and exopterygotic Orders there occur forms that are wingless, e. g., the females of many Lampyridae, in which there coexist the absence of wings and diminution of the change of form in the successive instars that make up the Ontogeny.

The Mallophaga and Anoplura again are purely parasitic forms and thus differ entirely from the Aptera and Apontoptera. Although the Aptera and Apontoptera have been associated by Packard as Synaptera it is still very doubtful whether there is any real affinity between these two Orders.

These considerations render it evident that we are not yet in a position to finally classify the wingless Orders of Insects.

Those who wish to do so may however adopt temporarily three divisions for them viz., 1) Synaptera, for Aptera and Apontoptera, 2) Parasitica, for Mallophaga and Anoplura, 3) Anapterygota, for Siphonaptera.

In reference to the construction of the new names here proposed it is perhaps right to point out that as it has been thought desirable to apply the termination -"ptera" to all the Orders for the sake of an uniform terminology, it is clear that in the case of the wingless Orders this termination can only be correctly used by combining it with some term signifying "destitute of". Hence the names I propose to apply to the wingless Orders indicate in each case the absence of wings.

The Zoological Laboratory, Cambridge, November 1903.

12. On the presence of mobile fat in the Chromatophores of the Crustacea (Hippolyte varians).

By Frederick Keeble, University College Reading, and F. W. Gamble, Owens College Manchester.

eingeg. 1. Dezember 1903.

The present paper is an abstract of our researches into the distribution and movements of fat in the prawn *Hippolyte*.

The researches have been carried on at Trégastel (Brittany), at Naples, and in the laboratories of Owens College Manchester, and of University College, Reading.

1) Distribution of Fat. *Hippolyte* offers a remarkable contrast to crabs, lobsters, and cray-fish with respect to the distribution of its fat. In these latter, according to Dastre (1901), storage-fat is confined to the liver: in *Hippolyte* we find that it occurs not only in liver, but also in the chromatophores and epidermal cells. As means of identification, we use 1) the optical characters of the granules, 2) the osmic acid reaction, 3) that of Sudan 3. and Scharlachrot (Michaelis methods).

In preparations fixed with Osmic acid and mounted in glycerine jelly the chromatophores show, in addition to red, orange and blue pigments, the granular fat associated with, but distinct from, these pigments.

The fat in the form of spherical colourless granules .5—1 μ in diameter, lies either in the centres or in the branches of the chromatophores. In a green *Hippolyte*, for example, the fat granules run in rows which follow the lines of the branching and anastomosing chromatophores in which they occupy separate tracts.

2) Movements of the Fat of the Chromatophores. Like the pigments themselves, the fat of the chromatophores is mobile. At night when the animals are in the nocturnal phase (Gamble and Keeble, 1900) all pigments being contracted to the centres, the fat is likewise aggregated in the centres. When the pigments pass into their branches, at daybreak, the fat also passes into its branches. When the pigments are fully expanded and occupy the finest intercellular ramifications, the fat appears in the form of a fine net-work — a lacteal system — about the terminations of the chromatophores in skin, muscle and connected tissue. Though, broadly speaking, fat-movement and pigment-movement correspond, the correspondence is not absolute, nor does artificial stimulation always affect pigment and fat alike.

3) The occurrence of fat in relation to food and to illumination. Fed and starved *Hippolytes* show the same general phenomena of fat distribution. The fat of the chromatophores appears, however to be independent of the food supply.

Light, on the other hand, exerts a powerful influence on the occurrence of fat in the chromatophores. Thus, *Hippolytes* taken from the sea and exposed for an hour to bright sunlight, shew a denser network of finer mesh than do controls kept in diffuse light.

Continued darkness produces, after five to eight days, depletion of the chromatophoric fat in male and immature female specimens. Depletion in mature females occurs in from eight to ten days; in large *Hippolyte viridis*, the process may even then be incomplete.

Such dark-kept specimens and controls kept for the same length of time in diffused light, exposed for three hours to direct sunlight showed dense networks of large colourless fat-granules in both cases.

4) Summary. The Chromatophores of *Hippolyte* normally contain colourless fat distributed in tracts separate from those occupied by the red and yellow pigments. The fat exhibits movements very similar to those of the diurnal pigments. These movements bring the fat from the chromotophore-centres to the inter-cellular spaces of the

tissues, and back from the branches to the centres. Under healthy conditions the amount of fat diminishes but little in diffuse light, whereas, in darkness, the fat disappears, and this whether food is supplied or not. Both light- and dark-kept specimens exhibit dense networks of fat after a short exposure to bright light.

A fuller statement and a consideration of the conclusions drawn from these experiments is in preparation.

References.

1901. Dastre, A., Sur la repartition des Matières grasses chez les Crustacés. Compt. Rend. Soc. d. Biologie. p. 412—414.

1900. Gamble & Keeble, *Hippolyte varians* a Study in Colour-change. Quart. Journ. Micr. Sc. Vol. 46. p. 589—698.

13. Nochmals über Trockenzeitanpassung eines Ancylus von Südamerika.

Von Oskar Boettger.

eingeg. 3. Dezember 1903.

Im Zool. Anzeiger Jahrg. 1903. S. 590—593, 17 Fig., hat E. Nordenskiöld über *Ancylus*-Schalen berichtet[1], die er im bolivianischen Chako gefunden hat, und die sich dadurch auszeichnen, »daß die sonst weiten Mündungen mit einer mit der übrigen Schale fest zusammenhängenden Schalenbildung überwachsen sind, die dem Tier nur eine kleinere sekundäre Mündung ließ«. Ein Blick auf die der Arbeit beigegebenen Figuren genügt, um zu erkennen, daß der schwedische Gelehrte jugendliche Gehäuse der Gattung *Gundlachia* Pfr. vor sich gehabt hat, wie sie typischer nicht gefunden und abgebildet werden können. Die Abbildungen Fig. 4—11 auf S. 591 lassen keine andre Deutung zu. Da Vertreter der genannten, im Gebiß von *Ancylus* übrigens abweichenden Gattung meines Wissens bislang aus Südamerika nicht bekannt geworden sind, wollen wir es unserm Autor verzeihen, daß er offenbar gar nicht daran gedacht hat, die übrigen interessanten Ancylinen-Gattungen, die hier in Betracht kommen könnten, wie z. B. *Latia* Gray und *Gundlachia* Pfr., bei dieser Gelegenheit in den Bereich seiner Betrachtungen einzuschließen.

Solche pantoffelähnlichen Schalen mit zu zwei Dritteln geschlossener Gehäusebasis, wie sie E. Nordenskiöld gefunden hat, kommen übrigens außer im Pliozän der Antillen schon im deutschen Untermiozän vor. Ich konnte in *Gundlachia francofurtana* Bttgr.[2] schon

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[1] Referat von W. Kobelt auch im Nachr.-Bl. d. deutschen Malakoz. Ges. 1903. p. 186—187.

[2] Vgl. namentlich Fig. 2 auf Taf. 29 in Palaeontographica, Bd. 24. 1877. p. 189—191, Taf. 29 Fig. 1—3.