

TREPOSTOME BRYOZOA FROM THE CARADOC SERIES, SHROPSHIRE

by JUNE R. P. PHILLIPS ROSS

ABSTRACT. *Mesotrypa bulmani* sp. nov., *Amplexopora thomasi* sp. nov., *Homotrypa* sp. A, and *Homotrypa* sp. B occur in the Hoar Edge Limestone in the lower part of the Caradoc Series, near Evenwood and Harnage. These trepostome species show similarities with species from Cincinnati strata in Ohio, Indiana, and Anticosti Island.

THE four trepostome species described in this paper were collected from the lower part of the Caradoc Series in the Evenwood and Harnage area in southern Shropshire (text-fig. 1). *Mesotrypa bulmani* sp. nov., *Amplexopora thomasi* sp. nov., and *Homotrypa* sp. A occur in the *Harknessella subquadrata* horizon in the section at Evenwood Quarry (text-fig. 2). *Mesotrypa bulmani* is also found in two quarries in the Hoar Edge Limestone south-west of Harnage Grange, and *M. bulmani* sp. nov., *A. thomasi* sp. nov., and *Homotrypa* sp. B occur in this formation at the Wilderness, Wilstone Farm House. These species are from fossil collections made during the mapping of the Shrewsbury District and locality data and identifications made by Dr. C. J. Stubblefield and Dr. G. Elles are listed in Pocock *et al.* (1938). The cryptostome *Phaenopora stubblefieldi* Ross (1962) from the Hoar Edge Limestone also came from these collections and was located in the upper part of the 15-foot section in Evenwood Quarry in the *Harknessella subquadrata* horizon which overlies lower units containing graptolites of the *Nema-graptus gracilis* Zone. The succeeding sandstone and shale beds above the Hoar Edge Limestone contain graptolites regarded as characterizing the *Diplograptus multidentis* Zone.



TEXT-FIG. 1. Index map of Evenwood-Harnage area, Shropshire.

Few bryozoan species have been described from the Caradoc Series and the occurrence of species of *Amplexopora*, *Homotrypa*, and *Mesotrypa* which have been recorded from [Palaeontology, Vol. 6, Part 1, 1963, pp. 1-11, pl. 1-3.]

Ordovician strata in North America, Greenland, England, Estonia, Russia, and Australia, adds to the knowledge of the distribution of these three genera. *Mesotrypa bulmani* sp. nov. is similar to *M. orbiculata* from the Cincinnati Arnheim Formation of south-eastern Indiana, *M. patella* from the Whitewater Formation of south-western Ohio (text-fig. 3), and *M. infida* from the *Rhynchidictya* beds in Minnesota. It shows little similarity to *M. lens* (M'Coy) (Spjeldnæs 1957) from the Caradocian Horderly Sandstone of eastern Shropshire.

Amplexopora thomasi sp. nov. resembles *A. pustulosa* from the Cincinnati Waynesville Shale of south-western Ohio, *A. ampla* from the Cincinnati Leipers Limestone of central Tennessee and the Cincinnati Fairmount Member of south-western Ohio, and *A. billingsi* from the Cincinnati English Head and Vaureal Formations of Anticosti Island.

Homotrypa sp. A is similar to a rare species, *H. dumosa*, from the Cincinnati Fairmount Member of south-western Ohio, and *Homotrypa* sp. B has many morphologic features that resemble *H. obliqua* from the Cincinnati Fairmount and Corryville Members of south-western Ohio, and *H. wortheni* from the Cincinnati Whitewater Formation of south-western Ohio and south-eastern Indiana.

Collection numbers with the prefixes WM and RR, and specimen numbers with the prefix GSM refer to material in the Geological Survey Museum, London.

SYSTEMATIC DESCRIPTIONS

Family AMPLEXOPORIDAE Miller 1889

Genus AMPLEXOPORA Ulrich

1882 *Amplexopora* Ulrich, p. 154.

1960 *Amplexopora* Ulrich; Boardman, pp. 16–20.

1920 *Acanthotrypella* Vinassa de Regny, p. 221.

Type species. *Amplexopora cingulata* Ulrich (1882, pp. 126, 254–6, pl. 11, figs. 5, 5a–c); designated by Ulrich (1882, p. 255).

Diagnosis. Colonies are ramose, encrusting, massive, or rarely bilaminar. Monticules are commonly present. Zoecial openings are polygonal and are enclosed by generally integrate zoecial walls. Mesopores are generally not abundant. Acanthopores are commonly abundant and occur at the junctions of zoecial walls. In axial regions the zoecial tubes have slender walls. In the peripheral regions the thickened zoecial walls have a laminar microstructure in which the outer parts of adjacent zoecial walls have steeply inclined laminae that intersect at acute angles. Diaphragms are present in the peripheral and subperipheral regions and may be flat, curved, or cystoidal. Some species display cystiphragms.

Amplexopora thomasi sp. nov.

