1852. Perris, E. "Histoire des métamorphoses du *Blaps producta* Dej.? et *Blaps fatidica*, Sturm." *Ann. Soc. Ent. France* (2) X, 1852, pp. 603-612, pl. xv (*Blaps fatidica*, pp. 609-612, pl. xv, figs. 20-21).
1877-8. Schiødte, J C. *Loc. cit.*, p. 532, pl. vi, figs. 1-13.

Blaps lusitanica, Herbst.

Blaps producta, Cast.

1852. Perris, E. "Histoire des métamorphoses du *Blaps producta*, Dej.? et *Blaps fatidica*, St." *Ann. Soc. Ent. France*, (2) X, 1852, pp. 603-612, pl. xv (*Blaps producta*, pp. 606-608, pl. xv, figs. 13-18).
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 246.

Blaps mucronata, Latr.

Blaps chevrolati, Sol.

Blaps mortisaga, Ol.

Blaps obtusa, Sturm.

1838. Patterson, R. and Haliday, A. H. "Note respecting the larva of *Blaps mortisaga*, Ol., with a description of the larva by A. H. Haliday." *Trans. Ent. Soc. London*, 1838, II, pp. 99-102, pl. xi, figs. 1-1g.
1839. Westwood, J O. "An Introduction to the Modern Classification of Insects" I (London 1839), pp. 1-462 (*B. mortisaga*, p. 321, text-fig. 39, 11).
1853. Chapuis, F. and Candèze, E. A. C. "Catalogue des larves des coléoptères, connues jusqu'a ce jour avec la description de plusieurs espèces nouvelles," pp. 343-653, 9 pls. *Mem. Soc. Roy. Sci. Liège*, VIII, 1853 (*Blaps obtusa*, p. 515, pl. vi, fig. 5).
1893. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 246.

Blaps plana, Sol.

1893. *Xambeu. "Moeurs et métamorphoses des Insectes." *Echange*, 1893 (*Blaps plana*, p. 49).

ELEODINAE.

Eleodes dentipes, Eschsch.

1878-9. *Gissler, C. F. *Bull. Brooklyn Ent. Soc.*, I, 1878-79, p. 19, figs. 4-5.

1909. Blaisdell, F. E. "A monographic revision of the Coleoptera belonging to the Tenebrionide tribe Eleodiini, etc." *Bull. U. S. Nat. Mus.*, LXIII, 1909, pp. 1-524, pls. i-xiii (*Eleodes denipes*, pp. 496, 497-499, pl. xiii, figs. 4-14).

Eleodes gigantea, Mannerh.

1878-9. *Gissler, C. F. *Bull. Brooklyn Ent. Soc.*, I, 1878-79, p. 19, figs. 4-5.

1909. Blaisdell, F. E. "A monographic revision of the Coleoptera belonging to the Tenebrionide tribe Eleodiini, etc." *Bull. U. S. Nat. Mus.*, LXIII, 1909, pp. 1-524, pls. i-xiii (*Eleodes gigantea*, p. 496).

Eleodes opaca, Say.

1909. *Swenk, M. H. "*Eleodes* as an enemy of planted grain." *J Econ. Ent. Concord N. H.*, 2, 1909, pp. 332-336, pls. ix-x.

PLATYSCELINAE.

Platyscelis gages, Fisch.

1888. *Lindeman, K. "Die schädlichsten Insekten des Tabak in Bessarabien." *Bull. Mosc.*, 1888, pp. 10-77 (*Platyscelis gages*, pp. 56-57).

1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 340.

PEDININAE.

Isocerus purpurascens, Herbst.

1898. *? Xambeu. "Moeurs et métamorphoses des Insectes, VII (1)." *Ann. Soc. Linn. Lyon*, XLV, pp. 9-66 (*Isocerus purpurascens*, p. 63).

Heliophilus ibericus, Muls.

Heliopathes ibericus, Muls.

1877. Perris, E. *Loc. cit.*, p. 263 and 103 respectively.

Phylan abbreviatus, Ol.

Heliopathes abbreviatus, Ol.

1887. *Rey, C. "Essai d'études sur certaines larves de Coléoptères et descriptions de quelques espèces inédites ou peu connus." *Ann. Soc. Linn. Lyon*, (n. s.) XXXIII, pp. 131-259, pls. i-ii (*Heliopathes abbreviatus*, p. 224).

1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 403.

1901. Xambeu. "Moeurs et métamorphoses des Insectes, IX (3)." *Rev. d'Entom.*, XX, pp. 7-68 (*Heliopathes abbreviatus*, pp. 21-23).

Phylan gibbus, F.

Holocrates gibbus, F.

1877. Perris, E. *Loc. cit.*, pp. 261-63 and 101 respectively.
1877-8. Schiφdte, J C. *Loc. cit.*, pp. 538-540, pl. vii, figs. 7-14.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 403.
1895. Judeich, J and Nitsche, H. "Die übrigen forstschädlichen Familien der Pentameren und Heteromeren." *Lehrbuch Mitt. Forstins.*, II (Wein, 1895), pp. 1299-1303 (*Heliopathes gibbus*, p. 1301).

Pedinus femoralis, L.

1887. Lindeman, K. "*Opatrum verrucosum* und *Pedinus femoralis* als Schädiger des Tabak in Bessarabien." *Entom. Nachr.*, XIII, pp. 241-244 (*Pedinus femoralis*, p. 244).
1888. *Lindeman, K. "Die schädlichsten Insekten des Tabak in Bessarabien." *Bull. Mosc.*, 1888, pp. 10-77 (*Pedinus femoralis*, pp. 50-56).
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 362.

OPATRINAE.

Phylax picipes, Ol.

Phylax littoralis, Mulsant.

1873. Mulsant, E. and Mayet, V., "Histoire des métamorphoses de diverses espèces de Coléoptères." *Opusc. Ent.*, XIV, 1873, pp. 65-100 (*Phylax littoralis*, p. 90). See also Perris, 1877, *loc. cit.*, p. 263.

Melanimon tibiale, F.

Microzoum tibiale, F.

Opatrum tibiale, F.

1877. Perris, E. *Loc. cit.*, pp. 264 and 104 respectively.
1895. Judeich, J and Nitsche, H. "Die übrigen forstschädlichen Familien der Pentameren und Heteromeren" *Lehrbuch Mitt. Forstins.*, II (Wein, 1895), pp. 1299-1303 (*Opatrum* [*Microzoum*] *tibiale*, p. 1302).

