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this against the theory of the migration of the embryo of the Rhizocephala. I also add that all the facts contained in this note are perfectly well explained under the hypothesis of direct fixation which still appears to me much the most probable.—*Comptes Rendus*, July 5, 1886, p. 84.

The Bed-Bug and its Odoriferous Apparatus.

By M. J. KÜNCKEL.

I have ascertained that the young *Cimices*, on issuing from the egg, bear three odorific glands, situated in the dorsal region of the abdomen. These glands occupy the median portion of the first three segments; all three, of the same dimensions, when seen under the microscope affect the form of a more or less inflated satchel; their outline exactly reproduces the contour of a melon-glass, with the bottom turned towards the head. Each gland opens externally by two orifices, placed on either side of the median line, and arranged transversely at the margin of the first, second, and third tergites, just over the line of separation of the segments; they have the aspect of open button-holes.

If we examine the young bugs when their digestive tube is gorged with blood, it is impossible, on account of their opacity, to perceive the odoriferous glands; to study these we must render the insects transparent by means of special artifices. We shall not at present describe their histological structure, but merely remark that they are cutaneous glands formed by a fold of the skin; moreover, after treatment with caustic potash we can ascertain that the cuticle of the integument is continuous with the invaginated cuticle which lines the interior of the gland.

These three *abdominal and dorsal* glands persist until the last change of skin; they then become atrophied and are replaced by a *thoracic and sternal* glandular apparatus. The Cimicides, which drink blood, like the Scutellerides, Pentatomides, Coreides, Lygæides, &c., which suck sap, are therefore provided with two systems of organs of secretion, situated in two opposite regions of the body, according as they are in the state of larva or pupa, or in the adult state.

The presence at different ages in the same insect of glands having different anatomical relations, but possessing the same physiological attributes, is a fact which leads us to interesting deductions. In fact when I first indicated it, in 1866*, I endeavoured to explain it, and I said that the glands of the pupæ became atrophied, because in the Pentatomides and others the scutellum, elytra, and wings coming to cover the superior arches of the abdomen, would place an obstacle in the way of the performance of their physiological function; but the bed-bug having only a short scutellum, small elytra, and no wings, the tergites of the abdomen are never covered, and it would seem that my explanation was defective: it will suffice for me to remark that this Hemipteron is an aberrant type, transformed by adaptation, that is to say, having lost its aerial locomotor organs to conform to a sedentary existence subordinated to the biological conditions imposed by its cohabitation with man; on the other hand,

* 'Comptes Rendus,' 2^e semestre, 1866, p. 483.

the presence of the two glandular systems, as in the Hemiptera furnished with organs of flight, demonstrates that originally the *Cimices* possessed normally-constituted elytra and wings.

Some naturalists, indeed, have thought that these creatures, when adult, represented the pupa-state of other Hemiptera, and that the number of moults justified their opinion. Now the disappearance of the larval and pupal odoriferous glands coincides with the appearance of new odoriferous glands, the exclusive appanage of the adult Hemiptera: then the *Cimices* capable of reproduction and regarded as pupæ are not able after another moult to acquire wings; they are creatures which have attained the last term of their development. If, like *Pyrrhocoris apterus** of the family Lygaeidae, they are capable of becoming winged, this would be at the time of the last moult, and the appearance of the elytra and wings of normal constitution would coincide with the disappearance of the abdominal glands and the appearance of the metathoracic glandular apparatus.

If the discovery of the odorific glands of the larvæ and pupæ belongs to me (1866), the discovery of the odoriferous gland in these adult Hemiptera was made by Léon Dufour (1833); but it was Leonhard Landois who ascertained the presence of the glandular apparatus in the bed-bug (1868)†. According to him this apparatus consists of two long bursæ, accumulating the secretion of a single median gland and gradually uniting in an excretory duct situated in the mesothorax and opening between the posterior legs by a single orifice! This is all wrong. It consists in reality of a pair of elongated appendiculate bursæ, of equal length, arranged symmetrically on the two sides of the median line, between the cavities of insertion of the posterior legs; each of these bursæ opens by a distinct orifice into a trapezoidal sac which occupies the whole metathoracic sternal region included between the line of separation of the mesosternum and metasternum and the insertions of the third pair of legs; the base of this sac is bilobed, and presents behind, on either side of the median line, two groups of minute glandular cæca. This sac opens externally by a pair of orifices placed in a depression on the sides of the metasternum at the level of the insertion of the third pair of legs; these orifices are placed on either side of a prolongation of the mesosternum which extends between the legs.

To sum up: the bed-bug, from the time of its hatching, in the state of larva and pupa, possesses three dorsal, abdominal, odoriferous glands, which disappear at the last moult, and are replaced in the adult state by a metathoracic sternal glandular apparatus. The presence of this apparatus is a criterion which enables us to prove that the *Cimex* has completed its evolution.—*Comptes Rendus*, July 5, 1886, p. 81.

* This Hemipteron, as was seen by Paul Meyer (1873) and as I have verified, in the larval and pupal states possesses three abdominal glands which disappear at the last moult when the metathoracic sternal gland is formed; during very warm and dry summers I have several times observed in individuals collected in the Botanical School of the Museum the simultaneous production of well-formed wings and of the metathoracic sternal gland.

† *Zeitschr. f. wiss. Zool.* Bd. xviii, p. 218, pl. xii. fig. 14.