# THE LARVA OF AN INDIAN CARABID BEETLE.

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

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

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

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

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

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

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

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

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

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

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

## EGGS.

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

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

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

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

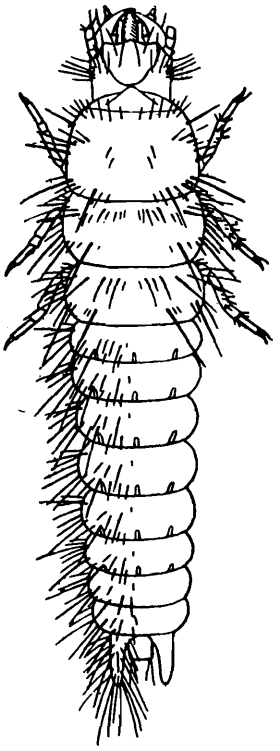
## LARVAE.

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

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

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

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

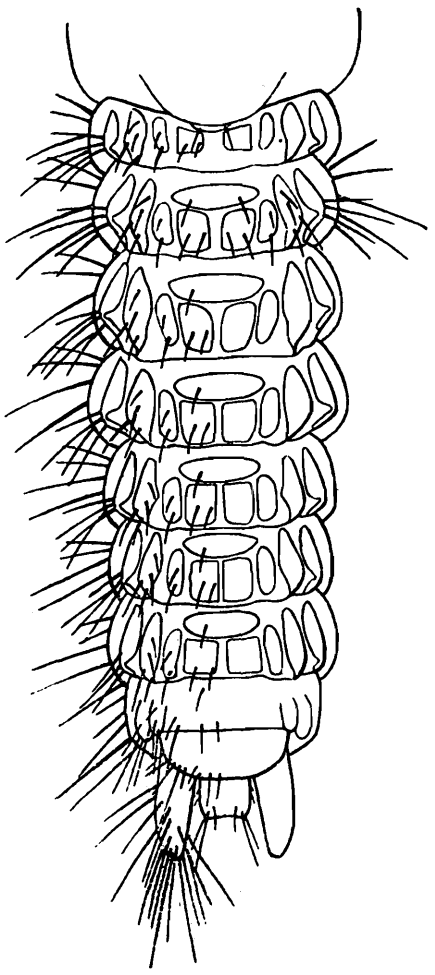


TEXT-FIG. 1.—Larva of *Omphra atrata*? Klug. Dorsal view. Setae of only one side shown : × 9.

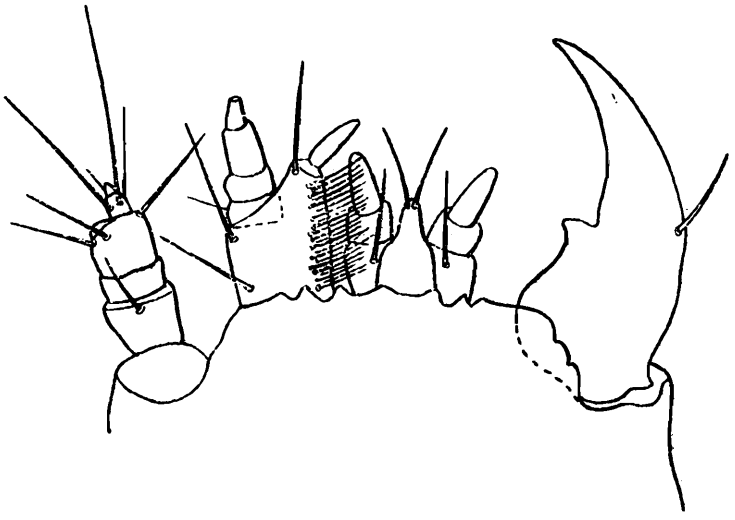
The dorsal surface of the head is not densely covered with hairs. Besides the irregularly scattered hairs there are some setae arranged more or less in two transverse rows behind the origin of the antennae. The margins are, however, somewhat densely setose, there being a large number of setae on each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

