

# THE BRYOZOAN GENUS *POLYPORA* M'COY

by T. G. MILLER

ABSTRACT. The genus *Polypora* M'Cooy 1844 is redefined by reference to the type material. M'Cooy's four original species of *Polypora* are redescribed, one being only tentatively retained within the genus, and one being assigned to *Fenestella* Lonsdale.

DURING the last 118 years more than 250 species of fenestrate bryozoa have been assigned to the genus *Polypora*. It is probable that imperfect knowledge of the characters of the genus has led to inclusion of species with quite different affinities. Shulga-Nesterenko, Morozova, and Nekhoroshev have attempted to subdivide the genus into species-groups based on the number of rows of zooecial chambers in the branches. In the light of the present re-examination it seems likely that a more valid subdivision of what is certainly an unwieldy genus will be based on the presence or absence of nodes on the obverse of the branches, and the arrangement of these with respect to a central carina, together with consideration of the organization and location of the zooecial chambers in relation to the 'basal plate'.

## SYSTEMATIC DESCRIPTIONS

Specimens with the prefix NMI are in the National Museum of Ireland, Dublin.

Order CRYPTOSTOMATA Shrubsole and Vine 1882

Family FENESTELLIDAE King 1850

Genus POLYPORA M'Cooy 1844

*Type species.* *Polypora dendroides* M'Cooy 1844, p. 206; pl. 29, fig. 9; Carboniferous, Tournaisian, Ireland.

*M'Cooy's diagnosis.* 'Expanding, interstices round, branching, having on one side from three to five rows of pores, the margin of which is never raised, interstices connected by thin, transverse, nonporiferous dissepiments.'

*Emended diagnosis.* Unifoliate fenestrate expansion of straight or slightly sinuous, regularly bifurcating, zooecia-bearing, non-carinate branches joined at regular intervals by transverse non-poriferous dissepiments. Branches circular or elliptical in cross-section, carrying regularly spaced elevated nodes on the central line of the obverse. Zooecia regularly arranged in three or more rows in the branches, the number increased for a short length below a bifurcation and similarly diminished above. In cross-section the zooecial chambers lie side by side on a flat basal plate in the plane of the expansion. In deep transverse section the zooecial base-shape is elongate-hexagonal to irregular polygonal. In shallow transverse section the calcareous investment of the branches is seen to be perforated by small 'tubules' which may be locally clustered, particularly round the margin of the zooecial apertures, and more compactly to form the cores of the branch

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nodes. Obverse of zoarium smooth, granular, or striated. Reverse similar to obverse but may also carry more or less regularly spaced node-like projections.

*Polypora dendroides* M'Coy

Plate 23, figs. 1-3

*Polypora dendroides* M'Coy 1844, p. 206; pl. 29, fig. 9.

*M'Coy's description.* 'Flat, fan-shaped, interstices thick, regularly branched, divaricating; dissepiments very thin, frequently oblique, and placed at nearly equal distances; fenestrules large, rhomboidal, poriferous face, with five rows of small impressed pores arranged in quincunx, reverse longitudinally striated.'

'This beautiful species is chiefly remarkable for the degree of divergence with which the interstices branch, and the small number of rows of pores. Length one inch, width one and a half inches; the interstices are about one line apart and half a line thick.'

*Material.* (1) Lectotype NMI XXIX.9a, Carboniferous 'Slate', Tournaisian, Hook Head, Fethard, Co. Wexford, Eire. Fragment of zoarium, roughly rectangular (30×25 mm.), showing obverse, on matrix of hard dark grey calcareous mudstone full of crinoidal and bryozoan fragments. (2) Homeotype NMI G.39:1962, Upper Tournaisian, Hook Head, Co. Wexford, Eire. Fragment of zoarium (25×20 mm.), partly obscured, showing obverse, in matrix of hard grey shaly bioclastic limestone.

*Micrometric formulae.* (1) Lectotype NMI XXIX.9a. (2) Homeotype NMI G.39:1962. (3) *Polypora bukhartmensiformis* Nekhoroshev 1956, p. 210, Lower Carboniferous Ulbinskaya suite, Rudnyi Altai, and Fominskaya zone, Kuznetsk Basin.

