

A microscopic examination of the ova of *Penthaeus capidarius* / by T. Spencer Cobbold, Esq., M.D. (Senior President of the Royal Medical Society of Edinburgh).

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15

A MICROSCOPIC EXAMINATION OF THE OVA OF PENTHALEUS CAPIDARIUS.*

BY T. SPENCER COBBOLD, ESQ., M. D.

Senior President of the Royal Medical Society of Edinburgh.

THE Ova, to which I wish to direct the attention of the Society this afternoon, are very much allied in character to those of the common Harvest Bug, (*Leptus autumnalis*), and the common Itch Insect, (*Acarus scabiei*), and are considered by Mr. Edwin Giles, of Ipswich, to be those of *Penthaleus capidarius*, or *Acarus capidarius*, formerly called *Acarus telluris*.

The eggs now exhibited to the Society, are scattered over the surface of Granite; and for the specimen before us, I am indebted to Stephen Jackson, Esq., of Ipswich, who picked it up on the sea shore at Vallo, in Norway, during the past summer; and by whom I am also informed, on the authority of Mr. King, of the same town, that in the year 1842, it was very common to find them attached to flints, old tiles, brickbats, and the like in the neighbourhood of Ipswich, but since then it would seem that they have disappeared from that district.

When seen with the naked eye they look as minute white specks,



and viewed singly are scarcely discernible. Fig. 1. represents a section of the specimen of the Granite, with the Ova scattered on its surface. When, however, we examine them with a common pocket lens, we

* Read before the Physiological Society of Edinburgh, November 22nd., 1851.

can at once detect their form and recognise their nature. Their diminutive size is a character common to most species of the same family, (*Acaridæ*.) To obtain, however, a more satisfactory knowledge of their morphology and construction, it is necessary to subject them to much higher magnifying powers, and the drawings now before the Society, represent them at different stages of development, magnified two hundred and fifty diameters linear.

The chief points of interest, to which we may direct our attention, bear reference to their external configuration; the changes in form during development; and the manner in which the mature embryo or larva makes its escape from the outer covering or *shell*.

The general form then may be at once recognised as that of a sphere flattened and depressed from above. (See Figs. 2 and 3.)



This button-like character is by no means an unfrequent appearance in the eggs of insects generally; and though I have not seen any precisely similar illustrations to those before us in the works of recent entomological writers; there is, nevertheless, figured in the great work of Swammerdam, Plate xxxiii, Fig. 1, a very similar form of an egg, belonging to one of the Noctuæ, or Post Meridian Moths; it is devoid, however, of certain markings, which, in the specimens before us, have a very chaste appearance, and which represent a series of alternate elevations and depressions, twenty-five in number, running from a central elevated point, to the outer border of the button-like surface.

When viewed laterally, and especially if the specimen be immersed in some transparent medium, not only are these morphological features readily confirmed, but we observe, through the outer covering, or *shell-membrane*, a small round opaque body, situated im-



mediately under the central prominence, as seen in Fig. 4. This there can be little doubt, corresponds to the Yolk, or Vitellus, in the Ova of birds and other animals, being enclosed in a special and distinct envelope of its own, constituting the Yolk Sac, or Vitelline membrane.

Keeping our attention fixed from time to time on the same Ova, we observe that this opaque body or Yolk increases at the expense of the surrounding medium or albumen, which is situated between it and the shell membrane, the alterations in form of which latter structure are almost entirely confined to the cupola, or cup-shaped



surface. I have employed the term *Cupola* here as expressive of the change which this part of the covering undergoes, becoming, as it does, in course of development, dome-shaped or convex; (see Fig. 5,) whereas in the first instance we found it depressed or concave; its central point only being excepted. (Fig. 3.)

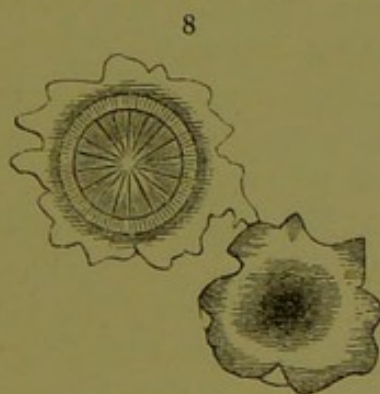
We have now arrived at the period when the embryo, or germe, enclosed within the Yolk Sac, has nearly attained its mature condition; and having exhausted the pabulum afforded by the albumen for its growth and nourishment "within," it is necessary that fresh materials be obtained from "without:" this can only be effected by a two-fold change, which takes place as follows:—*First*, we have the shell membrane giving way for the escape of the *Yolk Sac*, with its



included germe. This does not always take place exactly in the same manner; for sometimes the escape is made by the cupola being thrust on one side, and the *shell* membrane is broken up in various directions. (Figs. 6 and 7.) While at other times the Sac forces up the cupola

by a pressure equally applied, and causes it to fall off, after the manner of the extinguisher-like calyx of *Eschscholtzia*. (Fig. 8.)

The *Second* change consists in the breaking up of the Vitelline mem-

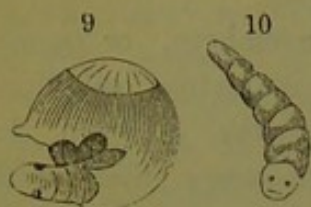


brane, or Yolk Sac, and of the consequent escape of the adult embryo or larva. This takes place at any part of the circumference of the membrane, except at that portion which was situated under the cupola. The reason of this seems to be owing to the deposition of a white material, precisely similar to that which covers the external membrane, and which is analogous in function to the calcareous shell in the case of

birds; but as to its composition, nothing definite can be advanced.*

* Since writing the above, I have been informed by Mr. Drummond, one of the members of the Society, who has lately made some chemical investigations on this subject, that the horny-like material forming the shell of the Ovum, consists of *Chitine*; the formula of which is closely allied to that of the *Proteine* compounds. It is well-known that this substance enters largely into the composition of the tegumentary system of Insects generally, and is especially abundant in the *Coleoptera*.

For what purpose the secondary shell exists, why it should occupy such a limited portion of the Yolk bag, and in what way it is here secreted, are queries, for the solution of which we will hazard no conjecture. The existence of grooves on its surface, corresponding to those of the cupola, are also quite discernible on the secondary shell. (Figs. 7, 8. and 9.)



The Sac having ruptured, the larva, which is of a bright crimson colour, escapes in the usual manner. (See Figs. 9 and 10.) It presents a pair of distinct eyes, but no feet, while the annular divisions of the body are barely apparent.

As to the process of development in Ova I can add nothing new, but will conclude with a short extract taken from the last Edition of Dr. Carpenter's valuable work on the "Principles of Physiology." (Page 387:—)

"In all cases the embryonic mass within the egg is first converted into a footless worm, resembling the higher *Entozoa*, or the inferior *Annelida* in its general organization, but possessing the number of segments—*thirteen*—which is typical of the class of Insects."

Edinburgh, February 2nd., 1852.

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