SOME LATE SILURIAN BRYOZOA FROM THE CANADIAN ARCTIC ISLANDS

by THOMAS E. BOLTON

ABSTRACT. One new species of trepostome *Diplotrypa franklini*, and two species of cyclostome *Fistulipora(?) mutabilis* Hennig and *Cyclotrypa silurica* Hennig originally described from the Ludlovian rocks of Gotland are characteristic of the Early Ludlovian shelly faunas scattered throughout the Canadian Arctic Islands.

BRYOZOA form only a small part of the Silurian shelly faunas collected from various islands in the Canadian Arctic Archipelago. However, some species are rather widespread and through their similarity with precisely dated fauna on the Island of Gotland assist in the regional correlation of the associated rock units.

In North America, Llandoverian and Wenlockian bryozoan faunas have been detailed by Bassler (1906, 1928) and Perry and Hattin (1960) but, with the exception of the Bryozoa of the Tonoloway Formation of West Virginia (Bassler 1923), Ludlovian Bryozoa are little known. In contrast, the Silurian Bryozoa of the Soviet Republic of Tuva have been studied in great detail by Astrova (1959, 1965), and recently the Ludlovian Bryozoa of Great Britain have been discussed by Owen (1960, 1962). Certain elements of both these faunas, especially among the Cyclostomata, are closely related to the Canadian Arctic bryozoan faunas. A still closer relationship is evident, however, between the Canadian species and forms described by Hennig (1905, 1906, 1908) from the Island of Gotland. Several species or closely related forms characteristic of the Early and Middle Ludlovian Hemse and Hamra Groups (Hede 1960) have been identified in the '*Atrypella schei* faunas' of the Read Bay Formation on Somerset, Cornwallis, and south-western Devon Islands and of the Douro Formation on north-western Devon Island (text-fig. 1). The most abundant form is the trepostome *Diplotrypa franklini* sp. nov., mainly from Early Ludlovian rocks, but in addition identified in Late Silurian or Early Devonian strata in east-central Ellesmere Island. Associated with this species are the cyclostomes *Fistulipora(?) mutabilis* Hennig and *Cyclotrypa silurica* Hennig, the cryptostome *Fenestella sp.*, and poorly preserved trepostomes of the genus *Eridotrypa*. Among the latter is a specimen (GSC No. 20430, Read Bay Formation, Cornwallis Island) with zooecia 0·25–0·3 mm. in diameter and rare diaphragms that is closer to *Eridotrypa umbonensis* Owen (1962, p. 203) from the Lower Bringewood Beds of the Welsh borderland than to *E. ramea* Hennig (1908, p. 38) with its more numerous diaphragms found within the Hemse Group.

SYSTEMATIC DESCRIPTIONS

Order TREPOSTOMATA Ulrich 1882
Genus DIPLOTRYPA Nicholson 1879

Type species. Favosites petropolitanus Pander 1830

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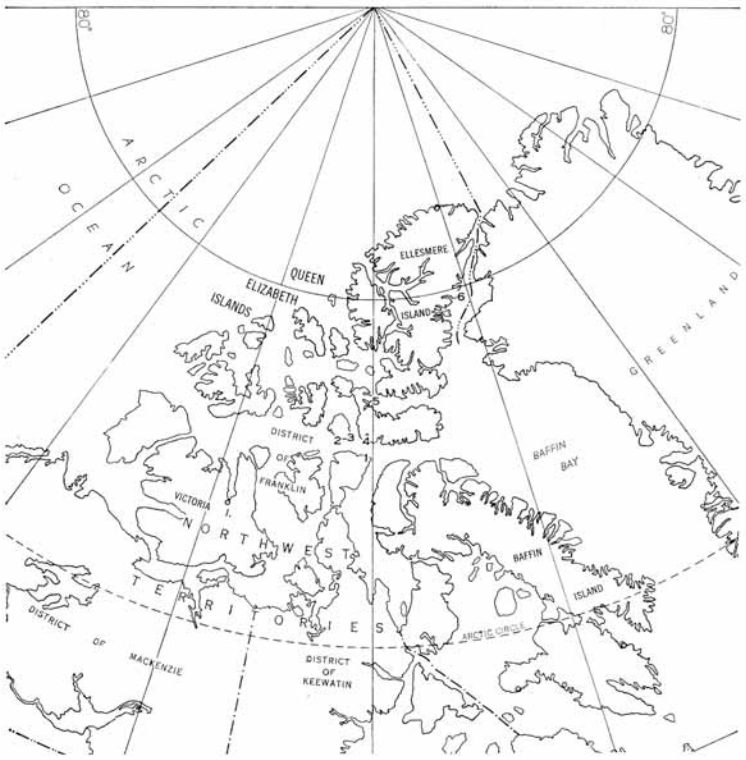
Diplotrypa franklini sp. nov.

