XX THE LARVAE AND PUPAE OF SOME BEETLES FROM COCHIN.

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(Plates xx-xxi).

I Cucujidae—*Uleiota indica*, Arrow.

(Plate xxi, figs. 13-19).

The specimens on which the following descriptions are based were found by Mr. B. Sundara Raj under bark at Parambikulam, 1700-3000 ft.

The adult agrees with the description [1] of the species to which I have referred it in every detail, except that the third joint of the antenna is slightly shorter instead of longer than the succeeding ones. In this respect, however, I find it to be in agreement with cotypes from Kanara, presented by Mr. H. E. Andrewes to our collection and to that of the Agricultural Research Institute at Pusa, and with others which Mr. Andrewes very kindly sent me for examination.

LARVA.

The larva of *U. indica* is whitish in colour, and closely resembles larvae of other species of the genus in general appearance.

The antennae arise from collar-like sockets which Perris (see "Larves de Coléoptères," p. 61) has supposed to represent a distinct segment, making four in all. The first segment beyond this is about half as long as the second, which bears a minute conical process on the inner side of its distal end and is slightly longer and much stouter than the third.

Immediately behind the base of each antenna are five ocelli. Normally four of these appear to be arranged in a row, with the remaining ocellus immediately behind the middle of the space between the upper two. But on one side of one specimen the solitary ocellus is in front of the space between the lower two members of the row.

The apex of the mandibles is strongly bidentate, and is followed by a row of about four small teeth on the inner edge.

The blade of the maxilla is strongly fringed at the apex. The three joints of the maxillary palps are of about equal length, but the

[1] *Trans. Ent. Soc.* 1901, pp. 599-600.

third is much slenderer than the other two. The terminal joint of the two-jointed labial palps is slightly longer and slenderer than the basal.

The anterior margin of the first tergite is convex, overlapping the back of the head. The posterior margins of all segments are straight, both above and below. All segments are distinctly broader than long. The two joints of the appendages of the eighth abdominal segment are distinct as in *U. planatus*, the basal joint being stout and the distal spiniform. The three joints of the appendages of the ninth abdominal segment are more or less completely fused as in *U. serricollis*.

U. serricollis is a Ceylonese species and its larva appears to resemble that of *U. indica* more closely than does any other larva yet described.

The larvae at present referred to the genus *Uleiota* may be distinguished from one another as follows:—

1.	Appendages of ninth abdominal segment two-jointed, not spiniform; only one ocellus on each side	*Gernet's undetermined larva.*
	Appendages of ninth abdominal segment spiniform, joints three in number when not all fused together; several ocelli on each side	2.
2.	Apex of mandibles bidentate; all three joints of maxillary palps equally distinct	3.
	Apex of mandibles tridentate; basal joint of maxillary palps very short and obscure (ocelli 3 + 2 on each side)	*U. crenatus.*
3.	Ocelli 4 + 2 on each side; appendages of ninth abdominal segment distinctly jointed	*U. planatus.*
	Ocelli 4 + 1 on each side; appendages of ninth abdominal segment rigid throughout	4.
4.	Appendages of eighth abdominal segment two-jointed (*i.e.* the terminal spine articulated, not fused, to the basal part); seventh abdominal segment wider than long	*U. indica.*
	Appendages of eighth abdominal segment rigid; seventh abdominal segment longer than wide	*U. serricollis.*

Pupa.

The pupa is white in life, and is very like that of *U. serricollis*. The antennae are much shorter than in the pupa of *U. serricollis*

(? in both sexes). They are ornamented with fleshy processes, of which the larger are placed in circlets round the ends of the developing segments of the antennae of the adult, and the smaller round the middle of each of these segments except the long basal one on which they are more numerous. The abdomen is armed on either side with a series of long, fleshy, more or less forwardly-directed processes, on to the end of each of which a large and more or less backwardly-directed spine is articulated.

A considerable number of Cucujid life-histories have already been worked out wholly or in part, and the following is a list of the descriptions known to me.

