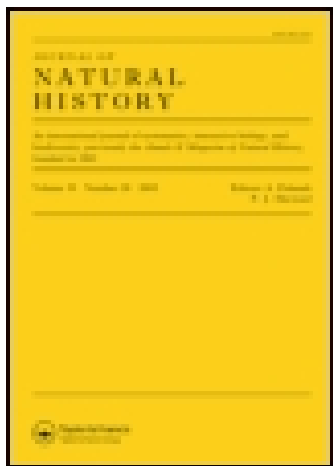


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On the first changes in the fecundated ovum of Lepas

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discovering and preserving the specimens on which the description of the species was based. The details as to discovery and preservation, as given in my paper, require modification in this sense; and I hope that future students will give Mr. Whitelegge the great credit due to him, not only for bringing this very fine species to the knowledge of the scientific world, but for the great skill shown in the preparation of the specimens which came under my notice.

I am, Gentlemen,

Maryport, Cumberland,
January 16th, 1888.

Yours faithfully,
STUART O. RIDLEY.

On Glyphastræa sexradiata, Lonsdale, sp. By P. MARTIN
DUNCAN, M.B. (Lond.), F.R.S., &c.

In a communication to the Geological Society (Quart. Journ. Geol. Soc. vol. xliii. Feb. 1887, p. 24) I described *Glyphastræa Forbesi*, Ed. & Haime, sp., and stated that its alliance with *Columnaria sexradiata*, Lonsd. (Quart. Journ. Geol. Soc. vol. i. 1845, p. 497), was very close, and I gave the form the name *Glyphastræa sexradiata*, Lonsd., sp. At the time a very careful search was made for the specimen described and figured by Lonsdale, but it could not be found, although all the other types of Lonsdale's N.-American tertiary species which were given to me by Sir C. Lyell were still in my possession. After the publication of the paper a coral was found by the Curator of King's College Museum; it was one of a number of fossils given by me to the College about twelve years since. This coral had upon it in Lonsdale's handwriting, with which I am very familiar, "*Columnastræa sexradiata*." On examining this coral, which is in the museum of the College in which I am Professor of Geology, I find that the distinctions between it and a specimen of *Glyphastræa Forbesi*, Ed. & H., sp., are not specific, but are due to growth. This last-named species was later in time of description than Lonsdale's, and therefore *Glyphastræa sexradiata*, Lonsdale, sp., is the correct name for *Columnaria sexradiata*, Lonsd., and *Glyphastræa Forbesi*, Ed. & Haime, sp. I am glad to be able to do this justice to the late Mr. Lonsdale. Since I examined the coral, last March, it has been cut without my knowledge or sanction.

King's College, Jan. 16, 1888.

On the first Changes in the Fecundated Ovum of Lepas.

By Prof. M. NUSSBAUM.

During the author's residence on the coast of California he was able to obtain an abundance of material. All the ova in the same animal are at the same stage of development, but the animals are very abundant and the breeding-season lasts for several months, so that by continued preparation the different stages may be obtained in different animals.

The author's description commences with the stage at which the copulation of the male and female cells is effected, and the masses of ova enclosed in a thin homogeneous sac protrude from the orifices of the oviducts into the space within the shell on each side of the head. The ova are small and numerous, ovate, with a blunt and

an acute pole. The masses of ova are at first soft and compressible, but the two sacs separate from the oviducts, fall into the cavity of the shell, and gradually become converted into harder, flattened masses. The greater firmness is to be ascribed to the increased thickness of the vitelline envelopes of the individual ova, and to the hardening of the material which binds them together. This cement must become softened again when the embryos are ready to creep out.

The fecundation of the ova takes place before the formation of the egg-sac. Living spermatosomata are occasionally found in the sac. Before the ova have reached the end of the oviducts which lead from the peduncle of the parent to the two sides of the head, the vitellus is of uniform structure and permeated throughout with lecythin-globules. On the separation of the directive bodies, which takes place after the penetration of the male element, the contents of the ovum are arranged so that at its rounded pole there is a dome of finely granulated vitellus, while towards the acute pole the lecythin-granules are collected together imbedded in a coarsely granular substratum. The separation of the directive bodies occurs at the obtuse pole and is accompanied in the ovum of *Lepas* by changes in the vitellus somewhat as described by the author in the ovum of *Ascaris megaloccephala*. The two pronuclei are also in the neighbourhood of the obtuse pole, with their surfaces of contact and fusion perpendicular to the long axis of the ovum.