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

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



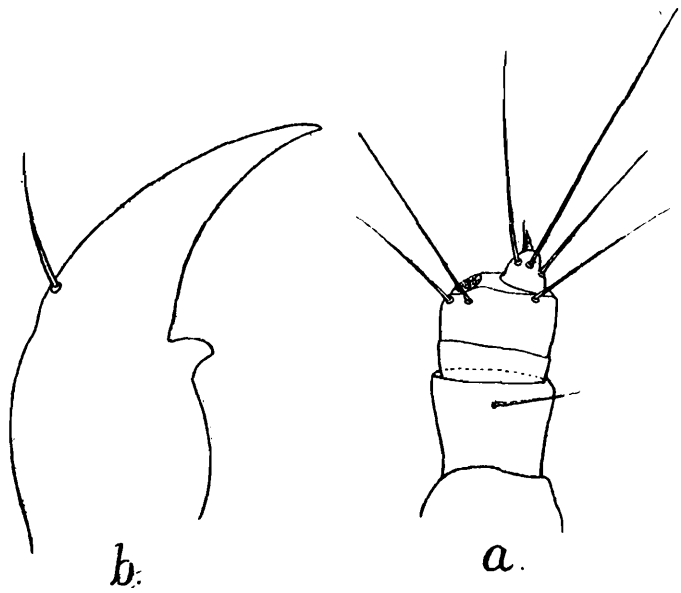
TEXT-FIG. 2.—Larva of *Omphra atrata* ? Klug. Ventral view of abdomen, showing the chitinous plates and ventral rows of setae: × 14.



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

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

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

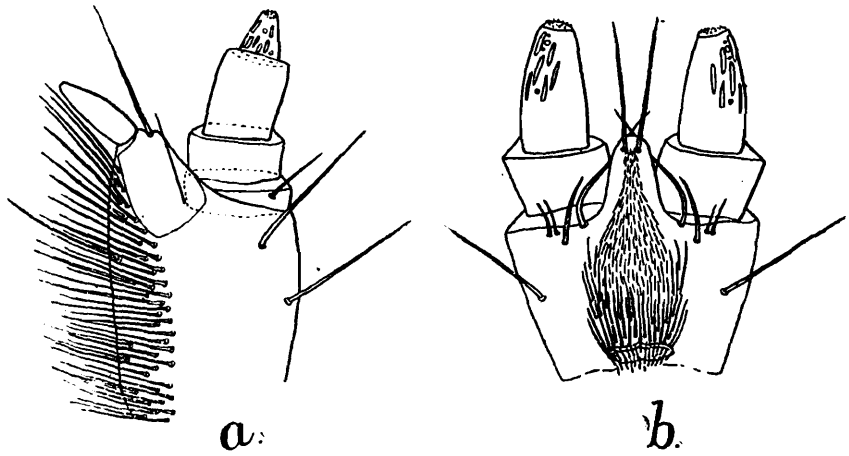



TEXT-FIG. 4.—Larva of *Omphra atrata* ? Klug.
*a*. antenna : ×66. *b*. mandible : ×66.

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

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

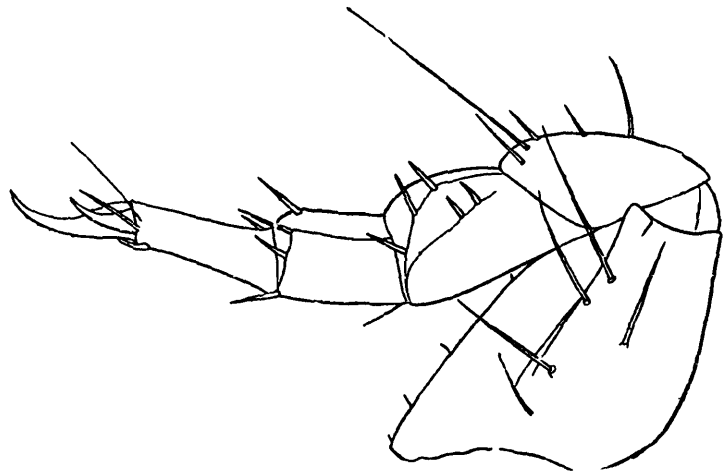
spines. The palp consists of four segments, the first two of which are much broader than long. The first segment, is the shortest, while the third, which is more than twice its length is the longest. The last segment is pyramid-shaped with its apex somewhat truncate. Its surface is covered with rounded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




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

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

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



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

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

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

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