Key for the determination of genera of Cucujid larvae.

P. de Peyerimhoff, *Ann. Soc. Ent. Fr.*, LXXI, 1902 (1902-3), pp. 717-8.

Catogenus rufus, Fabr.

* G. Dimcock, *Psyche*, III, pp. 341-2.
* W. F. Fiske, *Proc. Ent. Soc. Washington*, VII, p. 90.

Prostomis mandibularis, Fabr.

W. F. Erichson, *Arch. Naturg.*, 1847, pp. 285-6.
Chapuis and Candèze, "Catalogue des Larves des Coléoptères", *Mem. Soc. R. Sci. Liége*, VIII, 1853, p. 425.[1]
J. Curtis, *Trans. Ent. Soc. London* (n.s.) III, 1854-6, pp. 37-39, pl. v, figs. 23-24.
E. Perris, "Larves de Coléoptères", Paris, 1877, p. 56.

Cucujus clavipes, Fabr.

* Wilson, *Bull. Brooklyn Soc.*, I, p. 56.

Cucujus coccinatus, Lewis.

A. S. Olliff, *Cist. Ent.*, III, 1882-5, pp. 59-60, pl. iii, fig. 7.

Cucujus haematodes, Erichs.

* W. F. Erichson, *Naturg. Ins. Deutschl.*, III, 1845, p. 310.
H. Assmann, *Stett. Ent. Zeit.*, XII, 1851, p. 352, pl. ii, figs. C-D.
Chapuis and Candèze, *Mem. Soc. R. Sci. Liége*, VIII, p. 426, pl. ii, fig. 8 (figure reproduced in Lefroy's "Indian Insect Life," p. 301).

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* Papers marked thus are not available in Calcutta.
[1] Apparently = p. 85 of reprint (see Perris, "Larves de Coléoptères", p. 56).

Platisus integricollis, Reitter.

A. M. Lea, *Proc. Linn. Soc. N.S. Wales,* XXIX, 1904, pp. 88-9, pl. iv, fig. 6.

Inopeplus praeustus, Chevol.

P. de Peyerimhoff, *Ann. Soc. Ent. Fr.,* LXXI, 1902-3, pp. 715-8, 3 text-figs.

Uleiota[1] crenata, Payk.

F. B. White, *Ent. Mo. Mag.,* VIII, 1871-2, pp. 196-8.
E. Perris, "Larves de Coléoptères", pp. 60-62.

Uleiota[1] planata, Linn.

* W F. Erichson, *Naturg. Ins. Deutschl.,* 1846, p. 332.
Chapuis and Candèze, *Mem. Soc. R. Sci. Liége,* VIII, 1853, pp. 428-9.
E. Perris, *Ann. Soc. Ent. Fr.* (3) I, 1853, pp. 621-626, pl. xix, figs. 127-137 (2 figs. reproduced by Sharp, Camb. Nat. Hist., Insects, pt. ii, p. 234, fig. 115), and "Larves de Coléoptères", pp. 57-59.

Uleiota[1] serricollis, Candèze.

M. E. Candèze, *Mem. Soc. R. Sci. Liége,* XVI, 1861, pp. 341-343, pl. ii, figs. 1-1*e*.

? Uleiota[1] sp.[2]

C. v. Gernet, *Horae Soc. Ent. Ross.* VI, 1869, pp. 3-6, pl. i, figs. 7-7*g*.

Laemophloeus ater, Oliv.

J O. Westwood ("*Cucujus spartii*": see Perris, "Larves de Coléoptères", p. 60, concerning this synonymy), "Introduction to the Classification of Insects" I, pp. 149-150, fig. 12 (19).
E. Perris, "Larves de Coléoptères", p. 62.

Laemophloeus bimaculatus, Payk.

E. Perris, "Larves de Coléoptères", p. 62.

Laemophloeus clematidis, Erichson.

E. Perris, "Larves de Coléoptères", p. 62.

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* References marked thus are not available in Calcutta.

