

V. *The Egg and Early Larval Stages of a Coreid Bug, probably Dalader acuticosta, Amyot et Serv.; with a note on its Hymenopterous Parasite.* By NELSON ANNANDALE, B.A., Deputy Superintendent of the Indian Museum, Calcutta.

[Read November 16th, 1904.]

PLATE VIII.

So little is known regarding the life history of the Heteroptera that I have ventured to bring forward certain observations on this subject which are confessedly most incomplete. Possibly my figures and descriptions may be of value to some naturalist more fortunate in rearing the insect to be considered than I have been.

I.

On August 14th last, at Alipur in the suburbs of Calcutta, I found, attached by a spider's web to a tree-trunk, a dead leaf on which were 14 eggs. They were arranged separately, roughly in parallel rows but in no very definite manner. Their length was about 2.75 mm.; their height 1.9 mm.; their colour a rich golden-brown, shining and lustrous. As the embryo developed they became darker. Examination with a lens showed that the surface was patterned with a minute reticulation, and that a cordiform or sub-oval area was marked off at the broader end. This proved to be an operculum. Another area, of greater extent than the last, but having identical limits above was indicated. It was evidently due to internal structures partially revealed by the translucency of the egg-shell. In this region there were several extremely minute punctures, which were only seen under a fairly high power of the microscope. They were arranged in an arc round the upper limits of the operculum and were undoubtedly micropyles: they are too small to appear in the figure. The eggs were fastened to the leaf by a drop of a gummy substance less brittle and more elastic than that of the egg-shell. It was situated near the centre of the flattened base.

During the night between August 18th and 19th, each egg produced a young Heteropteron. The operculum was pushed out bodily and did not remain attached at any point to the remainder of the egg-shell. What I take to be the embryonic exuviae were left hanging from the upper part of the aperture thus formed in a heart-shaped mass, the free apex of which was produced into a delicate filament. The mass was also attached to the base of the egg-shell by a stouter filament, which originated above as a ridge on the inner surface of the mass. On the external face was a very conspicuous black spot, the nature of which I have been unable to determine.

In what manner the operculum was pushed out I cannot say, as I did not see the hatching. It appeared to be very firmly attached to the remainder of the shell although its limits were clearly defined to the eye. There was nothing of the nature of a hardened projection on the head of the larva when hatched.

The young bugs in their first instar measured 4.5 mm. in length. There was no visible difference in size between the different individuals of the brood. The head was squarish, but slightly rounded behind; the eyes were fairly large, but not prominent; I could detect no ocelli. At first sight the antennæ appeared to be five-jointed, but a closer examination showed that the first apparent joint was really a projection from the head: they were inserted into the upper part of the head. The rostrum originated close to the anterior margin of the head and was freely movable; only three joints could be detected in it with certainty. The tarsi appeared to have only two joints. The form and proportions of the different parts of the body are well shown in fig. 4. The colour was leaf-green, marked with purplish-brown, which changed to olive-green on the extremities of the limbs and antennæ. The dorsal "stink-glands" were rendered conspicuous by their prominence and dark colour.

The larvæ were sluggish, but they fed readily on the juices of various leaves, standing with their rostra vertically inserted into the vascular parts of the leaves, generally into the midrib. Their abdomens rapidly became almost globular.

During the night between August 21st and 22nd, the first ecdysis took place. A remarkable change both in structure and demeanour was at once apparent. The larvæ

were now about 7 mm. in length, but some individuals were distinctly larger than others. The abdomen had become narrower in proportion to its length; the separation between it and the thorax was now less marked; a raised Y-shaped area had appeared on the dorsal surface of the head; a third joint to the tarsus was feebly indicated (less feebly on the third pair of legs than on the first and second), and the darker markings on the body had become more extensive. The most notable change, however, was in the antennæ. The first and second joints had lengthened very considerably; the penultimate joint had become broad and flat, with a longitudinal ridge on its dorsal surface; the distal, increasing little in actual dimensions, was now pear-shaped. The expansion of the penultimate joint was rendered more conspicuous by the pale colour of the distal adding a purplish suffusion on its own distal half.

In the first instar, then, the antennæ were of a generalized type; in the second they had become highly specialized.

After the ecdysis the demeanour of the larvæ became much less sluggish. They ran about continually, agitating their antennæ, which were not held in the same attitude as in the first instar (compare figs. 4 and 5). They refused, however, to feed on the juices of leaves, and consequently died, in the course of a few days, of starvation.

I have already noted that the individuals differed from one another in size. With the exception of one, which died immediately after getting rid of its old skin, the larger individuals succumbed after the smaller. The difference I attribute not directly to innate physical characters but to the fact that on hatching all the young larvæ did not show the same aptitude in finding the leaves provided for their food. Some wandered about for several hours without settling down to suck, while others commenced to do so at once. All, however, apparently underwent ecdysis at the same time. I may mention that when the skin was cast the expanded joint of the antennæ was drawn out through the narrow aperture at the base of the organ, just as the claws of crabs are drawn out or the expansions on the femora of some Mantodea (e. g. *Hymenopus bicornis*).

As regards the systematic position of these Heteroptera, I have no hesitation in assigning them to be Coreidæ, and very little to the genus *Dalader*, which is remarkable for having antennæ with an expanded, ridged penultimate

joint and a pale-coloured, pear-shaped distal one. If this attribution is correct the species is almost certainly *Dalader acuticosta*, Amyot et Serv., as this is the only representative of the genus known from Lower Bengal, where it is not uncommon.

II.

On August 20th I found seven more eggs of the same species attached directly to the bark of the same tree at Alipur. A few days later I dissected six of them. Each was occupied by a small, black Hymenopteron, already fully formed but enveloped in a delicate membrane. It lay on its belly in the egg, with its head bent down beneath the level of its thorax. The anterior edge of the thorax was directed towards the operculum but was not in contact with it. A sub-triangular, whitish mass covered the dorsal surface of the abdomen, but was not in organic connection with it. Possibly this was all that remained of the proper occupant of the egg-shell which the Hymenopteron had devoured. A similar parasite was hatched from the seventh egg but unfortunately escaped.

In the collection of the Indian Museum I have recently come across a third clutch of eggs, attached to the leaf of a sugar cane. With them are the Hymenoptera bred from them, evidently belonging to the same species. By a very natural error the egg-shells are entered in the Museum register as being the cocoons of the parasite.

I do not know of any other case in which a Hymenopteron has been recorded as parasitic on the eggs of a Heteropteron, though other members of the same family are known to infest the egg-cases of cockroaches. The eggs of the species under consideration are probably very minute indeed and may be introduced through one of the micropyles. No other aperture could be detected in parasitized eggs. It is evident that the shells are firm when the infested eggs are laid, as their base does not preserve a cast of the surface to which they adhere.

The specimens of the parasite examined are in a poor state of preservation. They belong to the family *Chalcididæ* in its wider application : further it would be ridiculous for one who is not a specialist in the group to go.

EXPLANATION OF PLATE VIII.

- FIG. 1. Parasitized Egg of Heteropteron (? *Dalader acuticosta*),
from above.
2. " " " " "
 from one side.
3. Egg from which Heteropteron has hatched.
4. Larva in 1st instar.
5. " " 2nd "

FIGS. 1 to 3 $\times 8$; fig. 4 $\times 4$; fig. 5 $\times 3$.

In fig. 5 the artist has tipped the head of the insect up slightly so that the proximal extremity of the mouth parts appears.



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