The first division takes place, as in *Ascaris nigrovenosa*, perpendicularly to the fusion-surfaces of the pronuclei, and therefore in the long axis of the ovum. The plane of division produces two unequal globules of segmentation; the lecythin is contained only in the larger one. Then occurs a turning of the segmentation-spheres and a displacement of the contents of the nutritive cell, which culminates in bringing the surface of division into the equator of the ovum, perpendicular to its first direction. It is well known that in segmentation the superior animal-cell precedes the inferior vegetative one and grows around it. As to the formation of the germ-layers the information is imperfect; in fresh specimens an invagination-gastrula appeared to be formed. The head of the larva is always at the obtuse and the tail at the acute pole.

The results of the investigation are summarized as follows:—

The processes of maturation and fecundation of the ovum of *Lepas* arranged the vital parts in such a way that with the separation of the directive vesicles all the axes of the future embryo are already defined. The separation of the directive corpuseles and the first and second segmentations take place in the future long-axis of the animal, and the position of the directive vesicles indicates the future position of the cephalic portion of the embryo in course of formation.

If the relative positions of the axes continued in the way first occurring, it might be imagined that the contents of the ovum exclusively possessed the whole power of orientation. But as the first plane of division passes from a longitudinal to an equatorial plane, the envelope and its form must also possess directive

powers, which may be most judiciously referred to the principle of least resistance, more especially as the smaller animal-cell which is in advance in division is placed in the wide obtuse pole, and thus is enabled to divide again in the long direction of the ovum.

The first division, taking place in the longitudinal direction, does not, as further observations show, divide the ovum into the materials for the right and left halves of the body, although subsequently the sagittal plane of the embryo again coincides with the long axis of the ovum. This, however, may also be referred to the least resistance as a guiding principle, seeing that both in the embryo and the egg-capsule the longitudinal exceed the transverse axes in extent.

The agreement in the position of the directive vesicles, the first divisional plane of the segmenting ovum, and the future long axis of the embryo would consequently have to be referred to a common cause, which interposed as such in each case, but without the first orientation in space being conditional for any of the following ones.

If it be considered further that the egg-capsule is furnished by the ovum itself, so as the laws laid down by men become a measure and rule of conduct for men, the egg-capsule, although itself without any formative power, becomes in its rigid form the essential regulator of the position of the developing embryo of *Lepas* in the egg. — *Sitzungsberichte der kön. preuss. Akademie der Wissenschaften zu Berlin*, December 8, 1887, pp. 1052-1055.

On the Infection of a Frog-tadpole by Saprolegnia ferax.

By Prof. J. B. SCHNETZLER.

In a glass vessel containing 2 litres of water, in which the oxygen was continually renewed by aquatic plants, the author had two frog-tadpoles which had not undergone their transformation since last year (1886). However, the branchiæ had disappeared, and the tadpoles came to the surface of the water to respire air. These larvæ were nevertheless very lively, and their dejections proved that nutrition was effected in a normal fashion. As the volume of water and the quantity of food have a marked influence on the development of the larvæ of frogs, the author removed one of these tadpoles and placed it in a second vessel with aquatic plants. Both vessels were of ordinary white glass.

The two larvæ remained very lively without undergoing any metamorphosis, until, towards the end of last June, a fly (*Sarcophaga carnaria*) was placed in the first vessel. After death its body became covered with white filaments of *Saprolegnia ferax*. The tadpole, which had continued very lively up to this time, now soon became more sluggish in its movements; its body became quickly covered with filaments of *Saprolegnia*, and within two days after this infection it was dead.

Microscopic examination of the *Saprolegnia ferax*, which covered the body of the fly, showed that the protoplasm of its filaments was transformed into thousands of zoospores, which, by means of their two vibratile cilia, rapidly diffused themselves through the water. As these zoospores swim about and thus spread themselves through