

UPPER SILURIAN BRYOZOA FROM CENTRAL WALES

by D. E. OWEN

ABSTRACT. A thin band of limestone in the *Gypidula* beds of the Lower Ludlow succession of Builth was described by S. H. Straw (1937) as being made up of shells and nodular Bryozoa. The Bryozoa are described and shown to belong to eight species, seven new and one described by R. S. Bassler (1906) from the Rochester Shale. They are *Fistulipora umbrosa* sp. nov., *F. strawi* sp. nov., *Dekayella megacanthopora* sp. nov., *D. ramosa* sp. nov., *Leioclema explanatum* Bassler, *Monotrypa flabellata* sp. nov., *Rhombopora minima* sp. nov., and *Ptilodictya gracile* sp. nov.

S. H. STRAW (1937, pp. 423-4) described a thin band of limestone made up of shells of *Gypidula galeata* (Dalman) and of nodular Bryozoa near the base of the *Gypidula* beds of his Upper Silurian (Ludlovian) succession. He noted certain genera in his paper and intended to give them a more thorough examination later. He has handed over the material to the author and the Bryozoa are described herewith. All the specimens were collected from the right bank of the river Wye between Aber-Duhonw and the lodge of Glanwe, near Builth Wells, Radnorshire.

The Bryozoa, which make up a large proportion of the limestone, are jumbled in with shells and occasional corals. The weathered surfaces of the rock show the fossils as hollow casts and it is therefore difficult to describe their surface features, but thin sections of unweathered rock have shown that eight species, belonging to six genera, are represented. All but one (*Leioclema explanatum* Bassler) appear to be new, but this is not as surprising as it might seem at first, since the comparable Silurian horizon is represented in the United States by the specialized Cayuga salt-bearing deposits, which are devoid of Bryozoa. Species and individuals all tend to be smaller than the typical Wenlock forms but to compare closely with those in the Aymestry Limestone. In fact, the author has already collected five species, described here, from the Aymestry Limestone.

Order CYCLOSTOMATA Busk 1852
Family FISTULIPORIDAE Ulrich 1882
Genus FISTULIPORA M'Coy 1850

Fistulipora umbrosa sp. nov.

Plate 16, figs. 1, 2; text-fig. 1

Holotype. Section LL 1526A in the Manchester Museum.

Diagnosis. Zoarium massive, nodular, showing marked layering in section as though successive incrustations had built up the nodule. Average diameter of nodules 15-20 mm. Zooecia straight, oval in section, with thick shadowy granular walls, no lunules and very occasional diaphragms. The average size of the zooecia is 0.4 to 0.5 mm. by 0.3 to 0.4 mm. and the zooecia may be in contact or separated by narrow tabulated mesopores or vesicular tissue. Mesopores are 0.1 to 0.2 mm. across and their diaphragms occur at about $1\frac{1}{2}$ times tube width.

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Remarks. It is in the shadowiness of the walls that *Fistulipora umbrosa* differs from all other species of *Fistulipora*, though its method of growth and general characters are typical of the genus. Specimens, either whole or fragmentary, are very common through the bed.

Fistulipora strawi sp. nov.

Plate 16, figs. 3, 4; text-fig. 2

Holotype. Sections LL 1526D, F in the Manchester Museum.

Diagnosis. Zoaria encrusting but thick, average depth 4 to 5 mm., often occurring detached. Average width 8 to 10 mm. Zooecia cylindrical tubes without diaphragms, section nearly circular to polygonal with rounded corners, approximately 0.3 mm. in diameter, with slight lunules. Walls thin and granular. Mesopores 0.2 to 0.3 mm. closely tabulated, diaphragms occur at about one-half to three-quarters tube width.

Remarks. This species is very common and is much more typically fistuliporid than *Fistulipora umbrosa* from which it differs in having flatter encrusting zoaria, much thinner walls and traces of lunules.

