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features common to both are called by him chief or primary characters of organization. As such he mentions the similarity in development, already pointed out by Bütschli and the Hertwigs, the segmentation of the larvæ into three segments, the number, position, and origin of the generative organs, and their relations to the nephridial efferent ducts, the perfectly similar structure of the nerve-collar with its two centra, the ventral and dorsal longitudinal and the two pairs of transverse mesenteries. To these facts he adds some remarks on the great similarity in histological structure between Brachiopods and Chætogathes, as the great simplicity of all the epithelial layers, the subordinate significance of the connective tissue, the similar character of the muscles, the plexiform distribution of peripheral nerves, and the occurrence of horny setæ in ectodermal follicles.

The points of difference between Brachiopods and Chætogathes are explained as consequences of the development of the shell, which in itself cannot be an argument against their affinity. This shell caused the development of the peduncle, the arms, and the muscles, the removal of the anus to the right side or its total disappearance together with eyes, auditory organs (?), and jaws, and perhaps also the unisexuality (to prevent self-fertilization, while cross-fecundation was secured by the animals living in colonies).

As support for this view the author points out the great difference in plan and structure of peduncle, arms, and muscular system between different kinds of Brachiopods, especially between Testicardines and Ecardines.

MISCELLANEOUS.

Echinoderms of the Norwegian North-Atlantic Expedition.

By D. C. DANIELSSEN and J. KOREN.

THE 'Annals' for December last (p. 436) contained a translation of some remarks upon the genus *Solaster*, extracted from a paper by MM. Danielssen and Koren on the Echinoderms collected during the Norwegian North-Atlantic expedition. The article contains a list of the starfishes obtained, numbering forty-one species belonging to twenty genera, four genera and eleven species being indicated as new. The previously known species are *Asterias stellionura*, Perr., *A. panopla*, Stuxb., *A. Mülleri*, M. Sars, *A. grönlandica*, Steenstr., *A. rubens*, Lin., *Stichaster roseus* (O. F. Müll.), *S. albidus* (Stimps.), *Cribrella oculata* (Linck), *Pedicellaster typicus*, M. Sars, *Solaster affinis* (Brandt), *S. furcifer*, Düb. & Kor., *S. papposus* (Linck), *S. endeca* (Gmel.), *Pentagonaster granularis* (O. F. Müll.), *P. hispidus* (M. Sars), *Hippasteria plana* (Linck), *Asterina tumida* (Stuxb.), *Pteraster militaris* (O. F. Müll.), *P. pulvillus*, M. Sars, *P. multipes*, M. Sars, *Hymenaster pellucidus*, W. Thoms., *Astropecten Andromeda*, Müll. & Trosch., *A. arcticus*, M. Sars, *A. irregularis*, Linck, *Oteno-*

discus corniculatus (Linck), *Archaster tenuispinus* (Düb. & Kor.), *A. Parelii* (Düb. & Kor.), *Koethraster hispidus*, W. Thoms., and *Brisinga coronata*, O. Sars.

Of new species the following are indicated, but not described, by the authors, either in the paper cited or in a continuation of it, with an advanced copy of which we have been favoured by them:—*Asterias spitzbergensis*, *Solaster glacialis* (some particulars of which are, however, indicated in the authors' remarks on that genus), *Tylaster* (g. n.) *Willei*, and *Poraniomorpha* (g. n.) *rosea*.

The species described are:—

1. *Asterias Gunneri*.—Proportion of radii 1 : 5½; disk broad, with a few isolated spines; 5 thick arms, the backs with 5 rows of strong spines, encircled by cruciform pedicellariæ; similar pedicellariæ scattered over the whole back; sides of arms with a row of 26 strong spines surrounded by cruciform pedicellariæ; two rows of ambulacral papillæ, the outer the longest, and outside the ambulacral papillæ a row of 32 long strong spines, half surrounded by cruciform pedicellariæ; dermal skeleton strong. Colour above bright red; the pedicellariæ surrounding the spines form white tufts. Ventral surface yellowish white. From Spitzbergen, in 60 fathoms.

2. *Asterias hyperborea*.—5-rayed; proportion of radii 1 : 6; back with short, thick, close-set spines, surrounded by 2 or 3 cruciform pedicellariæ, placed one above the other; in the middle and at the sides of the arms the spines stand in regular rows; between the spines 1 to 3 tentacle-pores in the naked skin; two rows of ambulacral papillæ. Colour tile-red. From Bear Island, in 35 fathoms.