[1] Or *Hyliota* = *Brontes*, incl. *Dendrophagus*; see Arrow, *Trans. Ent. Soc.* 1901, p. 593.

[2] Not *U. crenata*; see White, *Ent. Mo. Mag.*, VIII, 1871-2, p. 198. The larva was not reared, and White thought it could not belong to the genus *Uleiota* at all. But it has all the distinctive characters of the larvae of this genus given in Peyerimhoff's key.

Laemophloeus dufouri, Laboulbène.

E. Perris, *Ann. Soc. Ent. Fr.* (3) I, 1853, pp. 618-621, pl. xix, figs. 122-6.

Laemophloeus ferugineus, Stephens.

Carpentier, *Bull. Soc. Linn. nord France,* 1877, pp. 239-241.
H. S. Olliff, *Entomologist,* XV, 1882, pp 214-5.

Laemophloeus hypobori, Perris.

E. Perris, "Larves de Coléoptères", p. 62.

Laemophloeus juniperi, Grouvelle.

F. Decaux, *Bull. Soc. Ent. Fr.,* 1890, pp. cxxv-cxxvi.

Laemophloeus monilis, Fabr.[1]

* Bellevoye. *Bull. Soc. Metz* (2) XIV, 1876, pp. 183-9.

Laemophloeus testaceus, Fabr.

E. Perris, "Larves de Coléoptères", pp. 59-60, pl. ii, figs. 43-45.

Lathropus sepicola, Müller.

* E. Perris in Gobert's Cat. Col. Landes, fasc. 3, p. 122, and "Larves de Coléoptères", pp. 62-65, pl. ii, figs. 46-53.

Pediacus dermestoides, Fabr.

E. Perris, *Ann. Soc. Ent. Fr.* (4) II, 1862, pp. 190-2, pl. v, figs. 535-543.

Prostominia convexiuscula, Grouvelle.

P. de Peyerimhoff, *Tran. Linn. Soc. London* (2 Zool.) XVII, 1914, pp. 156-159, figs. A.-F.

Silvanus advena, Waltl.

E. Perris, "Larves de Coléoptères", pp. 65-68.

Silvanus surinamensis, Linnaeus.[2]

J O. Westwood, "Introduction to the Classification of Insects" I, p. 154, fig. 13 (10-12).

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* References marked thus are not available in Calcutta.

[1] = *denticulatus,* Preyssl. (Munich Catalogue).

[2] The larvae figured by different authors are not all alike, and it scarcely seems possible that all of them can belong to one species.

J. F. J Blisson (*S. sexdentatus*), *Ann. Soc. Ent. Fr.* (2) VII, 1849, pp. 163-172, pl. vi, fig 1.

C. Coquerel (*S. sexdentatus*), *Ann. Soc. Ent. Fr.* VII, 1849, p. 172.

F. H. Chittenden, *U. S. Agric. Ent. Bull.* (n.s.) 4, 1896, pp. 121-2, figs. 59*a-d* (figure of larva reproduced with new figure of adult in Fletcher's "South Indian Insects", p. 290).

* Jablonouski, *Termes. Kosl.*, 1899, pp. 126-130, text-figs.

* J Curtis, "Farm Insects", Lond., 1883 (figure reproduced in *Ind. Mus. Notes* III [3] p. 120).

Lefroy, "Indian Insect Life", pp. 300-301, text-figs. 179-180.

Silvanus unidentatus, Fabr.

E. Perris, *Ann. Soc. Ent. Fr.* (3) I, 1853, pp. 627-633, pl. xix, figs. 138-143.

E. Perris, "Larves de Coléoptères", p. 65.

? Nausibius dentatus, Marsh.

J. O. Westwood, "Introduction to the Classification of Insects" I, pp. 153-4.

II. Lycidae—*Lyropaeus biguttatus,* Westwood,[1] and some "Trilobite Larvae."

(Plate xx, figs. 1-12).