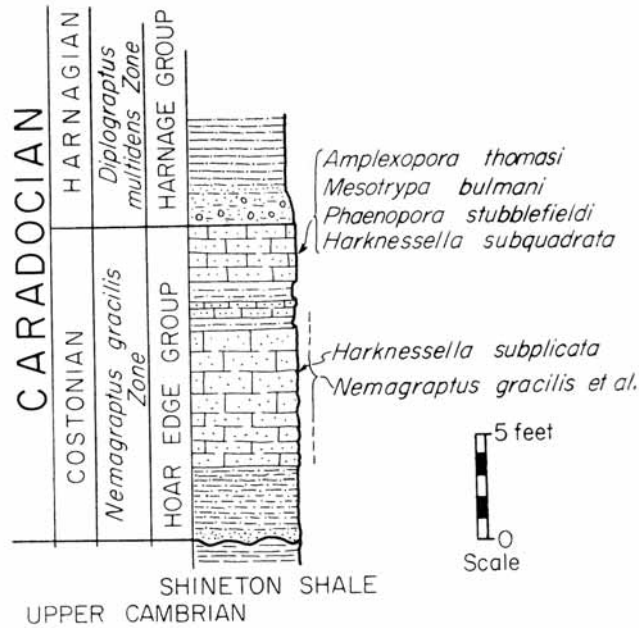
Plate 1, figs. 1–10

Material. Collections WM 1265 (including paratype GSM 102009), WM 1267, WM 1273 (including holotype GSM 102004, paratypes GSM 102005, GSM 102006), WM 1274 (including paratype GSM 102007), from the top part of Evenwood Quarry; and collection WM 1279, from the middle part of Evenwood Quarry; Hoar Edge Limestone, Hoar Edge Group; Caradoc Series; Ordovician.

Description. In tangential sections the slender, integrate zoecial walls enclose polygonal

or subpolygonal zooecial openings which vary considerably in diameter (Pl. 1, figs. 1, 7, 10). One to two mesopores are generally located at the junctions of the zooecial walls (Pl. 1, figs. 1, 10). Acanthopores are rare and, if present, are small, dense spots in the zooecial walls.

Transverse sections of ramose colonies display axial regions with thin-walled polygonal zooecial tubes and peripheral regions with thickened, integrate zooecial walls and



TEXT-FIG. 2. Measured section of the Hoar Edge Group in Evenwood Quarry (after Pocock *et al.* 1938).

diaphragms crossing the zooecial tubes. Transverse sections of bilaminate colonies display a dark medial line lacking microstructure and with zooecia on both sides of it. The zooecial tubes have thin walls in the medial region and thickened, integrate walls and diaphragms in the peripheral region (Pl. 1, figs. 2, 4).

In longitudinal sections of ramose colonies the axial regions display very broadly crenulate zooecial walls that are very slender. For some distance the walls diverge only slightly from the axis of growth of the branch and then bend abruptly into the peripheral region. In this region they thicken and are more closely crenulate and very slightly beaded. The zooecial openings are slightly oblique at the periphery. The zooecial and mesopore walls have an integrate, laminate microstructure as noted in the *Diagnosis* of *Amplexopora* (Pl. 1, fig. 9). The very slender, widely spaced diaphragms crossing the zooecial tubes pass into the steeply inclined wall laminae (Pl. 1, fig. 9). In the mesopores, which develop at the base of the peripheral region, the diaphragms are closely spaced.

In longitudinal sections of bilaminate colonies the zooecial tubes curve gently to the periphery and are crossed by widely spaced diaphragms. The zooecial openings are oblique to the periphery (Pl. I, fig. 8).

TABLE I
Measurements of *Amplexopora thomasi* sp. nov. (in millimetres)

<i>Catalogue no.</i>	<i>GSM 102007</i>	<i>GSM 102004</i> <i>holotype</i>
Diameter of zoarial stem	6-7	6-7
Diameter of zooecial opening min.	0.14 × 0.16	0.15 × 0.15
. max.	0.31 × 0.22	0.23 × 0.21
No. of zooecia per 2 mm.	6-8	6-8
Combined thickness of adjacent zooecial walls in peripheral region	0.04-0.06	0.04-0.06
Diameter of mesopore min.	0.03 × 0.03	0.05
. max.	0.10 × 0.12	0.10
Diameter of acanthopore	0.01-0.04	0.01-0.02
No. of acanthopores per zooecium	0-6	0-5
No. of diaphragms per 1 mm. in zooecium in peripheral region	4-6	3-5
No. of diaphragms per 1 mm. in mesopores.	14-20	11-15
Width of peripheral region	1.2	2.0
Ratio: width of peripheral region of zooecium/total width of zooecium.	0.4	0.6

Remarks. The species is characterized by slender zoarial stems with wide peripheral regions in which the thickened, crenulate, and slightly beaded zooecial and mesopore walls are distinctly integrate and in which mesopores have closely spaced diaphragms and the zooecial tubes have widely spaced diaphragms. Acanthopores, if present, are not prominent.

