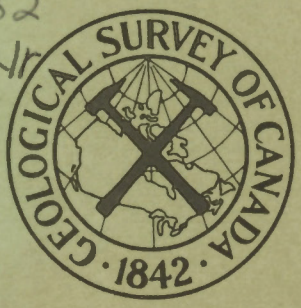

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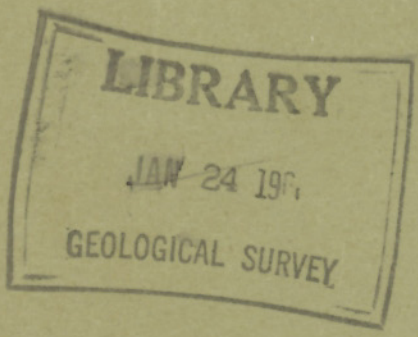

SOME SILURIAN STROMATOPOROIDS FROM NORTHWESTERN BAFFIN ISLAND, DISTRICT OF FRANKLIN

(Report, 2 figures and 4 plates)

A.A. Petryk

Price, $2.00

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ABSTRACT

Two separate and distinct stromatoporoid faunas occur in the carbonate facies of the Baillarge and Cape Crauford Formations, which comprise the Brodeur Group (late Middle Ordovician to Niagaran). The faunas indicate a Lower to Middle Silurian (Upper Llandovery to Wenlock) age.

Among the fourteen species described are new species of Clathrodictyon (C. lenticulare, C. miniapse), Intexodictyon (I. brodeurense), ? Gerronostroma (G. juvene), Stromatopora (S. baffinensis, S. baillargensis), and Actinodictyon (A. crispatum).

SOME SILURIAN STROMATOPOROIDS FROM NORTHWESTERN BAFFIN ISLAND, DISTRICT OF FRANKLIN

INTRODUCTION

The stromatoporoids described in this paper were collected from Brodeur Peninsula, northwestern Baffin Island, District of Franklin. Fourteen species of six genera are described from rocks of Lower and Middle Silurian (Late Llandoverian to Wenlockian) age. This study is the first attempt to establish stromatoporoid range zones (biozones) in the Canadian Arctic.

Type specimens are in the Geological Survey of Canada type collection, Ottawa.

ACKNOWLEDGMENTS

Professor C.W. Stearn acted as the writer's advisor at McGill University. Stratigraphic information is taken from H.P. Trettin (1965a, b). The research was supported by the Ministère des Richesses Naturelles, Quebec, and National Research Council, Ottawa.

STRATIGRAPHY

The Brodeur Group (Trettin, 1965a, p. 156) is composed of the Baillarge and Cape Crauford Formations. The Ordovician and Silurian stratigraphy is a summary of Trettin's study.

Table I gives the stratigraphic distribution of lithologies in the Brodeur Group. The Brodeur Group overlies the Ship Point Formation (Lemon and Blackadar, 1963) and underlies Quaternary deposits (see Table of Formations). The distribution of the Baillarge Formation (Blackadar, 1956, p. 18) on Brodeur Peninsula is shown on Figure 1. It is composed of fossiliferous and dolomitic limestone, dolomite, and shale. The Cape Crauford Formation has similar lithologies to those of the Baillarge Formation except that there are only minor amounts of shale and more breccias.

AGE AND CORRELATION

A comparison of the time-stratigraphic relationships of the stromatoporoids and the associated faunas in the Brodeur Group is made in the following section.

The ages of the stromatoporoids agree with Llandoverian-Wenlockian (Niagaran) ages suggested for the associated faunas (brachiopods, cephalopods, corals, etc.) by T.E. Bolton (in Trettin, 1965a, b). Clathrodictyon linnarsonni Nicholson and Ecclimadictyon microvesiculosum (Riabinin) are found lowest in the Brodeur Group. The former species is found in the Wenlock limestone, Visby, Gotland, and the latter species is

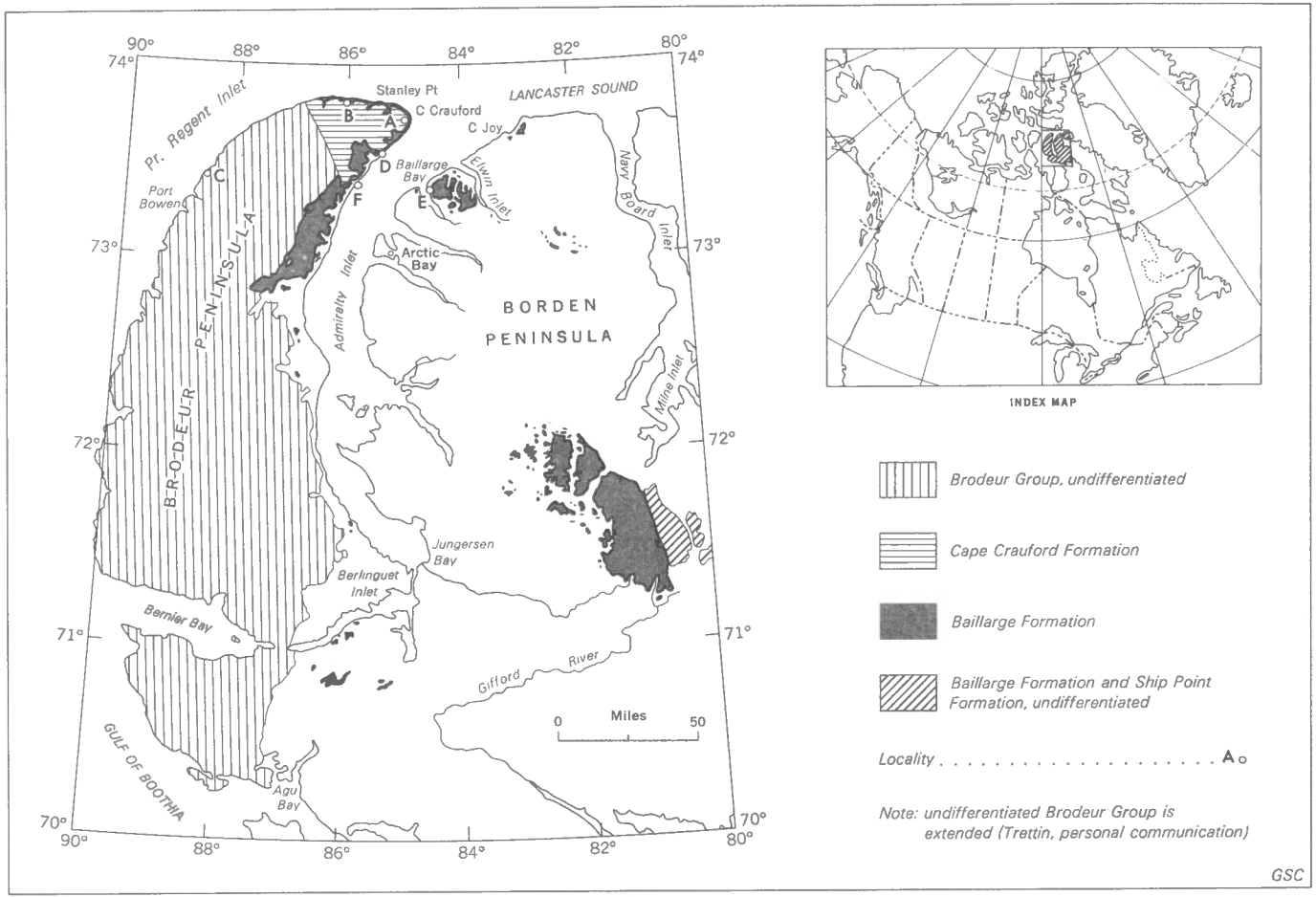

Figure 1. Geological sketch map showing localities on northwestern Baffin Island.

TABLE OF FORMATIONS

System	Group and approximate thickness (feet)	Formation and approximate thickness (feet)	Lithology
Quaternary			Silts, gravels clays
Disconformity			
Middle Silurian	Brodeur Group ± 2,940	Cape Crauford Formation 1,341	Limestone, fossiliferous dolomitized limestone, dolomite
Late Middle Ordovician		Baillarge Formation ± 1,600	Limestone, fossiliferous, dolomitic limestone, dolomite, shale
Disconformity (?) in northwest Borden Peninsula; conformity (?) at Baillarge Bay			
Middle and (?) Lower Ordovician		Ship Point Formation 920	Flaggy dolomite, fossiliferous

found throughout the Llandoverian in the Estonian S.S.R. Both species occur in faunal assemblage II of the Baillarge Formation (Table I), which Bolton considers as probably Niagaran. C. linnarsonni occurs throughout faunal assemblage II and near the top of faunal assemblage III. Ecclimadictyon fastigiatum (Nicholson) which occurs only in faunal assemblage III, ranges from Upper Llandoverian to Wenlockian. The fact that C. linnarsonni occurs in faunal assemblage II and III (about 218 feet of strata separate these zones), suggests that no hiatus exists between these assemblages. The ranges of E. fastigiatum and E. microvesiculosum suggest that faunal assemblage II may be Upper Llandoverian (lower Niagaran). There is no evidence to show that faunal assemblage II extends into the early Llandoverian, as Trettin suggested (1965a, p. 164).

Considerable diversification of species occurred during Baillarge time. All the genera mentioned except Actinodictyon are found in the Baillarge Formation, faunal assemblage III. The new species Clathrodictyon miniapse ranges throughout faunal assemblage III. Again, C. linnarsonni and E. fastigiatum indicate that faunal assemblage III is probably early Niagaran. Bolton states that "Reticularia (?)" undulata occurs in the Cape Schuchert Formation. This formation is Middle Llandoverian or early Niagaran on the basis of Monograptus convolutus (Poulsen, 1934).