Plate 81, figs. 1–6; Plate 82, fig. 4

1958 *Mesotrypa sp.* cf. *M. suprasilurica* Hennig; Thorsteinsson, pp. 49, 50, 52, 67.
1963 *M. suprasilurica* Hennig; Fortier *et al.*, pp. 132, 205.
1963 *M.* cf. *M. suprasilurica* Hennig; ibid., p. 240.
1965 *M. sp.* cf. *M. suprasilurica* Hennig; Bolton, p. 12.



TEXT-FIG. 1. Late Silurian bryozoan localities Canadian Arctic Archipelago. 1. Cape Admiral M'Clintock, Somerset Island. 2. Resolute Bay area, Cornwallis Island. 3. Goodsir Creek, Cornwallis Island. 4. Radstock Bay, Devon Island. 5. Colin Archer Peninsula, Devon Island. 6, Darling Peninsula, Ellesmere Island.

EXPLANATION OF PLATE 81

Figs. 1–6. *Diplotrypa franklini* sp. nov. 1. Longitudinal section multilaminate colony, paratype GSC 20425, ×23. 2. Tangential section showing large mesopores, paratype GSC 20423, *c.* ×32. 3, 5, 6. Tangential and longitudinal sections, holotype GSC 20421, *c.* ×32 and ×100. 4. Tangential section, paratype GSC 20422, *c.* ×32.

Description. Zoaria vary from small, cylindrical to subhemispherical to shallow conical mounds, some concentric layered; largest is 45 mm. wide and 30 mm. high; suggestion of a few low small monticules.

In tangential section, the zooecia are polygonal to subrounded, the openings slightly more oval where the zooecial walls are thicker (paratype 20425), 0·20–0·22 mm. in diameter, with a minimum of 0·15 mm. and a maximum of 0·28 mm. Generally eight to ten zooecia are present in 2 mm. Single rows of subtriangular to rectangular mesopores completely isolate, form a half circle, or are lacking from between zooecial openings, the arrangement varying within one complete colony horizontally and vertically, as well as between layers within a multilaminate colony (paratype 20425). Diameter of mesopores normally 0·1 to 0·15 mm., but some of the more rectangular mesopores extend up to 0·3 mm. (Pl. 81, fig. 2). Walls between mesopores and zooecial openings clear, amalgamate (?), thin (Pl. 81, fig. 6). Rare megacanthopore-like structures are confined to thickened walls at zooecial junctions, localized in paratype 20422, larger and more numerous in paratype 20426; absent from most colonies.

In longitudinal sections of multilaminate colonies, the normally erect zooecia and mesopores both may be inclined for a very short distance along the basal laminae. Thin diaphragms are present throughout the length of the zooecial tubes, horizontal to slightly oblique, but abruptly bending up at the boundary of the zooecial wall, 0·2 to 0·3 mm. apart (four to six per 1 mm.) with a minimum of 0·15 mm. and a maximum of 0·45 mm. (paratype 20423). Diaphragms much closer in mesopores, 0·1 mm. apart normally (ten to eleven per 1 mm.). Mesopores are continuous throughout zoaria, walls often curved inward at diaphragms. Walls clear, skeletal microstructures not preserved, of equal thickness throughout length of tubes.

