

# ON THE IMMATURE STAGES OF AN INDIAN SPECIES OF *HELICHUS* (DRYOPIDAE : COLEOPTERA).

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(Plate XI).

## INTRODUCTORY.

There is a great deal of difference of opinion with regard to the affinities of the families Dryopidae, Elmidae and Psephenidae of the superfamily Dryopidea. Studies of the adults of these families not having proved very useful in this connection, entomologists are now rightly looking to the structure of the immature stages of these beetles for clearing up their relationships. Böving (1) has recently studied *Psephenoides gahni* (Dryopidae) from this point of view. *Psephenoides*, as is evident from Böving's account, is specialized in several ways, hence to have a fairly comprehensive view of the family it is highly desirable that some simple genera like *Helichus*, etc., should be studied. Since 1883, when Kellicott (8) incidently figured the larva of *Helichus lithophilus*, hardly anything has been published on the younger stages of this genus. During 1927, while surveying the fauna of the Nerbudda river, I collected a large number of larvae of a species of *Helichus*<sup>1</sup> and made observations on their bionomics. The larvae were brought alive to Calcutta, where they lived in the laboratory for about six months, when suddenly they began dying. In the meantime, however, a few had pupated, but unfortunately none reached the adult state; fully formed pupae were also found inside the larval skins of some of the dead larvae. It, therefore, appears highly probable that the sudden death of the larvae was due to their not being able to metamorphose properly under laboratory conditions.

### *Habitat and habits of the larvae.*

The larvae were obtained for the first time in the Nerbudda near the village Koilari, about 45 miles from its source. They were not common at this place as only two specimens were obtained after four hours search. Two more specimens were collected near Khetgaon, about 8 miles further down the river. The larvae were, however, very common in the headwaters of the Dholbaja *nala* which falls into the Nerbudda River at a distance of about 10 miles from Khetgaon. The collection was mostly made in this *nala* near the village Bondor. At the time of collection (February, 1927) this stream was about a foot deep and five feet wide. Its bed was sandy, with numerous stones lying in the water channel. There was hardly any phanerogamic growth near

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<sup>1</sup> The material was sent for naming to Dr. A. D. Böving of U. S. National Museum, but he, owing to the absence of any good account of the immature stages of this genus, expressed his inability to refer the larvae to any species.

the stream. The current was rather slow, and the pH of the water was 8.45 (not corrected for salt error). Many larvae were also collected from several pools near the banks, the water of which was almost muddy. Both young and full-grown specimens were living together. They were mostly found in crevices on the under-surface of stones and could be easily dislodged therefrom. When the stones were turned upside down, the larvae crept over to the side away from the light.

The larva is very sluggish; it seldom moves and even then very slowly. In its resting position, its head is retracted under the prothorax and the legs are bent, the margins of the body being in close contact with the substratum. The larva can crawl along a smooth surface such as that of glass but it cannot climb up the sides of a glass vessel.

As is described hereafter, the larvae are provided with anal gills which are thrust out and exposed to water in the act of respiration. If a larva is disturbed, it retracts the gills, bends its legs and lies motionless, almost flush with the substratum. Some individuals were continuously disturbed with a view to ascertaining the period for which they could keep their gills retracted. It was observed that they could do so for about 25 minutes, at the end of which period the gills were protruded in spite of any disturbance. When taken out of water, the larvae do not live for more than half an hour.

### *Morphology.*

#### *a. Larva.*

The larva (fig. 1) differs considerably from the larvae of most of the allied genera, e.g. *Psephenoides*, *Psephenus*, etc. It is elongate-elyptical, narrowed posteriorly, and almost scale-like in appearance. The dorsal surface is convex, hard and horny, while the ventral side is flat and soft. The body segments are extended on either side and bear long hairs on their lateral margins. The extensions of the various body segments are more and more directed backwards as one goes from the anterior to the posterior end; those of the eighth abdominal segment being almost parallel to the middle line of the body. The pronotum does not only extend laterally but anteriorly as well, and forms a shield-like structure over the head. The lateral extensions, unlike those in the above named allied genera, are not at all fused with one another, consequently the body of the larva cannot closely adhere to the substratum. This explains why the larvae are not met with in rapid running waters.

A full-grown larva is about 0.60 cm. in length and 0.22 cm. across the thorax. Its dorsal surface is ochraceous, but under a powerful lens seems to be covered all over with minute black dots. In addition, there are numerous dark patches and blotches; those on the first six abdominal segments being more prominent. The ventral surface is pale, with an orange-coloured patch in the region of the first three abdominal segments.

The head (fig. 1) is very small, but quite heavily chitinized. Ordinarily it remains retracted, under the large pronotum, into a pocket formed by the invagination of the soft and large prosternum. The neck is very long, but is devoid of any sclerite.