In 1885 Nicholson and Foord redefined the genus *Fistulipora* M'Coy, emphasized the importance of the lunule, and described twelve species, four of them new. Three of their new species, and a fourth described by Lonsdale, occur in British Silurian rocks, all from the Wenlock series. They are: (1) *F. crassa* Lonsdale with a massive branching zoarium up to 10 cm. in length. In this, the vesicular tissue separating the zooecia is very simple and nowhere resembles tabulated mesopores. (2) *F. nummulina* Nich. and Foord has discoidal, lenticular zoaria up to 5 cm. across, and zooecia with occasional diaphragms, and lunules more marked than in *F. strawi*. (3) *F. dobunica* Nich. and Foord has exceedingly thin encrusting zoaria, and small zooecia scarcely distinct from the intervening vesicular tissue. (4) *F. cornavica* Nich. and Foord is encrusting hemispherical and layered. The marked lunules and diaphragms distinguish it from *F. umbrosa* and *F. strawi*.

EXPLANATION OF PLATE 16

All specimens from right bank of River Wye, between Aber-Duhonw and Glanwye, near Builth Wells, Radnorshire. Except for fig. 9, all figures are of the holotypes.

Figs. 1, 2. *Fistulipora umbrosa* sp. nov.; vertical section showing zooecia and mesopores; tangential section showing shadowy walls.

Figs. 3, 4. *Fistulipora strawi* sp. nov.; vertical section showing tabulated mesopores; tangential section showing zooecia with traces of lunules.

Figs. 5, 6. *Dekayella megacanthopora* sp. nov.; vertical section showing thickening in mature zone; tangential section showing large acanthopores.

Figs. 7, 8. *Dekayella ramosa* sp. nov.; vertical section showing tabulated mesopores; tangential section showing rounded zooecia, mesopores, and acanthopores.

Fig. 9. *Leioclema explanatum* Bassler; vertical section showing intersecting mesopores.

Figs. 10, 11. *Monotrypa flabellata* sp. nov.; vertical section showing crenulated walls; tangential section.

Figs. 12, 13. *Rhombopora minima* sp. nov.; transverse section showing thickened mature zone; vertical section showing vestibule and hemiseptum.

Figs. 14, 15. *Ptilodictya gracile* sp. nov.; transverse section showing mesotheca and thick zooecial walls; vertical section showing rows of rectangular zooecia.

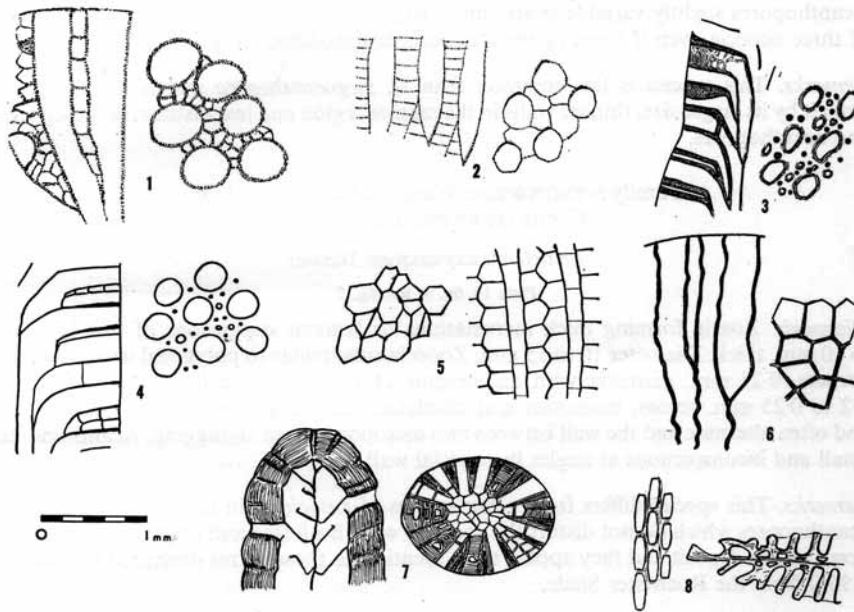
Order TREPOSTOMATA Ulrich 1882
 Family HETEROTRYPIDAE Ulrich 1890
 Genus DEKAYELLA Ulrich 1882

Dekayella megacanthopora sp. nov.