Discussion. This new species is assigned to *Diplotrypa* rather than to *Mesotrypa* because of the absence or rarity of acanthopores and cystiphragms, despite amalgamate (?) walls characteristic of the latter genus. *Diplotrypa franklini* differs from *D. nummiformis* (Hall), from the Rochester and Osgood Formations (Niagaran) of New York and Indiana States, in that the latter discoidal species has more closely spaced, more inclined diaphragms and normally six to seven zooecia in 2 mm. (Bassler 1906, p. 27; Perry and Hattin 1960, p. 707). *D. walkeri* Bassler (1906, p. 47) from the Rochester Formation of Ontario and New York State and *D. neglectoformis* Astrova (1959, p. 26) from the Wenlockian both have larger zooecia, discontinuous mesopores, and fewer diaphragms.

Mesotrypa suprasilurica Hennig (1908, p. 30, text-figs. 35–37), principally from the Late Llandoverian (Hede 1921, p. 31) but also recorded from the Early Ludlovian of Gotland, with which this new species was originally compared, is identical in zoarial form. It differs in that the species has more distinct acanthopores, some with rounded lumen often projecting into the hollow of the zooecial tubes and more oblique or funnel-shaped diaphragms. '*Prasopora*' [= *Diplotrypa?*] *gotlandica* Hennig (1908, p. 28) from the Early Ludlovian Hemse Group of Gotland has smaller zoaria and some cystiphragm-like and closer diaphragms. Astrova (1959, p. 29) has suggested that some of the species assigned to *Mesotrypa* that lack cystiphragms and acanthopores might be included in her Wenlockian genus *Mesotrypella*. This genus characteristically has branched colonies, with rounded or subrounded zooecial openings, oblique or flexed diaphragms, and very undulating walls of constant thickness throughout the entire colony, whereas *Diplotrypa*

has massive colonies and straight or slightly flexed walls. Specimens of *D. franklini* lacking acanthopores nevertheless have many features in common with *Mesotrypella alashensis* Astrova.

Distribution and types. D. franklini is most abundant in the Lower Ludlovian Member A of the Read Bay Formation, 459 to 731 ft. (holotype 20421; paratypes 20422, 20423) and at 1,365 ft. below the top on Goodsir Creek on the central-east coast of Cornwallis Island. Additional specimens have been identified 22 ft. above the base of Upper Ludlovian Member C of the Read Bay Formation at the same locality and in Member A near Resolute Bay, central-south coast of Cornwallis Island; upper beds of the Read Bay Formation, Cape Admiral M'Clintock, north coast of Somerset Island (paratype 20424) and the west side of Radstock Bay, south-western Devon Island (paratype 20425); lower beds of the Douro Formation, Colin Archer Peninsula, north-western Devon Island; and 3,380 to 3,400 ft. above base of undifferentiated Allen Bay–Read Bay Formation (Late Silurian or Early Devonian) on Darling Peninsula, east-central Ellesmere Island (paratype 20426).

Order CYCLOSTOMATA Busk 1852
Genus FISTULIPORA M'Coy 1850

Type species. Fistulipora minor M'Coy 1850

Fistulipora (?) *mutabilis* Hennig 1908

Plate 82, figs. 2, 5, 7, 8

1908 *Fistulipora mutabilis* Hennig, p. 19, pl. 2, figs. 1–7; pl. 7, figs. 3, 4; text-figs. 21–23.
1958 *F. sp.* cf. *mutabilis* Hennig; Thorsteinsson, pp. 50, 59.

Description. Zoaria thin small expansions, largest over 13 mm. long and 26 mm. thick.

In tangential section, the zooecial openings are oval, 0·2–0·25 mm. in diameter ranging between 0·18 to 0·3 mm., four to five zooecia in 2 mm. Lunaria are poorly developed, broadly arched to slightly indenting zooecial cavities, lacking or obscure on most zooecia. Vesicles subpolygonal or polygonal, variable in size and number, at least one between adjacent zooecia.

In longitudinal section, zooecia are recumbent near the base of a colony, erect with thin walls throughout the remainder of the zoarium. Diaphragms are rare, thin, horizontal. Zooecia are separated by single polygonal tubes, 0·1 mm. in diameter with closely spaced horizontal diaphragms, by interlocking tubes of varying diameter and horizontal or convex diaphragms, or by vesicles; the latter structures are particularly well developed in early stages of growth (Pl. 82, fig. 7). Thickness of these compound zones ranges between 0·4 and 0·7 mm.

