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MISCELLANEOUS.

On the Affinities of the Genus Polygordius with the Annelids of the Family Opheliidæ. By M. A. GIARD.

THE Polygordian which I have particularly studied occurs at the point of Beg-Mell, near Concarneau, where I discovered it during the spring-tides of April. It lives in a coarse shell-sand, like that which covers the tubes of *Terebella conchilega*. By sifting this sand through the fingers one may collect a great number of the *Polygordii* in a few minutes. The species, which I believe to be new, belongs to the same group as *Polygordius lacteus*, Schneider, and *P. Villoti*, Perrier—a group characterized by dioeciousness, the length of the body, the circle of anal glands, &c.

Several months before Perrier, M'Intosh had described, under the name of *Limnotrypane apogon*, an Annelid which he has since thought he could identify with *P. Villoti*. It is quite certain that *Limnotrypane* is a Polygordian; and as it seems to me necessary to divide up the genus *Polygordius*, I propose, in order to avoid complicating the nomenclature, to apply the name *Limnotrypane* to the dioecious Polygordians, retaining the name of *Polygordius* for the hermaphrodite species of small size and of more archaic characters.

The genus *Polygordius* thus restricted includes the species *P. purpureus*, Schneider (Heligoland and Sebastopol), and *P. flavo-capitatus*, Uljanin (Sebastopol).

The genus *Limnotrypane* includes *L. lactea*, Schneider (Heligoland), *L. apogon*, M'Intosh (Shetland), *L. Villoti*, Perrier (Roscoff), and *L. erythrophthalma*, sp. n. (Concarneau). *L. erythrophthalma* is the Polygordian that I have investigated. It may attain a length of more than 0·1 metre. It is of a very bright rose-colour with iridescent reflections. It much resembles *L. Villoti* and *L. apogon*, but is distinguished at once from both these species by its red ocular points. *L. Villoti* is blind; and *L. apogon* has the eyes pigmented with black. Further the blood of our species is green, which is not the case in any other known Polygordian.

At the anterior part of the body the metameres are separated by a very fine black streak; at the posterior part they are indistinct externally, and marked only by the dissepiments and the enlargements of the digestive tube when the animal is examined by transmitted light.

The cuticle is very thick; and there are no annular muscular fibres beneath the matrix layer. Nor have I found any annular muscles in the interior of the longitudinal layer. Like Rajevsky I regard the inner lining of this layer as a tissue of connective nature, containing on each side of the general cavity numerous endothelial cells and forming a mesentery above and below the intestine. The vascular apparatus consists of a dorsal and a ventral vessel, united in each metamere by lateral loops, upon which the generative products are developed. The nervous system is formed of two supracæsoophageal plates, of a collar, and of a ventral chain placed immediately beneath the epidermis and very easily studied in transverse sections. The segmental organs are straight and ciliated throughout. *L. erythrophthalma* contains mature ova and perfectly active spermatozooids as early as the end of April.

I shall describe in more detail the anatomy of this interesting type; but I wish to dwell at present upon the affinities which it presents to an important family of the Chætopoda, the Opheliidæ, affinities already foreseen by M'Intosh, and which appear to me to be at least as great as those of the Polygordians with *Saccocirrus*, put forward by Uljanin.

The type *Polygordius* is not, as has been said, an intermediate type of worm; it is an archaic and aberrant type of Annelid.

Polygordius is not a type intermediate between the Annelids and the Nematodes. The resemblance to the Nematodes consists solely in the general arrangement of the musculature, and especially in the excessive development of the longitudinal muscular lamellæ, from which result a very peculiar habit and a characteristic mode of progression. But the same arrangement exists in certain Annelids (*Polyophthalmus*), the movements of which are modified in a similar way; it is a character due to a convergence easily explained by adaptation to special surroundings.

Nor is *Polygordius* an intermediate type between the Annelids and the Nemertians, the relationship of which to the *Gymnotoca* appears to me exceedingly problematical. The vibratile cephalic pits of the Polygordians are by no means comparable to those of the Nemertians. Similar vibratile organs, fixed or exsertile, exist in Annelids belonging to the most various families, such as *Staurocephalus Chiajii*, Clap., *Pædophylax veruger*, Clap., *Syllis simillima*, Clap., *Aricia Erstedtii*, Clap., *Otenodrilus pardalis*, Clap., *Ammotrypane aulogaster*, Rathke, *Ophelia*, &c.

The absence of external vibratile cilia in the Polygordians, of which the digestive tube is ciliated internally throughout its whole length, is explained by the thickening of the cuticle and the great development of the musculature. The cuticle of *L. erythropthalma* bears from place to place traces of ciliary tufts analogous to those of *Polyophthalmus*; and I should not be at all surprised if we were to find among the Polygordians types strongly ciliated externally. The *Staurocephalidæ*, the embryonal form of which is not without analogy with the Polygordians, present a complete ciliary covering in certain species (*Prionognathus ciliatus*, Keferstein).