3. *Stichaster arcticus*.—5-rayed, small, convex above, flat beneath. Proportion of the radii 1 : 5. Back covered with groups of clavate spines, forming regular rows on the arms. Ventral marginal spines spatuliform, arranged in pairs. Anal aperture subcentral. Madreporic plate flat, nearly concealed by spines. Colour pale yellowish red; feet dark yellow. From Station 173; N. lat. 69° 17', E. long. 14° 42', in 300 fathoms, on mud with stones. Temp. 4°·6 C. (= 40°·3 F.).

4. *Asterias Normani*.—5-rayed; diam. 20 millim.; proportion of radii 1 : 3½. Back rather convex, covered with isolated, rather flattened, toothed, oval spines, which are broader at the summit, and usually closely enclosed by a thin transparent membrane, a continuation of the skin, and also by a tubular sheath, wider above, in which the spine is placed, as in a niche, the sheath being able to close up so as to conceal the whole spine except the extreme tip, or to contract so as to form only a narrow ring surrounding its base. The spines are closer and more irregularly placed on the disk than on the arms. The anal aperture is subcentral, and surrounded by small spines of the same kind; and the madreporic plate, which is near an interbrachial angle, is nearly round and has a radiate appearance at the margins. Ventral marginal spines sheathed; sheaths bearing at apex a cruciform pedicellaria. Colour yellowish red on the back; spines and their sheaths white. Ventral surface white. From Station 315; N. lat. 74° 53', E. long. 15° 15', at 180 fathoms, firm clay and sand. Temp. 2°·5 C. (= 36°·5 F.).

5. *Echinaster scrobiculatus*.—5-rayed; proportion of radii 1:3; diameter of disk 4.5 millim.; length of arms 5.5 millim. Back rather flat, strongly reticulate, covered with short isolated spines irregularly arranged. In each mesh a tentacle-pore. Anal aperture subcentral, surrounded by an oblong ring of fine spines; madreporic plate oblong, near the anal aperture. Dorsal marginal spines obtuse and short; ventrals long and more acute. Ambulacral grooves narrow, with three rows of toothed spines, the inner row longest. Colour yellowish red. From Station 195; N. lat. 70° 55', E. long. 18° 38', at 107 fathoms, gravel and clay. Temp. 5° 1 C. (= 41° 2 F.).

6. *Bathybiaster* (g. n.) *pallidus*.—For their *Astropecten pallidus* (Nyt Mag. Bd. xxiii. p. 62) the authors establish the new genus *Bathybiaster*, characterized as follows:—"Body depressed, 5-armed, with remarkably broad ambulacral grooves, upon the margins of which there are long pedunculate pedicellariæ. Interbrachial space broad, closely set with sessile pedicellariæ. Dorsal surface clothed with paxillæ; its disk, as well as the middle part of the arms, without tentacle-pores. Dorsal dermal skeleton formed, on the disk and middle part of the arms, by round closely imbricated calcareous plates, in the lateral parts of the arms by stelliform imbricated plates. No anus. Ambulacral pillars."

7. *Ilyaster mirabilis*, g. et sp. n.—The character of the genus is given as follows:—"Body 5-armed. Dorsal surface clothed with paxillæ. From the centre of the back rises a long cylindrical appendage clothed with spines. No anus. Two rows of conically pointed ambulacral feet." The species upon which this new genus is founded is a small starfish measuring 30 millim. across, with a disk 7 millim. in diameter. The proportion of the radii is 1:2½. The paxillæ covering the back are of a round or oblong form, with from 3 to 6 granules and sometimes a central granule. The madreporic plate is oblong, and placed close to the margin of an interbrachial angle. The arms have at their extremities three long conically pointed spines, one attached dorsally and two laterally; they have at the base a small, round, hollow articular surface. The arms have rather broad marginal plates on both surfaces. Colour pale yellowish red with yellowish-white ambulacral feet. A single specimen was obtained from Station 87; N. lat. 64° 2', E. long. 5° 35', on a clay bottom, at 498 fathoms. Temp. 1° 1 C. (= 30° F.).

From the centre of the dorsal surface of the disk there rises a conical process, 8 millim. long and about 2 millim. in thickness at the base, tapering to a thickness of about 0.5 millim. at the free extremity, which is rounded off. This peculiar process feels solid throughout the greater part of its length, and only the wide basal part seems to be hollow. It is entirely clothed with paxillæ, which are distant from each other, and are placed in transverse rows, passing in a sort of spiral from the base to the apex, where there is a very small naked point.

With regard to this remarkable starfish, the authors remark that

there may be some doubt as to whether it is a fully developed animal or only a stage of development. The three spines at the apex of the arms are to be found, although not of the same size, in very young examples of many species of the family Astropectinidæ. In many species of the same family, especially when young, there is also a very small conical protuberance in the centre of the disk; but on comparing such young animals of about the same size as *Ilyaster*, they find that these peculiarities are of such a nature that they can scarcely change in any essential degree with age; and therefore they have felt compelled to form a new genus for the present species.