Amplexopora thomasi is similar to *A. billingsi* (Bassler 1928) from the Ordovician (Cincinnatian) English Head and Vaureal Formations, Anticosti Island. *A. billingsi* has

EXPLANATION OF PLATE I

Figs. 1-10. *Amplexopora thomasi* sp. nov. 1, Tangential section showing integrate walls between zooecial tubes and mesopores, collection WM 1273, holotype GSM 102004, ×20. 2, Transverse section of a bilaminate colony showing narrow peripheral region of thickened walls, collection WM 1273, GSM 102005, ×20. 3, Part of longitudinal section in peripheral region showing thick, laminate zooecial walls and diaphragms in zooecial tubes and mesopores, collection WM 1274, GSM 102007, ×50. 4, Part of transverse section of bilaminate colony showing integrate, laminate zooecial walls in peripheral region, collection WM 1273, GSM 102005, ×50. 5, Part of a longitudinal section in the peripheral part of a ramose colony showing the finely crenulate zooecial walls, collection WM 1273, GSM 102004, ×20. 6, Part of a longitudinal section of a ramose colony showing very slender walls in the axial region and thickened walls in the peripheral region, collection WM 1274, GSM 102007, ×20. 7, Tangential section showing general arrangement of zooecial openings, collection WM 1274, GSM 102007, ×20. 8, Longitudinal section of a bilaminate colony showing diaphragms across zooecial tubes, collection WM 1265, GSM 102009, ×50. 9, Part of a longitudinal section in peripheral part of a colony showing integrate, laminate zooecial walls, and thin diaphragms, collection WM 1274, GSM 102007, ×100. 10, Tangential section showing distinct boundaries between adjacent zooecial walls, collection WM 1273, GSM 102004, ×50.

fewer zooecial openings per 2 mm., fewer mesopores, and more numerous diaphragms in the zooecial tubes. Both species have inconspicuous acanthopores, closely spaced diaphragms in the mesopores, and crenulate zooecial walls. *A. thomasi*, *A. pustulosa* Ulrich (1890) from the Ordovician (Cincinnatian) Waynesville Shale, Hanover, Ohio, and *A. ampla* Bassler (1904) from the Ordovician (Cincinnatian) Leipers Limestone, Nashville, Tennessee, are similar in the diameter of their zoarial stems and have about the same number of zooecia per 2 mm. *A. pustulosa* and *A. ampla* differ from *A. thomasi* in having diaphragms in the axial region, and *A. pustulosa* commonly has acanthopores at the junctions of the zooecial walls and has few mesopores in the peripheral region.

SYSTEM	SERIES	GROUP	FORMATION	MEMBER	
ORDOVICIAN	CINCINNATIAN	RICHMOND	ELKHORN		
			WHITEWATER	<i>Mesotrypa patella</i> <i>Homotrypa wortheni</i>	
			LIBERTY		
			WAYNESVILLE	<i>Amplexopora pustulosa</i>	
			ARNHEIM	<i>M. orbiculata</i>	
		MAYS-VILLE	McMILLAN	CORRYVILLE	<i>H. obliqua</i>
			FAIRVIEW	FAIRMOUNT	<i>H. dumosa</i> <i>H. obliqua</i> <i>A. ampla</i>
		EDEN			

TEXT-FIG. 3. General geologic column of formations and members in the Cincinnatian Series in south-western Ohio and south-eastern Indiana from which Bassler (1915) reported the bryozoan species that are here compared with the Caradocian species.

Amplexopora thomasi appears to have some similarity to *A. muchisoni* (Spjeldnaes 1957), the type of which is from 'Horderley', Shropshire, but its exact locality and stratigraphic position is not known. Unfortunately the type material of *A. muchisoni* is partly recrystallized so that recognition of the species is difficult. However, Spjeldnaes (1957, text-figs. 1a, b) illustrates the typical wall microstructure of species of *Amplexopora* and his text-fig. 1b appears to show small mesopores and also acanthopores at the junctions of the zooecial walls.

The species is named in honour of Dr. H. Dighton Thomas, British Museum (Natural History).

Family MONTICULIPORIDAE Nicholson
Genus MESOTRYPA Ulrich 1893

Type species. *Mesotrypa infida* (Ulrich 1886, p. 88).

Diagnosis. Colonies are discoidal, hemispherical, conical, or encrusting expanses. Lower surfaces of discoidal colonies are flat or concave. Polygonal or cylindrical zooecial tubes grow directly upwards from the basal lamina and are crossed by flat and curved diaphragms. Mesopores are present in both the proximal and distal parts of a colony and have closely spaced diaphragms. Zooecial openings are polygonal in some colonies and circular in others. Mesopore openings are rectangular or polygonal and may be very

small. Acanthopores are prominent where the zooecial openings are angular and mesopores are small, and they are small and indistinct in colonies where zooecial openings are round and mesopores are large. The zooecial and mesopore walls display a granular microstructure at low magnifications.

Mesotrypa bulmani sp. nov.

Plate 2, figs. 1–9; Plate 3, figs. 2, 4

Material. Collections WM 1262 (including paratype GSM 102003) and WM 1274 (including paratype GSM 102008), from the top part of Evenwood Quarry. Collection WM 1279 (including paratypes GSM 102011–102015), from the middle part of Evenwood Quarry. Collections RR 2635 (including paratype GSM 102016), RR 2636 (including paratype GSM 102019), RR 2637, and RR 2638, from the old quarry in the wood near Coundmoor Brook. Collections RR 2669 and RR 2672 (including holotype GSM 102017), Wylde's Quarry, near Harnage Grange. All collections from Hoar Edge Limestone, Hoar Edge Group; Caradoc Series; Ordovician.

Description. Many of the discoidal colonies, 10 to 13 mm. diameter at their bases, and 1 to 2 mm. high, have flat or concave bases. The encrusting colonies vary from small, cylindrical forms, 1.5 to 2 mm. in diameter, to broad, explanate forms that extend across fragmented shells and other material.