Discussion. Similar species include *F. strawi* Owen, but with fewer intervening vesicles, and certain forms of *F. promiscua* Perry and Hattin with barely discernible lunaria. As

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EXPLANATION OF PLATE 82

Figs. 1, 3. *Cyclotrypa silurica* Hennig. Longitudinal and tangential sections, GSC 20429, ×23.
Figs. 2, 5, 7, 8. *Fistulipora* (?) *mutabilis* Hennig. 2, 7. Tangential and longitudinal sections, GSC 20427, ×25. 5, 8. Longitudinal section showing complete colony and enlargement of upper right corner, GSC 20428, ×10 and ×23.
Fig. 4. *Diplotrypa franklini* sp. nov. Tangential section showing a few acanthopores, paratype GSC 20426, ×23.
Fig. 6. *Cheilotrypa ostiolata* (Hall). Longitudinal section to show irregular axial canal, GSC 20431, ×10.

many zooecia of *F. mutabilis* apparently lack lunaria, or where developed the lunaria are inconspicuous, this species might equally be assigned to *Cyclotrypa* Ulrich 1896. Specimen No. 20428 (Pl. 82, figs. 5, 8) with its dense stereom (?) and pseudo-ramose habit is strikingly similar in both tangential and longitudinal sections to *Cheilotrypa? opinabilis* Astrova (1965, p. 156, pl. 13, figs. 2*a*, *c*) from the Lower Ludlovian. The irregular central filling is 3·4 to 4·6 mm. thick in the Canadian specimen and between 0·18 and 2·8 mm. thick in the Russian specimen. In neither specimen is a true irregular axial canal or adjacent non-tabulated vertical zooecia characteristic of *Cheilotrypa* (*C. ostiolata* (Hall) from the Rochester Formation at De Cew Falls, Southern Ontario, Pl. 82, fig. 6) evident in the central filling; accordingly the Canadian form is interpreted as an encrusting form of *Fistulipora mutabilis*.

Distribution and types. Lower Ludlovian Member A of the Read Bay Formation, 618 and 698 ft. below the top (GSC Nos. 20427, 20428), Goodsir Creek on central-east coast, and upper beds of the Read Bay Formation near Resolute Bay, central-south coast of Cornwallis Island. The syntypes were from the Early Ludlovian Hemse Group (Hede 1921, p. 57), but the species was recognized by Hennig throughout the Late Llandoverian to Middle Ludlovian strata of Gotland.

Genus CYCLOTRYPA Ulrich 1896

Type species. Fistulipora communis Ulrich 1890.

Cyclotrypa silurica Hennig 1908

Plate 82, figs. 1, 3

1908 *Cyclotrypa silurica* Hennig, p. 24, pl. 1, fig. 19; pl. 4, figs, 8, 9; text-figs. 26–29.
1958 *C. sp.* cf. *C. silurica* Hennig; Thorsteinsson, pp. 49, 50.

Description. Zoarium cylindrical, branching, up to 12 mm. in diameter.

In tangential section, zooecia are thin walled, oval, 0·2 mm. in diameter with a maximum of 0·28 mm., five zooecia in 2 mm. Lunarium undeveloped. Adjacent zooecia nowhere in contact, separated by at least one polygonal vesicle; interzooecial distance ranges from 0·1 mm. to more than 0·4 mm.

In longitudinal section, zooecia open obliquely to the zoarial surface, thin walled, with a few thin, horizontal diaphragms in both axial and peripheral regions up to 0·8 mm. apart. The interzooecial tissue normally is vesicular; in single tubes the cystiphragm-like diaphragms are 0·1 to 0·3 mm. apart, closest in the peripheral regions.

Discussion. The branching form and cystiphragm (?) structure of *C. silurica* allies it with the Ludlovian species *Fistuliramus sinensis* Astrova (1965, p. 153, pl. 12, figs. 2*a–d*; pl. 13, figs. 1*a*, *b*), but it lacks the lunaria and heavy concentration of 'cystiphragms' in the peripheral zone characteristic of that genus.