Gonocephalum intermedium, Fisch.

1888 *Lindeman, K. "Die schädlichsten Insekten des Tabak Bessarabien." *Bull. Mosc.*, 1888, pp. 10-77 (*Opatrum intermedium*, pp. 19-49).

Gonocephalum pusillum, F.

1888. *Lindeman, K. "Die schädlichsten Insekten des Tabak in Bessarabien." *Bull. Mosc.*, 1888, pp. 10-77 (*Opatrum pusillum*, p. 58).

Gonocephalum pygmaeum, Stev.

1839. Westwood, J. O. *Loc. cit.*, p. 319, text-fig. 39, 6.

Gonocephalum simplex, F.

Gonocephalum micans, Germ.

1902. *Xambeu. "Moeurs et métamorphoses des Insectes." *Ann. Soc. Linn. Lyon*, 1902, XLIX, pp. 1-53 and 95-160 (*Gonocephalum micans*, p. 122).

Opatrum sabulosum, L.

1870. Lucas, M. H. *Bull. Soc. Ent. France*, 1870, pp. lxxxii-lxxxiii.

1871. Lucas, M. H. "Note sur la vie evolutive de l' *Opatrum sabulosum.*" *Ann. Soc. Ent. France*, 1871, pp.452-460, pl. 7, figs. 9-17.

1877-8. Schiødte, J C. *Loc. cit.*, pp. 541-543, 585, pl. vii, figs. 15-19.

1895. Judeich, J. and Nitsche, H. "Die übrigen forstschädlichen Familien der Pentameren und Heteromeren." *Lehrbuch Mitt. Forstins.*, II (Wien, 1895), pp. 1299-1303 (*Opatrum sabulosum*, pp. 1301-1302).

1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 422.

Opatrum verrucosum, Germ.

1888. *Lindeman, K. "Die schädlichsten Insekten des Tabak in Bessarabien." *Bull. Mosc.*, 1888, pp. 10-77 (*Opatrum verrucosum*, p. 43).

1887. Lindeman, K. "*Opatrum verrucosum* und *Pedinus femoralis* als Schädiger des Tabak in Bessarabien." *Entom. Nachr.*, XIII, pp. 241-244 (*Opatrum verrucosum*, pp. 242-43).

Sinorus colliardi, Fairm.

1877. Perris, E. *Loc. cit.*, pp. 263-264 and 103 respectively.

Bycrea villosa Pasc.

1885. Duges, E. "Métamorphoses de la *Bycrea villosa*, Pasc." *Ann. Soc. Ent. Belgique*, XXIX (2), 1885, pp. 51-55, pl. iv, figs. 1-25.

PHALERIINAE.

Phaleria bimaculata,[1] L.

Phaleria cadaverina, Latr. nec *cadaverina*, F.

1865. Fairmaire, L. "Note explicative des figures 1 à 9 de la planche 11 au sujet de la larve de la *Phaleria cadavernia.*" *Ann. Soc. Ent. France*, (4) V, 1865, p. 657, pl. xi, figs. 1-9.
1877. Perris, E. *Loc. cit.*, pp. 269-271, fig. 277 and p. 109, fig. 277 respectively.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 478.

Phaleria cadaverina, F.

1889. Fowler, W "Description of the larva of *Phaleria cadaverina*, F." *Ent. Mo. Mag.*, XXV, pp. 304-305.

Halammobia pellucida, Herbst.

Phaleria hemisphaerica, Kust.

1877. Perris, E. *Loc. cit.*, p. 272, fig. 278 and p. 112, fig. 278 respectively.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 478.

CRYPTICINAE.

Crypticus quisquilius, L.

Crypticus glaber, Dej.

1834. *Bouché, P. F. "Naturgeschichte der Insekten, besonders in Hinsicht ihrer ersten Zustände als Larven und Puppen" (Berlin, 1834), pp. v, 216, 10 pls. (*Crypticus glaber*, p. 191).
1839. Westwood, J. O. *Loc. cit.*, p. 319.
1877. Perris, E. *Loc. cit.*, pp. 259-261 and 99 respectively.
1877-8. Schiφdte, J C. *Loc. cit*, pp. 535-538, pl vii, figs. 1-4.

BOLITOPHAGINAE.

Bolitotherus cornutus, Panz.

1861. Candèze, E. C. A. "Histoire des métamorphoses de quelques Coléoptères exotiques." *Mem. Soc. R. Sci. Liège*, XVI, pp. 325-408 (*Bolitotherus cornutus*, p. 365, pl. iii, fig. 9).

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[1] Gebien (Junk's *Coleopterorum Catalogus*, Tenebrionidae, p. 346) refers this description to *Phaleria cadaverina*, Latr., which is synonymous with *P. bimaculata*, L., and not to *P. cadaverina*, Fab., under which name Perris described the larva.

Bolitophagus armatus, Panz.

1877. Perris, E. *Loc. cit.*, pp. 276-278, figs. 288-89 and p. 116, figs. 288-89 respectively.
1877-8. Schiφdte, J C. *Loc. cit.*, p. 546, pl. ix, figs. 1-4.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, pp. 493, 494.

Bolitophagus reticulatus, Linn.

1854. Curtis, J. "Descriptions of some Coleopterous Larvae, etc." *Trans. Ent. Soc. London*, (n. s.) III, 1854, pp. 33-40 (*Bolitophagus reticulatus*, p. 36, pl. v, figs. 13-22).
1859. Kraatz, G. "Ueber die ersten Stände einiger Coleopteren." *Berlin Ent. Zeits.*, III, 1859, pp. 304-312 (*Bolitophagus reticulatus*, pp. 309-310, pl. iv, fig. 5).
1877. Perris, E. *Loc. cit.*, pp. 273-275, figs. 279-287 and p. 113, figs. 279-287 respectively.
1877-8. Schiφdte, J. C. *Loc. cit.*, pp. 544-546, pl. viii, figs. 1-7.

Bolitonaeus quadridentatus, Cand.

1861. Candèze, E. C. A. "Histoire des métamorphoses de quelques Coléoptères exotiques." *Mem. Soc. R. Sci. Liège*, XVI, pp. 325-408 (*Bolitotherus quadridentatus*, p. 368).

Megeleates sequoiarum, Cas.