In tangential sections the zooecia are variable in size and shape. In a well-developed discoidal colony, GSM 102017, almost round zooecial openings and polygonal or rectangular mesopores fill the spaces between clusters of large, polygonal zooecial openings and a few mesopores. In these clusters where the mesopores are very few, acanthopores, 0.02 to 0.03 mm. in diameter, are present at the junctions of the zooecial walls (Pl. 2, fig. 7); where the mesopores are distinctly visible between the zooecia, the acanthopores are generally lacking (Pl. 3, fig. 4). In an encrusting form, GSM 102003, and a discoidal form, GSM 102015, the polygonal zooecial openings are separated by a few mesopores, and prominent acanthopores, 0.03 to 0.06 mm. in diameter, lie at the junctions of the zooecial walls (Pl. 2, fig. 8). Deeper tangential sections of colonies display more slender walls enclosing polygonal tubes (Pl. 2, fig. 5). Walls between zooecia and mesopores are slender and amalgamate.

In longitudinal sections the zooecial tubes may be slightly reclined for a short distance along the basal lamina (Pl. 2, fig. 4). Acanthopores and mesopores are commonly present a short distance above the basal lamina and extend to the distal parts of colonies.

EXPLANATION OF PLATE 2

Figs. 1–9. *Mesotrypa bulmani* sp. nov. 1, Part of longitudinal section of subperipheral and peripheral parts of colony showing diaphragms in the zooecial tubes and mesopores, collection WM 1279, GSM 102011, $\times 50$. 2, General aspect of transverse section, collection WM 1279, GSM 102012, $\times 20$. 3, Part of a longitudinal section of a multilaminar colony showing thin, granular walls in the peripheral region, collection RR 2635, GSM 102016, $\times 50$. 4, Longitudinal section of multilaminar colony showing slender zooecial walls and diaphragms in the zooecial tubes and mesopores, collection WM 1279, GSM 102013, $\times 20$. 5, Deep tangential section showing distinct acanthopores at the junctions of very slender zooecial walls, collection WM 1274, GSM 102008, $\times 50$. 6, Tangential section showing polygonal zooecial openings, numerous mesopores, and very fine acanthopores, collection RR 2636, GSM 102019, $\times 50$. 7, 8, Tangential sections showing distinct acanthopores at junctions of zooecial walls; collection RR 2672, holotype GSM 102017, $\times 50$; and collection WM 1262, GSM 102003, $\times 50$, respectively. 9, Oblique longitudinal section showing diaphragms in the mesopores and in the long zooecial tubes, collection WM 1279, GSM 102011, $\times 20$.

As the walls, mesopores, zooecial tubes, and acanthopores have some variation in their direction of growth, a longitudinal section may pass across and then back into a mesopore, acanthopore, or even a zooecial tube. The zooecial and mesopore walls thicken slightly as they extend to the periphery (Pl. 2, figs. 4, 9). The very slender zooecial walls have a very fine, laminate microstructure that commonly appears granular at low magnifications. The clear inner parts of the zooecial walls lining the zooecial tubes consist of fine laminae lying at 45 degrees to the inner boundary. The outer parts of adjacent zooecial walls appear as dark bands of intertonguing convexly curved, granular

TABLE 2
Measurements of *Mesotrypa bulmani* sp. nov. (in millimetres)

Catalogue no.	GSM 102017
No. of zooecia per 2 mm.	8-10
Diameter of zooecial opening	max. 0.22 × 0.22 min. 0.16 × 0.16
Diameter of zooecial opening in monticule	max. 0.29 × 0.29 min. 0.29 × 0.26
Combined thickness of adjacent zooecial walls in peripheral region	0.02
Diameter of mesopore	max. 0.10 × 0.15 min. 0.06 × 0.03
Diameter of acanthopore	0.01-0.03
No. of acanthopores per zooecium	2-4 in monticules
No. of diaphragms per 1 mm. in zooecium	6-8
No. of diaphragms per 1 mm. in mesopore	about 25

laminae. The thin diaphragms crossing the zooecial tubes and mesopores pass into the wall laminae after bending abruptly at the zooecial wall boundary. Acanthopores have slender, dark walls enclosing clear axial spaces. In encrusting forms the zooecia extend upright to the periphery and in discoidal forms the zooecial tubes curve broadly near the periphery (Pl. 2, figs. 4, 9). Diaphragms are present throughout the length of the zooecial tubes and are commonly flat, or convexly or concavely curved, and in the peripheral region may be more closely spaced and include additional kinds such as compound and cystoidal diaphragms (Pl. 2, fig. 4). The mesopores have closely spaced diaphragms throughout their length (Pl. 2, figs. 3, 4, 9).

Remarks. The species is characterized by small, commonly discoidal colonies with round or subpolygonal zooecial openings, sparsely distributed mesopores, abundant diaphragms throughout the length of the mesopores, widely spaced diaphragms in the zooecial tubes, and small acanthopores which are most prominent in the monticules.