Distribution and types. This species was identified from collections 331 (GSC No. 20429) and 618 ft. below the top of the Lower Ludlovian Member A of the Read Bay Formation, Goodsir Creek, central-east coast of Cornwallis Island. The syntypes were from the Middle Ludlovian Hamra Group (Hede 1921, p. 76) but the species also was recognized by Hennig in the Late Llandoverian, Wenlockian, and Early Ludlovian strata of Gotland.

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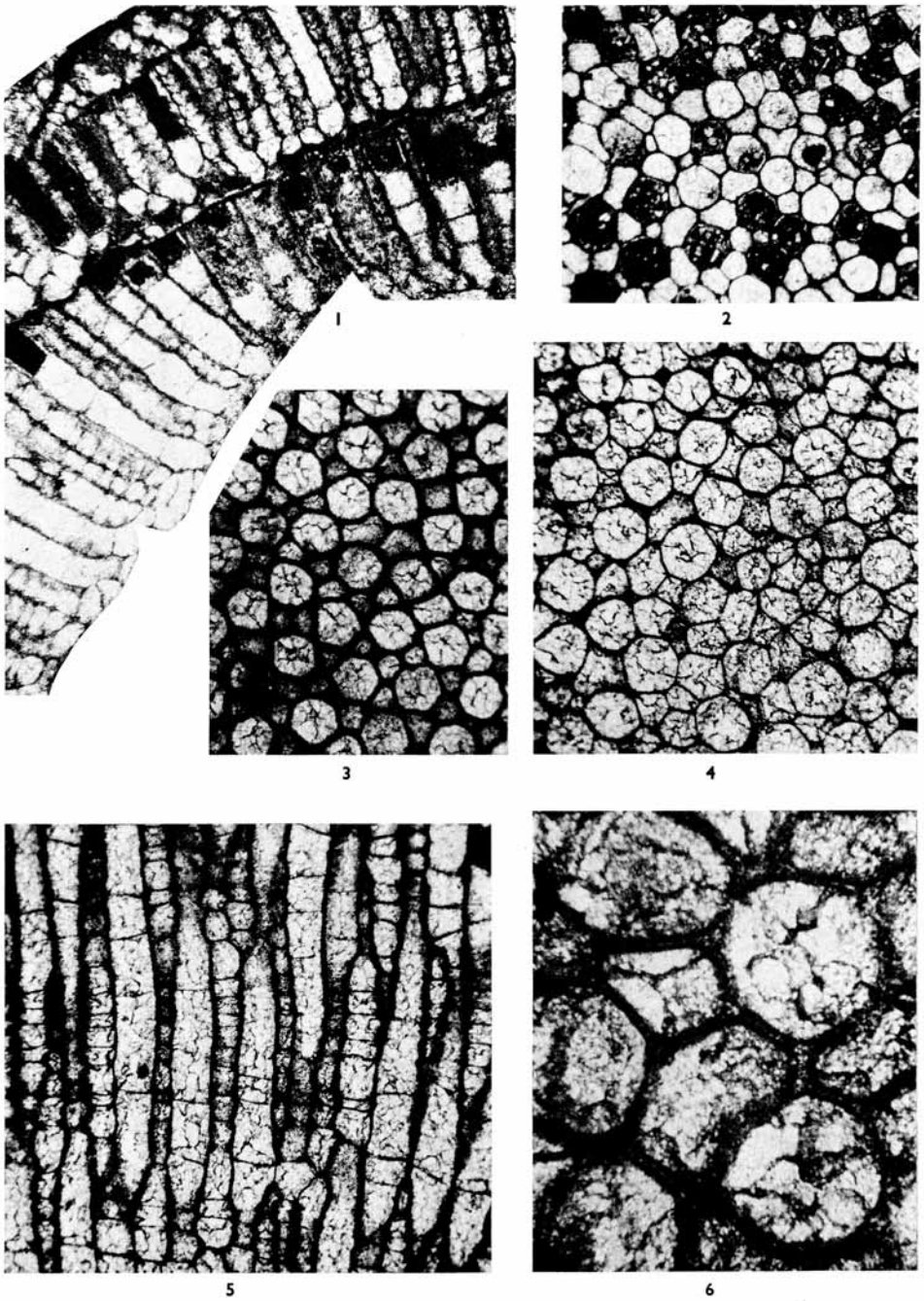
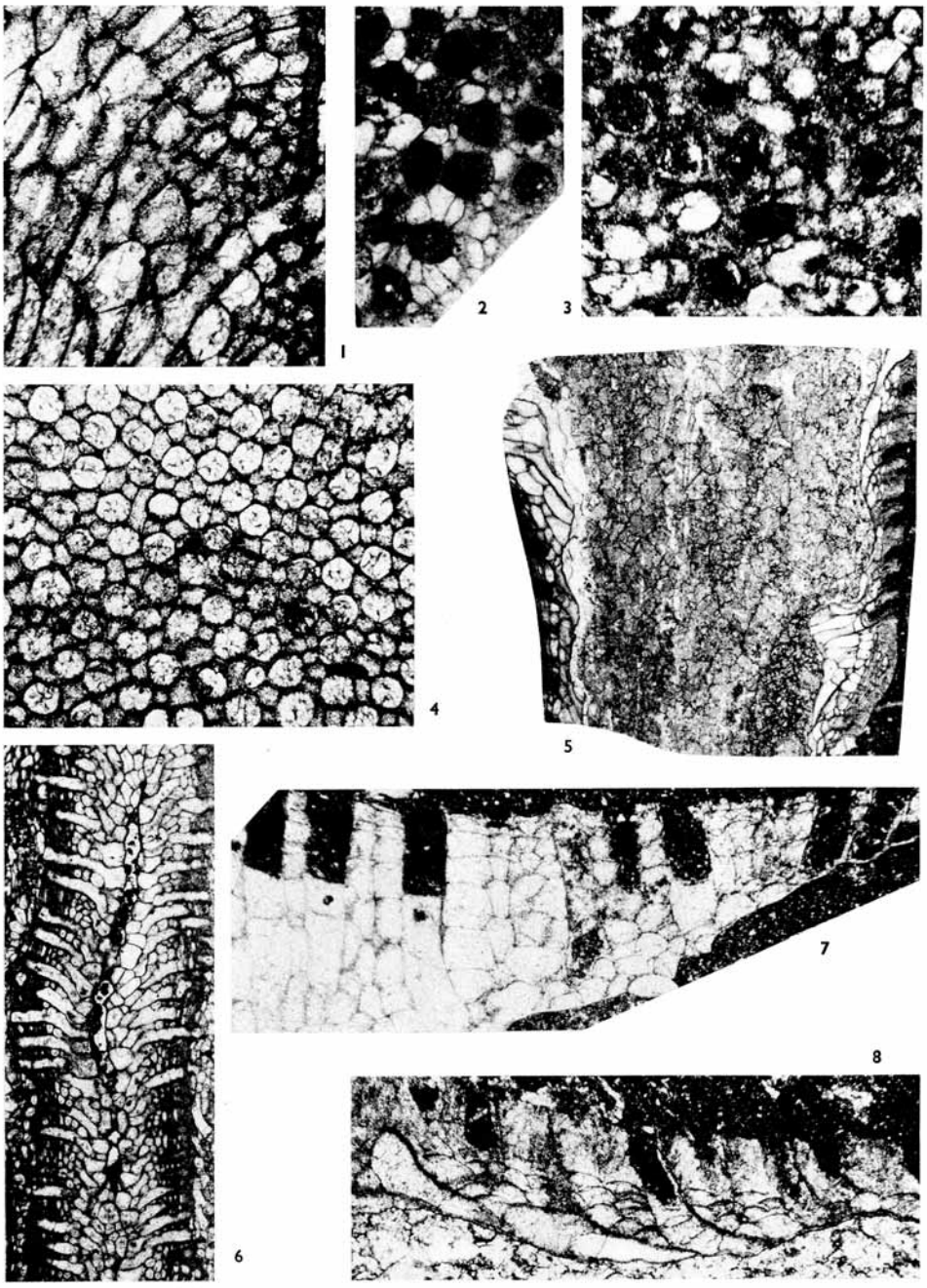


BOLTON, Silurian Bryozoa from Canada



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