The absence of setæ in a Chætopod need not surprise us more than the absence of articulated limbs in certain Arthropods (*Sacculina*, *Cryptoniscus*, &c.). We may trace the gradual disappearance of these organs in the series of the Opheliidæ, from *Ophelia* to *Polyophthalmus* and *Ammotrypane*, certain species of which, described by M'Intosh, are almost certainly destitute of setæ.

The organization of the *Polyophthalmi* scarcely differs from that of *Limnotrypane*. At Concarneau I studied a large *Polyophthalmus* (0·3 metre and more) common among the Corallines and *Melobesiacæ*, which I identify provisionally with *P. pictus*, Dujardin. The form of the mouth, the vibratile apparatus, the appendage of the pharynx, the anal papillæ, the ventral furrow, and the general arrangement of the musculature perfectly remind one of what exists in *Limnotrypane*. The resemblance is still greater if we compare two transverse sections suitably chosen.

In *Saccocirrus* the arrangement of the muscles and especially that

of the nervous system are far from presenting the same analogy. We find in it, in fact, two lateral nervous trunks such as exist in many groups of Tubicolar Annelids, and not a median chain like that of the Polygordians. The segmental organs also present considerable differences.

It would be very desirable to determine by an embryogenic investigation the exact degree of relationship of the Polygordians and Opheliidæ, which comparative anatomy leads us to suppose is very close. The embryo of *Polygordius* is an embryo of a primitive Annelid, a typical *Trochosphæra*. We have no information as to the embryogeny of *Polyopthalmus*. The supposed embryos of *Ophelia*, described and figured in a recent memoir, are unfortunately only embryos of *Arenicola piscatorum*.—*Comptes Rendus*, August 9, 1880, p. 341.

The Starfishes of the deeper Parts of the Gulf of Mexico.

By M. E. PERRIER.

For two consecutive years Mr. Alexander Agassiz, on board the 'Blake,' has performed a series of dredgings in the deep parts of the Gulf of Mexico. He has obtained the most brilliant results, and has done me the honour to confide to me the task of studying and describing the numerous starfishes that he has collected, forming a collection of more than 300 specimens. I beg leave to submit to the Academy, in a few words, a summary of my researches.

Luidiæ, *Archasteres*, and *Goniasteridæ* form the basis of this important fauna; but we also find in it *Linckia*, *Echinasteres*, *Solasteres*, and several *Pterasteres*; and the great division of the *Asteriadae* is represented by some exceedingly remarkable forms, to which I shall devote this first notice. In 1874 Wyville Thomson described, under the name of *Zoroaster fulgens*, a starfish of the section *Asteriadae*, which was met with only once in the Atlantic by the 'Challenger,' at a depth of 767 fathoms. The genus *Zoroaster*, which is distinguished in the family to which it belongs by the thickness and regularity of the skeleton of the starfishes included in it, is represented in the collection of Mr. Alexander Agassiz by two new species, to which I propose to give the names of *Zoroaster Sigsbeeii* and *Z. Ackleyi*, in honour of the captain of the ship and his lieutenant. *Z. Sigsbeeii* is at once distinguished by the considerable projection made by the enormous ossicles of its disk, which is thus rendered clearly distinct from the arms and comparatively voluminous. The arms, which are nearly rigid, are conical; and their skeleton consists of nine regular series of square ossicles. In *Z. Ackleyi* the ossicles of the disk are not salient, the disk is continuous with the arms, which are about twelve times as long as its radius, so that the animal has the physiognomy of a *Chætaster*. These arms are much more mobile than those of the other species, and are formed of seventeen rows of rather small ossicles. In the two species which I have before me the plates of the ventral region of the arms are covered with small flattened spines placed close together and intermixed with larger spines, so as to recall to mind the covering of the ventral surface of the *Luidiæ*; the adambulacral plates even bear, as in the latter, a comb of compressed spines, the direction of which is perpendicular to that of the ambulacral groove, and the innermost of which is

recurved like a sabre, as in the *Astropectinidæ*. The ambulacral tentacles are quadriserial at the base of the arms, but biserial at the extremity—which is an additional proof how artificial is the old division of the *Asteriæ* adopted by Müller and Troschel. These tentacles are terminated by a very small sucking-disk, which still further approximates *Zoroaster* to *Luidia*; they are intermixed with small straight pedicellariæ (*pédicellaires droites*): we may give the same name to some of these organs disseminated between the dorsal plates. The *Zoroasteres* were brought up by the dredge in sight of St. Kitts, from depths varying between 120 and 321 fathoms.