1896. *Wickham, H. F. "Descriptions of the larvae of some Heteromerous and Rhynchophorous beetles." *J New York Ent. Soc.*, IV, pp. 118-124, pl. iv (*Megeleates sequoiarum*, p. 118).

RHIPIDANDRINAE.

Eledona agaricola, Hbst.

Bolitophagus agaricola, F.

Boletophagus agricola.

Eledona agaricicola, Latr.

1834. *Bouché, P. F. "Naturgeschichte der Insekten besonders in Hinsicht ihrer ersten Zustande als Larven und Pappen" (Berlin, 1834), pp. v, 216, 10 pls. (*Bolitophagus agaricola*, p. 191, pl. ix, fig. 7).
1839. Westwood, J O. *Loc. cit.*, p. 315, text-fig. 38, 4.
1842. Erichson, W. F. "Zur systematischen Kenntniss der Insectenlarven." *Arch. für Naturg.*, VIII (1), pp. 363-379 (*Boletophagus agricola*, p. 366).
1843. Dufour, M. L. "Histoire des métamorphoses de l' *Eledona agaricicola*, Latr." *Ann. Sci. Nat.*, (2) XX, 1843, pp. 284-289, pl. xii B, figs. 1-7.

1867. Frauenfeld, G. von. "Zoologische Miscellen. XII." *Verh. zool.-bot. Ges. in Wien*, XVII, pp. 775-804 (*Bolitophagus agaricola*, p. 780).
1877-8. Schiφdte, J. C. *Loc. cit.*, p. 547.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 502.

DIAPERINAE.

Diaperis boleti, L.

1795. Olivier, M. *Entomologie*, III, 1795, No. 55.
1832. *Hammerschmidt, C. E. "De ins. agric. damn." 1832, pl. i.
1843. Dufour, M. L. "Histoire des métamorphoses du *Diaperis boleti*." *Ann. Sci. Nat.*, (2) XX, 1843, pp. 290-291, pl. xii B, figs. 10-14.
1867. Frauenfeld, G. von. "Zoologische Miscellen, XII." *Verh. zool.-bot. Ges. in Wien*, XVII, pp. 775-804 (*Diaperis boleti*, p. 780).
1877-8. Schiφdte, J C. *Loc. cit.*, pp. 547-49, pl. viii, figs. 14-22.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 513.

Hoplocephala haemorrhoidalis, F.

1869. Gernet, C. v. "Beiträge zur Käferlarvenkunde." *Horae Soc. Entom. Ross.*, VI, 1869, pp. 3-16 (*Hoplocephala haemorrhoidalis*, p. 8, pl. ii, fig. 9).
1877. Perris, E. *Loc. cit.*, pp. 280-81, figs. 297-299 and p. 120, figs. 297-299 respectively.

Scaphidema metallicum, F.

Diaperis aenea, Panz.

Scaphidema aeneum, Panz.

1839. Westwood, J O. *Loc. cit.*, p. 314, text-fig. 37, 11-19.
1877-8. Schiφdte, J C. *Loc. cit.*, pp. 552-54, pl. ix, figs. 10-16.

Platydema ellipticum, F.

1861. *Candèze, E. C. A. "Histoire des métamorphoses de quelques Coléoptères exotiques." *Mem. Soc. R. Sci. Liège*, XVI, pp. 325-408 (*Platydema ellipticum*, p. 370).

Platydema europaeum, Cast. et Brll.

1857. Perris, E. "Histoire des Insectes du Pin Maritime." *Ann. Soc. Ent. France*, (3) V, pp. 341-395, pls. viii-ix (*Platydema europaea*, pp. 343-45, pl. viii, figs. 401-412).

Platydema palliditarse, Cast. et Brll.

1904. *Xambeu. "Moeurs et métamorphoses des insectes XIV." *Ann. Soc. Linn. Lyon*, LI, 1904, pp. 67-154 (*Platydema palliditarse*, p. 123).

Platydema violaceum, F.

1857. Perris, E. "Histoire des Insectes du Pin Maritime." *Ann. Soc. Ent. France*, (3) V, pp. 341-395 (*Platydema violacea*, p. 346).
1877. Perris, E. *Loc. cit.*, pp. 278-80, figs. 290-296 and p. 118, figs. 290-296 respectively.
1877-8. Schiødte, J C. *Loc. cit.*, pp. 550-52, pl. viii, figs. 25-29.

Alphitophagus bifasciatus, Say.

Phylethus quadripustulatus, Step.

1877-8. Schiødte, J. C. *Loc. cit.*, p. 555, pl. vi, figs. 17-27.

Ceropria subocellata, Cast. et Brll.

1861. *Candèze, E. C. A. "Histoire des métamorphoses de quelques Coléoptères exotiques." *Mem. Soc. R. Sci. Liège*, XVI, pp. 325-408 (*Ceropria subocellata*, p. 369).

Pentaphyllus testaceus, Hellw.

1842. Erichson, W. F. "Zur systematischen Kenntniss der Insectenlarven." *Arch. für Naturg.*, VIII (1), pp. 363-379 (*Pentaphyllus testaceus*, p. 366).
1877. Perris, E. *Loc. cit.*, pp. 281-283, figs. 300-303 and p. 121, figs. 300-303 respectively.
1877-8. Schiødte, J C. *Loc. cit.*, pp. 557-559, pl. x, figs. 1-5.

ULOMINAE.

Gnathocerus cornutus, F.

Cerandria cornuta, F.

Echocerus cornutus, F.

1854. Motschulsky, V de. "Sur la larve et chrysalide de la *Cerandria cornuta*." *Etud. Entom.*, III (Helsingfors, 1854), pp. 67-68.
1869. Gernet, C v. "Beiträge zur Käferlarvenkunde." *Horae Soc. Ent. Ross.*, VI, 1869, pp. 3-16 (*Gnathocera* [*Cerandria*] *cornuta*, pp. 11-15, pl. ii, fig. 10).
1907. *Reineck, G. "Neue Beobachtungen über *Echocerus cornutus*, F." *Zeitschr. wiss. Insektenbiol.*, III, pp. 128-129.

Lyphia tetraphylla, Fairm.

Lyphia ficicola, Muls. et Rey.

1877. Perris, E. *Loc. cit.,* pp. 283-285, figs. 304-309 and p. 123, figs. 304-309 respectively.

Tribolium confusum, Jacq du Val.