Larvae, pupae and an adult of this species were found clustered together on the under side of a large slab of stone, which was resting on other stones in such a manner as to leave a clear space above the ground beneath it. The pupae hung head downwards from the mid-dorsal fissure of the cast larval skins, which remained unshrivelled on the stone in the positions taken up by the larvae prior to pupation.

Adults were obtained in Cochin at altitudes varying from the level of the base of the hills to two or three thousand feet above the sea, and there is one specimen in our collection from the Nilgiris. The distribution of black pigment is very variable, and the black spots on the elytra are often absent. A specimen from Nedumangad in Travancore, determined by Bourgeois himself as *L. aurantiacus*, Bourgeois,[2] evidently belongs to the same species; and *L. aurantiacus* may therefore be regarded as a synonym of *L. biguttatus.*

Larva.

The larva is flattened as a whole, and is of a blackish brown colour.

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* References marked thus are not available in Calcutta.

[1] *Ann. Mag. Nat. Hist.* (5) V, 1880, p. 213.

[2] *Ann. Soc. Ent. Fr.* LXXVII, 1908-9, pp. 503-4.

The head can be retracted into a tubular pouch opening below the anterior margin of the prothorax, and the short thick antennae can be retracted into the head. The almost globular termination of each antenna is ornamented with more or less labyrinthine markings. The mandibles are small and are inserted in the middle line as in other Lycid larvae. They are very slender and project almost vertically downwards as a whole, but are directed slightly backwards basally and forwards distally, being lightly curved throughout. Their extremities rest in grooves on the upper surfaces of the somewhat fleshy blades of the maxillae, and as the mandibles are rather long they press the maxillae downwards till they too project almost vertically. The maxillary palps are three-jointed (excluding the basal support), and the labial palps two-jointed; both have the form of a slender cone.

The pronotum is roughly triangular, nearly as long as wide, truncate in front, and slightly rounded at the two posterior angles. The mesonotum and metanotum are roughly rectangular, slightly more than twice as wide as long, with the anterior angles somewhat obtuse and the posterior somewhat acute, especially those of the metanotum. Equally well developed spiracles are present on the mesothorax and metathorax.

The first eight abdominal tergites are much alike. The anterior ones are somewhat, and the posterior ones much, narrower than the thoracic segments, and all are very much shorter. Each is produced laterally into a simple stout backwardly-curved process. The terminal abdominal segment is somewhat longer than the segments immediately in front of it, being little more than twice as wide as long.

The abdominal sterna bear a pair of small conical processes on their posterior margins. These processes are more distinct on the posterior than on the anterior segments, and bear a tuft of bristles on the last two. The sternum of the terminal segment is without these processes, and bears the sucker-like anus.

PUPA.

The pupa is white in life, but the preserved specimens have become brownish.

The pronotum is quadrangular with almost straight sides; it is broader behind than in front, and even in front is broader than long. It does not overlap the head, which is bent downwards.

Each of the first three abdominal segments bears on either side above the stigma an elongate simple process with conical base, and below it a similar but moniliform (? jointed) process. The five following segments bear only a pair of conical processes above the stigmata, those of the first of these segments being the smallest. The terminal segment bears a pair of much slenderer processes.

The appendages are smooth, and not distinctly segmented.

"TRILOBITE LARVAE."

The *Lyropaeus* larva described above belongs to the group known as "Trilobite Larvae." The "Trilobite Larvae," which have hitherto attracted most attention, have been of extraordinarily large size, and the group has been a puzzle to entomologists ever since Perty described his *Larva singularis* in 1831. The following references to "Trilobite Larvae" are known to me:—

*1831. Perty, M. "Observationes Nonnullae in Coleoptera Indiae Orientalis", p. 33, pl. i, figs. 8-9.