(For explanation of column headings see Miller 1962, p. 120; in addition, R/B = number of rows of zooecia in branch, ND = base-diameter of branch nodes.)

	R/B	B/10	D/10	Z/5	N/5	B <sub>w</sub> (mm.)	ZD (mm.)	ND (mm.)
1.	3 4 6	6-8	4-5½	13-16	5-7	0.5-0.9	0.15×0.2	0.13
2.	4	7-11	5	13½-15½	5-7	0.6-0.8	0.19	0.13
3.	4-6	6-8	4½-5½	14-16	?	0.8-0.85	0.12×0.18	?

*Description.* Zoarium probably flat, fan-shaped. Branches thick, straight, sub-elliptical in cross-section. Dissepiments short, half the diameter of the branches. Fenestrules long, with rounded ends, occasionally oval, width about equal to the diameter of the branches. Zooecia normally in four rows, but increased to six below a bifurcation, and diminished to three immediately above. Zooecial apertures oval, margins minutely sub-asteroid due to the presence of fifteen or sixteen short thin internal projections resembling the septa of corals. Branch nodes on obverse circular at base, high conical in profile, with grooved sides and rounded perforate tops. Zooecial bases elongate-hexagonal (eH) to irregular polygonal.

*Discussion.* The lectotype is considered to be the one used by M'Coy for his lower figure. In the Griffith Collection of the National Museum of Ireland it is labelled '? Type for structure'. Under the same catalogue number (XXIX.9) is a second specimen, hitherto supposed to be a syntype, labelled '? Type for form'. This is a fragment of a zoarium, roughly semicircular, 40×25 mm., showing the reverse, in a matrix of pale grey crystalline limestone, from the Carboniferous 'Upper' Limestone of Blacklion, Co. Cavan, Eire. The rock at this locality is a reef-facies limestone of Upper Viséan (B<sub>2</sub>) age. It is

clear that this second specimen (now labelled XXIX.9*b*), which, in spite of showing only the reverse of a zoarium, must have been used for M'Coy's *upper* figure, is not conspecific with its companion, and must therefore be discarded from the type material of *Polypora dendroides*. It is probably a specimen of *P. (?) verrucosa* (see p. 169), but as the obverse is not visible a precise determination cannot be made.

In shallow transverse section the finely granular (or minutely porous) calcareous tissue of the main zoarial skeleton is seen to be penetrated by small 'tubules'. These appear in the section as clear spots surrounded by a darker zone without a sharp margin. The tubules are 10–12  $\mu$  in diameter and are distributed fairly evenly in the skeletal tissue 40–80  $\mu$  apart. This wide separation of the tubules is replaced by a closer packing in two situations: (*a*) round the margin of the zoecial apertures, where fifteen or sixteen are placed against the margin, about their own diameter apart, or a little more (12–15  $\mu$ ); and (*b*) at the site of the branch nodes, where usually eight tubules appear to bend together and coalesce into an asteroid space surrounding a solid central structure. Similar structures were figured (but not discussed) by Ulrich (1890) in *Polypora cesteriensis* Ulrich and *P. halliana* Prout.

This formation of branch nodes by a growing together or bunching of tubules suggests that the carinal nodes in *Fenestella* may have a similar structure. The tentative interpretation by Bassler (1953, p. 120) of these carinal nodes as possibly homologous with the acanthopores of the Trepostomata—an interpretation followed by me (Miller 1961, p. 223)—may have to be revised. It is interesting to note in this connexion that in general appearance and arrangement the tubules in *Polypora* recall the micracanthopores of the Ordovician bifoliate cryptostome genus *Pachydictya* recently described by Phillips (1960, pl. 5, fig. 4).

*Polypora marginata* M'Coy

Plate 24, fig. 3

*Polypora marginata* M'Coy 1844, p. 206; pl. 29, fig. 5.

*M'Coy's description.* 'Interstices thick, irregularly bifurcate; sides margined; dissepiments thin; fenestrules small, elongate, oval, or approaching to a square form; reverse with direct, deep, longitudinal striae; poriferous surface, with five alternating rows of pores, and interjacent, waved striae.

