

Brunst bemerken; nur bei einigen Männchen ließen sich im Hoden und Nebenhoden sehr spärlich ausgebildete Samenkörper nachweisen. Vielleicht war für diese Art die Jahreszeit noch zu früh und findet die Begattung wohl erst später im October und November statt.

Von anderen Arten erhielt ich nicht genügend zahlreiche Exemplare, um darüber berichten zu können.

Aus den mitgetheilten Befunden scheint mir immerhin hervorzu-gehen, daß sich auch selbst schon bei den deutschen Arten der Chirop-teren die Fortpflanzung nicht gleich verhält. Es dürfte sich daher empfehlen, besonders die südlicher vorkommenden Arten einer ge-nauen Untersuchung zu unterziehen.

3. The Ontogeny of *Limulus*.

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eingeg. 28. Juli 1890.

The following is preliminary to a more detailed account with ample illustrations which will be published soon. The work was done in the Marine Biological Laboratory at Woods Holl, Mass., during the summers of 1889 and 1890. In my views of the earlier stages as seen from the surface I fail to corroborate Osborn's account¹ in many particulars. The eggs were artificially fertilized and were carried through until hatching.

1) The segmentation nucleus is subcentral and is surrounded by a thin pellicle of protoplasm. It undergoes several divisions before any signs of segmentation are visible from the surface. The products of this division migrate more rapidly toward that pole of the egg where the germ is subsequently to appear than to any other portion of the sur-face. Forty hours after impregnation the egg itself begins to segment and this segmentation has in its general appearance a mesoblastic character, recalling to a slight degree Metschnikoff's² pl. XIV fig. 5. The result of this yolk segmentation is to divide the egg into a number of yolk cells, in the centre of each of which there is a nucleus with its thin layer of protoplasm.

2) The result of migration of the products of egg and nuclear segmentation is the formation of a blastoderm at first on one side of the egg, the cells of which are smaller and less charged with yolk than those of the rest of the ovum. At this time surface views show no traces of regularity. At one pole are numbers of poorly defined small cells

¹ Johns Hopkins University Circulars. No. 43. 1885.

² Zeitschr. f. wiss. Zool. XXI. 1871.

while at the other the cells are greatly larger and fewer in number. The blastoderm thus formed produces a lighter spot on one side of the egg which strikingly resembles the primitive cumulus of the Arachnids. With the formation of this blastoderm the secretion of the Blastoderm-haut (Amnion of Packard, deutovum of my former paper³) begins.

3) In from 8 to 11 days after impregnation (the period varies in eggs of the same lot) a small circular pit appears in the centre of the primitive cumulus. This I regard as the blastopore. This soon becomes triangular and then elongates, while on the next day a second cloud appears behind the first, but connected with it. At first the second cloud is smaller but it soon attains equality with the primitive cumulus and soon surpasses it. During this process the outlines become indistinct, more so than in Balfour's⁴ pl. XIX fig. 1 which in other respects, except in length agrees well. During this process the blastopore increases in length backwards, in the shape of a shallow groove (primitive groove) the enlarged anterior end of which continues to mark the original site of the first appearance of the structure. This primitive groove runs back into the posterior cloud and fades out behind. A second lighter area has now become prominent along the margins of the blastopore and its posterior continuation, produced by the proliferation, as shown by sections, of mesodermal cells from the margins. These wander in between the rest of the blastoderm (ectoderm) and the yolk (entoderm) cells which occupy the interior. Gastrulation produces no entoderm.

4) In 15 days this primitive groove has become less distinct, through the flattening of its walls; while the germinal area, now outlined by the limits of the extension of the mesoderm, has become divided by the appearance of a transverse groove into cephalic and post-oral plates, the anterior being smaller and more sharply limited than the other. In twelve hours more a second groove appears behind the first, cutting off a narrow ridge, the first post-oral somite. At this stage the embryo is readily comparable with Metschnikoff's pl. XVII fig. 3, except in the following particulars: The two ends of the embryo are more nearly equal, the single somite developed is much shorter and the median groove is fainter and extends into both cephalic and caudal plates. Successive somites are added by budding from the caudal plate until the number six is reached. The embryo now closely resembles Balfour's pl. XIX figs. 3a and 3b except that it covers far less of the surface of the egg, the first somite is separate from the

³ Quarterly Journ. Microsc. Soc. XXV. 1885.