1901. Xambeu. "Moeurs et métamorphoses des Insects, IX (3)" *Rev. d'Entom.,* XX, pp. 7-68 (*Tribolium confusum,* p. 63).

Tribolium ferrugineum, F.

Tribolium castaneum, Herbst.

1839. Westwood, J. O. *Loc. cit.,* p. 319, text-fig. 39, 2-3.
1855. Lucas, M. H. "Observations sur les métamorphoses du *Tribolium castaneum,* Herbst., coléoptère hétéromère de la tribu des Diapériens." *Ann. Soc. Ent. France,* (3) III, pp. 249-259, pl. xiii, no. iii.
1877-8. Schiφdte, J. C. *Loc. cit.,* pp. 563-565, pl. x, figs. 18-20.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.,* p. 579.

Phthora crenata, Muls.

1857. Perris, E. "Histoire des insectes du Pin Maritime." *Ann. Soc. Ent. France,* (3) V, pp. 341-359 (*Phthora crenata,* pp. 351-52, pl viii, figs. 421-429).

Palorus depressus, F.

1877-8. Schiφdte, J. C. *Loc. cit.,* pp. 561-63, pl. x, figs. 12-15.

Uloma culinaris, L.

1877. Perris, E. *Loc. cit.,* pp. 265-267 and 105 respectively.

Uloma perroudi, Muls. et Guilleb.

1857. Perris, E. "Histoire des insectes du Pin Maritime." *Ann. Soc. Ent. France,* (3) V, pp. 341-395 (*Uloma perroudi,* pp. 347-49, pl. viii, figs. 413-420).

Alphitobius diaperinus, Panz.

Heterophaga opatroides, Brll.

1848. Lucas, M. H. *Bull Soc. Entom. France,* 1848, (2) VI (*Heterophaga opatroides,* p. xiii).
1877-8. Schiφdte, J C. *Loc. cit.,* pp. 565-68, pl. xi, figs. 1-3.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.,* p. 601.

Alphitobius piceus, Ol.

Alphitobius fagi, Curt.

Alphitobius mauritanicus, L.

1839. Westwood, J. O. *Loc. cit.*, p. 319, fig. 38, 20.
1857. Lucas, M. H. "Note sur les mátamorphoses de l'*Alphitobius mauritanicus,* Linné." *Ann. Soc. Ent. France,* (3) V, pp. 71-84, pl. iv, no. iii.
1877-8. Schiφdte, J. C. *Loc. cit.*, p. 568, pl. xi, figs. 4, 5.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 602.

Hypophloeus bicolor, Ol.

1839. Westwood, J. O. *Loc. cit.*, p. 315, fig. 38, 6.
1877-8. Schiφdte, J. C. *Loc. cit.*, pp. 559-561, pl. x, figs. 8-11.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 551.

Hypophloeus fasciatus, F.

1877. Perris, E. *Loc. cit.*, pp. 287-88 and 127 respectively.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 551.

Hypophloeus linearis, F.

1857. Perris, E. "Histoire des insectes du Pin Maritime." *Ann. Soc. Ent. France,* (3) V, pp. 341-395 (*Hypophloeus linearis,* pp. 358-360, pl. viii, figs. 439-443).
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 551.

? Hypophloeus pini, Panz.

Hypophloeus ferrugineus, Crtz.

1857. Perris, E. "Histoire des insectes du Pin Maritime." *Ann. Soc. Ent. France,* (3) V, pp. 341-395 (*Hypophloeus ferrugineus,* Creutz., pp. 354-356, pl. viii, figs. 430-438).

Hypophloeus unicolor, Pill. et Mitterp.

1877. Perris, E. *Loc. cit.*, pp. 285-287 and 125 respectively.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 551.

TENEBRIONINAE.

Iphthimus italicus, Truqui.

1859. Mulsant, E., and Revelière, E. "Notes pour servir a l' histoire de quelques Coléoptères." *Opusc. Ent.,* XI, pp. 63-68 (*Iphthimus italicus,* p. 63-65).

Upis ceramboides, L.

1912-3. *Saalas, U. "Die Larven der *Stenotrachelus aeneus,* Payk. und *Upis ceramboides,* L., sowie die Puppe der

letzteren." *Helsingfors Acta Soc. Fauna et Fl. Fenn*, XXXVII, No. 8, 1912-13, 12 pp., 2 pls.

Menephilus cylindricus, Herbst.

Menephilus (*Tenebrio*) *curvipes*, Fab.

1857. Perris, E. "Histoire des insectes du Pin Maritime." *Ann. Soc. Ent. France*, (3) V, pp. 341-395 (*Menephilus* [*Tenebrio*] *curvipes*, Fab., pp. 361-364, pl. viii, figs. 444-457).

Tenebrio molitor, L.

1721. Frisch, J L. ("Von dem gelben meel-wurm und dem Schwarzen kefer, so daraus wird," pp. 1-3, pl. i, figs. 1-6). *Beschreibung von allerley Insecten in Teutschland, nebst nützlichen Anmerckungen*, III." (Berlin, 1721).

1775. De Geer, C. *Mem. Hist. Ins.*, V (Stockholm, 1775) (*Tenebrio molitor*, pp. 35-37, pl. ii, figs. 6-11).

1788-93. Gmelin, J F. In C. a Linné "Systema Naturae", Ed. 13, I (*Tenebrio molitor*, p. 1995).

1795. Olivier, M. *Entomologie*, 1795, IV, No. 57.

1802-5. Latreille, P. A. *Hist. nat. des. Crust. et Insectes*, X, pp. 289-292.

1804. *Posselt, C. F. *Beyträge zur Anat. der Insekt.* (Tubingen, 1804), 36 pp., 3 pls. (*Tenebrio molitor*, p. 25, pl. iii, figs. 1-14).

1807. *Sturm. *Deutsch. Insekt.*, 1807, II, p. 214, pl. xlvi.

1817. Cuvier, G. *Regne Animal, Les Insectes*, pt. I (*Tenebrio molitor*, p. 371).

1839. Westwood, J O. *Loc. cit.*, p. 317, text-fig. 38, 14-16.

1853. Chapuis, F. and Candèze, E. A. C. "Catalogue des larves Coléoptères connues jusqu'a ce jour avec la description de plusieurs espèces nouvelles," pp. 343-653, 9 pls. *Mem. Soc. R. Sci. Liège*, VIII, 1853 (*Tenebrio molitor*, p. 176).

