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angesehen werden können. Denn beide unterscheiden sich neben der Färbung, auf die gar kein Gewicht gelegt werden darf, bloß durch die »conspicuously emarginate« resp. »truncate with the corners rounded caudal fin.« (cf. Heckel, l. c. p. 76 und 77, Fußnote). Ich besitze übrigens einige beinahe und einen völlig schuppenlosen *Nemachilus barbatulus* Günth. aus unseren Teichen.

Schlaupitz, Dom., Kr. Reichenbach, Schlesien, 11. Mai 1891.

5. A Preliminary Note on the Development of Limulus longispinus.

By K. Kishinouye, Imperial University, Tōkyō, Japan.

eingeg. 23. Mai.

The following is a brief recapitulation of the results of the investigations which I carried on in the Zoological Laboratory of Imperial University, Tōkyō, Japan on the embryology of *Limulus longispinus*. A more detailed account of them will be published in the Journal of the College of Science, Imperial University, Japan.

1) Germinal Layers. — About 9 days after fertilization, a blastodermic thickening comparable to the »primary thickening« of the spider[1] may be seen on the ventral surface of the egg. The thickening gradually extends and afterwards becomes an ellipsoidal disc. The indifferent cells of the thickening separate into 2 layers — ectoderm and mesoderm, and form the rudiment of the ventral plate.

About 14 days after fertilization, the mesoderm is divided into many transverse metameres and almost simultaneously into two lateral parts, beginning at the anterior end. About 4 days later we find at the posterior end of the ventral plate a little median groove from which mesodermic cells proliferate. This groove probably corresponds to the »secondary thickening« of the spider.

The endoderm is represented by the yolk cells, which remain in the interior of the egg. This process may be considered as an abbreviation of a process found in some other Arthropods, in which all of the segmentation nuclei come at one time to the surface of the egg, and afterwards some of them return to the yolk and form the endoderm.

2) Segments and Appendages. — At first the segments of the cephalic lobe and the 1st appendage is cut off from the anterior end of the ventral plate as one segment. Then posterior to this segment, the segment of the 2nd appendage is cut off, and in succession the

[1] Kishinouye, On the Development of Araneina, Journ. Sc. Coll. Japan. vol. IV.

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segments of the 3rd—7th appendages. Afther the formation of the segment of the 7th appendage, the segment of the 1st appendage is cut off from the 1st segment, and then segments of the 8th, 9th etc. appendages are formed behind the segment of the 7th appendage.

The 5th appendage is first of all produced, then gradually anteriorly 4th, 3rd, 2nd, 1st, then gradually posteriorly 6th, 7th etc. All the appendages are postoral in origin. The 7th appendage becomes the metastomum.

3) Coelomic Cavity. — The coelomic cavity is not produced in the segments of the 2nd, 3rd, and 4th appendages. The cephalic lobe and the segment of the 1st appendage have a common coelomic cavity, which developes along the lateral sides of the stomodaeum, and reaches to the dorsal part through the yolk. In every one of the segments posterior to the segment of the 5th appendage a pair of the coelomic cavities appear, which extend over the yolk and envelope it. The dorsal ends of all these coelomic cavities as well as the coelomic cavities themselves meet one another in the dorsal median line; but they do not fuse together. Hence a longitudinal median lumen (the dorsal cir-

culatory vessel) and many lateral slits (the ostia). The mesoderm belonging to the segments of the 2nd, 3rd, and 4th appendages play no part in the formation of the dorsal circulatory vessel.

When the dorsal circulatory vessel is formed the coelomic cavity of the segments of the 5th, 6th and 7th appendages is divided into 2 portions — a ventral, and a dorsal, which now do not communicate with each other. The ventral portion of the coelomic cavity belonging to the segment of the 5th appendage remains as the coxal gland.

4) Dorsum and Ventrum. — In *Limulus* there is a distinct line of demarcation between the dorsum and the ventrum. The ventrum is reflexed dorsalwards in the cephalothorax. The cephalothorax of *Limulus* (and of *Trilobites* also) is composed of 5 lobes, — median (rachis), 1st lateral (pleurae), and 2nd lateral (free cheeks). The 2nd lateral lobes are the reflexed portions of the ventrum. In *Limulus* they are connected, right and left, in front. In the abdomen, the ventrum is not reflexed dorsalwards; therefore the dorsal surface of the abdomen is formed of the dorsum only and is composed of 3 lobes (the median and the laterals).

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It is remarkable that in *Limulus* (in *Trilobites* also) the eyes are always on the ventral side of the line of demarcation between the dorsum and the ventrum, and that spines are always on this line (in *Limulus* spines are found on the dorsal median line also, but they are in the dorsum only).

5) Nervous-System. — The nervous-system arises from a paired longitudinal thickening of the ectoderm. The anterior ends of these thickenings are much broader than the posterior parts, and there are two pairs of the ectodermic invaginations. These parts form the brain. About 24 days after fertilization, 9 pairs of ganglia may be seen (there is a pair of them in the segment of the metastoma). They are separated from the general ectoderm from the anterior end gradually. From the 3rd pair of ganglia backwards there is a lateral commissure in each segment. The brain has one transverse commissure. The separation of the brain from the general ectoderm is later than that of ganglia. There is a peculiar grouping of the nuclei, as that found in the retinal portion of the eye, in the nervous system before it is separated from the general ectoderm.

6) Eyes. — The eyes are developed from pre-oral ectodermic invaginations, externally to the brain. They are produced at the margin of the ventral plate, and retain this position; therefore they are afterwards found in the dorsal surface of the body by the reflection of the ventrum. The lateral eyes, moreover, migrate posteriorly, hence many authors have wrongly supposed them to belong to a thoracic segment. The invagination of the lateral eyes is soon obliterated. The median eyes originate from a pair of little ectodermic invaginations. These invaginations are afterwards united into a tube and the tube is subsequently reduced to a solid rod, the distal end of which is enlarged and lies always at the margin of the ventrum and the dorsum.

Tōkyō, 13. April, 1891.

6. Schizocerca diversicornis Daday oder Brachionus amphifurcatus Imhof? Eine synonymische Bemerkung.

Von Dr. E. von Daday,
Docent an der Universität in Budapest.

eingeg. 23. Mai 1891.

O. E. Imhof äußert sich anläßlich der Bemerkungen über die »Liste des Rotifères observés en Galicie« betitelte Notiz A. Wierzejski's bezüglich der *Schizocerca diversicornis* v. Daday wie folgt: »Diese Rotatorienform wurde in den Materialien von Weltner in Berlin aus norddeutschen Seen gefunden und im Zoolog. Anzeiger

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