TRANSACTIONS.

*On the METAMORPHOSES of a COCCUS found upon ORANGES.**

By RICHARD BECK.

(Read March 13th, 1861.)

IF the external surface of almost any of the sweet oranges be only cursorily examined, it will be found more or less spotted with small scales, the shields of a coccus or scale insect; they are adherent to the rind of the orange, but can easily be detached; and, on turning one of the larger ones over, it will be found, on examination under a low power, to present, as the most striking feature, a large accumulation of eggs lying beneath a cottony secretion (Plate V, fig. 1, *b*); very frequently these eggs are in the process of hatching, and, under such circumstances, we have the insect in its larva state (fig. 3).

The body is white, oval, and very flat: there are two antennæ proceeding from underneath; they are about one fourth the length of the body, rather hairy, and of eight or nine joints, two very small light-pink ocelli, or simple eyes, occur one on each side, at the very edge of the body, and about where the long curves of the oval commence; considerably below the antennæ is a proboscis, a long and apparently horny tube, proceeding from a conical base. These, with the exception of a few isolated hairs, are the only external organs of the head that are apparent. The legs are six in number, each consisting of, I think, four members; the terminal ones being provided with a hook, and two or more very small suckers hardly to be distinguished from

* The author considers these observations as very incomplete; his object in laying them before the society in such a state was to afford any member an opportunity of investigating the subject whilst the oranges were in season, having since found that the same coccus is in great quantities on plants in this country, and that the eggs are now hatching; he would still call the attention of microscopists to the subject.

hairs. At the extremity of the body two exceedingly minute hairs trail behind for some considerable length; and besides these are numerous setæ and orifices, parts, I believe, of the organ for the secretion of the cottony substance and the hard shield.

The locomotive power of the larva—and this is the only time it makes use of it—is I believe very limited; frequently it settles close to the parent home, and I imagine that when once the proboscis is inserted in the orange it is never removed; the insect thus located, the skin on the back changes to a darker colour, thickens, and ultimately becomes a cast skin, the coccus having retreated between the secretions of the hard shield, as a protection above, and the cottony substance as a close attachment below, but to neither of them is it ever adherent; at this stage it also loses every trace of antennæ, legs, and eyes, whilst, on the contrary, the proboscis is more fully developed: this is evidently the pupa state, and thus far I have been unable to detect any difference between male and female.

The first indication that I have found of the male insect is the presence of two dark and rather diffused red spots in the head, and also a simultaneous disappearance of the proboscis (fig. 4). Then after a skin is cast, there is an entire disappearance of the organs for the secretions of the shield, which is completed of a long and narrow shape; one stage more in advance and the ocelli are black and distinct, and there can be traced two long antennæ and two wings at the side; six legs are also in process of development, the two in front being directed forward, which is a peculiarity of the pupa of this genus; and at the extremity of the body is a protuberance I imagine to be the male organ (fig. 5). Another skin is yet cast, and then there is a perfect male insect (fig. 6). The ocelli are four, two above and two below; the antennæ, eight or nine jointed, very delicate, hairy, and nearly the length of the whole body; the legs have four members, the terminal one of each being provided with a single hook and two or more delicate suckers; the wings project considerably beyond the body, they are transparent, but covered with very minute hairs, and strengthened by a simple ribbing of two corrugations which unite at the base. The two halteres or poisers are oval, and terminate with a hair bent like a hook at the extremity; and that which I presume to be the male organ is long, attenuated, and attached at its base to, and immediately above, a truncated projection which has an aperture at its apex.

We thus find in the male complete insect metamorphoses.

I am unable to say as much of the female, though I presume such must be the case, as only a perfect insect is capable of reproducing its species. I have not as yet paid as much attention to this sex, but so far as my investigations have gone, after it has changed into the pupa state all external organs entirely disappear, excepting those at the extremity of the body, and the proboscis, which becomes stronger and larger (fig. 8); the secretion of the shield is continued until nearly four or five times the size of the male, and the body of the insect bears about the same proportion; it then deposits its eggs, between one and two hundred in number, which are placed on end in great regularity, and the first ones will frequently be found hatching before the last are laid.

The external surface of the shield of the male (fig. 7) gives very marked indications of the three changes that have taken place: first, there is the cast skin of the larva; secondly, the shield for the pupa; and thirdly, a thin and short addition to the shield for the wings of the imago, which I believe is lifted up when the insect escapes.

There are also three similar indications on the external surface of the female shield, and these may also warrant the conclusion that its metamorphoses have been complete.

It is somewhat surprising that these cocci are to be found in a living state at all, after the change they must have experienced in the climate; it is, however, very evident that the larva and pupa states are much hardier than that of the imago; at least so far as the males are concerned, I have found it very difficult to obtain any alive after the external organs were fully developed. As it is, the circumstances under which they appear are very favorable to their examination; one single orange, if well selected, will supply every condition I have mentioned; and I imagine that from the fact of the shield being such a complete protection, the metamorphoses are more distinct in their development than under the more ordinary circumstances where the insect itself is exposed. I have invariably used Mr. Wenham's binocular arrangement with the microscope, and I can only say that for this class of investigations the results are perfectly marvellous.