1839. Westwood, J. O. "Introduction to the Classification of Insects" I, p. 254, figs. 27 (1) and 28 (1).

1841. Erichson, W. F. "Zur systematischen Kenntniss der Insectenlarven." *Arch. Naturg.*, VII, pp. 91-92.

1861. Candèze, M. E. "Histoire des Metamorphoses de quelques Coléoptères exotique." *Mem. Soc. R. Sci. Liége,* XVI, 1861, pp. 358 (apparently p. 34 in reprint) and 403-4, pl. vi, fig. 12.

1887. Kolbe, H. J. "Ueber einige exotische Lepidopteren- und Coleopteren-Larven, (6) Perty's '*Larva singularis*'" *Ent. Nachr.*, III, pp. 37-39.

1887. Lucas, M. H. *Bull. Soc. Ent Fr.*, 1887, pp. xxxv-xxxvii, reprinted in "Mission Pavie Indo-Chine 1879-1895", 1904, pp. 104-5.

1898. Gahan, C. J "Dipeltis a Fossil Insect?" *Nat. Sci.* XII, pp. 42-44, 2 text-figs.

*1899. Bolivar, I. "Anomalous Larvae from the Philippines." *Act. Soc. Espan.* 1899, pp. 130-133, text-figs.

1899. Bourgeois, J "Description de deux larves remarkables appartenant probablement au genre *Lycus.*" *Bull. Soc. Ent. Fr.*, 1899, pp. 58-63, 2 text-figs.

1899. Sharp, D. "On the Insects from New Brittain," Willey's Zool. Results, p. 383, pl. xxxv, figs. 4-4*b*.

1899. Sharp, D. Cambridge Natural History, Insects, pt. II, p. 251.

1900. Hanitsch, R. "An Expedition to Mount Kina Balu, British North Borneo." *J Straits R. Asiatic Soc.* No. 34, pp. 77-79.

1901. Shelford, R. "Notes on Some Bornean Insects." *Rep. Brit. Ass.*, 1901, pp. 690-691.

1908. Gahan, C. J. "Lampyridae from Ceylon." *Proc. Ent. Soc. London,* 1908, p. xlviii.

1913. Gahan, C. J "On some Singular Larval Forms of Beetle to be found in Borneo." *J Sarawak Mus.* I, pp. 61-65, 3 text-figs.

Perty thought his *Larva singularis* was to be ascribed to a Necrophagous rather than to a Malacodermatous insect; but Westwood disagreed with him, and suggested that it belonged

* Papers marked thus are not available in Calcutta.

rather to some species of *Lycus*. To this genus—which has since been subjected to extensive subdivision—he was also inclined to refer the slender parallel-sided insect of the "Trilobite" group, which he was the first to notice and figure.

Erichson accepts these insects as Malacoderms, but in spite of their weak mandibles regards them, because of their shape and because the head is completely retractile, as Lampyrids rather than Lycids. Candèze agrees with Erichson; but Kolbe returns to Westwood's view, and even goes so far as to suggest that the specimens which were sent to him were probably the larvae of *Lycus* (*Lycostomus*) *melanurus*, Blanchard.[1] The opinions of other authors are similarly divided.

Gahan (1913) favours Lycidae, but does not think the insects can belong to the genus *Lycus*, as they are very unlike the authenticated larvae of that genus. He thinks it more probable that they belong to some genus in which only the male—perhaps not even the male[2]—is winged. Further, he points out that the known distribution of "Trilobite Larvae" corresponds to that of the genus *Lyropaeus*, of which only males are known to him; and he suggests an association with this genus. His conclusion is in a measure confirmed by the above observations on the development of *Lyropaeus biguttatus*, and it is noteworthy that all the winged specimens that I have seen are males.

The larvae which give rise to these winged insects are, however, not particularly large, and throw no certain light on the status of the much larger insects with which the name "Trilobite Larvae" is more particularly associated. Two large insects of the "Trilobite" type were also, however, found in the Cochin forests. These are figured on pl. xx, figs. 9-12.