The marine conditions during Cape Crauford time must have been considerably different from those during Baillarge time for the stromatoporoid species are different. All are new species except Stromatopora

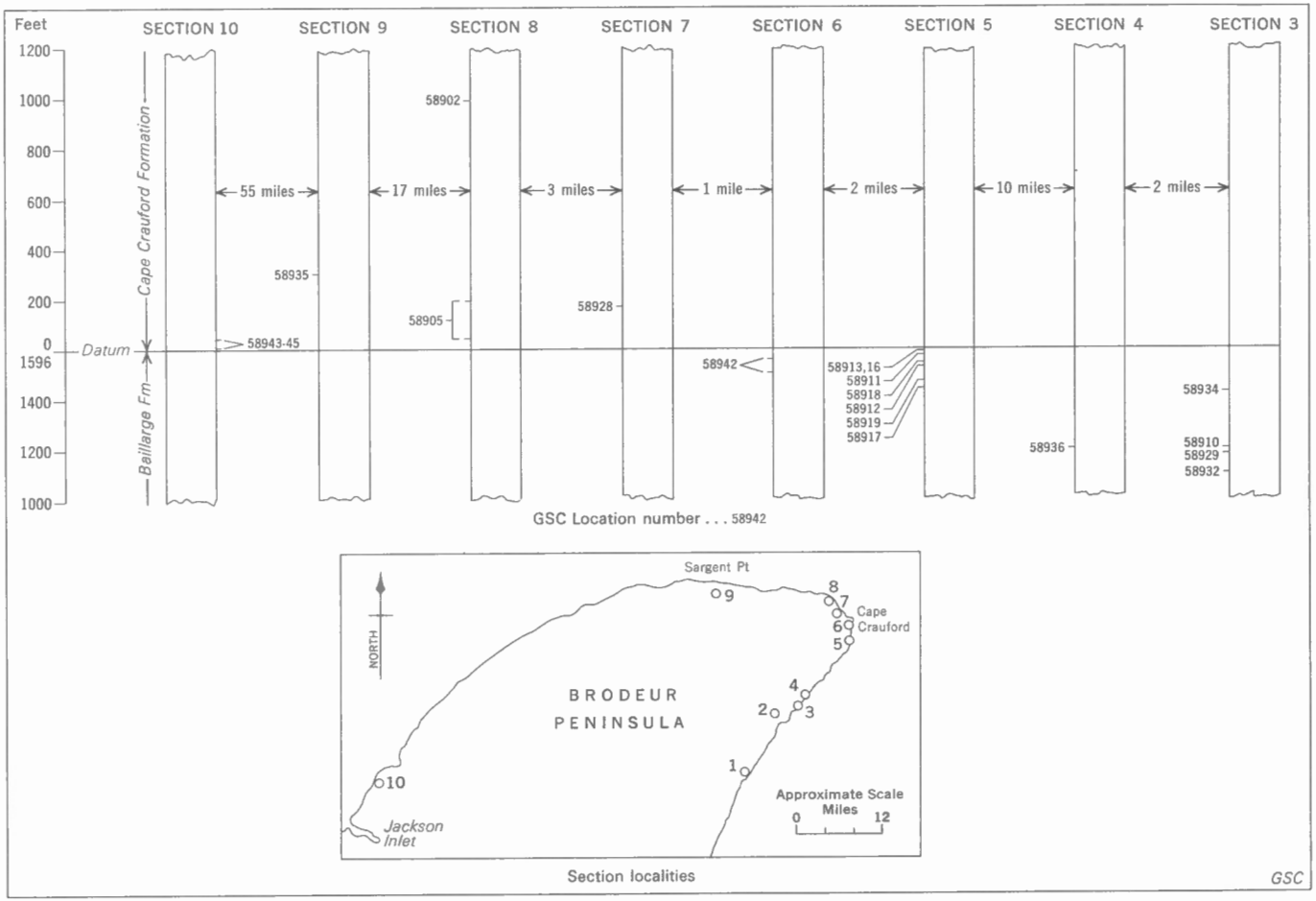

Figure 2. Distribution of stromatoporoids within the Brodeur Group on northwestern Brodeur Peninsula.

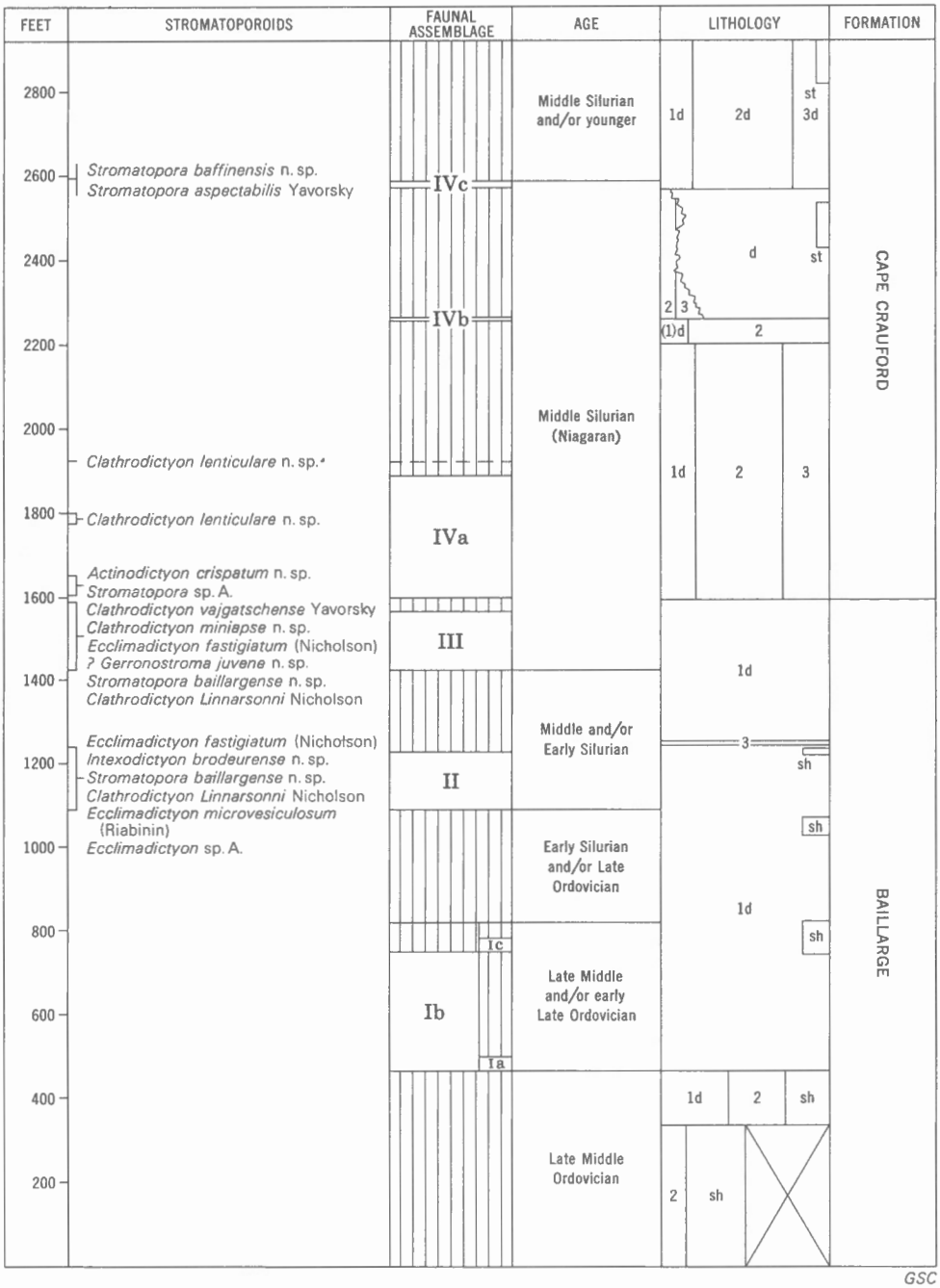

Table I. Stromatoporoids, faunal assemblages, age, and lithology of the Brodeur Group.

GSC Location Number	Interval in feet	Actinodictyon crispatum n. sp.	Stromatopora baffinensis n. sp.	Stromatopora aspectabilis Yavorsky	Stromatopora baillargense n. sp.	Stromatopora sp. A.	? Gerronostroma juvene n. sp.	Intexodictyon brodeurense n. sp.	Ecclimadictyon sp. A.	Ecclimadictyon fastigiatum (Nicholson)	Ecclimadictyon microvesiculosum (Riabinin)	Clathrodictyon lenticulare n. sp.	Clathrodictyon vajgatschense Yavorsky	Clathrodictyon miniapse n. sp.	Clathrodictyon Linnarsonni Nicholson
58902	1000-20		3*	2											
58935	315											1			
58905	57-207											1			
58928	170											1			
58945	1-50	3				1	Cape Crauford Fm.								
58916 58913	1585-96	Baillarge Fm.			1		2			2			1		
										2			3	4	
58911	1575-85									1					
58918	1560-70													1	1
58942	1550													1	
58912	1531													1	
58919	1470				1			2		1				1	
58917	1456													1	
58934	1426														4
58936	1208										1				
58910	1179														2
58929	1176														1
58932	1100-10								1		3				3
	covered														

* The number denotes the number of specimens of a species collected at a particular interval and from which thin sections have been prepared.

GSC

Table II. Stratigraphic distribution of stromatoporoids in the Brodeur Group.

TABLE III – Lithology and stratigraphy of the Brodeur Group.