Mesotrypa bulmani is similar to *M. infida* (Ulrich 1886, 1893) from 'the middle third of the Trenton Shales at Minneapolis' (= the *Rhinidictya* and *Ctenodonta* beds of Ulrich 1893, p. 1) in the form of the zoarium and the shape of the zooecial openings. *M. bulmani* has smaller zooecial openings both in and between the monticules, has fewer acanthopores per zooecium, and lacks funnel-shaped diaphragms. *M. bulmani* resembles *M. orbiculata* Cumings and Galloway (1913) from the Ordovician (Cincinnati) Arnheim Formation near Harmon's Station, Indiana, in the size and form of the colonies,

and in the arrangement of the diaphragms in the zooecial tubes and mesopores. *M. bulmani* has a greater number of zooecia per 2 mm., fewer and smaller mesopores between the zooecia, and generally smaller acanthopores. *M. bulmani* resembles *M. patella* (Ulrich 1890) from the Ordovician (Cincinnatian) Whitewater Formation, Oxford, Ohio, in having about the same number of zooecia per 2 mm., small acanthopores of about 0.02 mm. diameter, and in the arrangement of diaphragms in the mesopores and zooecial tubes. *M. bulmani* has fewer mesopores between the zooecial openings in smaller colonies.

The species is named in honour of Professor O. M. B. Bulman, Sedgwick Museum, Cambridge.

Genus HOMOTRYPA Ulrich 1882

Type species (by original designation). *Homotrypa curvata* Ulrich (1882, p. 242, pl. 10, figs. 7, 7a-d).

Diagnosis. Colonies are ramose and encrusting. Monticules may be present. In tangential sections, wide integrate zooecial walls enclose polygonal or subpolygonal zooecial openings. Acanthopores with dense, concentrically laminate walls commonly occur at the junctions of zooecial walls. Mesopores are sparse and may be present only in clusters. In longitudinal sections zooecial walls are thin in the axial region and thicken in the peripheral region where they display a laminate microstructure. The thick laminae of the diaphragms and cystiphragms pass into the wall laminae and form part of the zooecial walls. These wall laminae are steeply inclined to the boundary of the zooecial tube and laminae of adjacent walls abut in an irregular dark band or line. Cystiphragms and diaphragms are abundant in the peripheral region.

Homotrypa sp. A

Plate 3, figs. 1, 3, 5, 6

Material. Single fragment of a colony in collection WM 1265, from the top of Evenwood Quarry; Hoar Edge Limestone, Hoar Edge Group; Caradoc Series; Ordovician. Figured specimen GSM 102010.

Description. The specimen is part of a ramose colony. In tangential sections polygonal mesopores are distributed around the polygonal and subpolygonal zooecial openings

EXPLANATION OF PLATE 3

Figs. 1, 3, 5, 6. *Homotrypa* sp. A. Collection WM 1265, GSM 102010. 1. Tangential section showing general arrangement of zooecial openings and clusters of large zooecia, $\times 20$. 3. Tangential section showing subpolygonal zooecial openings, mesopores, and crescentic lines of cystiphragms curving across zooecia, $\times 50$. 5. Part of an oblique transverse section in the peripheral region showing curved laminate microstructure of zooecial walls, $\times 50$. 6. Part of a longitudinal section in the subperipheral and peripheral regions showing cystiphragms lining the zooecial tubes and diaphragms crossing the zooecial tubes, $\times 50$.

Figs. 2, 4. *Mesotrypa bulmani* sp. nov. 2. Transverse section of a small colony showing the slender zooecial walls and mesopores with closely spaced diaphragms, collection WM 1279, GSM 102014, $\times 20$. 4. Tangential section showing general arrangement of zooecial openings, collection RR 2672, GSM 102017, $\times 20$.

Figs. 7-9. *Homotrypa* sp. B. Collection RR 1481, GSM 102018. 7. Part of an oblique longitudinal section in the peripheral region showing cystiphragms and diaphragms in the zooecial tubes, $\times 50$. 8. General aspect of longitudinal section in peripheral region showing closely spaced diaphragms and cystiphragms in zooecial tubes, $\times 20$. 9. Tangential section showing distinct acanthopores at the junctions of zooecial walls, $\times 50$.

(Pl. 3, figs. 1, 3). Dense acanthopores are occasionally observed at the junctions of the zooecial walls and they may indent the inner parts of the zooecial walls into the zooecial tubes. Curved cystiphragms cross the zooecial openings (Pl. 3, fig. 3). The zooecial walls are generally integrate but may also appear amalgamate.

In longitudinal sections the zooecial tubes curve in a broad arc and are oblique to the periphery (Pl. 3, fig. 6). In the peripheral region the zooecial walls thicken and display a laminate microstructure. The inner parts of the zooecial and mesopore walls consist of steeply inclined laminae and the laminae of adjacent zooecial walls intertongue and abut in a steeply pitched arc to form a dark, outer band (Pl. 3, fig. 5). Cystiphragms commonly located only on the distal wall in the peripheral region are widely spaced so that adjacent cystiphragms are not always in contact (Pl. 3, fig. 6). Widely spaced, flat diaphragms cross the zooecial tubes in the peripheral region. The mesopores lack diaphragms and acanthopores were not readily observed in longitudinal sections.

TABLE 3
Measurements of *Homotrypa* sp. A (in millimetres)

Catalogue no.	GSM 102010
Diameter of zoarial stem	3-5
No. of zooecia per 2 mm.	9-10
Diameter of zooecial opening	0.18 × 0.16
max.	0.13 × 0.13
min.	0.02-0.04
Combined thickness of adjacent zooecial walls in peripheral region	0.08 × 0.06
Diameter of mesopore	0.02 × 0.03
max.	0.01
min.	0-4
Diameter of acanthopore	0-2
No. of acanthopores per zooecium	0.77
No. of diaphragms per 1 mm. in zooecium in peripheral region	0.41
Width of peripheral region	
Ratio: Width of peripheral region of zooecium/total width of zooecium	

Remarks. The species is characterized by slender, ramose stems in which the peripheral region contains very slender zooecial walls and very few diaphragms and few cystiphragms, the latter generally located on the distal zooecial walls. Acanthopores are sparse, and mesopores are numerous.