One of them (pl. xx, figs. 9-10) is very like the larvae found to develop into males of *Lyropaeus biguttatus*. The principal differences are the presence of more definite tubercles at the angles of the thoracic terga in the former than in the latter; the paler colour of the upper surface; and the yellow colour of the legs and sterna and of the lower surface of the lateral extensions of the terga, which contrast strongly with the black pleural structures. These, however, are features which may well be acquired only as maturity is approached. The specimen is not nearly so large as many species are known to become, and dissection has shown it to be immature; but it may perhaps represent a stage in the development of the female of *Lyropaeus biguttatus*, a female which in that case will almost certainly prove to be larviform.

The other specimen of "Trilobite Larva" found in Cochin (pl. xx, figs. 11-12) is slightly smaller, is black in colour, and is ornamented with more numerous and more elaborate tubercles and

[1] Authenticated larvae of this species have since been briefly described by Shelford (*Rep. Brit. Ass.*, 1901, p. 690). They do not appear to be of the "Trilobite" type, and are only 25 mm. long when full grown.

[2] See also Shelford's comment on a previous note by Gahan (*loc. cit.* 1908)

papillae, and appears to have shorter mandibles as these do not press the maxillae downwards and so are completely hidden. It differs greatly in this way from the larvae of *Lyropaeus biguttatus*, and need not be further discussed here.

Another South Indian species is represented in our collection by a dried specimen whose head, prothorax and legs are missing. It is transitional in character between the two preceding, resembling the former in colour, but having a double row of rudimentary tubercles down the back, and rudimentary tubercles on the abdominal epimera and episterna. It may represent a further stage in the development of that species; or it may be more nearly allied to a series of smaller larvae from Naduvotam (Nilgiris, 7000 ft.) which are preserved in the collection of the Agricultural Research Institute, Pusa, whence two specimens have been presented to our collection. It closely resembles these larvae in structure, but in them the yellow on the lower surface is confined to the anterior part and lateral angles of the prothorax, the anterior parts of the mesosterum and metasternum near the middle line, the abdominal sterna, and the bases of the legs.

The occurrence in the Pusa collection of a male insect from Naduvotam, belonging to the *Lyropaeus*-like genus *Calochromus*, suggested the possibility that this might be an adult of the species to which the "Trilobite Larvae" from that locality belonged. *Calochromus* is placed by Bourgeois (*Ann. Soc. Ent. Fr.* XI, 1891, p. 348) in the *Lygistopterus* group of genera, which immediately precedes in his system the *Dilophotes* group containing *Lyropaeus*[1]; and the larva of *C. melanurus* which has been briefly described by Shelford (*Rep. Brit. Ass.*, 1901, p. 690) appears to be of the "Trilobite" type. Males of *Calochromus* are much more numerous than females among the few specimens I have examined; but this may be due to their being more active, and females undoubtedly occur in some species. It is, however, possible, that some species of the genus may have large larviform females, or even that winged and larviform females may occur together in some or all species.

Our collection contains, in addition to the above South Indian specimens of the *Lyropaeus* or broad type of "Trilobite Larva", specimens of this type from the following localities:—

Ceylon: Peradeniya (? two species[2]).
Bengal: Chittagong—Rangamatti.
Burma: Sadon (Myitkyina Dist.); Pegu.
Malay Peninsula: Lankawi; Singapore.
Philippines.

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[1] The genera *Calochromus* and *Lyropaeus* are, however, placed almost at opposite ends of the family by Westwood (*Trans. Ent. Soc. London*, 1878, pp. 96 and 104-5, and "Illustrations of Typical Specimens of Coleoptera in the collection of the British Museum, Pt. I, Lycidae", London, 1879, pp. 2-8 and 78).

[2] In one of these, represented by a single small specimen, the metathoracic stigmata are absent, and the prolongations of the angles of the abdominal terga and of other plates are very feebly developed.

Specimens of the slender type are represented from the following localities:—

Malay Peninsula: Johore.
Sinkep Island (near Sumatra).