LITHOLOGY

(legend for Table I)

1: fossiliferous crytocrystalline limestone
2: thinly interstratified microcrystalline limestone and dolomite
3: strata of type 2 brecciated by solution of evaporites, and associated undulatory stromatolites
sh: shale, shaly impurities
st: silty impurities
d: cross-cutting and thickly stratified dolomite
Note: lithology column in Table I shows rock types expressed in per cent

BIOSTRATIGRAPHY

FAUNAL ASSEMBLAGE IVc (loc. A, Fig. 1): Stromatopora baffinensis n. sp., S. aspectabilis Yavorsky, Streptelasma kukense Teichert, Favosites cf. F. favosus (Goldfuss) from Stanley Point (Teichert, 1937, p. 129), Halysites sp., Porpites aff. P. michiganensis (Bassler), orthoconitic cephalopod

FAUNAL ASSEMBLAGE IVb (loc. B): Favosites cf. F. favosus (Goldfuss)

FAUNAL ASSEMBLAGE IVa (locs. A-C): Clathrodictyon lenticulare n. sp., Stromatopora sp. A. Actinodictyon crispatum n. sp., Streptelasma kukense Teichert, Favosites cf. F. favosus (Goldfuss) from Stanley Point, Cystihalysites sp., Catenipora sp., Brachyprion aff. B. robustum Twenhofel, Stegerhynchus (?) sp., strophomenid brachiopod, Clorinda (?) or Glassia (?) sp., Pterinea sp., Holopea sp., Hormotoma sp., Leperditia sp.

Correlation: faunal zone IV is Niagaran, pre-late Wenlockian (Read Bay), on the basis of absence of Atrypella.

FAUNAL ASSEMBLAGE III (locs. A,D): Clathrodictyon vajgatschense Yavorsky, C. miniapse n. sp., C. linnarsonni Nicholson, Ecclimadictyon fastigiatum (Nicholson), Intexodictyon brodeurense n. sp., ?Gerronostroma juvene n. sp., Stromatopora baillargensis n. sp., Favosites sp. same sp. as in zone II, "Ptychophyllum" or "Naos" sp., Rhipidium sp. same as in zone II, strophemenid brachiopod, "Reticularia (?)" undulata Poulsen, Clorinda (?) sp., Leperditia sp.

Table III (cont.)

Correlation: "Reticularia(?)" undulata was described by Poulsen from the Cape Schuchert Formation on NW Greenland. The formation is Middle Llandoverian or early Niagaran on the basis of Monograptus convolutus (Poulsen, 1934)

FAUNAL ASSEMBLAGE II (loc. D): Clathrodictyon linnarsonni Nicholson, Ecclimadictyon microvesiculosum (Riabinin), E. sp. A, Favosites sp. same as in zone III, Palaeofavosites sp., Vacuopora n. sp., "Ptychophyllum" or "Naos" sp., Rhipidium sp. close to Conchidium arcticum from NW Devon Island (Holtedahl, 1914), Brachyprion cf. B. philomela Billings of Southampton Island (Teichert, 1937, p. 139), Hormotoma sp. some with large whorls

Correlation: faunal assemblage II shares several elements with III and is considered by Bolton as probably Niagaran. The position of this zone, however, below "Reticularia(?)" undulata suggests that it may extend into the early Llandoverian

FAUNAL ASSEMBLAGE Ic (loc. D): Receptaculites cf. R. arcticus Etheridge, Streptelasma sp., Grewingkia sp., Calapoecia sp., Plasmopora cf. P. lambei Schuchert, Catenipora sp., crinoid fragments incl. square columnals, Arthroclema cf. A. armata Ulrich, Helopora sp., Rhinidictya sp., Austinella sp., Leptaena sp., Triplesia sp., Beloitoceras sp., illaenid trilobite, Ceraurus(?) sp., of Lepidocoleus sp.

Correlation: Arctic Ordovician fauna, early Lake Ordovician and slightly older

FAUNAL ASSEMBLAGE Ib (loc. F): Receptaculites sp., Catenipora sp., Maclurites cf. M. manitobensis (Whiteaves)

Correlation: Arctic Ordovician fauna, Red River representative

FAUNAL ASSEMBLAGE Ia (about 2 mi. SW of loc. D): Catenipora sp., Calapoecia cf. C. canadensis Billings, Plasmopora sp., Batostoma sp.

Correlation: Arctic Ordovician fauna

Identification and correlation of faunal assemblage I: G.W. Sinclair; faunal assemblage II-IV: T.E. Bolton; Table III modified after Trettin (1965b) with stromatoporoid identifications added.

aspectabilis Yavorsky (1961)[1] which was collected from the highest stratum, faunal assemblage IVc, in the Cape Crauford Formation. The genus Actinodictyon occurs only in the Cape Crauford Formation. The stromatoporoids in the Cape Crauford Formation are insufficient to give any specific age assignment. The Cape Crauford Formation is considered to be Niagaran, pre-late Wenlockian, on the basis of the absence of the brachiopod Atrypella (Trettin, 1965a, p. 162).

The distribution, number, stratigraphic position of the stromatoporoids species are set in Tables I and II and Figure 2; Table III gives the associated fauna; fossil locations are given in the Appendix.

PREVIOUS STROMATOPOROID WORK

Early stromatoporoid studies were published by Nicholson (1886-1892), Parks (1907-1936), and Galloway (1955, 1957).

Modern stromatoporoid classifications have been proposed by Yavorsky (1950-1963), Lecompte (1951, 1956), and Galloway (1955, 1957); that of Galloway (1957) is used in this study. Stromatoporoid terminology based on tissue microstructure has been revised by Stearn (1966)[2]. Tissue microstructures are important in separating families and genera. Stearn's terminology is used in this paper.

PRESERVATION

Preservation of both the gross structures and microstructures of most of the coenostea from Brodeur Peninsula is good. Permineralization by calcite-bearing solutions has virtually eliminated primary porosity. Dolomitization is locally present in the Brodeur Group, but it has not significantly obliterated stromatoporoid structures. Destructive recrystallization has occurred in the specimens collected from weathered and leached zones.

The crystal boundaries show no relationship to the tissue. Crystals are large (50 to 300 microns) and their boundaries cross the pillars and laminae indiscriminately. In places, jagged contacts between the coarse crystals roughly divide the galleries. Locally, in vertical sections, small intracrystalline movements have revealed close-set parallel cleavage planes. Where these cleavage planes pass through the tissue, they give it the appearance of being transversely porous.

The most poorly preserved specimens are those collected from relatively deep-weathered zones. Minute fractures and partings between crystal boundaries have provided access for solutions to leach and reprecipitate a fine calcite druse in galleries and other openings. The tissue is no longer distinct, but appears faded; only "ghosts" remain.

[1]Unfortunately, the occurrence of the species given by Yavorsky is simply Silurian.

[2]Stearn's revised generic descriptions are used except that of Ecclimadictyon Nestor, 1964, Intexodictyon Yavorsky, 1963, Actinodictyon Parks 1909; the writer has amended the latter descriptions.

In most of the Brodeur Peninsula specimens, the epitissue and endotissue[1] are distinguishable within the same thin section. In some sections where preservation is best, the epitissue masks the endotissue (microreticulate tissue completely masks endotissue). If the epitissue is poorly developed or preserved, specific and generic assignment is complicated. Indeed, in species with maculate or melanospheric tissue (Stearn, 1966), the gross structure may appear entirely different in a specimen with a poorly preserved epitissue from a specimen with a fully developed epitissue.

If carbonate muds are trapped within a coenosteum, the normal structural growth is unchanged. Solutions from the carbonate muds entombing a coenosteum have infiltrated some specimens. Only the margin of the coenosteum is changed to a golden-brown hue. The presence of microstylolites and compressed structural elements attest to this conclusion. Most often the structure remains intact, but the tissue is obliterated; tissue reversal is uncommon (Stearn, 1966).

Some stromatoporoids from Brodeur Peninsula are found tumbled with subhemispheroidal coral heads; others are irregular lenticular masses, measuring about 3 to 10 inches across, encrusting brachiopod coquinas. Because most of the coenostea are whole and in place, the marine environment must have been quiet, protected from vigorous waves and currents, perhaps by a wide shallow shelf.

SYSTEMATIC PALAEONTOLOGY

Family CLATHRODICTYIDAE Kühn, 1939

1939 Family Clathrodictyonidae no. fam., Kühn, p. 338.
1939 Family Clathrodictyonidae Kühn, p. A42.
1957 Family Clathrodictyidae Kuhn, Galloway, p. 432.

---

[1] C. W. Stearn (1966) has written at length about tissue types and preservation. He has substituted the term "secondary tissue" (Galloway, 1957) by "clothing or coating" tissue. Stearn states that the adjective "secondary" carries the suggestion of tissue deposited by inorganic agencies after the organism was dead. The writer, though agreeing with Stearn, has substituted the words epitissue and endotissue for "primary" and "secondary" tissue, because they are clear and concise.

The Shorter Oxford English Dictionary (1933, p. 2199) defines tissue in the biological sense as "the substance, structure or texture of which an animal or plant body or any part or organ of it is composed...it may be an aggregate of similar cells". Epi- and endo- are the common Greek prefixes for upon and within, respectively. These words have been used in the Descriptive Palaeontology of this paper.

Genus CLATHRODICTYON Nicholson and Murie, 1878

Type species C. vesiculosum Nicholson and Murie, 1878

1878 Clathrodictyon, Nicholson and Murie, p. 220.
1886 Clathrodictyon, Nicholson, p. 77, p. 147.
1887 Clathrodictyon, Nicholson, p. 1.
1927 Clathrodictyon, Twenhofel, p. 107.
1937 Clathrodictyon, Ripper, p. 1.
1939 Clathrodictyon, Kühn, p. A42.
1951 Clathrodictyon, Lecompte (part), p. 129.
1955 Clathrodictyon, Yavorsky, pp. 39-49.
1957 Clathrodictyon, Galloway, p. 433.