'The broad, flat, margin of the branches distinguishes this rare species at a glance from any of the other corals likely to be confounded with it.'

*Material.* Holotype NMI XXIX.5, Carboniferous 'Upper' Limestone, Upper Viséan (horizon in Upper *Dibunophyllum* zone ( $D_2 = P_1$ )), *vide* Fowler and Robbie 1961, p. 80), Killymeal, Dungannon, Co. Tyrone, Northern Ireland. Fragment of zoarium, 11  $\times$  25 mm., showing reverse, on matrix of dark grey compact crystalline limestone.

EXPLANATION OF PLATE 23

Figs. 1–3. *Polypora dendroides* M'Coy. 1, Obverse of zoarial fragment,  $\times 4.5$ . Holotype NMI XXI.X.9*a*. 2, Obverse, showing arrangement of zoecial apertures on branch surface,  $\times 20$ . Holotype NMI XXIX.9*a*. 3, Shallow transverse section showing arrangement of tubules round apertural margins, and at site of a branch node (irregularly shaped light patch with dark diffuse margin at top right),  $\times 100$ . Homeotype NMI G.39:1962.

*Micrometric formula*

	R/B			B/10	D/10	Z/5	N/5	B <sub>w</sub> (mm.)	ZD (mm.)	ZB
NMI XXIX.5	4	5	8	5-9	4-5	15½-18	?	0.6-1.1	0.12-0.15	eH

*Description.* Branches thick, rather sinuous, compressed-elliptical in cross-section. Dissepiments thin. Fenestrules rectangular. Zooecial chambers in five rows, increasing to eight below, and diminishing to four above, a bifurcation. Zooecial apertures small, circular, slightly less than their own diameter apart; the outer rows commonly projecting slightly into the fenestrule so as to produce a sinuous margin. Zooecial bases elongate-hexagonal. Details of branch nodes unknown. Reverse minutely striated parallel to long axes of branches and dissepiments, without auxiliary projections.

*Polypora (?) verrucosa* M'Coy

Plate 24, fig. 2

*Polypora verrucosa* M'Coy 1844, p. 206; pl. 29, fig. 6.

*M'Coy's description.* 'Interstices rarely bifurcating, regular, equal, rounded; dissepiments thin, distant; fenestrules rectangular, five times as long as wide, about one-third wider than the interstices, equal; obverse with four rows of prominent, wart-like pores, about ten in each row to the length of a fenestrule; between the pores are waving longitudinal striae; reverse nearly smooth.'

*Material.* Holotype NMI XXIX.6, Carboniferous 'Upper' Limestone, Upper Viséan (horizon in reef-facies, upper *Beyrichoceras* zone (B<sub>2</sub> = D<sub>1</sub>), *fide* Hodson 1956), Blacklion, Co. Cavan (near Enniskillen, Co. Fermanagh), Eire. Fragment of zoarium, 25 × 10 mm., showing patches of obverse, on matrix of grey crystalline limestone full of fenestellid bryozoan fronds.

*Micrometric formula*

	R/B			B/10	D/10	Z/5	N/5	B <sub>w</sub> (mm.)	ZD (mm.)	ZB
NMI XXIX.6	3	4	5	5½-7½	2-3	11-12	?	0.48-0.58	0.10-0.13	?

*Description.* Branches of moderate thickness, straight, subparallel, circular in cross-section, dissepiments thin. Fenestrules long, narrow, rectangular. Zooecial chambers in four rows, increasing to five below, and diminishing to three above, a bifurcation. Zooecial apertures relatively small, circular, with prominent peristomal collars, placed nearly twice their diameter apart along the branches; apertures on the outer rows project slightly into the fenestrules so as to produce a beaded effect. Obverse surface deeply sculptured in ridges and grooves streamlined past and between the zooecial apertures. No nodes on the branches. Reverse with fine longitudinal striations. Shape of zooecial base unknown.