I have examined the mouthparts of one specimen of the latter type from Johore, and of one of the specimens of the former type from Lankawi and of those from Ceylon. They are all constructed on the same plan, but are apt to be less slender than in the larva of *Lyropaeus biguttatus*.[1]

It is difficult to see how these creatures can feed. The mandibles are presumably used to pump juices along the grooved maxillae in much the same way as the maxillae are used to pump juices along the grooved mandibles of Hemerobiid larvae. But "Trilobite Larvae" seem to have no means of grasping prey. Presumably therefore they must eat something which they need not grasp securely, such as snails or planarians. Dr. Annandale tells me that he found these "larvae" in great abundance in the Malay Peninsula. He noticed that the broad and slender types always occurred together, which led him to think that the difference might conceivably be sexual[2]; and that they were only found where planarians were plentiful and snails scarce. It seems not unlikely, therefore, that they feed on planarians. It is also possible that they may feed on the juices of decaying wood, etc., which might account for the long periods of time during which they have been known to live without being known to feed (Gahan, 1913, p. 62).

Trilobite larvae are known in some instances at least to be luminous. This was first recorded by Kolbe (*loc. cit.*) on very uncertain authority, but Shelford (*loc. cit.*) has since noticed that one species has a pair of phosphoresecent organs on the penultimate segment of the abdomen.

III. Tenebrionidae—*Catapiestus indicus*, Fairmaire.

(Plate xxi, figs. 20-25).

Fairmaire described this species (*Ann. Soc. Ent. Belge.* XL, 1896, p. 28) from specimens collected in Kanara, and noted that it occurred in "Sikkim" also. It appears to have a wide distribution extending from the Western Ghats of Southern India to the Abor country and Lower Burma (for details see Tenebrionidae of the Abor Expedition, *Rec. Ind. Mus.* VIII).

The specimens described below were taken with adults from under the bark of a fallen log. A cast larval skin was found close behind the pupa.

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[1] Other authors refer to the maxillary and labial palps as four and three-jointed respectively, instead of as three and two-jointed as they appear to me to be both in cleared cast-skins and potashed specimens.

[2] The slender type does not seem to occur in the Indian Peninsula or Ceylon; but this may mean that it is only in the Malay Region, where "Trilobite Larvae" appear to reach their highest development, that larviform males occur.

LARVA.

The larva of *Catapiestus indicus* is a parallel-sided, elongate, flattened insect, brownish in colour, and terminated behind by a pair of long spiniform processes (see pl. xxi, figs. 20-21).

The head is almost semicircular, with a well-defined and somewhat prominent clypeus which bends downwards, so that the semicircular labrum is almost vertical and only partly visible from above. The suture limiting the frons behind is (? always) very distinct; it extends on either side from a point in the middle line immediately in front of the anterior margin of the pronotum, almost in a straight line towards a point on the margin of the head immediately behind the base of the antenna; but after traversing nearly half this distance, it turns abruptly forwards to run a short distance parallel to the sagittal plane and then bends straight outwards till it regains its former line, which it resumes and follows to the margin of the head.

The ocelli are four in number on each side, three in a line situated immediately behind the base of the antenna, and one a little behind them on the dorsal surface.

The antennae are four-jointed. The basal joint is scarcely as long as broad; the second joint is somewhat longer than broad; the third joint is fully twice as long as the second and scarcely as thick; the fourth joint is minute, being only about as long as the third joint is broad, and about one-third as broad as long.

The mandibles are stout and are tridentate distally, the middle tooth being the largest and most prominent, the lowest the smallest and more or less fused with it. There is a very large molar tooth.

The lobe of the maxilla is about twice as long as broad, simply rounded distally. The maxillary palps have three joints, of which the middle one is a little the longest and the third is slenderer than the other two, which latter are of uniform width throughout and are together about as long as the lobe. The labial palps have two joints of about equal length; the basal is stouter than the distal.

The terga are traversed, except in the terminal segment, by a median longitudinal groove or suture which does not, however, extend across the slightly darkened transverse band by which each is bordered behind. Each segment except the last bears laterally a few long erect hairs.