Diagnosis. Coenosteum composed of imperforate, continuous, laminae commonly undulant or crumpled and short pillars that are confined to an interlaminar space. The pillars and laminae are a single uniform layer of compact, commonly speckled, tissue. Where the laminae are bent the pillars extend from their downward inflections in cylindrical form.

Clathrodictyon lenticulare n. sp.

Plate I, figures 1, 2

Exterior. The bulbous coenosteum is 9 cm diameter and 6 to 9 cm in height; the surface is smooth.

Vertical sections. The structure is characterized by a dense vesicular network of irregularly spaced laminae and pillars and relatively large lens-like cysts.

Laminae are straight and continuous except where they appear to bulge over large lens-like galleries or where they are folded over trapped foreign matter; the cyst plates extend horizontally by imbricating with each other; elsewhere they appear irregularly superposed suggesting that astrorhizae are responsible for their expansion. Laminae curve down over the lens-like cysts to join the laminae below. At high magnification the laminae are seen to be the result of cyst plates arranged side by side. There are sixteen to twenty laminae in 2 mm (average seventeen); they are 20 to 50 microns thick, of compact tissue.

Pillars are spool, cylindrical or conical in form. They are irregularly developed; most are perpendicular to the laminae, but many are oblique. Minuteness, variability in form and preservation make the pillars difficult to measure; ten to fifteen occur in 2 mm and they are 20 to 50 microns thick. Pillar tissue is generally less compact than that of the laminae.

Astrorhizal canals are rarely seen in longitudinal section. This suggests that the system of tubes is highly sinuous and that the predominant trend is parallel to concentric laminae.

Galleries vary in size and shape. The isometric form is commoner than the cystic form. About 40 per cent of the section is occupied by gallery space.

Tangential sections. The concentric laminae appear as curved bands composed of dark dots of tissue which are the cut ends of pillars, in a relatively light background of tissue. These bands alternate with clear interlaminar zones which contain relatively smaller dots of tissue. The dots range from 50 to 100 microns in size. Where the section lies closest to the plane of the laminae the dots are densely packed about 100 microns apart.

The dendritic branches of the astrorhizal system radiate out from what appears to be a tripartite or compound centre of tubes. The tubes are oval in cross-section; they range from 200 to 300 microns, long diameter, 100 to 150 microns, short diameter and are comparable to the lens-shaped galleries seen in vertical sections. Apparently, the lens-shaped galleries are tangentially cut astrorhizal canals. About seven canals radiate from an astrorhizal centre; these centres are about 4 mm apart.

Discussion. This species is similar to C. vesiculosum Nicholson and Murie, 1878, except for the relatively wide lens-like galleries, which reflect the oval shape of the astrorhizal canals, and straighter and more widely spaced laminae. The species is named C. lenticulare because of the presence of the wide lens-like galleries.

Material and occurrence. Three specimens of this species were collected from the Cape Crauford Formation on Brodeur Peninsula, sections 7, 8 and 9, faunal assemblage IVa, GSC locs. 58928, 58905, 58935.

Types. Holotype, GSC No. 20201, a-f (loc. 58905); paratypes, GSC Nos. 20202, a-d (loc. 58928) and 20203, a-f (loc. 58935).

Clathrodictyon vajgatschense Yavorsky

Plate I, figures 3, 4

1961 Clathrodictyon variolare Rosen var. vajgatschense Yavorsky, p. 27, pl. XIV, figs. 1-3.

Exterior. The bulbous coenosteum measures 8 to 10 cm in diameter and 5 to 8 cm in height, measured from the centre of the base to the highest point on the coenosteum. The surface is smooth to monticular. About six latilaminations occur in 2 cm.

Vertical sections. The structure is characterized by vesicular galleries and regularly wavy laminae of different sizes and shapes. The centre of each wave contains a small astrorhizal tube.

Laminae are continuous but irregularly spaced. Closely and widely spaced laminar zones appear to alternate somewhat regularly. This irregularity of laminar spacing reflects a varying or interrupted growth rate. The variable thickness of the laminae attest to this probability. There are five latilaminations in 2 mm. The laminae are sharply upturned at astrorhizal tubes, thereby producing small columns which on surface appear as

monticules. The monticules are about 400 microns in diameter, rise about 200 microns and are 1 mm apart. Eight to ten laminae occur in 2 mm; they are 30 to 70 microns thick; tissue is compact.

Cylindrical to spool-shaped pillars are confined to one interlaminar space. Their spacing and thickness is highly irregular, four to eight in 2 mm and 30 to 100 microns thick. At high magnification the structure of laminae and pillars appears to be the result of an orderly arrangement of dissepiments or cyst plates. Pillar tissue is compact.

Astrorhizal tubes are conspicuous in vertical sections. They appear as minute (100 to 200 micron diameter) tubes about 1 mm apart. The tubes are not straight but are slightly bent. They commonly extend about 2 cm in a section. Horizontal branching from these tubes is rarely seen.

Galleries are unequal in size and shape. They are oval, round or cystic; some appear isometric, others rectangular. Dissepiments, 20 microns thick, extend locally through the gallery spaces. About 50 per cent of the section is gallery. Foreign matter is concentrated in the dark latilaminar zones.

Tangential sections. The structure is characterized by irregular-sized dots of dark tissue in a background of lighter tissue and conspicuously meandering astrorhizae. The dots are cut pillars (20 to 50 microns). Some pillars are joined by dissepiments. Astrorhizal branches 100 microns in diameter ramify densely throughout the section; dark tissue lines some of the tubes. Locally, clear oval or circular spots are the remains of trapped organisms.

Discussion. The species differs from C. lennuki Nestor, 1964, in having a greater range in the number of laminae and pillars, more widely spaced laminae, and pillars which are not as thick. C. variolare Rosen has many more laminae, and smaller galleries which alternate with larger ones. The values for laminae, pillars and galleries are identical to C. variolare Rosen var. vajgatschense Yavorsky, 1961, however, the astrorhizal systems are apparently more closely set in the specimens from Brodeur Peninsula. This latter point is not considered of specific importance, in this case. Yavorsky's variety is elevated to species status.

Distribution. The species is found near the Urals, in rock of Silurian age.

Material and occurrence. The species is represented in the collections by four specimens from the Baillarge Formation, section 5, faunal assemblage III, GSC locs. 58913, 58916.

Types. Hypotypes, GSC Nos. 20204, a-c (loc. 58916); 20205, a-f (loc. 58913); 20206, a-g (loc. 58913); 20207, a-c (loc. 58913).

Clathrodictyon miniapse n. sp.

Plate I, figures 5, 6

Exterior. The coenosteum is hemispherical to low-domical in form; its outer edge is projected horizontally over the sediments on which it grew. In some vertical sections this basal edge makes wavy apopheses projecting into

the sediments. Basal diameters range from 7.5 to 18 cm (the latter value is taken from a low-domical or discoidal form) and average 10 cm. Their heights range from 4 to 8 cm and average 6 cm. The surfaces of most specimens are poorly exposed; an exfoliated or cleaved surface is generally smooth with few large, irregular undulations. Mamelons which measure about 2 mm in diameter, rise 50 microns and are regularly spaced about 5 mm apart, occur in some surfaces. Latilaminations are indistinct; about three to six occur in 1 cm.

Vertical sections. Laminae are straight, continuous and regularly spaced. The regularity in structure persists over enclosed foreign matter. The laminar spacing of nine specimens ranges from sixteen to twenty-two in 2 mm; average is eighteen and one-half. Laminar thickness ranges from 20 to 50 microns, and averages 30 microns. Tissue is compact to speckled.

Pillars are conical to cylindrical in shape. The pillars and laminae appear to be formed by cyst plates that are placed side by side. These cyst plates or dissepiments imbricate around mamillae or mamelons and along some layers. Thickness of laminae and pillars are the same, except where the pillars thicken as they diverge upward into laminae. Fourteen to eighteen pillars occur in 2 mm. Tissue is compact to speckled.

Galleries are subisometric and are generally low vaulted archways. In places the pillars are closely set, creating high vaulted archways. About 50 per cent of sections is occupied by gallery space.

Monticules are common in the upper layers of the coenosteum. Some are the result of the doming of tissue over trapped conispiral organisms (?) or sediments. Others are low undulations that can be found everywhere in the coenosteum. Axial canals of astrorhizae are commonly centred in these up bends which measure about 1 mm diameter and are 2 to 3 mm apart. In some sections monticules are absent. Astrorhizal axial canals are 150 microns in diameter and are from 2 to 4 mm apart. The minute branches which measure 100 microns diameter, extend horizontally, or diagonally, through the vaulted galleries.

Tangential sections. The concentric laminae appear as dark curved to wavy bands of tissue that alternate with thinner, clear interlaminar zones. Evenly distributed and densely packed dots occur in both zones. Astrorhizal centres are 2 to 4 mm apart; they are 150 microns in diameter and have dendritic branches 100 microns in diameter. The dark dots or cut pillars are 25 to 75 microns across; twenty-five to thirty occur in 1 square millimetre. Coil-shaped organisms or trapped sediments are visible in some sections.

Discussion. The above specimens differ from C. vesiculosum in having straighter laminae and pillars; C. tenerum Yavorsky (1957, p. 17) has fewer laminae but more widely spaced pillars. The structure is characterized by minute arches or vaults to which the name C. miniapse is given.

Material and occurrence. Nine specimens were collected from the Baillarge Formation, sections 4, 5 and 6, faunal assemblage III, GSC locs. 58912, 58913, 58917-58919, 58942.