When alive, *Ilyaster* carries the central dorsal appendage pretty nearly erect; but it moved in small curves, and appeared as if it might have been a ruptured peduncle, by which the animal had been attached. If it be really the remains of such a peduncle, this must have undergone some alteration after the animal became free, as is shown by the form of the free end of the appendage.

At the first glance it seemed that *Ilyaster* might possibly be a young example of *Bathybiaster pallidus*, with which it agrees in many points; but this notion has to be given up on comparing young specimens of *Bathybiaster* with *Ilyaster*. The latter has no pedicellariæ; and where *Bathybiaster* has the large peculiar pedicellariæ, along the ventral grooves, *Ilyaster* has a very large spine. *Ilyaster* has four strong teeth, while young examples of *Bathybiaster* have no teeth, and adult animals only two.

The examination of the small conical prominence of the middle of the disk, which occurs in many species of the Astropectinidæ, shows that it has the same covering of paxillæ as the rest of the back of the disk. It is somewhat otherwise with the appendage in *Ilyaster*. Here the covering is different from that of the disk; so that although we may be inclined to regard the appendix morphologically as a higher development of the above-mentioned small conical knot, it has, at any rate, undergone alterations which cause *Ilyaster* to differ in appearance from all other known starfishes. But the notion that the central conical process of the Astropectinidæ is a residue of a former peduncle by which the animal was attached becomes greatly strengthened by our acquaintance with the dorsal appendage of *Ilyaster*, which undoubtedly points towards the embryonic stage of the Crinoidea. It seems very probable that *Ilyaster* has such a larval stage, and that even when free it will always bear recognizable traces of this earliest period of its existence. If so, we have to do with an extremely interesting phylogenetic phenomenon, namely that the Starfishes have been developed from the Crinoids.

In a supplementary note the authors refer to M. E. Perrier's description of his *Caulaster pedunculatus*, a translation of which appeared in this Journal for February last (p. 151).

They also describe a new species of *Echinus* under the name of *E. Alexandri*, and discuss at some length the characters of the following species—*Pedicellaster typicus*, M. Sars (with which they combine Sladen's *P. palæocrystallus*), and *Korethraster typicus* and

Hymenaster pellucidus of Wyville Thomson, giving revised generic and specific characters for the last two forms.—*Nyt Magazin for Naturvidenskaberne*, Bind xxvii. pp. 267–299, with 4 plates; and Bind xxviii. 10 pp., and 2 plates, 1882–83.

Note on a Peripatus from the Island of Dominica, West Indies.

As even isolated facts with regard to this interesting “Arthropod” are of interest, I may state that Mr. G. F. Angas, C.M.Z.S., who has lately returned from an expedition to the island of Dominica, West Indies, has presented to the Trustees of the British Museum the single specimen of *Peripatus* found by him. This example has thirty pairs of feet, not counting the oral papillæ as some confusion has arisen in the mode of counting, I may say that, like Professor Moseley, I find thirty-one pairs of feet in Grube’s figure of *P. Edwardsi*. In the present condition of our knowledge it is, as a reference to Mr. Moseley’s paper in this journal (ser. 5, iii. pp. 263–267) will show, impossible to give definitely a specific name to a single specimen; but I may point out that in the Dominican specimen the form of the “pits on the under surface of the foot-cones” may for some be said to be circular, for others linear, and that there is a similar variation in the extent to which these pores may be said to be distinct; the differences which obtain between examples is due, possibly, to differences in the mode or length of time of preservation. No doubt the monograph commenced by the late Prof. Balfour, and now, as I understand, in course of preparation by Mr. Adam Sedgwick, will set at rest the questions which affect the specific differences of this archaic genus.

F. JEFFREY BELL.

The Breeding of the Sea-Lamprey. By M. L. FERRY.

The author records a circumstance which seems to show that the ova of the sea-lamprey are fecundated while still contained within the body of the female. He says that in the early part of June 1874 a keeper caught in the Allier a female lamprey adhering by its mouth to a boat near Moulins, opened it, and placed the ova in a large pan. As it rained, the pan was soon filled with water; and in about twenty days the ova were all hatched. It has been supposed that the ova of the lamprey were fecundated by the male after expulsion from the body of the female; the author thinks that the relations of the sexes are more intimate, and that the females are fecundated while they and the males are adhering side by side to the same rock or the same tree, a situation in which they are sometimes found in groups, where they remain attached and interlaced in such a manner that it is easy to capture them.—*Comptes Rendus*, March 12, 1883, p. 721.