

XXII.—*Descriptions of new Species of Polyzoa from the Lower and Upper Silurian Rocks of North America.* By H. ALLEYNE NICHOLSON, M.D., D.Sc., F.R.S.E., Professor of Biology in the Durham University College of Physical Science, Newcastle-on-Tyne.

[Plate XIV.]

HAVING in a former communication described the species of *Alecto* and *Hippothoa* which have come under my notice as occurring in the Cincinnati Group (Lower Silurian) of Ohio, I have now to describe from the same formation several species of *Ptilodictya* and one of *Ceramopora*, which I have been able to determine, from the collections submitted to me by Mr. U. P. James and Prof. Edward Orton, and all of which appear to be new. I have also an interesting species of *Fenestella* to describe, from the Upper Silurian (Guelph division of the Niagara formation) of the State of Ohio.

1. *Ptilodictya falciformis*, Nich. Pl. XIV. figs. 1–1 b.

Polyzoary consisting of a single, unbranched, or slightly branched, elongated, flattened and two-edged frond, the form of which is curved or falciform, and which gradually expands from a pointed base till it reaches a width of two lines within a distance of less than half an inch above the base. The total length may exceed two inches; but the width, in typical examples, rarely exceeds two and a half lines. The transverse section is acutely elliptical, the thickness in the middle not exceeding half a line; and the flat faces of the frond are very gently curved and not angulated. A central laminar axis, though often undemonstrable, can sometimes be clearly shown to exist. The edges of the frond are thin and sharp, formed by a narrow band, which is marked with longitudinal or slightly oblique striæ and by the apertures of minute imperfect cells. Both sides of the frond are celluliferous, the cells being apparently perpendicular to the surface, and being arranged in intersecting diagonal lines, which form angles of about 30° with the sides of the frond, and thus cut one another at about 60° . The mouths of the cells are oval or somewhat diamond-shaped, their long axis coinciding with that of the frond, alternately placed in contiguous rows, about eight in the space of one line measured diagonally; the outermost rows very slightly smaller than the others. Walls of the cells moderately thick; no surface-granulations, tubercles, spines, or elevated lines. The mouths of the cells parallel with the general surface, neither lip being especially prominent, and the plane of the aperture not being oblique.

As a general rule the polyzoary is simple, unbranched, and falciform. I have seen, however, in the fine collection of Mr. Dyer, of Cincinnati, some specimens in which the frond bifurcates at its distal extremity, and at least one example in which it splits into three divisions. I have also seen examples of what may probably prove to be a distinct species, in which the frond is very much wider than is normally the case.

This beautiful species is allied to *Ptilodictya* (*Escharopora*) *recta*, Hall, on the one hand, and to *P. lanceolata*, Goldf., *P. gladiola*, Billings, and *P. sulcata*, Billings, on the other hand. The specimens from which the above description is taken were sent to me with the label of *Escharopora recta* attached to them; and at first sight they certainly closely resemble this species, especially in the disposition of the cells in intersecting diagonals of great regularity. It is certain, however, that they are distinct from Hall's species—the chief differences consisting in the fact that the frond of *P. falciformis* is greatly flattened, so that the transverse section is acutely elliptical instead of being "cylindrical or subcylindrical," whilst the edges are sharp and non-celluliferous, and the entire frond is regularly curved and sabre-shaped instead of being straight. Hall states that *Escharopora recta* is not branched, but possesses root-like processes. Judging, however, from his figures, it would seem probable that his specimens have been drawn and described in an inverted position, and that this form is in reality dichotomously branched (Pal. N. Y. vol. i. pl. xxvi. fig. 1 a).

From *Ptilodictya lanceolata*, Goldf. (Petref. pl. xxxvii. fig. 2), the present species is readily distinguished, more especially by the disposition of the cells, which are in regularly intersecting diagonal lines; whereas in the former there is a central series of longitudinally arranged cells, flanked on each side by diagonal rows directed like the barbs of a feather.

With *Ptilodictya gladiola*, Billings (Cat. Sil. Foss. of Anticosti, p. 10), our species agrees in the shape of the frond; but it is proportionally twice as wide, whilst the cells are oval instead of being rectangular or oblong, and are disposed in decussating diagonals instead of in regular longitudinal lines as in the former.

Lastly, *Ptilodictya sulcata*, Billings (*loc. cit.* p. 35), whilst resembling *P. falciformis* in shape, is distinguished by the nearly square cells with intercellular sulci, and by the fact that the cells are arranged in longitudinal lines.

Locality and Formation.—Not uncommon in the Cincinnati Group, near Cincinnati, Ohio. Collected by Mr. U. P. James.