1877-8. Schiφdte, J C. *Loc. cit.*, pp. 568-571, pl. xi, figs. 6-11.

1893. Lintner, J. A. "Eighth report on the injurious and other Insects of the state of New York for the year 1891." (Albany, 1893). (*Tenebrio molitor*, p. 177, text-fig. 29*a*.)

1896. Chittenden, F. H. "The principal Household Insects of the United States. Insects affecting cereals and other dry vegetable foods." *Bull. U. S. Dept. Agri. Ent.*, IV (Washington, 1896), 130 pp., 64 text-figs. (*Tenebrio molitor*, p. 116, text-fig. 54*a*).

1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 630.

? 1901. *Manger, K. "Einiges über die Entwicklung von *Tenebrio molitor*." *Soc. Ent.* (Zurich), XVI, pp. 73, 74.

1908. *Lindner, A. "Schwarze Mehlwürmer." *Gefied. Welt.* (Magdeburg, 1908), XXXVII, pp. 92-93.

1914. Herrick, G. W. *Insects injurious to the Household.* (New York, 1914), 470 pp., 152 text-figs., 8 pls. (*Tenebrio molitor*, p. 229).

Tenebrio obscurus, F.

1839. Westwood, J. O. *Loc. cit.*, p. 318, text-fig. 38, 17.
1893. Lintner, J. A. "Ninth report on the injurious and other Insects of the state of New York for the year 1892" (Albany, 1893). (*Tenebrio obscurus*, p. 307, text-fig. 5*a*.)
1896. Chittenden, F. H. "The principal Household Insects of the United States. Insects affecting cereals and other dry vegetable foods." *Bull. U. S. Dept. Agri. Ent.*, IV (Washington, 1896), 130 pp., 64 text-figs. (*Tenebrio obscurus*, pp. 117-118).
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 630.
1914. Herrick, G. W *Insects injurious to the Household.* (New York, 1914), 470 pp., 152 text-figs., 8 pls. (*Tenebrio obscurus*, p. 227-229, pl. iii).

Tenebrio opacus, Duft.

1855. Mulsant, E. and Guillebeau. "Notes pour servir a l'histoire des Tenebrions." *Opusc. Ent.*, VI, 1855, pp. 9-13 (*Tenebrio opacus*, pp. 9-11) ? reprinted from *Ann. Soc. Linn. Lyon*, I, 1855. See also Perris, 1877, *loc. cit.*, p. 290.
1877-8. Schiødte, J C. *Loc. cit.*, p. 571.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 630.

Tenebrio picipes, Herbst.

Tenebrio transversalis, Duft.

1839. Westwood, J O. *Loc. cit.*, p. 317, text-fig. 38, 14-16.
1855. Mulsant, E. and Guillebeau. "Notes pour servir a l'histoire des Tenebrions." *Opus Ent.*, VI, 1855, pp. 9-13 (*Tenebrio transversalis*, pp. 11-13) ? reprinted from *Ann. Soc. Linn. Lyon*, I, 1855, p. 11.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 630.

Catapiestus indicus, Fairm.

1915. Gravely, F. H. "The larvae and pupae of some beetles from Cochin." *Rec. Ind. Mus.*, XI, pp. 353-366, pls. xx-xxi (*Catapiestus indicus*, pp. 363-365, pl. xxi, figs. 20-21).

PYCNOCERINAE.

Prioscelis serrata, F.

1897. *Kolbe, H. J. "Coleopteren (Käfer und Netzflugler)." *Deutsch. Ostafr.*, IV (Lief vi, vii, viii), 364 pp., 3 pls. (*Prioscelis serrata*, p. 244, pl. iii, fig. 25).

HELOPINAE.

Helops angustatus, Luc.

Helops agonus, Muls.

1887. *Rey, C. "Essai d'études sur certaines larves de coléoptères et descriptions de quelques espèces inédites ou peu connus." *Ann. Soc. Linn. Lyon*, (n. s.) XXXIII, pp. 131-259, pls. i-ii (*Helops agonus*, p. 225).

Helops assimilis, Kust.

1877. Perris, E. *Loc. cit.*, pp. 292-293 and 132 respectively.

Helops coeruleus, L.

1836. Waterhouse, G. R. "Descriptions of the Larvae and Pupae of various species of Coleopterous Insects." *Trans. Ent. Soc. London*, I, 1836, pp. 27-33, pls. iv-v (*Helops coeruleus*, p. 29, pl. iv, fig. 3).
1839. Westwood, J O. *Loc. cit.*, p. 312, text-fig. 36, 20-25.
1840. Perris, M. E. "Observations sur quelques Larves Xylophages." *Ann. Sci. Nat.*, (2) XIV, pp. 81-96, pl. iiiA (*Helops coeruleus*, pp. 81-83, pl. iiiA, figs. 1-5).
1877. Perris, E. *Loc. cit.*, pp. 290-291, fig. 310 and p. 131, fig. 310 respectively.
1877-8. Schiφdte, J C. *Loc. cit.*, pp. 571-574, pl. xi, figs. 15-22.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 687.

Helops ecoffeti, Kust.

1887. *Rey, C. "Essai d'études sur certaines larves de coléoptères et descriptions de quelques espèces inédites ou peu connus." *Ann. Soc. Linn. Lyon*, (n. s.) XXXIII, pp. 131-259, pls. i. and ii (*Helops ecoffeti*, p. 224).
?1896. *Xambeu. "Moeurs et métamorphoses d'insectes, V" *Ann. Soc. Linn. Lyon*, XLIII, pp. 53-100 and 123-188 (*Helops ecoffeti*, p. 128).

Helops laevioctostriatus, Goeze.

Helops striatus, Geoffr

1857. Perris, E. "Histoire des Insectes du Pin Maritime." *Ann. Soc. Ent. France*, (3) V, pp. 341-395 (*Helops striatus*, p. 367, figs. 458-465).
?1890. *Planet, L. *Le Naturaliste* (Paris, 1890), XII (*Helops striatus*, p. 17).
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 688.

Helops lanipes, L.

1837. Blanchard, E. "*Helops lanipes*, Fab." *Mag. Zool.*, 1837, class IX, pl. 175, figs. 1-2.

Helops laticollis, Kust.

Helops cerberus, Muls.

1892. Xambeu. "Moeurs et métamorphoses d'insectes (II)." *Echange*, suppl. (Lyon, 1892), pp. 1-46 (*Helops cerberus*, p. 11).