*Discussion.* The striking feature of this species is the absence of nodal structures from the centre line of the branches on the obverse, combined with the ridged and grooved sculpturing of the calcareous investing tissue. Both these characters recall the condition in the fenestellid genus *Levifenestella* Miller 1961. The question whether M'Coy's *P. verrucosa* should be detached as a member of a genus distinct from *Polypora* must await the recognition of similarly characterized species in other bryozoan faunal assemblages. For the present it is tentatively assigned as *P. (?) verrucosa*.

## Genus FENESTELLA Lonsdale 1839

*Fenestella papillata* (M'Coy)

Plate 24, fig. 1

*Polypora papillata* M'Coy 1844, p. 206, pl. 29, fig. 10.

*M'Coy's description.* 'Interstices rarely bifurcating, very narrow, rounded; fenestrules circular or oval; poriferous surface smooth, with three alternating rows of pores; reverse smooth, with a small papillated pore at the origin of most of the dissepiments.

'This species is remarkable for its large and round fenestrules, which are of such a size that the interstices and dissepiments appear disproportionably thin. The prominent pores on the outer side have caused me to doubt the propriety of placing this coral in the same genus with the preceding species [*P. marginata*]. It is very rare.'

*Material.* Holotype NMI XXIX.10, Carboniferous 'Upper' Limestone, Upper Viséan (horizon in reef-facies, upper *Beyrichoceras* zone (B<sub>2</sub> = D<sub>1</sub>), *vide* Hodson 1956), Blacklion, Co. Cavan (near Enniskillen, Co. Fermanagh), Eire. Fragment of zoarium, 20 × 20 mm., showing reverse, on matrix of massive grey calcilutite.

*Micrometric formulae*

	B/10	D/10	Z/5	N/5	B <sub>w</sub> (mm.)	ZD (mm.)	ZB
1. NMI XXIX.10	16	8	15-17	27-30	0.30-0.40	0.10	hH
2. <i>F. polynodosa</i> Miller 1961	12-17	7-9	15-18	32-36	0.30-0.40	0.15	sT

*Description.* Normal reticulate fenestellid meshwork of carinate zooecia-bearing branches with inter-branch dissepiments. Branches relatively stout, straight, or slightly sinuous. Dissepiments thinner than the branches. Carinae narrow, with a row of small, closely set nodes with elliptical bases. At a few places the line of carinal nodes becomes sinuous, the nodes lying alternately on either side of the central line, thus approaching the condition of the carinal nodes in *Minilya* Crockford 1944. Zooecial apertures large, circular, slightly more than their own diameter apart, with prominent peristomal collars, indenting the fenestrules, four or five to a fenestrule. Zooecial bases of variable shape, from triangular through subtriangular (sT) to hemi-hexagonal (hH). Reverse longitudinally striated, with scattered non-perforate steep-sided elevations, some of which lie opposite the ends of dissepiments.

*Discussion.* It is difficult to understand M'Coy's attribution of this species to his genus *Polypora*. The holotype, which is undoubtedly the one figured by M'Coy, shows the reverse of a zoarial fragment. By grinding down part of this fragment it has been possible to show the characteristic fenestellid features of the obverse. There is nowhere any trace

## EXPLANATION OF PLATE 24

Fig. 1. *Fenestella papillata* (M'Coy). Holotype NMI XXIX.10, polished surface slightly oblique to plane of zoarial expansion showing at top left the arrangement of carinal nodes, × 17.

Fig. 2. *Polypora* (?) *verrucosa* M'Coy. Holotype NMI XXIX.6, part of obverse, × 16.

Fig. 3. *Polypora marginata* M'Coy. Holotype NMI XXIX.5. Reverse of zoarium with partial transverse section (polished surface) at left, showing arrangement of zooecial apertures, × 14.

of the 'three alternating rows of pores' of M'Coy's description. On the contrary, the typical fenestellid rows of zooecial apertures separated by a noded carina can be clearly distinguished.

*F. papillata* is close to *F. polynodosa* Miller from the Irish Tournaisian. It differs in having a slightly smaller number of zooecial apertures to a fenestrule, in the smaller zooecial apertures, and in the slightly less closely packed carinal nodes. Also, the zooecial base in *F. papillata* shows a strong tendency to become stabilized as hemi-hexagonal, and is distinguishable from the predominantly subtriangular base in *F. polynodosa*.