Plate 16, figs. 5, 6; text-fig. 3

Holotype. Section LL 1526A in the Manchester Museum.

Diagnosis. Zoarium ramose, slender, 1.5 to 2 mm. diameter. Zooecia oval in section, 0.25 mm. along the long axis, 0.15 mm. across, with marked thickening of walls in the



TEXT-FIGS. 1-8. Vertical and tangential sections of Upper Silurian Bryozoa. 1, *Fistulipora umbrosa* sp. nov. 2, *F. strawi* sp. nov. 3, *Dekayella megacanthopora* sp. nov. 4, *D. ramosa* sp. nov. 5, *Leio-clema explanatum* Bassler. 6, *Monotrypa flabellata* sp. nov. 7, *Rhombopora minima* sp. nov. 8, *Ptilo-dictya gracile* sp. nov.

mature region. Zooecia start nearly parallel to the surface in the immature region and turn sharply to reach the surface at right angles. Diaphragms few. Many mesopores 0.05 to 0.1 mm. across having few diaphragms. Many acanthopores, some up to 0.1 mm. in diameter and some perhaps a tenth of this size with gradations between the two extremes.

Remarks. This species is very common and is distinctive particularly in tangential section, when the white dots of the mesopores and the dark points, often with a tiny white centre, of the acanthopores are seen.

Dekayella ramosa sp. nov.

Plate 16, figs. 7, 8; text-fig. 4

Holotype. Section LL 1526A in the Manchester Museum.

Diagnosis. Zoarium ramose, about 3 mm. in diameter. Zooecia circular in section, about 0.3 mm. across, thickened only slightly in the mature region. Zooecia parallel to surface in immature region but turn sharply to reach surface nearly at right angles. Occasional diaphragms. Mesopores numerous, often tabulated, 0.05 to 0.1 mm. diameter. Acanthopores slightly variable in size up to 0.05 mm., occurring evenly at the junction of three zooecia even if some of these zooecia are modified as mesopores.

Remarks. This species is less common than *D. megacanthopora* and is distinguished from it by its larger size, thinner walls in the mature region and less distinctive mesopores and acanthopores.

Family STENOPORIDAE Waagen and Wentzel 1886

Genus LEIOCLEMA Ulrich 1882

Leioclema explanatum Bassler

Plate 16, fig. 9; text-fig. 5

Diagnosis. Zoaria forming thick incrustations or laminar expansions of one layer, 5 to 10 mm. thick. Diameter 10 to 15 mm. Zooecia subcircular to polygonal with rounded corners, 0.25 mm. diameter with diaphragms $1\frac{1}{2}$ to 2 tube widths. Mesopores large 0.2 to 0.25 mm. across, numerous and tabulated, the diaphragms a tube width apart and often alternate and the wall between two mesopores often zigzagging. Acanthopores small and inconspicuous at angles in zooecial wall.

Remarks. This species differs from other species of *Leioclema* in having inconspicuous acanthopores which do not distort the zooecial wall. Both free and encrusting examples occur in this deposit and they appear to be identical to those forms described by Bassler (1906) from the Rochester Shale.

Family TREMATOPORIDAE Miller 1889

Genus MONOTRYPA Nicholson 1879

Monotrypa flabellata sp. nov.

Plate 16, figs. 10, 11; text-fig. 6

Holotype. Section LL 1526A in the Manchester Museum.

Diagnosis. Zoarium hemispherical, fanlike in section, sometimes attached at the base to other objects. Average diameter 10–12 mm., average height 7 to 8 mm. Zooecia polygonal with separate walls; thickening from immature to mature region only slight;

average diameter 0.3 mm.; walls with wide crenulations, about four to 1 mm. and with some straight or nearly straight sections. Diaphragms occasional but rare.

Remarks. This is the commonest species in the deposit and its crenulated walls are easily recognizable in the hand specimens with a lens. It is very like *M. benjamini* Bassler from the Rochester Shales but differs in having zooecia of much smaller diameter and fewer and larger crenulations.