The antennae (fig. 2) are three-jointed, with a large basal piece (*bp*). The first joint is short and stout and bears numerous stiff setae at its distal extremity. The second joint is the largest of the three and is fairly thick. The third joint is very minute and is not provided with the terminal bristle which is usually found in other genera of this family. It is hardly distinguishable from the seta (*s*) at the apex of the second antennal joint.

The mandibles (fig. 3) are large, sub-triangular, and without any teeth. Their tips are more or less blunt and strongly chitinized; they protrude out of the mouth.

The maxillae (fig. 4) are long, flattened, slipper-shaped, with small cardo (*c*) and well developed stipes (*st*). The latter bears numerous setae, of which the one near the anterior outer corner is very long. The galea (*g*) and lacinia (*l*) are distinct and provided with numerous marginal setae and hairs. The maxillary palpi (*m<sub>x</sub>p*) are fairly long and three-jointed; their terminal joint has a pair of minute setae at the apex.

The labium (fig. 5) is very large, and bears numerous branched and unbranched bristles in its distal region. The sub-mentum (*sm*) is more or less semi-circular in outline and is separated from the rest of the labium by a fine transverse suture. The mentum (*m*) is fairly large. The palpiger (*plg*) is very distinct, and the palp (*lbp*) is two-jointed. The distal margin of the ligula (*li*) is covered with dense fine hairs. The hypopharynx (*hyp*) is a fork-shaped structure, lying longitudinally in the middle of the labium; under high power it appears to be made up of minute tubercles.

The prothorax (fig. 1) is very large. The meso- and metathorax, which are fairly well developed, are hardly fused with each other. The thoracic sterna are distinct and broad and the legs of one side are therefore, widely separated from those of the other. The legs are well developed, and the coxae (*cox*) are fairly large, conical and thick.

The first eight abdominal segments (fig. 1, 1-8) are almost similar to one another except in point of size. The ninth segment (9) is large and rectangular, and its sternal region is quite distinct from the lateral pieces. The tenth segment is small and very thinly chitinized. It surrounds the terminal part of the rectum and is hardly visible.

The larvae breathe by means of a pair of protrusible rectal gills (fig. 6). Each gill consists of a long filament from the base of which numerous fine branches originate which are almost as long as the filament itself. When the gills are protruded they appear as three tassel-like tufts. In *Psephenoides*, according to Böving, there are also two branchiae. But in *Elmis* (*Elmidae*), according to Fowler (4) and Lefroy (5), there are three branchiae. It is highly probable that in *Elmis* also there are only two branchiae which appear three when protruded.

#### b. Pupa.

The pupa (fig. 7) is shorter and broader than the larva, being 0.50 cm. long and 0.25 cm. across the thorax. Unlike that in the allied genera, *Psephenoides*, etc., it is not fixed to the substratum. Its body is deeply curved, the ventral side being concave. The head and thorax are thick and broad, while the abdomen is narrow and compressed. The eyes

(e) are very prominent. The thorax, both above and below, and the ventral surface of the abdomen are pale ochraceous, while the dorsal surface of the abdomen is grey. There is a pair of crescent-shaped dark marks on each thoracic and abdominal notum. The antennal sheaths (*as*) are long and thick. All the appendages of the head and thorax are distinct and free from the body. Unlike that of the larva, the thorax of the pupa lacks the lateral extensions, but its abdomen is provided with extensions which, however, are quite different from those of the larva. Each abdominal extension is conical, bearing strong marginal hairs, and the vertex of the cone is produced into a long narrow process. On the dorsal side of each extension there is a club-shaped appendage (*ap*), those on the 6th abdominal segment being especially conspicuous. These appendages do not seem to have been described in any other member of this family. The gills are absent. The ninth abdominal segment is more or less retracted into the preceding body segments. The external genitalia (*gen*) are well developed.

#### Remarks.

The *Helichus* larva described above resembles the larva of *Psephenoides* in the form and size of the head and thorax, but in the general shape of the body, the nature of the lateral extensions, etc., it comes closer to the larva of *Elmis* (Elmidae), as described by Chapuis and Candeze (2), and to that of *Limnius* which I have been able to examine through the courtesy of Dr. A. D. Böving. The *Helichus* pupa also differs considerably from that of *Psephenoides*.

The larvae of *Helichus*, *Psephenoides* and *Elmis* have rectal branchiae and in this respect differ from those of *Psephenus*, *Eubrianax*, etc., which have a series of gills on the underside of the abdomen, therefore the arrangement of placing these latter genera in a family quite distinct from those including the former seems to be quite justified. It may, however, be pointed out that the larvae of *Psephenoides* and *Psephenus*, belonging to the two different groups defined above, are almost identical in the general form of the body; but this may be due to their similar habitats, namely, rapid running waters.

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