2. *Ptilodictya emacerata*, Nich. Pl. XIV. figs. 2-2 b.

Polyzoary consisting of minute, narrow, linear fronds, which branch dichotomously, and have the form of a much flattened, acutely pointed ellipse in transverse section. Width one third of a line; length of largest specimen observed two lines. Cells elliptical, their long axes corresponding with that of the branches, about six or seven in the space of one line measured longitudinally. There are four, five, or rarely six rows of cells in the frond. When four rows of cells are present, two of these (in the centre) are longitudinal, and one row on each side is composed of cells directed in an obliquely ascending manner. When there are five rows, as is most commonly the case, the three central ones are longitudinal and a lateral row on each side is oblique. When there are six rows, two central ones are longitudinal and two on each side oblique. The cell-mouths are much longer than wide, and each row is separated from the next by an elevated line. The lateral margin of the frond on each side forms an obtuse non-celluliferous edge, the width of which is so small that it cannot always be detected. A central axis was not clearly determined, but is doubtless present.

The only previously recorded species of the genus to which *Ptilodictya emacerata* presents any close resemblance is *P. fragilis*, Billings, from strata of the same age in Anticosti (Cat. Sil. Foss. of Anticosti, p. 9). Our species, however, is distinguished from the latter by its uniformly more minute dimensions, the smaller number of rows of cells in the frond, and the possession in general of no more than a single row of oblique cells on each side. *P. fragilis*, on the other hand, has a width of from two thirds of a line to one line, with from eight to ten rows of cells, and two or three rows of oblique marginal cells on each side. It is possible our form is only a variety of *P. fragilis*; but in the absence of figures of the latter, and in the face of the differences above mentioned, I think it safest to regard *P. emacerata* as a distinct species.

Locality and Formation.—Cincinnati Group, near Cincinnati, Ohio. Collected by Mr. U. P. James.

3. *Ptilodictya flagellum*, Nich. Pl. XIV. figs. 3-3 b.

Polyzoary consisting of a single, narrow, unbranched, two-edged, flattened frond, which has an acutely elliptical section. The frond commences at an attenuated base, and gradually expands till a width of one line is reached, the total length of the

only specimen examined being eight lines. The general form of the frond is falciform, but towards the base it is alternately bent from side to side in a flexuous manner. The cells are arranged in longitudinal rows, about ten rows in the space of one line, the cells of contiguous rows alternating with one another. The cell-mouths, where most perfect, are narrow and long-oval—where worn, subcircular; and the rows of cells are separated by strongly elevated longitudinal ridges. The non-celluliferous margins of the frond are inconspicuous; and the central axis, though doubtless present, was not clearly determined.

This species most nearly resembles *Ptilodictya gladiola*, Billings, from which it is distinguished by its much smaller size and less width, and by its flexuous form. From *P. falciformis*, Nich., it is separated not only by the above characters, but also by the longitudinal arrangement of the cells.

Locality and Formation.—Cincinnati Group, Lebanon, Ohio, immediately below the horizon of *Streptelasma corniculum*. Collected by Prof. Edward Orton and Mr. W. Bean.

4. *Ptilodictya* (?) *arctipora*, Nich. Pl. XIV. figs. 4-4 b.

Polyzoary forming a cylindrical, slightly branched frond, which is not sharp-edged, exhibits no non-celluliferous borders, and shows no traces of a central laminar axis. Cells arranged in obscurely longitudinal alternating rows, apparently perpendicular to the surface, and radiating in all directions from an imaginary axis. Cell-mouths very much compressed, much longer than wide, expanded below and attenuated superiorly, where they are often somewhat twisted and bent. Upon the whole, the cells are pyriform in shape, with their narrow ends directed upwards, about eight occupying the space of one line measured vertically, and twelve the same space measured diagonally. The cells are not always in contact, especially in their upper portion; and their borders are always distinctly marked off by impressed lines; but they are not arranged between elevated longitudinal ridges. The margins of the cells are very thick and conspicuous, not granulated, tuberculated, or spinigerous.

The best-preserved fragment examined had a length of eight and a half lines, dividing at its summit into two branches, its diameter being rather more than one third of a line.

From its cylindrical form, and the absence of a laminar axis or of non-poriferous margins, it would seem certain that this singular form is not a *Ptilodictya*; but I am at a loss to know where it should properly be placed, its extreme minuteness

rendering its generic affinities very uncertain, owing to the impossibility of making out the details of its internal structure. It has, however, some affinity with *Ptilodictya* (?) *raripora*, Hall, from the Clinton Group; and I have therefore referred it provisionally to this genus.