⁴ Quart. Journ. Microsc. Soc. XX. 1880.

cephalic plate, the primitive groove extends across the somites, its anterior end terminating at the mouth while posteriorly it runs into the caudal plate; the caudal plate is much smaller than in Balfour's figure.

5) Just after six somites are formed paired thickenings, the rudiments of legs arise near the outer margins of each. The six pairs arise simultaneously. I have seen no traces of Osborn's semicircular groove.

6) Almost simultaneously with the outgrowth of the legs paired thickenings for the nervous system appear. There are a pair of these in each somite of the body while three pairs appear in the cephalic plate. A few days later a series of six pairs of segmentally arranged sensory thickenings arise outside of the legs, and extend in a line from the cephalic lobes backwards, as briefly described by Patten⁵. These have different fates. The first pair gives rise to the median ocelli of the adult; the second to a peculiar sense organ as yet undescribed occurring on the thin skin just in front of the first pair of appendages; the third soon disappears; the fourth forms the »dorsal organ« of Watase, which persists longer than the third; the fifth gives rise to the paired compound eyes; while the sixth is evanescent. At first these are all similar and are plainly sensory. These organs are connected with each other and with the brain by a longitudinal nerve which takes an undulating course between the organs and the bases of the legs.

7) There is a precocious separation of ectoderm and entoderm (yolk cells) during the formation of the blastoderm. Blastopore and primitive groove produce no invagination of entoderm cells. The entoderm retains its primitive character as a solid mass of large yolk cells until after the caudal spine appears. The yolk cells are not true vitellophags. They metabolize the yolk which is contained in each, but the cells themselves are directly converted into the living epithelium of the mid gut. By this process a lumen is formed, first at the anterior end. The stomodeal-mesenteric wall is first to break through; the opening into the proctodeum appears much later. The proctodeum is very short, not extending far from the anus.

8) In embryos at the time of hatching the sternal artery has arrived at the condition found in the adult scorpion. It consists of a tube lying on the upper surface of each half of the oesophageal nerve ring. Not until much later than my studies have gone does it attain the investing character of the adult.

⁵ Journ. Morphology III.

9) Packard's »brick-red gland« is of mesodermal origin. It contains in its interior the cavity of the fifth post-oral somite. Its inner end is terminated by a thin layer of flattened epithelium. It soon becomes folded on itself and the region of the bend grows rapidly forward. The outer limb of the fold becomes in time folded at four points and these new bends grow out in each body segment, giving rise to the lobes characteristic of the organ in the adult. With the folding numerous fusions of the walls occur, followed by perforations, giving rise to the peculiar anastomosing structure of the adult organ.

These points so briefly summarised, go far I think towards the support of that view which would recognise a close relationship between Arachnids and *Limulus*, while at the same time they serve to remove the *Merostomata* more widely from the *Crustacea*.

Woods Holl, Mass., July 17. 1890.

III. Mittheilungen aus Museen, Instituten etc.

1. Bitte.

Dr. Paul Pelseneer (Ecole normale, Gand) occupé à l'étude de Lamellibranches, serait reconnaissant à ceux de ses Collègues qui pourraient lui procurer des spécimens, en alcool, des genres :

Crassatella, *Gastrochaena*, *Pholadomya*, *Ungulina*, *Verticordia*.

2. Linnean Society of New South Wales.

30th July, 1890. — 1) Geological. — 2) and 3) Botanical. — 4) On a new genus of *Tenthredinidae*, with a description of two new species. By W. W. Froggatt. The writer describes two species of saw-flies allied to the Australian genus *Pterygophorus*, for which he proposes the generic name of *Philomastix*; they are remarkable for the handsome funnel-shaped joints of which the antennae of the male are composed, and the great length of the antennae of the female. The species described come from the northern parts of New South Wales and North Queensland. — 5) Additional Notes on *Peripatus Leuckarti*. By J. J. Fletcher, M.A., B.Sc. Some account is given of forty-two specimens of *Peripatus* from three new localities in this colony — Mt. Kosciusko, the Blue Mts., and Dunoon on the Richmond River — all collected since the last occasion on which the attention of the Society was drawn to this species. Apart from the interest attaching to the occurrence of the specimens from Mt. Kosciusko at high altitudes (5000—5700 ft.) where for several months in the year the ground is covered with snow, the collection as a whole is remarkable for the interesting variations of colour and pattern which are presented, but chiefly for the unusual abundance (50 per cent.) of males, the characters of which were not found to be precisely in agreement with those of the only two male specimens hitherto recorded; that is to say, round whitish papillae were found on some or all of

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