Types. Holotype, GSC No. 20208, a-c (loc. 58919); paratypes, GSC Nos. 20209, a-e (loc. 58917); 20210, a-g (loc. 58912); 20211, a-d (loc. 58919); 20212, a-d (loc. 58918); 20213, a-i (loc. 58919); 20214, a-f (loc. 58919); 20215, a-d (loc. 58913); 20216, a-d (loc. 58913).

Clathrodictyon linnarsonni Nicholson

Plate I, figures 7, 8

1887 Clathrodictyon linnarsonni Nicholson, p. 5, pl. I, figs. 7, 8.

Exterior. The coenosteum is, generally, hemispherical; the base is irregularly convoluted and centrally wrinkled. The upper surface of the coenosteum extends slightly horizontally at its base, so that, in vertical section it appears bell-shaped. Basal diameters (measured above the horizontally extended base) range from 10 to 20 cm, and the heights from 5 to 10 cm. The surface is smooth and covered with irregular shaped mamelons upon which are sparsely scattered monticules. The sizes of the protuberances increases proportionally with coenosteal growth. Mamelons are 1 to 3.5 cm in diameter, rise 2 to 7 mm and are 1.5 cm apart; monticules are 0.7 to 2 mm in diameter, rise 0.7 to 2 mm and are 8 mm to 1 cm apart.

Vertical sections. Laminae are straight, continuous and regularly spaced; they are gently inflected into monticules or mamelon columns or they may be curved above foreign matter. In ten specimens the laminar spacing in 2 mm averaged twelve and one-half and ranged from eleven to sixteen. Laminae range from 20 to 75 microns in thickness, and average 27 microns. Tissue is compact to speckled. Pillars are cone- to spool-shaped and they perpendicularly span only one interlaminar space. They appear to be downward inflections in the laminae. Where dark epitissue has been removed, some pillars appear to be formed by adjacent, down curved dissepiments or cyst plates which either arise from the laminae or are intimately bound with them. There they seem to be prolongations of funnel-shaped inflections of the laminae. The thickness and separation of pillars is similar to that of the laminae. Pillars range from nine to fourteen and average eleven in 2 mm. Tissue is compact to speckled. Galleries are round to oval in shape and make up about 65 per cent of sections. They measure 100 to 200 microns vertically, and 100 to 800 microns horizontally. The structure in mamelon columns is no different from that in any other part of the coenosteum except that astrorhizae are concentrated in and about them. Mamelons are 2 mm wide, 0.7 to 1 mm high and about 8 mm apart.

Central astrorhizal canals with diagonal and horizontally spreading branches are common. The diameters of the central canals and branches are about the same, 150 to 300 microns. The almost vertical canals are 3 to 7 mm apart. Some horizontal tubes extend 3 mm between the laminae.

Tangential sections. Irregularly thickening and thinning, dark, concentric bands of tissue are separated by thinner clearer zones with less tissue. The dark bands are sections that lie in and about the laminae. Pillars appear as irregular oval dots of dark speckled tissue. Rarely are dissepiments seen connecting the pillars. The pillars measure 75 to 125 microns; about fifteen occur in 1 square millimetre, but more occur within mamelon regions.

Astrorhizal branches radiate dendritically from central canals. Their diameters and separations are as those given in vertical section. Astrorhizae occur inside and outside mamelon areas.

Discussion. These specimens differ from typical C. vesiculosum in having generally, more widely spaced laminae. The laminae and pillars are straighter and thicker than those of C. vesiculosum; they form a more regular network of subrectangular to isometric galleries. The range in the number of laminae is less than that of C. vesiculosum. Unlike the often diagonal and incomplete pillars in C. vesiculosum, the pillars of C. linnarsonni perpendicularly span interlaminar space. The species differs from Nicholson's (1889) description of C. straitellum D'Orbigny sp. in having astrorhizae and pillars which span an interlaminar space. The species cannot be put into the genus Stromatoporella because it lacks the characteristic tissue called "ordinicellular" (Stearn, 1966) and ring pillars of this genera. The species differs from C. lennuki Nestor, 1964, in having closer set pillars and well developed astrorhizae in the mamelon columns. Although Nicholson's description of C. linnarsonni lacks detail, it is considered complete enough to make specific assignments possible.

Distribution. This species is found in the Wenlock limestone, Visby, Gotland.

Material and occurrence. Ten specimens were collected from the Baillarge Formation, sections 3, 5, faunal assemblages II and III, GSC locs. 58932, 58929, 58910, 58934, 58918.

Types. Hypotypes, GSC Nos. 20217, a-c (loc. 58932); 20218, a-c (loc. 58932); 20219, a-f (loc. 58932); 20220, a, b (loc. 58929); 20221, a-f (loc. 58910); 20222, a, b (loc. 58910); 20223, a-d (loc. 58932); 20224, a-c (loc. 58932); 20225, a-e (loc. 58934); 20226, a-d (loc. 58934); 20227, a-e (loc. 58918).

Genus ECCLIMADICTYON Nestor, 1964

Type species Clathrodictyon fastigiatum Nicholson, 1886

1964 Ecclimadictyon gen. nov., Nestor, p. 60.

Diagnosis. The laminar to bulbous coenosteum is composed of strongly zigzag-shaped anastomosing, continuous to discontinuous laminae of compact to speckled tissue. Thin irregularly spaced cylindrical pillars are confined to an interlaminar space and appear as dark dots in tangential section.

Ecclimadictyon fastigiatum (Nicholson, 1886)

Plate II, figures 1, 2

1886 Clathrodictyon fastigiatum Nicholson, p. 43, fig. 3; p. 78, fig. 12 (unwritten).

1887 Clathrodictyon fastigiatum Nicholson. Nicholson, p. 8, pl. II, figs. 3, 4.

	1889	Clathrodictyon fastigiatum Nicholson.	Nicholson, p. 152, pl. XIX, figs. 1-5.
	1895	Clathrodictyon fastigiatum Nicholson.	Whiteaves, p. 52, pl. II.
	1896	Clathrodictyon fastigiatum Nicholson.	Whiteaves, p. 135.
	1906	Clathrodictyon fastigiatum Nicholson.	Parks, p. 18, pl. I, figs. 3, 4.
	1907	Clathrodictyon fastigiatum Nicholson.	Parks, p. 18, pl. I, fig. 6.
	1908	Clathrodictyon fastigiatum Nicholson.	Parks, p. 24, pl. VII, fig. 8.
	1939	Clathrodictyon fastigiatum Nicholson.	Riabinin, p. 6, pl. I, figs. 6-9.
	1951	Clathrodictyon fastigiatum Nicholson (partim).	Riabinin, p. 20, pl. XIV, fig. 1, non 2-6.
non	1915	Clathrodictyon fastigiatum Nicholson.	Boehnke, p. 169.
non	1929	Clathrodictyon fastigiatum Nicholson.	Yavorsky, p. 84, figs. 1-3.
non	1940	Clathrodictyon fastigiatum Nicholson.	Chi, p. 292, figs. 1a-b.
non	1955	Clathrodictyon fastigiatum Nicholson.	Yavorsky, p. 44, pl. XV, figs. 7, 8.
	1956	Clathrodictyon fastigiatum Nicholson.	Stearn, p. 50, pl. II.
non	1961	Clathrodictyon fastigiatum Nicholson.	Yavorsky, p. 28, pl. XIV, figs. 4-6.
	1964	Ecclimadictyon pandum Nestor,	p. 69, diag. 33, pl. XXIII, fig. 6; pl. XXVIII, fig. 6.

Exterior. Coenostea are bulbous, tabular or low domical in form. The bulbous or hemispherical coenostea measure 10 to 15 cm at their bases. One tabular coenosteum measured 20 cm in diameter and 2 to 4 cm in thickness. Surfaces are smooth with low undulations. Protuberances reflect the presence of trapped organisms or sediments.

Vertical sections. Laminae are crumpled into wide, irregular sized, chevron folds. If a lamina is traced laterally it abruptly joins with either the lamina immediately above or below; eight to fourteen laminae occur in 2 mm; the four specimens[1] averaged ten and one-half in 2 mm. They are about 50 microns thick. Tissue is speckled.

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[1] Minor variations in the number of laminae can occur in the same section. The variations are attributed to adverse periods of growth ("dwarfing" effect); tissue is often darker and inclusions of detrital matter are common. If the section is slightly oblique to the laminae, the zigzag structure is maintained, however, many of the points at which they ordinarily touch appear as small denticles. Also, in some sections, the regular zigzag network may be periodically succeeded by disrupted zones in which closely set irregular pillars predominate. These zones are not primary structures, but reflect the presence of oblique fractures in the specimen from which the section was prepared. Care must be exercised to avoid erroneous conclusions about the structural elements present.

Pillars most often arise from downward-pointing inflections in the laminae. They are cylindrical to cone-like in form. At high magnification some pillars appear like dissepiments thinly covered with lighter epitissue. Pillars are, generally, 200 microns apart, 20 microns thick and have speckled tissue. Their structure is amalgamated with the laminae, but they are less conspicuous than the laminae.

At low magnification, galleries appear irregular in size, but closer observation shows that their forms and dimensions are uniformly isometric or pseudopentagonal. Local variations are caused by folding structure about foreign matter or near astrorhizal systems. Dissepiments are present, but inconspicuous. About 50 per cent of sections is gallery.

Low domical monticules are rare. Some continue down in the structure as astrorhizal columns. Astrorhizal systems are difficult to see. Central tubes are 200 microns wide and 1 to 2 mm apart; branches measure 100 to 200 microns in diameter. Longitudinal sections of the central tubes show that they are straight and perpendicular.