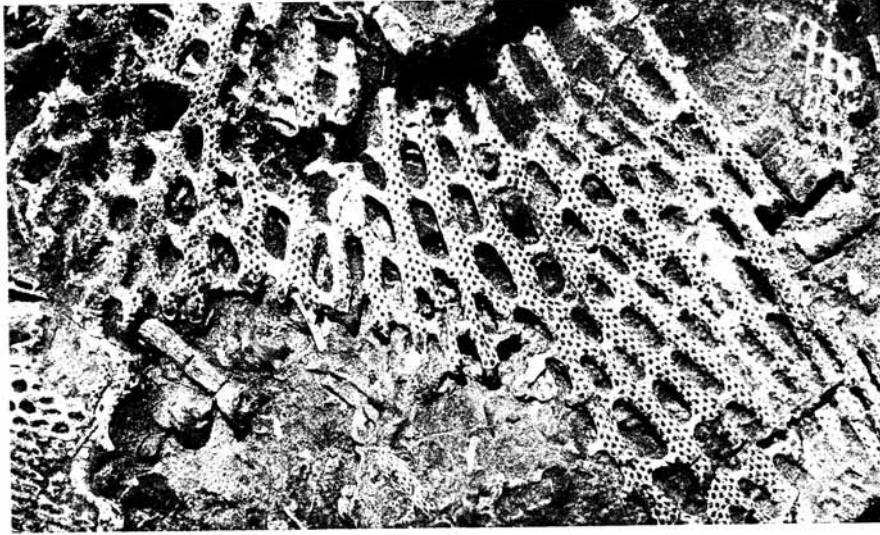
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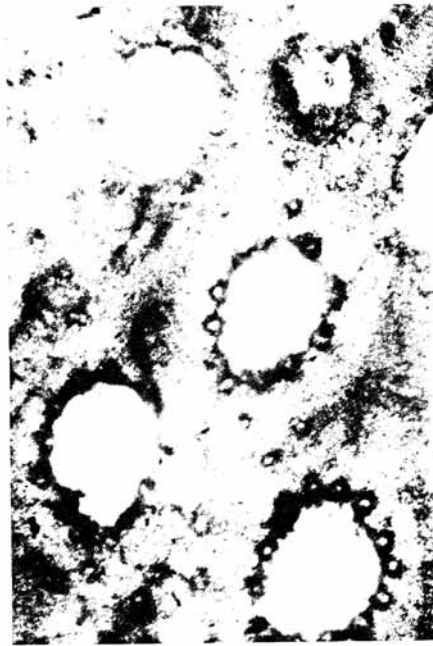
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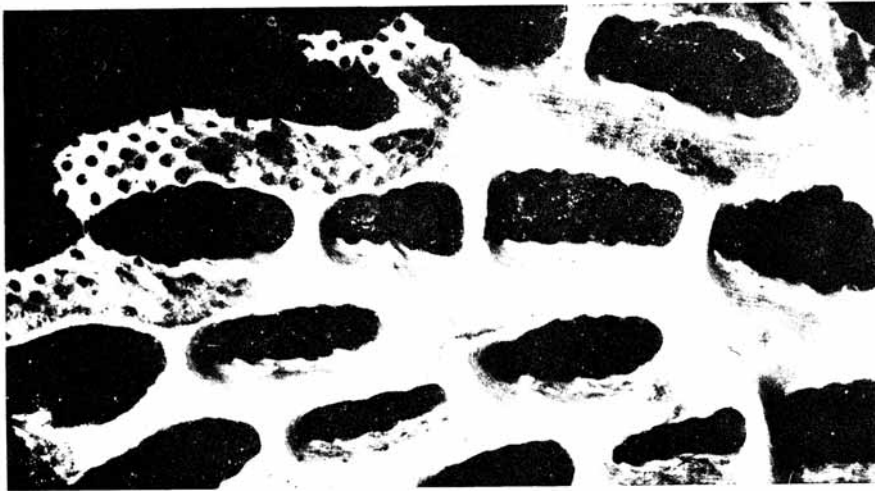
MILLER, *Polypora*



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MILLER, *Polypora*