Two species of *Monotrypa* have been described from the British Silurian rocks, *M. crenulata* Nicholson (1884, p. 125) and *M. macropora* Foord (1884, p. 338). The former, which is conspecific with *Favosites fibrilla* Smith, occurs typically in the Wenlock Limestone of Dudley, and is a large hemispherical species 3 to 4 cm. in diameter and height. The zooecial walls have marked crenulations and diaphragms occur at 1-2.5 mm. intervals. *M. macropora* Foord, from the Wenlock Shales, is a wide flat form with straight walls and more numerous diaphragms. Neither would be confused with *M. flabellata*.

Note on *Favosites fibrilla* Smith

Dr. K. P. Oakley drew the author's attention to this species described by Smith (1930, p. 319) from material from Llandovery in the Geological Survey Museum (Geol. Soc. Coll. 6858), and considered by him to be a species of *Monotrypa*. Spjeldnaes (1957) suggested it might be *Amplexopora* but gave no reasons.

Diagnosis. Zoarium hemispherical, fanlike in tangential section, approximately 20 mm. across. Zooecia polygonal, 0.4 to 0.5 mm. diameter with crenulate walls, few diaphragms, crenulations about three to the millimetre. Mesopores and acanthopores absent. Separation of zooecial walls very marked.

Remarks. This form differs from *M. crenulata* Nicholson only in having fewer diaphragms more widely spaced. In the author's experience, the frequency of diaphragms can vary in different parts of a zoarium. Thus *F. fibrilla* Smith would appear to be *M. crenulata* Nicholson. *Amplexopora* differs from *Monotrypa* most obviously in having numerous acanthopores. These are absent in *F. fibrilla* Smith. In older collections there are numerous specimens labelled *Favosites fibrosa* (Goldfuss) and *Alveolites fibrosa* (Goldfuss). Lonsdale (1839) figures the former and M'Coy (1854) the latter. Neither appears to be Goldfuss's original species (1826) which is ramose. According to Spjeldnaes (1957) Lonsdale's figured specimen is *Batostoma murchisoni*.

Order CRYPTOSTOMATA Shrubsole and Vine 1882

Family RHABDOMESIDAE Vine 1883

Genus RHOMBOPORA Meek 1872

Rhombopora minima sp. nov.

Plate 16, figs. 12, 13; text-fig. 7

Holotype. Section LL 1526A in Manchester Museum.

Diagnosis. Zoaria small ramose stick-like 1 to 1.5 mm. in diameter. Zooecia with occasional diaphragms arise from central axis at about 45°; a few reach the surface through well-marked vestibules at right angles to the axis, with inferior hemisepta; between these there is a solid wall of fibrous structure with many acanthopores.

Remarks. This species is fairly common and the thick-walled mature zone and its clearly marked vestibules are distinctive.

Family PTILODICTIDAE Zittel 1880
Genus PTILODICTYA Lonsdale 1839

Ptilodictya gracile sp. nov.

Plate 16, figs. 14, 15; text-fig. 8

Holotype. Section LL 1526C in the Manchester Museum.

Diagnosis. Zoaria consist of thin net-like ribbons, 3 to 4 mm. in diameter. No complete specimen has been preserved in the rock examined and the total length is therefore not known. Zooecia arise from mesotheca and rise slightly to the surface; walls thick, apertures rectangular with rounded corners, 0.25 mm. long, 0.1 mm. wide arranged in parallel, longitudinal rows, 8–16 in width. No mesopores or acanthopores.

Remarks. This species is similar in many respects to *Pachydictya crassa* (Hall) as figured by Bassler (1906, p. 57). There is no evidence from fragments found, however, that the zoaria branched dichotomously, though such junctions would be strongest and therefore most likely to be preserved. More important is the fact that *Ptilodictya gracile* has neither diaphragms nor vesicular tissue between the zooecia, two characteristics of *Pachydictya*. Transverse sections through the smaller tips are extremely common throughout the deposit.

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