The last segment bears on each side two stout backwardly-curved spines, of which the posterior is followed dorsally by three similar spines. The last four form a straight line lying obliquely across the base of the long terminal spine. The terminal spine bears two long erect hairs rather more than half way along the ventral surface. One such hair is associated with each of the smaller spines, except the middle one of the three above the base of each terminal spine; and six are arranged in a semicircle

on the ventral surface of the body of the segment, between the anal papilla and the margin. The anal papilla is semicircular, and bears one pair of blunt conical spinules in the angles, and four smaller spinules arranged in a square medially. Of these four the two anterior are distinctly smaller than the two posterior.

PUPA.

The pupa is white in colour. Its form is shown on pl. xxi, figs. 22-23. Each of the marginal denticulations of the prothorax is continued into a papilla which is empty and transparent in the preserved specimen and so does not show in the photograph, and these papillae are tipped with long erect hairs. Similar hairs are present one on either side of the labrum, three on either side of the clypeus, two immediately in front of each eye, two between and behind the eyes, one in the middle of the anterior margin of the pronotum, two on either side mounted on papillae a little behind the anterior margin of the pronotum, one on either side a little in front of the posterior margin of the pronotum, two on either side of the meso- and metanotum,[1] one on either side of the third and two on either side of the fourth to eighth abdominal sterna.

The first six abdominal sterna are quadrangular, the seventh and eighth more nearly triangular. There is a pair of short divergent styles in the position of the anal papilla of the larva. The terminal segment is very like that of the larva; the anterior pair of marginal spines and the semicircle of hairs behind the anal papilla have, however, disappeared ; and the two hairs on each of the terminal spines are now mounted on strong spinules.

The most important works on Tenebrionid larvae appear to be [2] :—

1839. Westwood, J O. "Introduction to the Classification of Insects" I (London, 1839), pp. 316-324, text-figs.

1853. Chapuis and Candèze. "Catalogue des Larves des Coléoptères." *Mem. Soc. R. Sci. Liége,* VIII, pp. 513-517, pl. vi, figs. 5-6*a*.

1877. Perris, E. "Larves de Coléoptères" (Paris, 1877), pp. 252-294, pl. viii, fig. 277, pl. ix, fig. 310.

1877. Schiodte, J C. "De Metamorphosi Eleutheratorum Observationes" *Naturhist. Tidsskr.* XI, pp. 479-598, pls. v-xii.

All known larvae of the subfamily Tenebrioninae, in which Gebien places the genus *Catapiestus* (Junk's "Coleopterorum Catalogus", Tenebrionidaem-Trictenotomidae), appear to be described or referred to in these works, except that of *Menephilus*

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1 Three on the left side of the mesonotum in our only specimen.

2 A useful list of Tenebrionid larvae, with a key to generic characters, is given by Kiesenwetter and Seidlitz, *Naturg. Ins. Deutschl.*—Coleoptera V (1) Tenebrionidae (Berlin, 1898), pp. 207-217.

cylindricus (=*curvipes*).[1] This larva, and two others belonging to the same subfamily, seem to resemble the larva of *Catapiestus indicus* more closely than do any other Tenebrionid larvae of which I have seen descriptions. The other two are *Iphthimus italicus*[2], and the South American species of *Upis* referred to on p. 319 of the first volume of Westwood's "Introduction to the Classification of Insects."[3] The larva of the last named insect is, however, known only from fragments of its cast-skin, and many of its characters are consequently somewhat uncertain.

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[1] Described by Perris, *Ann. Soc. Ent. France*, (3) V, 1857, pp. 361-7, pl. viii, figs. 444-457.

[2] Described by Mulsant and Revelière, *Opusc. Ent.* XI, 1859, pp. 63-66.

[3] Described by Westwood, *Trans. Ent. Soc. London*, II, 1837-40, pp. 157-162, pl. xiv, figs. 11-18.