Tangential sections. Distinction between laminae sensu stricto and interlaminar spaces is vague because of the folded nature of the laminae. The tissue fabric is vermiform. Astrorhizae are inconspicuous in the structure; they are 200 microns wide and about 2 mm apart. Scattered, irregular sized dots (20 to 150 microns) represent the cut ends of pillars or the apices of inflected laminae. Tissue is speckled. Trapped sediments and coil-shaped organisms occur in some sections.

Discussions. Nestor (1964) makes C. fastigiatum the type species of his genus Ecclimadictyon, in which he claims that the laminae are directly connected without the development of pillars. The four specimens studied in this report show that laminae are more often connected by distinct pillars than by direct connection with other laminae. Nestor also claims that dissepiments and astrorhizae are not present; these structures are present in the species described herein. The holotype, C. fastigiatum Nicholson, shows all the above stated features Nestor claims are absent. His new species E. pandum has all the above features which he claims are absent in E. fastigiatum and is here placed in synonymy with E. fastigiatum.

Distribution. The species is found in the Wenlock of Great Britain, in the "zone of Pentamerus esthonus" of Estonia (Upper Llandoverian and Wenlock), in the Guelph Formation (Upper Middle Silurian) of Ontario, and in the Cedar Lake Formation of Manitoba, Canada (Niagaran).

Material and occurrence. Six specimens were collected from the Baillarge Formation, section 5, faunal assemblage III, GSC locs. 58919, 58911, 58913, 58916.

Types. Hypotypes, GSC Nos. 20228, a, b (loc. 58916); 20229, a-c (loc. 58919); 20230, a-e (loc. 58911); 20231, a-i (loc. 58916); 20232, a-i (loc. 58916); 20233, a-c (loc. 58916).

Ecclimadictyon microvesiculosum (Riabinin)

Plate II, figures 3, 4

1951 Clathrodictyon vesiculosum Nicholson and Murie. Riabinin, p. 14, pl. V, figs. 1, 2; pl. VI, figs. 3, 4.
1951 Clathrodictyon microvesiculosum Riabinin, p. 15, pl. V, figs. 4, 5; pl. VI, figs. 5, 6.
1951 Clathrodictyon microvesiculosum (partim) Riabinin, p. 15, pl. V, fig. 3; pl. IX, figs. 1, 2.
1964 Ecclimadictyon microvesiculosum (Riabinin). Nestor, p. 65, pl. XXV, figs. 1-4, pl. XXVIII, figs. 1, 2.

Exterior. Coenostea are bulbous, hemispherical to compressed domical forms with smooth to wavy surfaces; diameters range from 4.5 to 14 cm. Monticules may be present 2 to 3 mm apart. Latilaminations are present in some specimens, five to seven in 2 cm.

Vertical sections. Laminae are curved in irregular zigzags and are joined to each other at the apices of the inflections and by small pillars. The structure is like a diagonal net with holes of irregular size. In some thin sections sets of crumpled laminae are separated every 0.5 to 1 mm by two relatively straight laminae that form an interlaminar space measuring 100 to 200 microns. In this space, the pillars clearly project downward from the laminae. The number of jagged laminations in 2 mm ranges from ten to nineteen and averages fifteen. The laminae and pillars average 40 microns in thickness and are compact.

Galleries are variable in size and shape. Some are ovoid to broad rectangles, others have more than six sides. Their diameters, measured vertically between two zigzag laminae, are less than that of the interlaminar spaces that are spanned by perpendicular pillars. Galleries account for about 50 per cent of the sections.

Astrorhizae are rare and difficult to see in vertical section. They appear as clear, round to oval spaces measuring 150 to 200 microns in diameter. Tubes rarely disrupt or cut the structure. When a canal is visible its position is vertical to the laminae. Dissepiments are absent.

Tangential sections. The concentric structures over mamelon columns are transected laminae out of which project irregularly curved bars, identical in thickness to the laminae and which are, in fact, obliquely cut pillars. In the clear spaces, pillars and sections of diagonal laminae appear as dark, 40 micron dots. Astrorhizal canals occur in and outside of the mamelon regions; they are 2 mm in diameter and about 2 mm apart. The centres of mamelons or monticules are 1 to 3 mm apart.

Discussion. The somewhat regular, wider interlaminar spaces between the polyhedral galleries may be horizontally branching astrorhizae. This structure is not everywhere seen, nor is it continuous.

Nestor (1964, pp. 5-8) reviewed Nicholson's, Yavorsky's and Riabinin's work on Ordovician and Llandoverian stromatoporoids in Estonia. He argued that too many new "species" of Clathrodictyon were being introduced from studies of vertical sections that cut structure with varying

degrees of obliqueness. Clathrodictyon kudriavzevi Riabinin, Ecclimadictyon microvesiculosum (Riabinin) and others, are subject to wide variation in this respect. Nestor remeasured many of Riabinin's type species and found them to be about one-fifth less than recorded values. Riabinin was prone to base his separation of species on their stratigraphic occurrence. The relatively straight laminae are interpreted by Nestor as dissepiments. Except for a lower average speacing of laminae, the specimens are identical with the type species C. vesiculosum.

Distribution. In Estonia, the species is found throughout the Llandoverian.

Material and occurrence. Four similar specimens were collected from the Baillarge Formation, sections 3 and 4, faunal assemblage II, GSC locs. 58932, 58936.

Types. Hypotypes, GSC Nos. 20234, a, b (loc. 58932); 20235, a-d (loc. 58932); 20236, a-c (loc. 58932); 20237, a-c (loc. 58936).

Ecclimadictyon sp. A

Plate II, figures 5, 6

Exterior. Only a fragment of a coenosteum (10x7x5 cm) was collected. It is a massive, wavy, tabular form, of a light, whitish buff colour and without clear latilaminations. The surface is wavy and smooth.

Vertical sections. The predominant elements in the structure are relatively thick, sharp zigzagged laminae which irregularly connect without the formation of pillars. The laminae can be traced for only a short distance laterally before they join with others.

Within the thick laminae are relatively thin microlaminae. The microlaminae extend horizontally, uninterrupted through the zigzag structure. They are fairly well spaced (four in 2 mm) and generally straight. At higher magnification they are seen locally, either to inflect downward before they join the heavy laminae or they may gently curve down and join the microlaminae below (because of their continuity, they are not called dissepiments). The microlaminae are 200 to 300 microns apart; a relatively dark, endotissue of 1 micron thickness is covered with light epitissue which makes the total thickness of the microlaminae 5 microns. The epitissue and endotissue are compact.

The heavier, irregular, chevron-folded laminae are 100 microns thick. One side of a zigzag may be 1.5 to 2 mm long and extend across three to four of the horizontal microlaminae. The inflection of the laminae forms an angle, which ranges from 40 to 60 degrees. Measured vertically from points of inflection[1], four to five laminae occur in 2 mm. In places the regular, zigzag laminae curve to form thick cyst plates. Such areas appear to contain astrorhizal clusters. In other parts of the section, the laminar complex appears as dots of tissue 100 microns across. The tissue in the laminae is compact to speckled. Minute cleavage planes within the calcite mosaic erroneously suggest transverse porosity.

[1] Nestor (1964) has used the term "carcasses", it seems to represent the aggregate structure of zigzagged laminae and interlaminar space.

The astrorhizal system is difficult to see. It can be traced where the laminae bend or curve, rather than sharply inflect. Some branches have been cut and appear in the plane of section as clear, oval to round areas, 300 microns across, surrounded by laminar tissue.

Galleries conform to the irregular nature of the laminae. They are 100 to 200 microns, measured perpendicular between two laminae and extend irregularly. The fine microlaminae cross gallery space. About 55 per cent of the section is gallery[1].

Tangential sections. Bands of relatively light tissue appear superimposed upon a dark, irregular, discontinuous vermicular network. Irregular round dots of dark tissue are conspicuous within clear spaces. Where the section is closest to being tangential, the tissue is an irregular network of small and large arcs about 100 microns thick. When sufficient epitissue is removed, by preservation and/or grinding, microlaminae (1 micron thick) are visible extending across and joining with the thicker tissue to form wide arcs. The relatively light bands of tissue conform to these arcs, which are microlaminae. Tissue in the structural elements is of varying degrees of compactness. About 60 per cent of the sections are tissue.

Discussion. The above species is grossly similar to Ecclimadictyon porkuni (Riabinin, 1951) however, three significant features distinguish it from the latter species; there are half as many laminae, microlaminae are straight, more continuous and the angle (40° to 60°) at the point of inflection of the laminae is about half that in E. porkuni.

Astrorhizae are difficult to see in tangential sections; they are recognized as clusters of about seven, clear, oval to round centres (100 to 300 micron diameter), surrounded by dark tissue.

Material and occurrence. One specimen was collected from the lower part of the Baillarge Formation, section 3, faunal assemblage II, GSC loc. 58932.

Types. Figured specimen, GSC No. 20238, a-f.

Genus INTEXODICTYON Yavorsky, 1963

Type species Intexodictyon perplexum Yavorsky, 1963

1963 Intexodictyon, Yavorsky, p. 34.
1964 Intexodictyon, Nestor, p. 72.

Diagnosis. Massive coenosteum composed of persistent dense or compact pillars confined to a single interlaminar space. The pillars arise from the laminae and form a complexly interwoven interlaminar tangle. Astrorhizae may be present.

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[1] The structural elements appear different if the section is not vertical or too thin. Several sections were made to verify this.

Intexodictyon brodeurense n. sp.

Plate II, figures 7, 8

Exterior. The coenosteum, represented only by fragments in the collection, appears massive. The undulating surface is covered with small mamelons, about 2 to 3 mm in diameter, 1 mm in height and 3 to 5 mm apart.