Helops pellucidus, Muls. et Rey.

1877. Perris, E. *Loc. cit.*, pp. 293-294 and 133 respectively.
1898. Kiesenwetter, H. v., and Seidlitz, G. *Loc. cit.*, p. 687.

Helops pyrenaeus, Muls.

?1890. *Xambeu. *Le Naturaliste* (Paris, 1890), XII (*Helops pyrenaeus*, p. 279).
1893. *Xambeu. "Moeurs et métamorphoses d'insectes." *Ann. Soc. Linn. Lyon*, XL, pp. 1-52 (*Helops pyrenaeus*, p. 30).

Hydromedion nitidum, Mjoberg.

1906. Mjöberg, E. "Zur Kenntnis der Insektenfauna von Süd-Georgien." *Ark. f. Zool.*, III (13), pp. 1-14 (*Hydromedion nitidum*, p. 10, pl. i, fig. 4).

Hydromedion sparsutum, Müll.

1906. Mjöberg, E. "Zur Kenntnis der Insektenfauna von Süd-Georgien." *Ark. f. Zool.*, III (13), pp. 1-14 (*Hydromedion sparsutum*, pp. 6-7, text-fig. 4*a-e*, pl. i, fig. 2).

Perimylops antarcticus, Müll.

1906. Mjöberg, E. "Zur Kenntnis der Insektenfauna von Süd-Georgien." *Ark. f. Zool.*, III (13), pp. 1-14 (*Perimylops antarcticus*, pp. 11-14, text-figs. 5*a-d*, pl. i, fig. 5).

MERACANTHINAE.

Meracantha contracta, Beauv.

1896. *Wickham, H. F. "Descriptions of the larvae of some Heteromerous and Rhynchophorous beetles." *Journ. New York Ent. Soc.*, IV, pp. 118-124 (*Meracantha contracta*, p. 119, pl. v, fig. 2).
1915. *Hyslop. "Observations on the life-history of *Meracantha contracta*, Beau." *Psyche*, XXII, pp. 44-48, pl. xxii.

STRONGYLIINAE.

? Strongylium tenuicolle, Say.

1874. Riley, C. A. "Sixth annual report on the noxious, beneficial and other Insects of the State of Missouri." 1874, pp. 117-118, text-fig. 32.

The Indian Museum collection of Tenebrionidae includes larvae of *Catapiestus indicus* and a cast larval skin of *Strongylium sobrinum*. The larvae of *Catapiestus indicus* have already been described (*loc. cit.*); but as the characteristic structures of the posterior end of the abdomen do not show well in the plate I take this opportunity of figuring them on a larger scale (pl. xx, fig. 5).

The cast larval skin of *Strongylium sobrinum* was found with a newly emerged adult in rotten wood. The adult was soft and quite white, but quickly hardened and assumed the characteristic dark olive colour when put alive into a tube with some of the wood from which it was taken. The larva of this species is as yet unknown. Many of its characters can, however, be determined from the skin, and these may now be described. It is unfortunate that the general form of the body cannot be determined. It seems unlikely, however, that the anus protruded in the living larva to anything like the extent that it does in the larva believed by Packard to be that of *Strongylium tenuicolle*, Say.

Strongylium sobrinum, Dohrn.

(Pl. xx, figs. 6-7.)

Locality.—Darjeeling District: Kalimpong, *ca.* 2000 ft. (in rotten wood).

The head bears a number of very large spines which appear to have had a definite arrangement. What this arrangement was, however, is not clear in the somewhat contorted state of the exuvium.

The labrum is more or less oval, and quite twice as broad as long. The antennae appear to be two-jointed, the basal joint being both shorter and broader than the other, which is about twice as long as broad and bears a few spines distally; but it is possible that they are incomplete. The mandibles are massive; they are much worn, but each appears to have had three terminal teeth and one large molar tooth. The blades of the maxillae are fringed with very strong spines; there are a number of finer spines behind the margin at the tip, and a few very long slender ones behind these. The maxillary palps are three-jointed, and are a little shorter than the blades; the first joint is about twice as broad as long; the second is scarcely as long as the first is broad, and scarcely as broad as long; the third is about as long as the second is broad and nearly twice as long as broad. The labrum is squarish

with almost straight sides. Its palps are two-jointed; the basal joint is stout, but scarcely as broad as long; the distal joint is only about half as broad as the basal, and is distinctly longer than broad.

The legs appear to have been soft and fleshy, but are each tipped with a strong claw.

All segments of the body except the anal are much shrivelled. There is a row of about eight[1] strong hairs in front of the anus, and a pair of smaller hairs a little in front of these on the same segment. On the ventral margin of the flattened posterior surface of the anal segment is a pair of large upwardly curved horns near the middle line, with a pair of strong hairs between them. Ten similar hairs are arranged on each side of the segment (pl. xx, fig. 7). The dorsal margin is thickly dentate, and there is a pair of transverse fossae situated laterally on the posterior surface immediately above a small tooth (see pl. xx, fig. 6).

[1] Four on one side, three and a small one a little out of the row on the other.

EXPLANATION OF PLATE XX.

FIG. 1. Larva of *Pleurarius brachyphyllus*, towards the end of the stage with spiniform bristles. × 5.

,, 2. Fourth segment of fully developed larva of *Pleurarius brachyphyllus*. × 5.

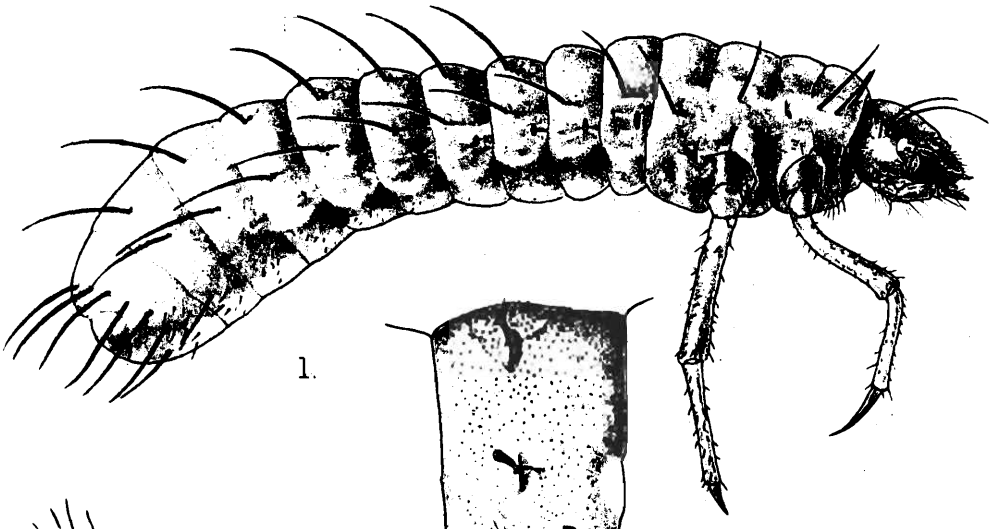
,, 3. Claviform bristle of same larva more highly magnified.