Homotrypa sp. A, which is represented by a single specimen in the collections studied, is similar to a rare species, *H. dumosa* Bassler (1903), from the Ordovician (Cincinnatian) Fairmount Member of the Fairview Formation at Covington, Kentucky, and Cincinnati, Ohio. The two species are similar in having slender zooecial walls in the peripheral region and in having few acanthopores, few diaphragms, and few cystiphragms in the peripheral region. Insufficient material does not permit adequate definition of this species from the Hoar Edge Limestone.

Homotrypa sp. B

Plate 3, figs. 7-9

Material. A single fragment of a colony in collection RR 1481, The Wilderness, 18 chains north-west of Wilstone Farm House; Hoar Edge Limestone, Hoar Edge Group; Caradoc Series; Ordovician. Figured specimen GSM 102018.

Description. The specimen is part of a ramose colony with overgrowths. In tangential sections the subpolygonal zooecial openings are crossed by cystiphragms (Pl. 3, fig. 9). Prominent acanthopores with dense, laminate walls and a clear axial region lie at the junctions of the zooecial walls and may project into the zooecial tubes. An occasional acanthopore penetrates the sides of the zooecial walls. Mesopores are rare and, if present, occur as small polygonal structures between the zooecia. The zooecial walls are generally integrate.

In longitudinal sections, which display mainly the peripheral region and only the crushed, delicate walls of the axial region, the zooecial tubes are filled with flat and cystoidal diaphragms and overlapping cystiphragms (Pl. 3, figs. 7, 8). The inner parts of the zooecial walls consist of steeply inclined laminae and laminae of adjacent zooecial walls intertongue in a distally convex arc which extends distally as a dark, rolled band. The thick laminae forming the diaphragms and the cystiphragms pass into the wall laminae. Acanthopores appear as long, clear tubes cutting through the zooecial walls.

TABLE 4
Measurements of *Homotrypa* sp. B (in millimetres)

<i>Catalogue no.</i>	<i>GSM 102018</i>
Diameter of zoarial stem	6-9
No. of zooecia per 2 mm.	8-9
Diameter of zooecial opening	max. 0.23 × 0.22
min.	0.10 × 0.10
Combined thickness of adjacent zooecial walls in peripheral region	0.02-0.06
Diameter of mesopore	max. 0.06 × 0.02
min.	0.03 × 0.02
Diameter of acanthopore	0.03-0.05
No. of acanthopores per zooecium	0-2
No. of diaphragms per 1 mm. in zooecium in peripheral region	10-11

Remarks. This species is characterized by a peripheral region which has thick zooecial walls, few but distinct acanthopores, few mesopores, and numerous cystiphragms and diaphragms.

Homotrypa sp. B and *H. obliqua* Ulrich (1882) from the Ordovician (Cincinnatian) Fairmount and Corryville Members at Cincinnati, Ohio, are similar in having about the same number of zooecia per 2 mm., few mesopores, and a similar arrangement of diaphragms and cystiphragms. *Homotrypa* sp. B has larger, more prominent acanthopores. *Homotrypa* sp. B and *H. wortheni* (James 1882; Bassler 1903) from the Whitewater Formation at Oxford, Ohio, and Richmond, Indiana, are similar in having about the same number of zooecia per 2 mm., few mesopores, and thick zooecial walls in the peripheral region. *Homotrypa* sp. B has fewer and more prominent acanthopores.

Insufficient material does not permit adequate definition of this species from the Hoar Edge Limestone.