Vertical sections. At X10 magnification, the laminae are relatively dark, irregularly spaced, continuous, gently undulant in mamelons. The mamelons may occur on broader and sharper inflected waves (pl. II, fig. 7). Thickness range from 50 to 70 microns. At higher magnification a denser, compact primary lamina underlies the epitissue. Locally, about columns, the primary laminae appear to bend obliquely downward to join with curved dissepiments. A relatively lighter, less compact, discontinuous, irregular, pseudolaminae may occur between the laminae proper. This structure is produced by the joining of irregular pillars and dissepiments which arise mostly from below the laminae. These pseudolaminae and their supporting pillars appear to have caved down from the laminae proper. There are five to seven lamina proper, in 2 mm. Foreign material in the form of pellets, generally, less than 100 microns diameter, is locally concentrated between laminae. Pillars are highly irregular in form and spacing. They arise from the base of a lamina and may be perpendicular or oblique to it. Some appear to be the result of a downward inflection in the lamina and appear like funnels perpendicular or oblique to it. The curved, oblique pillars may not cross an interlaminar space directly, but instead, they may arch horizontally and entwine with other pillars or dissepiments which, in turn, cross the interlaminar space and create irregularly shaped smaller galleries. Perpendicular pillars are spaced three to seven in 2 mm; they are 50 to 70 microns across. About 60 per cent of the section is occupied by gallery space.

The exact nature of the astrorhizal system is unknown. Astrorhizae wind in and out of the structure and vertical sections of the tubes are not easily observable. In tangential section they are 200 to 300 microns across. Generally, the canals meander along the laminae. The holotype contains a large 1 mm circular structure with smaller subsidiary tubes, 200 microns wide, leading away from it. This may be an astrorhizal cylinder although there is no evidence of its upward extension. Dissepiments are common but obscured by epitissue.

Tangential sections. Conspicuous mamelon columns of concentric and radial structure rarely have an axial canal; one canal measured 500 microns in diameter. Astrorhizae extend up within the mamelon columns and appear, in tangential section, as clear centres about 200 microns in diameter and about 2.5 mm apart. Wide, discontinuous, clear regions between the concentric laminae are astrorhizal tubes. Pillars occur as dark compact dots, 70 microns across, some with laminae. Curved irregular pillars appear as a network of connected bars in mamelon. Some intermamelon regions contain a high concentration of pellets which could be confused with pillars. Dissepiments are best seen in regions where the section has cut interlaminar space obliquely.

Discussion. Some confusion exists concerning the genus Intexodictyon (Yavorsky, 1963) and Hammatostroma (Stearn, 1961). Yavorsky established his genus to include largely Silurian and some Devonian species with compact

tissue, and irregular, incomplete and almost cystose pillars. Stearn's genus has fibrous laminar tissue, but speckled pillar tissue. Stearn (personal communication) suggests that the pillar structures of the two forms may differ. The above form is grossly similar to I. perplexum Yavorsky; however, the pillars are twice as thick and set twice as far apart. This species is named after Brodeur Peninsula (and the Brodeur Group), where it was collected.

Material and occurrence. Two specimens of the species were collected from the Baillarge Formation, section 5, faunal assemblage III, GSC loc. 58919.

Types. Holotype, GSC No. 20239, a-e; paratype, GSC No. 20240, a-e.

Family ACTINOSTROMATIDAE Nicholson, 1886

1886 Family Actinostromatidae Nicholson, p. 74.
1922 Family Actinostromatidae Stechow, p. 151.
1957 Family Actinostromatidae Nicholson, Galloway, p. 437.

Genus GERRONOSTROMA Yavorsky, 1931

Type species G. elegans Yavorsky, 1931

1931 Gerronostroma n. gen., Yavorsky, p. 1406, pl. I.
1941 Gerronostroma, Riabinin, p. 91.
1955 Gerronostroma, Yavorsky, pp. 34-38.
1957 Gerronostroma, Galloway, p. 438.

Diagnosis. Coenosteum composed of well defined compact pillars and laminae. Laminae persistent and transversely porous. Pillars spool-shaped, composed of porous tissue and conspicuously superposed from one interlaminar space to the next.

? Gerronostroma juvene n. sp.

Plate III, figures 1-4

Exterior. The coenostea are massive, bulbous or tabular in form. The bulbous form is incomplete, but its estimated measurements are about 10 cm diameter by 5 cm radial height, measured through the centre of the coenosteum. The undulating surface is rough. Latilaminae are not present in the dark grey-brown coloured coenosteum. The larger light grey-buff, tabular coenosteum measures 30 cm diameter and its thickness was greater than 10 cm. Mamelons of irregular size, shape and distribution are sporadically covered with papillae. Mamelons are 5 to 10 mm in diameter, rise about 1.5 mm and are about 1 to 2 cm apart. Papillae are 1 to 1.5 mm in diameter and rise about 0.5 mm. The surface is roughened by the emergence of the ends of the pillars. Small pits about 0.75 mm in diameter and 3 to 4 mm apart cover the surface.

Vertical sections. The general appearance is that of a tattered and broken net or grid. Laminae are discontinuous, broadly undulating and generally regularly spaced. Some laminae appear to have their broken ends turned up

or down. Local breaks and swells in the laminae reflect the presence of an astrorhizal network which ramifies throughout the structure. Beneath the epitissue is a finer, darker microlamina of endotissue which is 12 to 50 microns thick. This wide range in thickness is due to an irregular pinching and swelling of the microlaminae. The average thickness of the epitissue and endotissue ranges from 80 to 100 microns. There are six to eight laminae in 2 mm. The generally evenly spaced laminae, in some sections, alternate somewhat regularly with closely spaced wavy laminae and dissepiments; five to eight irregular laminae occur in the 1 mm thick zones. The zonation reflects latilaminar growth; about five latilaminae occur in 1 cm. Under X40 magnification, the microlaminae appear to pass through the pillars. Epitissue may completely mask the finer laminar structure. Reversals in the relative preservation of the endotissue of the microlaminae occur in the same section, that is, their tissue may be either darker or lighter than the epitissue. The epitissue and endotissue are of varying degrees of compactness.

The relatively thick pillars are irregular in spacing and appear to continue through several interlaminar spaces. The irregularity in spacing of pillars is caused by the interlacing astrorhizal system. Pillars are cylindrical to spool-like in form;the latter forms have a thicker epitissue than the former. They are confined to one interlaminar space; five to seven occur in 2 mm. Microstructure is similar to that of the laminae; however, the endotissue is thinner and less dense or compact. The endotissue is about 50 microns in diameter; when epitissue covers the endotissue the pillars are 100 to 180 microns thick. Some pillars seem to extend out and curve up from their bases in the laminae, that is, they are not straight and perpendicular.

Broad mamelon columns and smaller monticular inflections are intimately connected with astrorhizal growth. Pillars diverge away from the apices of folds but remain perpendicular to the laminae. Astrorhizal axial canals diagonally wind through the lattice; they are 500 microns in diameter. The 200 to 300 micron diameter astrorhizal branches, either extend into, and are confined by one interlaminar space, or they curve upward and extend across the structure.

Galleries are rectangular; some are round due to the expansion of spool-shaped pillars. About 45 per cent of sections is occupied by gallery space.

Dissepiments are present in well preserved specimens. They are gently curved to highly curved near mamelon columns where they imbricate irregularly to form cysts. Epitissue about these fine (10 micron) filaments blends with that of the laminae and pillars. The dissepiments pass through pillars as they extend through the galleries. Some appear to form secondary laminae between the primary ones. Usually, only one dissepiment will continue laterally in the confines of a single interlaminar space. Trapped foreign matter, muds and pellets, occur here and there.

Tangential sections. A good "hexactinellid network" is not developed in the sections studied. There is some suggestion of this texture between mamelons, where the plane of section lies in the laminae. Tangentially cut laminae appear as dark concentric bands over the mamelon columns. The thickness of the bands depends upon the obliqueness of the plane of section at

the laminae and the amount of epitissue on the laminae. Straight to curved cylindrical pillars project from both sides of the laminae.

Locally, in oblique sections, some pillars span the interlaminar region, others seem to curve up into the plane of section and appear as dots. In the clear spaces pillars appear as dots arranged in "single-file", about 100 microns apart, between two adjacent laminae. The cores or endotissue of the pillars appear as dark, 30 to 40 micron dots; heavy epitissue will thicken them to 150 microns or more. Some pillar centres contain lumina, this again may be tissue reversal, the result of preservation. Laminae and pillar tissue vary in degrees of compactness.

Discussion. This species may be assigned by different specialists to either the genus Actinostroma or Gerronostroma, depending upon the weight given to certain characters. The following morphological features detailed in the specific description are characteristic of Actinostroma: coenosteum laminar to globular; surface tuberculate; pillars with or without lumina; tissue compact; astrorhizae present. However, pillars appear superposed, discontinuous and, in tangential sections, have no radial arms. The last two characters are suggestive of Gerronostroma although this genus also has transversely porous laminae, rare astrorhizae, and lacks lumina. Despite the absence of these characters in the species studied, the fact that radial arms are not present and that pillars appear superposed favours the genus Gerronostroma.

The two specimens from Brodeur Peninsula show some affinity to A. whiteavesi Nicholson (1891), except that in A. whiteavesi astrorhizae are reduced to vertical canals which appear on the coenosteal surface or in tangential section as rosette-like groups and pillars have moderately well-developed radial processes. The astrorhizal axes in the species from Brodeur Peninsula have a good branching network, but pillars do not have radial arms in tangential section and there are fewer pillars in 2 mm (five to eight) than in A. whiteavesi (ten).

The new species from Brodeur Peninsula is grossly similar to C. nikitini Yavorsky (1961, p. 12), however, there are fewer pillars and astrorhizae are present in the new species. Yavorsky's species is found in Middle Devonian rocks of the U.S.S.R.