The starfish for which I propose the name of *Hymenodiscus Agassizii* is still more remarkable. I have examined two specimens which together complete the characters: one is a perfect disk, but destitute of arms; in the other the arms are well preserved, but the disk is perforated in the centre. They were collected in sight of Dominica, at depths of 321 and 450 fathoms. These are very delicate starfishes, which constitute an intermediate type very differently marked from the celebrated *Brisingæ* of Asbjörnsen. The *Hymenodisci*, in fact, resemble the *Ophiuri* in their rounded disk, clearly distinct from the arms, which are slender, elongated, mobile, and provided with a lateral row of spines like those of these animals, and likewise seem to serve only as organs of locomotion. But these arms are twelve in number, while there are never more than seven in the *Ophiuri*, and very generally only five. The disk is flattened, very thin, and destitute of a skeleton; so that it is represented only by a transparent membranous circle stretched upon the circlet formed by the whole of the first ossicles of the arms, and almost in contact with the buccal membrane. The stomach has hardly more space for its lodgment than the thickness of a sheet of paper; and one is puzzled to know what can be the usual food of an animal so constructed. Spicules in the form of fenestrated calcareous plates, each bearing a small spine, are disseminated in the substance of the dorsal membrane. Through its walls one can clearly perceive the circular canal which surrounds the mouth, and the ambulacral vessels which start from it and penetrate into the arms, terminating at their extremity, and giving origin in their course to only a double row of ambulacral tubes. I have found no trace of the long cæcal processes which the stomach sends forth into the arms in all the *Stellerida*; and, unfortunately, I have been unable to observe the genital glands in the individuals that I possess; but from this we must not conclude that these glands are developed in the disk in *Hymenodiscus* as in the *Ophiuri*.

The skeleton of the arms is very simple and of a very peculiar structure. It is formed of four series of pieces. The two median series form the dorsal ridge; they are produced laterally into a sort of shield which partially covers the pieces of the two lateral series. The latter alternate with the preceding, and form the border of the ambulacral furrow; each of them bears in its middle a long lateral spine, covered by a soft sheath, inflated into a club, and having at its apex a tuft of pedicellariæ. These are crossed pedicellariæ (*pédicellaires croisées*), characteristic, as I have shown in previous memoirs, of the great division of the *Asteriadae*.

These four series of pieces form a groove in which the ambulacral

vessel rests, exactly as the ambulacral vessel of the *Comatulæ* rests in the furrow of the arm-skeleton. *The ambulacral pieces hitherto absolutely characteristic of the class Stellerida are deficient in the Hymenodisci.* A few irregular calcareous trabeculæ uniting the lateral pieces of the arm-skeleton are their sole representatives in the neighbourhood of the mouth. It is to be noted that the characters furnished by the pedicellariæ have survived the characters furnished by the constitution of the ambulacral groove, which has hitherto been regarded as typical; and this is a confirmation of the value which I thought ought to be attached to the pedicellariæ in the classification of the starfishes when I proposed to substitute the indications furnished by them for those derived from the number of rows of ambulacral tubes, which had been depended on by Müller and Troschel. The absence of ambulacral pieces, and of calcareous pieces covering the groove on the oral surface of the arms, does not allow us to compare the organization of the arms of *Hymenodiscus* except to that of the arms of the *Comatulæ*. The contrast between the arms and the disk, and the probable absence of genital glands and digestive cæca from the arms, on the other hand, approximate the *Hymenodisci* to the Ophiuri; by the absence of ambulacral pieces, and consequently of buccal pieces, they depart from all known Stellerida; their pedicellariæ, however, indicate that they constitute an aberrant form of the division of the Asteriadae, in which they take their place, but as a distinct family, by the side of *Labidiaster*, *Pedicellaster*, and *Brisinga*, which, like them, possess only two rows of ambulacral tubes. *Labidiaster* has a much greater number of arms; *Pedicellaster* has only five; the *Brisingæ* from eleven to twelve, but quite differently constructed. These latter animals, in fact, enter without any difficulty into the ordinary type of starfishes, of which the *Hymenodisci* constitute a form quite different from any thing hitherto known to us, and presenting the most exceptional characters.—*Comptes Rendus*, Aug. 30, 1880, p. 436.

On Gastrosaccus spinifer. By THOMAS R. R. STEBBING.

During the present month of August I have been successful in finding *Gastrosaccus spinifer* of both sexes at Whitby, in the sand at low water. I have also had the opportunity of seeing specimens and mountings of the species in Mr. Norman's very extensive collection of Crustacea. Mr. Norman has called my attention to the erroneous formation of the specific name *spiniferus*, which must of course be written *spinifer*. There can, I think, be no doubt whatever that the name *G. sanctus* must be confined to the species described by Sars under that title, as quite distinct from the present *G. spinifer* of Goës. At the same time, one of Mr. Norman's dissections, which agrees exactly with a subsequent one of my own, seems to show decidedly that the marsupial pouch is attached to the first pleopods, contrary to the criticism of Prof. G. O. Sars, who denies the attachment of the marsupium to the first pleon-segment. It may be further remarked that the number of spines on the telson and uropods appears to be subject to slight variations in different specimens.

Tunbridge Wells, Aug. 31, 1880.