,, 4. Fourth segment of larva of *Aceraius kuwerti*. × 5.

,, 5. Anal segment of larva of *Catapiestus indicus* from below. × 12.

,, 6. Anal segment of last larval exuvium of *Strongylium sobrinum*, cleared and viewed as a transparency, from behind.

,, 7. The same from the side.



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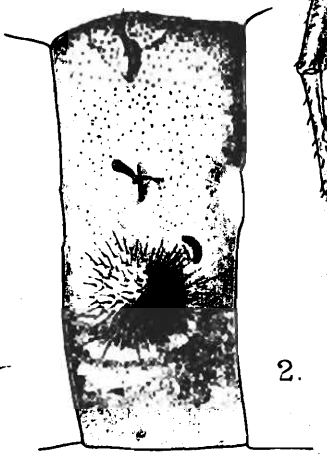

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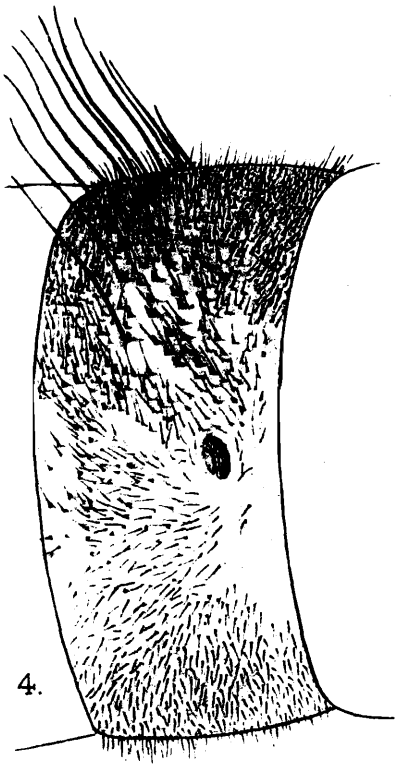

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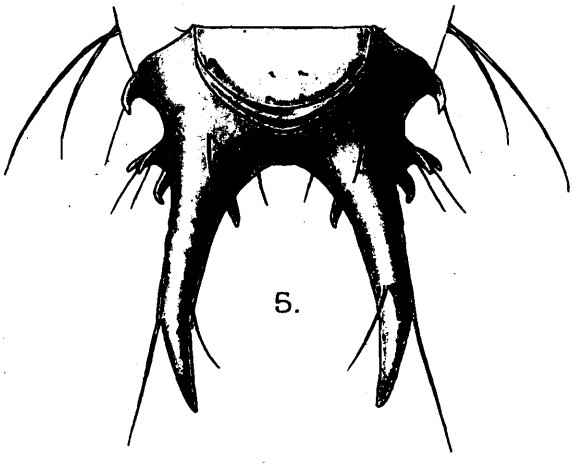

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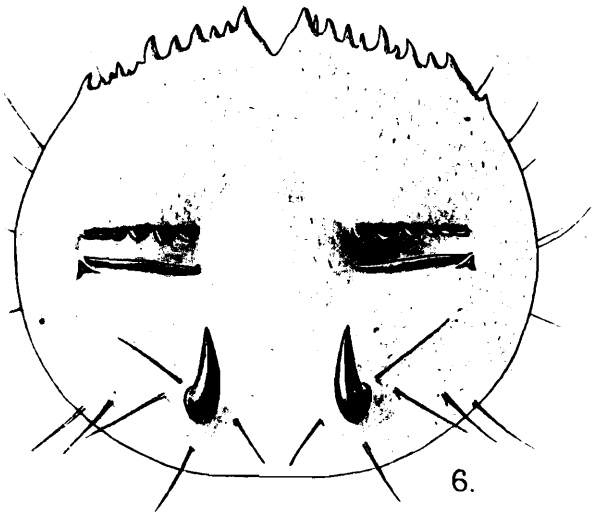


6.

7.

Bemrose, Colls., Derby

PASSALIDAE AND TENEBRIONIDAE.

EXPLANATION OF PLATE XXI.

FIG. 8. Third right leg of larva of *Aegus roepstorffi*, showing stridulating surface.

,, 9. Second right leg of larva of *Aegus roepstorffi*, showing stridulating surface.

,, 10. Right mandible of larva of *Aegus roepstorffi*.

,, 11. Left mandible of larva of *Aegus roepstorffi*.

,, 12. Third right leg of larva of *Nigidius dawnae*, showing stridulating surface.