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COLLECTION LOCALITIES

HOAR EDGE LIMESTONE

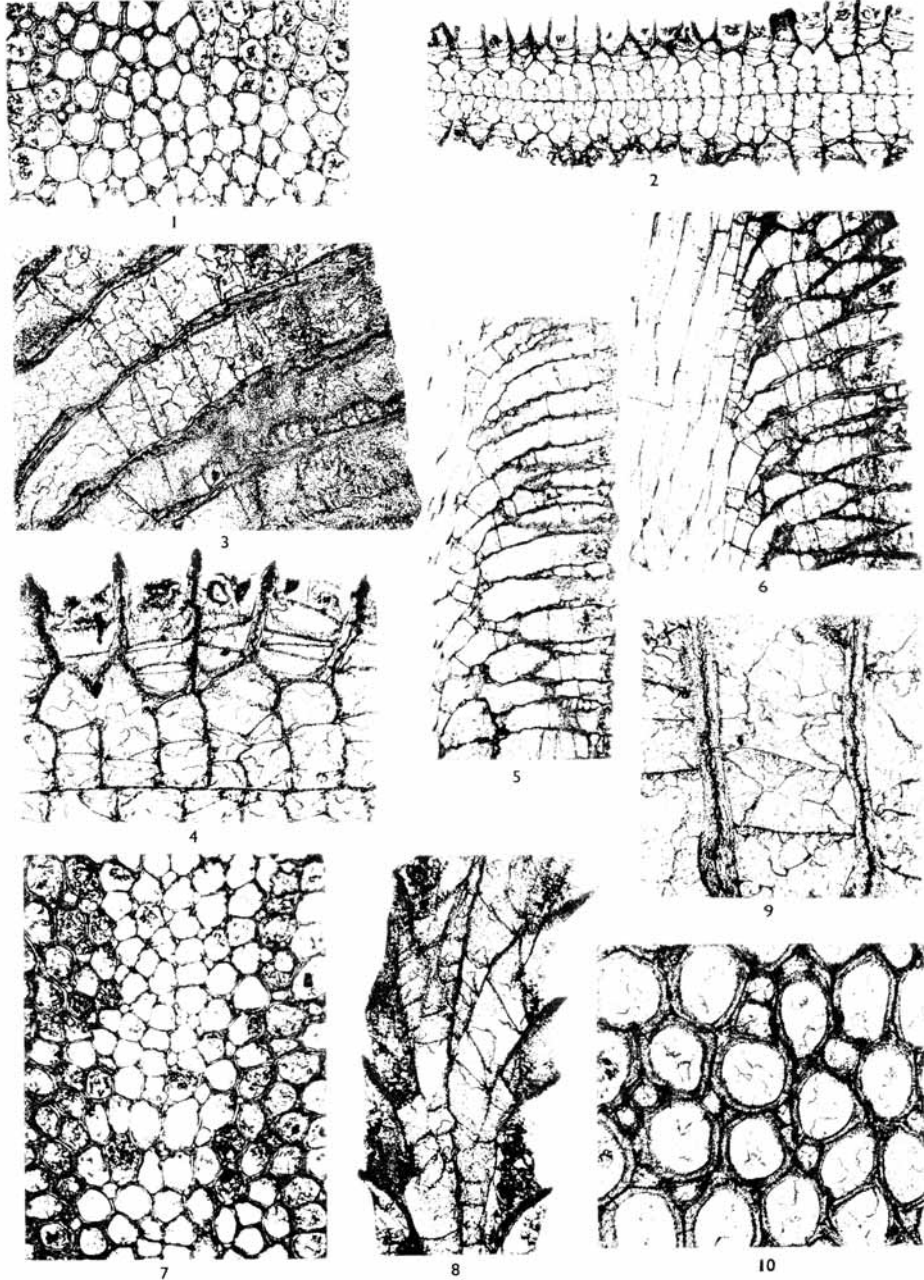
- WM 1262, WM 1265, WM 1267, WM 1273, and WM 1274, from the upper part of Evenwood Quarry at the east end of Black Dick's coppice, 300 yards south of Evenwood, Shropshire: WM 1262 has *Phaenopora stubblefieldi* and *Mesotrypa bulmani*; WM 1274 has *Amplexopora thomasi*, *M. bulmani*, and *P. stubblefieldi*; WM 1267 has *A. thomasi* and *P. stubblefieldi*; WM 1273 has *M. bulmani*, *A. thomasi*, and *P. stubblefieldi*; WM 1265 has *A. thomasi*, *Homotrypa* sp. A, *P. stubblefieldi*, and *Mesotrypa* sp.
- WM 1279, from the middle part of Evenwood Quarry at the east end of Black Dick's coppice, 300 yards south of Evenwood, Shropshire: *Amplexopora thomasi* and *Mesotrypa bulmani*.
- RR 1481, The Wilderness, 18 chains north-west of Wilstone Farm House, Shropshire: *Homotrypa* sp. B, *Amplexopora*? sp.
- RR 2635, RR 2636, RR 2637, and RR 2638, old quarry in the wood near Countmoor Brook, over $\frac{1}{2}$ mile south-west of Harnage Grange, Shropshire: *Mesotrypa bulmani*. Locality as indicated by Pocock *et al.* (1938, fig. 28).
- RR 2669 and RR 2672, Wylde's Quarry, 30 chains south-west of Harnage Grange, Shropshire: *Mesotrypa bulmani*. Locality as indicated by Pocock *et al.* (1938, fig. 28).

