dermi viventi si possono dividere in 2 grandi gruppi, di cui uno comprende le *Oloturie* ed i *Crinoidi*, l'altro le *Ophiure*, le *Asterie* e gli *Echini*. Adottando la nomenclature proposta da Haeckel[12] chiamerò il 1° gruppo dei *Monorchonia*, il 2° gruppo dei *Pentorchonia*, sebbene ad essi io dia altra estensione ed altro significato, come lo dimostra il differente posto da me assegnato ai *Crinoidi*, che da Haeckel sono stati ascritti ai *Pentorchonia*.

Nel lavoro completo darò piu ampie spiegazioni sulle divergenze che in proposito esistono tra i miei studi, fondati sulla ontogenia, e quelli, fondati sull' Anatomia comparata e sulla Paleontologia dal geniale Zoologo di Jena.

Cagliari, Istituto d'Anatomia comparata e Zoologia, 20 Maggio 1899.

## 3. The External Features in the Development of Lepidosiren paradoxa, Fitz.

By J. Graham Kerr. Read May 4, 1899. Royal Society of London. (Abstract.)

The paper opens with a short account of the habits of *Lepidosiren* as observed in the Gran Chaco. A description is then given of the external features in the development. The more important points in this may be summarised as follows.

The egg is very large, 6,5—7 mm in diameter. It is surrounded by a special capsule at first thick and almost jelly-like in appearance, later on (after fertilisation) thin and horny. Outside this was found in rare cases a thick jelly resembling that of the common frog's egg. The egg is without a trace of dark pigment. Segmentation is complete, resembling most nearly that of the egg of *Amia*, and leads to a condition with an upper hemisphere of small cells with large segmentation cavity, and a lower of large yolk cells. Gastrulation begins with the appearance of a row of depressions, or a continuous groove along about one-third of the whole extent of the margin between small and large cells. During its progress the small-celled portion spreads over the lower yolk cells by the addition to its margin of small cells split off from the yolk cells. As the groove referred to deepens into a slit to form the archenteron, it becomes gradually shorter, and the eventual complete blastopore is a crescentic slit only about a quarter of the length of the original groove. The medullary folds soon appear running forwards from the blastopore. There is no trace externally of a blastoporic or protostomal seam running along the back between the

[12] Die Amphorideen und Cystoideen. Beiträge zur Morphologie und Phylogenie der Echinodermen. Festschrift zum siebenzigsten Geburtstage von Carl Gegenbaur, am 21. August 1896. p. 160 e seg.

medullary folds. The folds are low and inconspicuous, and they are continued into one another behind the blastopore, which becomes the anus. There are only slight traces of overarching of the medullary folds to enclose a neural canal. During the later stages of intraoval development, the posterior end of the body becomes much more conspicuously folded off the yolk than the head end. The *Lepidosiren* hatches out as a tadpole-shaped larva, still completely devoid of dark pigment. Just about the time of hatching the cloacal opening closes temporarily. As the larva develops it becomes extraordinarily amphibian-like. It possesses large pinnate external or somatic gills, four on each side, corresponding to branchial arches I, II, III, and IV. A large cement organ is also present, which during its early stages is of the characteristic crescent shape so usual in the embryos of Anura. Pigment begins to appear about ten days after hatching—first in the retina, then over the dorsal surface, especially anteriorly. The larval condition lasts during the first six weeks after hatching. Towards the end of this period the cement organ undergoes atrophy. The somatic gills atrophy later. During the process of their doing so, the *Lepidosiren* passes through a condition in which the stumps persist evidently corresponding to that well known in the young *Protopterus*, the group of external gills with their common stalk having come by differential to be situated immediately above the fore limb. After the close of the larval period the Lepidosirens become much darker in colour and more lively in their movements. Young were obtained from the nest up to a length of 60 mm. About this time the cornea begins to assume the white unhealthy appearance that it has in the adult. In the young of this size, small yellow spots appear, and in the young of 90 mm these are conspicuous. Occasional yellow blotches persist in the young *Lepidosiren* of eighteen months, but in the adult they disappear.

The paper concludes with general remarks on the phenomena described. The segmentation approaches most closely that of Ganoids. The shortening up of the invaginating groove is considered to illustrate a process which has taken place in phylogeny in the passage from the primitive holoblastic egg to the meroplastic condition. The continuity of the medullary folds behind the anus is adduced together with the evidence accumulating of the prolongation of the blastopore along the floor of the medullary groove in other forms (Amphibia, *Ceratodus*, e.g.) as affording potent evidence in favour of the hypothesis which derives the Vertebrata from ancestral forms as primitive as the Coelenterata, and possessing an elongated mouth traversing the neural surface. The occurrence of external gills in the young of three so comparatively primitive groups of Vertebrata as Crossopterygians,

Dipnoans, and Amphibians; their occurrence on four branchial arches in *Lepidosiren*, and on at least the hyoid arch in Crossopterygians, and the occurrence of a probable homologue on the mandibular arch in Urodela, are taken as suggesting that these structures are organs of great antiquity in the Vertebrate stem, and that there was formerly one present on each visceral arch. It is pointed out that were this so, it would afford a theory of the origin of the vertebrate limb, which would be supported by much of the evidence brought forward by the supporters of the Gegenbaur view, and which at the same time would avoid the most important difficulties in the way of this view.

## 4. Weitere Beiträge zur Physiologie der Dipnoerflossen, auf Grund neuer, von Mr. Arthur Thomson, an gefangenen Exemplaren von Ceratodus angestellten Beobachtungen.

Von Richard Semon (Ludwigshöhe bei München).

(Mit 1 Figur.)

eingeg. 25. Mai 1899.

In früheren Arbeiten[1] habe ich über die Biologie des *Ceratodus* mitgetheilt, was ich während eines längeren Aufenthaltes in der Heimat des Fisches an frei lebenden, oder kurze Zeit gefangen gehaltenen Thieren beobachten konnte. Diese Mittheilungen konnten natürlich nicht erschöpfend sein, weil die Beobachtung eines im tiefen Wasser lebenden Fisches in seinem Freileben über manche Fragen überhaupt nicht Auskunft geben kann, und weil die Untersuchung der gefangen gehaltenen Fische durch die primitiven Verhältnisse des Lagerlebens, die Unmöglichkeit sie in großen, mit Glaswänden versehenen Behältern zu betrachten, in hohem Grade erschwert war. So blieb über die Function der paarigen Flossen noch Vieles dunkel. In einer späteren Arbeit[2] wurde ich auf Grund der anatomischen Untersuchung der paarigen Flossen, besonders durch das genauere Studium ihrer Gelenkverhältnisse, zu dem Schlusse geführt, daß diese Organe nicht mehr bloße Schwimm- oder Steuerorgane seien, sondern daß sie schon begonnen hätten neuen Functionen zu dienen. Als eine solche neue Function bezeichnete ich die Aufgabe, den Körper über dem Grunde fortzuschieben: »Wenn übrigens die Anpassung an die Function des

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[1] R. Semon, Verbreitung, Lebensweise und Fortpflanzung des *Ceratodus Forsteri*. Zoolog. Forschungsreisen in Australien und dem malayischen Archipel, Bd. I. 1. Lief. (Jen. Denkschriften Bd. IV.) 1893. Im australischen Busch und an den Küsten des Korallenmeeres. Leipzig, 1896.

[2] R. Semon, Die Entwicklung der paarigen Flossen des *Ceratodus Forsteri*. Zool. Forschungsreisen in Australien, 2. Bd. I. Lief. 1898.