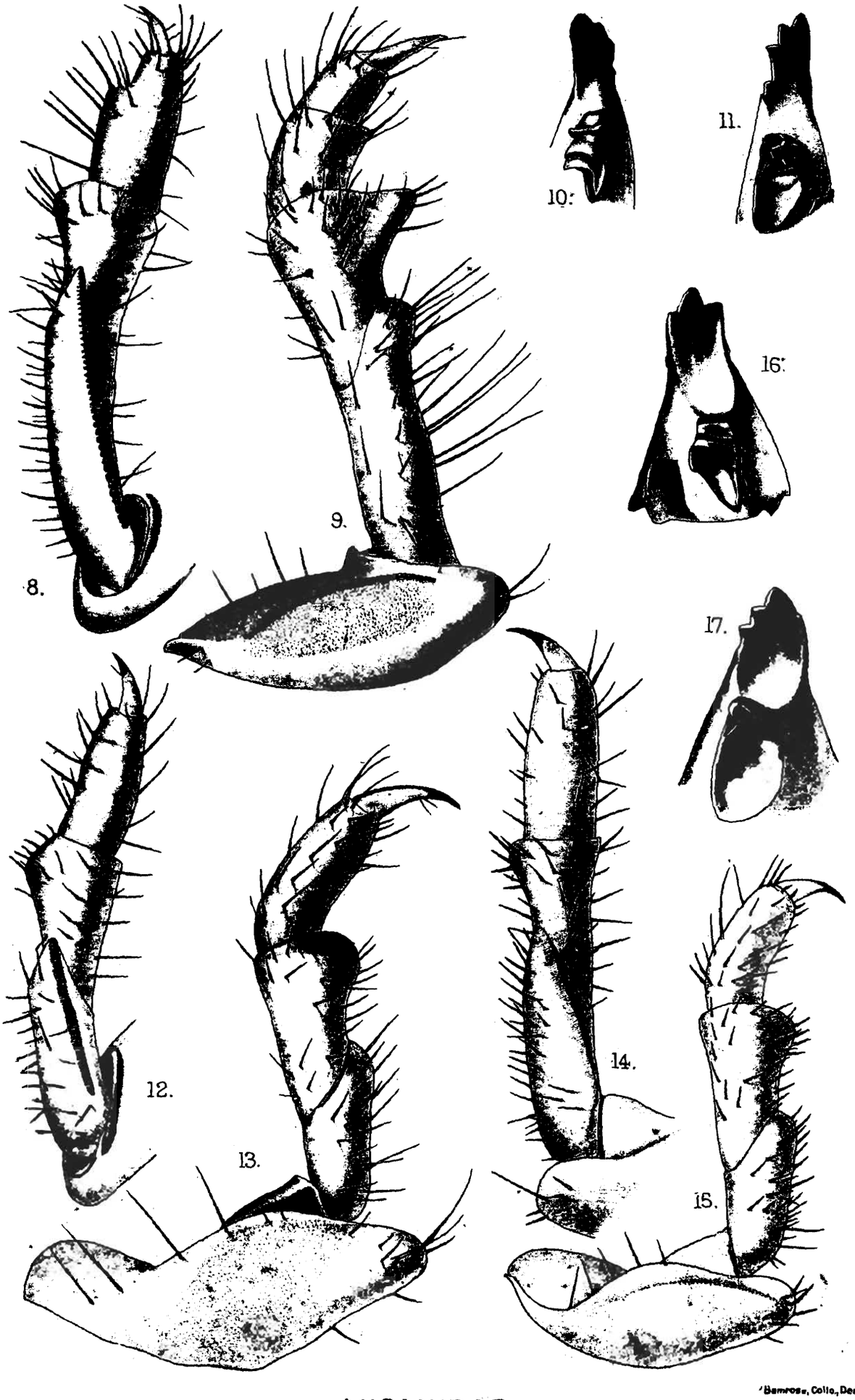
,, 13. Second right leg of larva of *Nigidius dawnae*, showing stridulating surface.

,, 14. Third right leg of larva of *Nigidius impressicollis*, showing stridulating surface.

,, 15. Second right leg of larva of *Nigidius impressicollis*, showing stridulating surface.

,, 16. Right mandible of larva of *Nigidius impressicollis*.

,, 17. Left mandible of larva of *Nigidius impressicollis*.



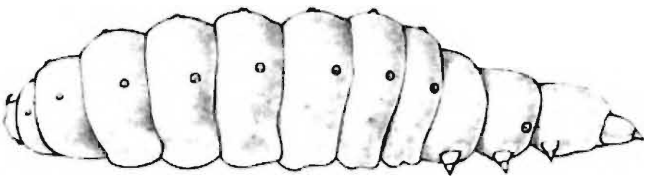
LUCANIDAE.

Bemrose, Colls., Derby.

EXPLANATION OF PLATE XXII.

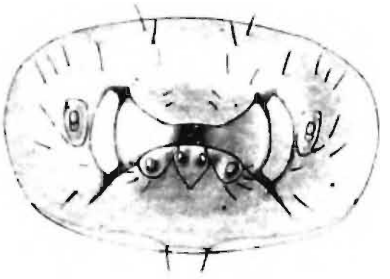
FIG. 18. Larva of *Hectarthrum trigeminum.*
,, 19. Mandible of same larva.
,, 20. Antenna of same larva.
,, 21. Head of same larva from front.
,, 22. Maxillae and labium of same larva.
,, 23. Larva of *Cardiaspis pisciformis* from below.
,, 24. Anterior part of head of same larva from below.
,, 25. Anterior part of head of same larva from above.
,, 26. Pupa of same species from below.
,, 27. Adult of same species from below.
,, 28. Adult of same species from above.

19.



18.

20.



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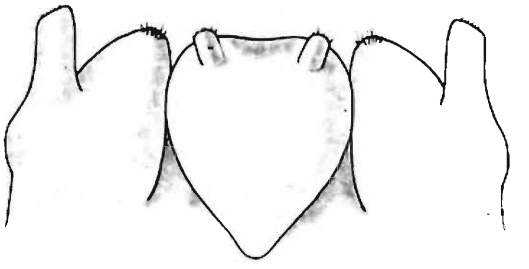
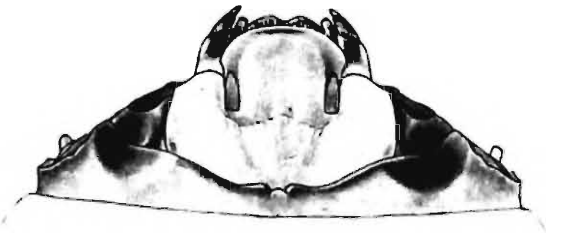


22.

23.



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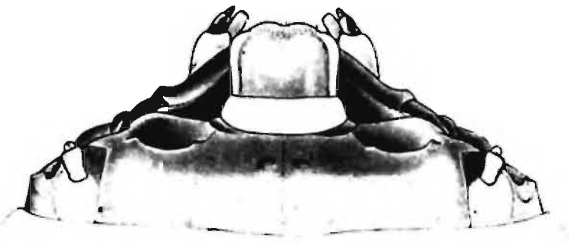
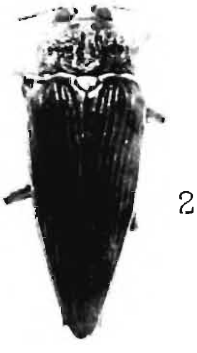


25.

26.

27.



28.

Bemrose, Colls., Derby

CUCUJIDAE AND BUPRESTIDAE.