Locality and Formation.—Cincinnati Group, near Cincinnati, Ohio. Collected by Mr. U. P. James.

5. *Ptilodictya fenestelliformis*, Nich. Pl. XIV. figs. 5–5 b.

Polyzoary palmate or subpalmate towards the base, dividing distally into small branches. Basal expansion and branches flattened and sharp-edged, the branches being acutely elliptical in cross section, and about three fourths of a line in thickness centrally. Cells covering the whole surface on both sides, with the exception of the sharp lateral margins, which are non-celluliferous, as well as of certain non-poriferous areas to be subsequently noticed. The cells on the two aspects of the flattened frond respectively have their bases separated by a thin laminar axis. The cells in the middle of the frond are about three eighths of a line in height, gradually diminishing towards the margins. Cell-mouths ovate, slightly longer than broad, arranged in longitudinal rows, alternate or subalternate in contiguous rows; about five cells in one line measured longitudinally, and six in the same space measured diagonally. The longitudinal spaces between the rows of cells are broad and slightly elevated, and are faintly striated longitudinally or obscurely punctate. On the other hand, the spaces between the *ends* of the cells are very much narrower; and the surface thus closely resembles that of a small *Fenestella*—the cell-mouths looking like “fenestrules,” the longitudinal interspaces between the cells representing the “interstices,” and the narrow spaces between the ends of the cells corresponding with the “dissepiments.” The only specimens examined exhibit numerous, apparently solid, rounded or stellate areolæ, of an average diameter of two thirds of a line, which are not occupied by cells, but which exhibit an obscurely pitted surface.

In its superficial characters this form might readily be taken for a *Fenestella*, whilst the character last mentioned gives it somewhat the aspect of certain species of *Chaetetes* (*Monticulipora*). Its internal structure, however, proves it beyond all question to be a genuine *Ptilodictya*; and I am not acquainted with any other species of this genus with which it could be confounded.

Locality and Formation.—Cincinnati Group, near Cincinnati, Ohio. Collected by Mr. U. P. James.

6. *Fenestella nervata*, Nich. Pl. XIV. figs. 6, 6 a.

Fronde fan-shaped (?), composed of narrow, closely approximated branches, about four or five of which occupy the space of one line. On the non-celluliferous side of the frond are two strong, slightly diverging, rounded ribs, about half a line in diameter, like the midribs of a multicostate leaf. From the sides of these ribs the branches spring obliquely, being directed in opposite directions on opposite sides of the rib, with which they make a very acute angle (10° or less). Fenestrules long and narrow, nearly twice as long as wide, about three in the space of one line measured vertically, and about five in the same space measured transversely. For the most part the fenestrules do not alternate in contiguous rows, but are placed opposite one another. The narrow rounded dissepiments are thus also placed nearly or quite opposite to one another. Branches faintly striated in a longitudinal direction. Celluliferous side unknown.

The only example of this species that I have seen is imperfect, and the ribs from which the branches rise are placed two lines apart near the base, and four lines apart near the summit. It would seem most probable that the ribs sprung from a common root, and that there were many of them in the perfect frond. The species is distinguished not only by the possession of these ribs, but also by the long narrow fenestrules, which are not placed alternately, but so disposed that the dissepiments connecting contiguous branches become opposite or subopposite.

Locality and Formation.—Summit of the Niagara Formation (in beds probably the equivalent of the Guelph Formation of Canada), Cedarville, Southern Ohio. Collected by Prof. Edward Orton.

7. *Ceramopora ohioensis*, Nich. Pl. XIV. figs. 7-7 d.

Polyzoary incrusting, forming thin expansions attached to the surface of Brachiopods and Corals, and consisting, typically at any rate, of a single layer of oblique cells. Cells arranged in intersecting diagonal lines, and disposed in a somewhat concentric manner round more or fewer central points; their upper walls thin and arched; the cell-mouths oblique and, when most perfect, semicircular in shape. About eight cells in the space of one line.

Such are the appearances presented by this fossil when quite perfect; and its examination in this condition leaves little doubt as to the propriety of placing it in Hall's genus

Ceramopora. Worn examples, however, exhibit very different characters; and when the entire original surface has been abraded, it is sometimes difficult or impossible to determine whether or not one is dealing with this or some entirely different form.

When slightly worn, the appearances shown in fig. 7 *a* are exhibited. The delicate front wall of the cell has now disappeared; and the cavity of the cell appears to be divided into two distinct compartments, a larger and a smaller, both of a somewhat triangular shape, by an oblique internal septum. Besides, other smaller cavities appear in the walls separating the different cells.