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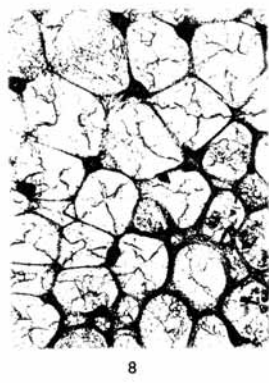
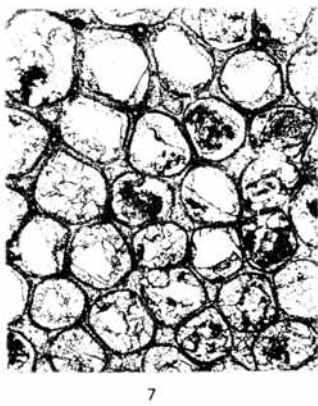
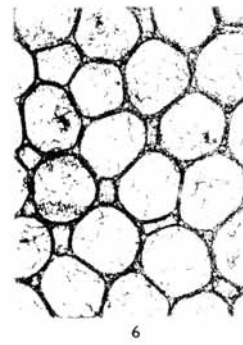
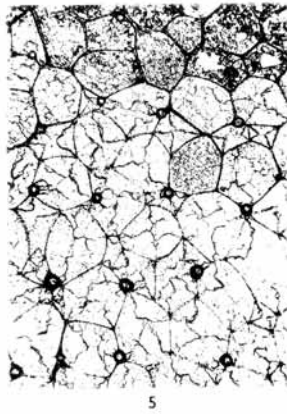
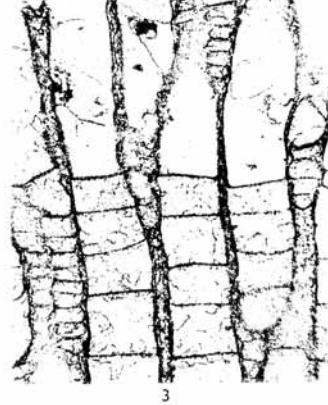
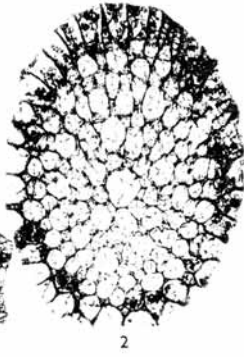
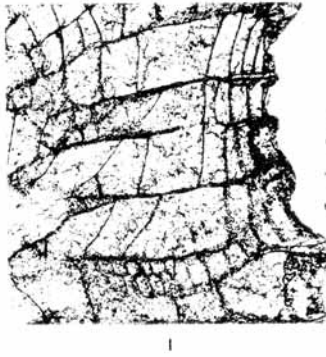
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JUNE R. P. PHILLIPS ROSS
Illinois State Geological Survey,
Urbana, Illinois, U.S.A.

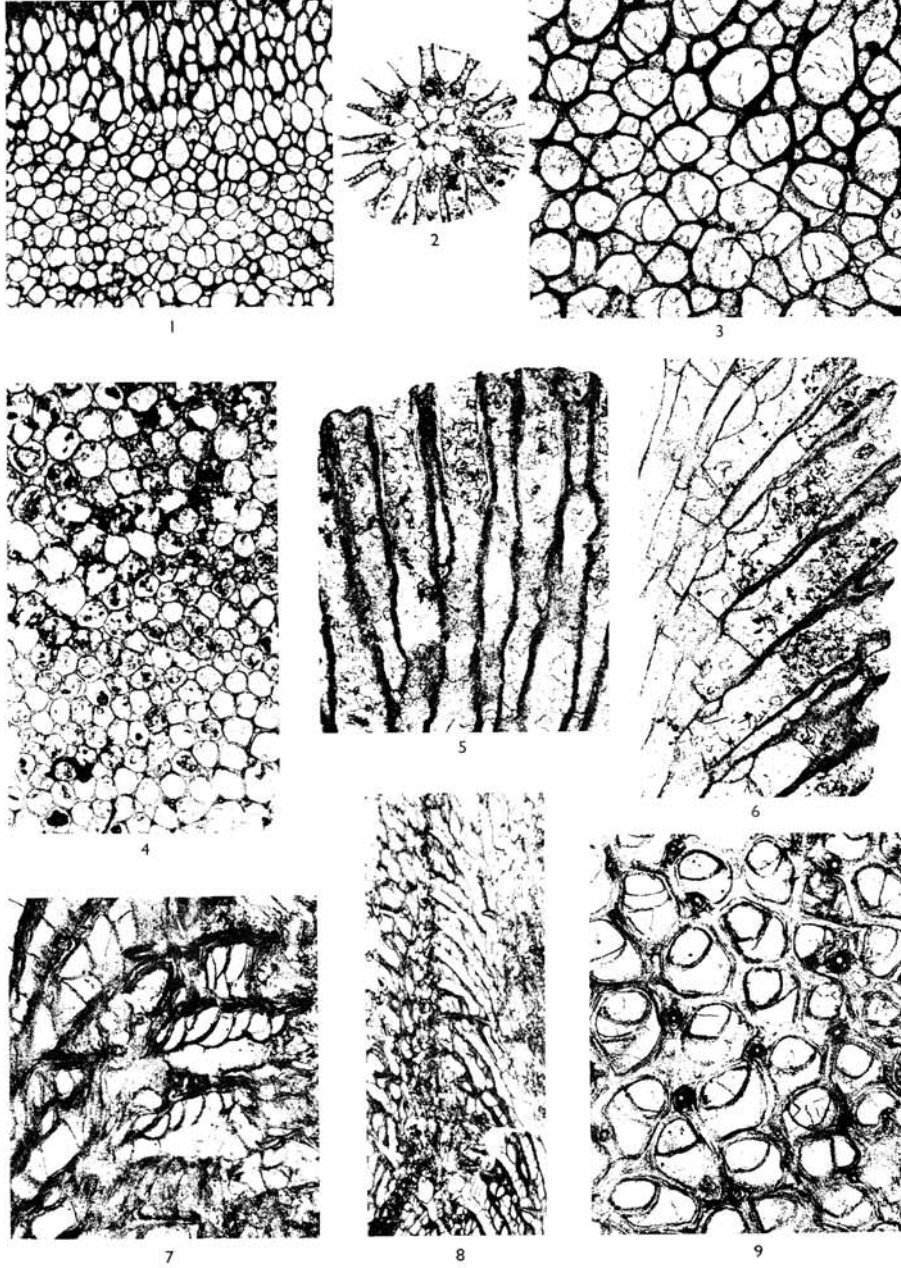
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