When more deeply worn down, or under certain conditions not clearly understood, the cells (figs. 7 *c* & 7 *d*) appear in the form of rounded or oval apertures, arranged in diagonal rows, but separated by a vast number of small rounded foramina, which appear to be the mouths of interstitial tubuli. In this condition the fossil presents much the appearance of certain species of *Chætetes* (*Monticulipora*).

The best examples of this singular Polyzoon that I have seen, grow in the form of thin crusts, rarely exceeding one fourth of a line in thickness, upon *Strophomena alternata*, Conrad, and upon various species of *Chætetes*. In some examples it would seem that several layers of cells are superimposed on one another; but I am not sure of the nature of these specimens. Not uncommonly the cells are concentrically disposed round a number of irregular areolæ, each of which is formed by a number of cells radiating from a central point. Young examples form circular crusts, with a slightly cupped centre, from which the cells radiate in every direction (fig. 7 *b*). Lastly, examples are not uncommon which appear to have the form of small branching stems. Some of these certainly are merely constituted by thin crusts growing upon various ramose species of *Chætetes*. Others, however, appear to be entirely composed of the Polyzoon itself; and it is possible that these will eventually prove to be a distinct species.

Locality and Formation.—Cincinnati Group, near Cincinnati, Ohio. Collected by Mr. U. P. James.

EXPLANATION OF PLATE XIV.

Fig. 1. Ptilodictya falciformis, Nich., a small example, of the natural size. 1 *a*. Transverse section of the frond, enlarged. 1 *b*. Small portion of the surface, greatly enlarged.

Fig. 2. Ptilodictya emacerata, Nich., of the natural size. 2 *a*. Transverse section of the frond, enlarged. 2 *b*. Portion of the surface, greatly enlarged.

- Fig. 3. Ptilodictya flagellum*, Nich., of the natural size. 3 *a.* Transverse section of the same, enlarged. 3 *b.* Portion of the surface, enlarged.
- Fig. 4. Ptilodictya (?) arctipora*, Nich., a fragment, of the natural size. 4 *a.* Portion of the same, enlarged. 4 *b.* A few cells of the same, enlarged further.
- Fig. 5. Ptilodictya fenestelliformis*, Nich., a fragment near the base of the frond, of the natural size. 5 *a.* Transverse section of the same, enlarged. 5 *b.* Portion of the surface, showing one of the non-poriferous areolæ, enlarged.
- Fig. 6. Fenestella nervata*, Nich., a fragment, of the natural size. 6 *a.* Portion of the same, enlarged.
- Fig. 7. Ceramopora ohioensis*, Nich., part of an incrusting specimen, greatly enlarged. 7 *a.* A few cells from a worn specimen of the same, greatly enlarged. 7 *b.* Portion of a young example of the same, showing the radiating growth of the cells from a central point, enlarged. 7 *c* & 7 *d.* Fragments of much-worn specimens of the same (?), showing numerous interstitial tubuli, enlarged.

XXIII.—On some new exotic Sessile-eyed Crustaceans.

By the Rev. THOMAS R. R. STEBBING, M.A.

[Plate XV. A.]

I. OF the Crustaceans now to be described, the first is a small Amphipod sent to me by H. J. Carter, Esq., F.R.S., who found three specimens of it in a sponge, a branched Suberite, from the Antarctic sea, dredged up by Sir J. Ross in S. lat. about $77\frac{1}{2}^{\circ}$ and E. long. 175° , from a depth of 300 fathoms.

Two of the specimens are about an eighth of an inch in length, the third being very much smaller. Whether the larger pair had attained their full size or not is open to question. All are of a dark-brown colour—in that respect, Mr. Carter tells me, resembling the sponge from which he took them. All were closely coiled up, with the gnathopods hidden and tail and antennæ tucked under the body. This posture, coupled with the breadth of the pereion or thorax, gave the creatures a subglobose aspect, at the first glance not a little resembling that of a folded Sphæromid. In point of fact, however, their affinities seem to be with the genus *Dexamine*, Leach. The superior antennæ have the first joint stout, the second more slender and twice as long, the third not differing from the following articulations of the flagellum. In the lower antennæ only two of the joints of the peduncle could be made out distinctly, being probably the penultimate and



Nicholson, Henry Alleyne. 1875. "XXII.—Descriptions of new species of Polyzoa from the Lower and Upper Silurian Rocks of North America." *The Annals and magazine of natural history; zoology, botany, and geology* 15, 177–184. <https://doi.org/10.1080/00222937508681054>.

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