The above factors, coupled with a Middle Silurian age of the strata from which the specimens were collected, justify the introduction of a new species. The species is named ? G. juvene because it is the youngest form of this genus yet described.

Material and occurrence. Two specimens were collected from the upper part of the Baillarge Formation, section 5, faunal assemblage III, GSC loc. 58916.

Types. Holotype, GSC No. 20241, a, b; paratype, GSC No. 20242, a-d.

Family STROMATOPORIDAE Winchell, 1867

1867 Family Stromatoporidae Winchell, p. 98.
1886 Family Stromatoporidae Winchell, Nicholson, p. 74.

1939 Family Stromatoporidae Winchell, Kühn, p. A44.
1957 Family Stromatoporidae Winchell, Galloway, p. 445.

Genus STROMATOPORA Goldfuss, 1826[1]

Type species S. concentrica Goldfuss, 1826

Diagnosis. Coenosteum composed of an amalgamate network of tissue in which neither laminae nor pillars are easily distinguished. Vertical elements (pillars) predominate in the structure and are separated by high galleries called pseudozooidal tubes. Microlaminae composed of a line of dark granules, or more rarely a clear path in the tissue, are present in some species. Tangential sections show an irregular continuous network of tissue with small galleries and few areas of isolated tissue. The tissue is cellular or microreticulate.

Stromatopora baffinensis n. sp.

Plate III, figures 5-8

Exterior. The coenosteum is irregular, long and domical in form. The base projects sharply as a wave-like expansion into a mixed fossiliferous calcareous mud. Latilaminations are not present.

Vertical sections. The coarse grid is characterized by relatively thick laminae and stout pillars. The concentric laminae are generally straight and continuous. Locally, a thick lamina may appear cleaved. The divided lamina may continue laterally, or it may rejoin to assume its original form. Where this occurs, regular stout pillars span the apparent division, so that the basic structure is maintained. Locally, three relatively thin laminae join to form a single thick lamina. The thick laminae, composed largely of a "microreticulate" epitissue (Stearn, 1966) are underlain, in part, by "microlaminae"[2] and shorter, imbricating dissepiments. At high magnification, where the microreticulate tissue does not mask the primary elements the basic elements in the structure apparently are broad imbricating dissepiments. In some sections the broad dissepiments are set side by side in an arrangement common to Clathrodictyon. In the holotype, four to five laminae occur in 2 mm, but other specimens have seven laminae. They are 100 to 400 microns thick; the dissepiments or "microlaminae" are about 10 to 20 microns thick.

The pillars are spool-shaped and expanded where they merge with the laminae. Dissepiments underlie the microreticulate epitissue. The

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[1]Because the literature on Stromatopora is so voluminous, no attempt has been made here to cite it. The reader is referred to Galloway (1957, p. 447).

[2]Microlaminae are put in quotes because it is uncertain whether they exist as continuous sheets of tissue, as Galloway has defined the word.

pillars are superposed and regularly spaced; about five to six occur in 2 mm and they are 70 to 150 microns thick, discounting the expanded parts.

The microreticulate tissue resembles a checker-board. The light spots are "cellules" and the dark centres, "melanospheres" (Stearn, 1966). The melanospheres are about 25 microns in size; thirteen to fourteen series of melanospheres (measured horizontally or vertically) occur in 1 mm. Poor preservation may mar the discreteness of the melanospheres. Commonly, the melanospheres appear closer to each other vertically than horizontally. This alignment of melanospheres gives the laminae an appearance of being transversely porous. In other parts of the section, the melanospheres are horizontally set, and are so close that they appear to be continuous. If microlaminae underlie every continuous strand of melanospheres, horizontally, then microlaminae should underlie every series of melanospheres vertically. This obviously does not occur[1].

Astrorhizae cannot be clearly distinguished in vertical sections. The predominant tubular structures are the caunopores. These conspicuous tubes, 80 to 200 microns diameter, cut across the structural elements or lie within them. They are walled with a dark tissue, 12 microns thick. Some contain tabulae, 20 microns thick. Locally the tabulae are dissepiments which extend through the tubes[2]. The caunopores are set about 1 mm apart, but they curve everywhere in the coenosteum.

The galleries are round and measure 100 to 250 microns diameter. About 70 per cent of vertical sections is occupied by gallery space.

Tangential sections. The laminae appear as concentric zones of dark, porous, melanospheric tissue which alternates with clear gallery zones containing pillars about 1 mm in diameter. Tangentially or longitudinally cut caunopore tubes densely ramify through the structure. Where the section lies in the plane of the laminae, 25 micron melanospheres are evenly and closely set.

Discussion. The species described from northwestern Baffin Island, contains features characteristic of both Stromatopora and Ferestromatopora. In the type species of Stromatopora, S. concentrica Goldfuss, the pillars or vertical elements predominate in the structure and are separated by high galleries called pseudozooidal tubes. Generally, neither laminae nor pillars are easily distinguished. In the species from Brodeur Peninsula, laminae predominate in the structure, pillars are relatively subordinate, but both elements are easily distinguishable; galleries are small and round.

Galloway (1957, p. 447) re-defined the genus Stromatopora and he emphasized that microlaminae underlay the maculate tissue. The microlaminae, used in Galloway's sense, do not underlie every series of horizontally disposed melanospheres. Where they cross gallery space they are much more widely separated than the series of melanospheres which compose the

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[1]Stearn (personal communication) suggests that the series of melanospheres, set in contact horizontally and vertically, create a microlaminar grid-like structure.

[2]It is uncertain if the tabulae are always separately secreted in the caunopore tubes.

laminae. The microlaminae are not straight and continuous, but curve to connect with the laminae below. Locally, they appear to be more like dissepiments, that is, broad onlapping sheets of tissue, than true microlaminae. Where the melanospheric tissue is not well preserved, there are broad imbricating dissepiments within the thick laminae. The dissepiments lie in the thick laminae and in the stout pillars proper. The microstructure is similar to the larger structures in the Baffin Island species but the cellules, which would correspond to galleries, are larger and the melanospheres, or dark dots of tissue, are closer vertically than horizontally, so that the vertical element predominates.

Galloway (1957, p. 448) also claimed that in Stromatopora pseudozooidal tubes are dominant over laminae. It is obvious in the new species from Baffin Island that the 'pseudozooidal tubes' are subordinate to the laminae.

The new species has some affinities with Ferestromatopora Yavorsky but they are minor. Both have amalgamate structure, but the species from Brodeur Peninsula has perfect microreticulation. The horizontal elements predominate over the pillars, but both are well developed. Galleries are relatively small, round and superposed; in Ferestromatopora, galleries are not superposed. Galloway (1957, p. 446) for example has included in Ferestromatopora the specimens Stromatopora concentrica illustrated from Belgium by Lecompte. Stearn (1966, p. 112) states:

> "Although typical specimens of Ferestromatopora are easily distinguished from typical ones of Stromatopora on the basis of the absence of pseudozooidal tubes and the dominance of horizontal elements, such species as S. divergens Galloway and St. Jean, S. laminosa Lecompte, and S. eumaculosa Galloway and St. Jean, whose microlaminae seem to be derived from microreticulate tissue, could be assigned to either genus. Such species can be assigned to Stromatopora if the galleries are superposed forming pseudozooidal tubes, and to Ferestromatopora if the tubes are missing. The splitting of this group with microreticulate tissue away from both genera seems to offer a solution to this problem that expresses the biological relationships more satisfactorily."

The genus Stromatopora should be critically re-evaluated with the view of introducing a new genus.

The regular nature of the laminar and pillar structure and the perfectly developed microreticulate tissue, establishes a unique species from northwestern Baffin Island.

Material and occurrence. Three specimens were collected from the highest faunal assemblage IVc of the Brodeur Group, section 8, GSC loc. 58902.

Types. Holotype, GSC No. 20243, a-e; paratypes, GSC Nos. 20244, a, b; 20245, a, b.

Stromatopora aspectabilis Yavorsky

Plate IV, figures 1, 2

1961 Stromatopora aspectabilis Yavorsky, p. 40, pl. XXIII, figs. 4-7.
1961 Stromatopora vorkutensis Yavorsky, p. 39, pl. XXIII, figs. 1-3.

Exterior. The coenosteum is a thick, tabular, broad wavy expansion measuring about 8 cm in thickness and more than 30 cm in width. One wave length measures 7 cm.

Vertical sections. The sections are characterized by an amalgamate network of continuous, bumpy laminae and pillars that form a network of round, poorly superposed cyst-like galleries. Locally, the laminae are discontinuous where groups of closely set tubes extend vertically through the coenosteum. In such places the tubes are lined by thick tissue which appears to bifurcate and join repeatedly about the vertical pseudozooidal tubes. The amalgamate nature of the laminae and pillars is dependent upon the basic underlying structural elements, the dissepiments. About seven to eight laminae occur in 2 mm and their thickness is similar to that of the pillars, 100 to 150 microns. The laminar epitissue has been secreted upon the dissepiments, so that the dissepiments curve into the pillar structure. As a result the pillars appear to bifurcate as they extend into laminae. About six pillars occur in 2 mm.

The dissepiments commonly extend somewhat horizontally so that they have been described as "microlaminae" by some authors.[1] The dissepiments, apparently, overlap; the line of overlap is usually hidden by the epitissue at the lamina-pillar confluence. They are clearest in the round to cyst-like galleries. They extend undeterred through relatively large vertical caunopore (?) tubes. Dissepiments are about 100 microns apart and 10 microns thick, so that sixteen to twenty occur in 2 mm. About 45 per cent of sections is gallery.

Astrorhizae are not easily distinguishable in vertical sections. They may be connected to the larger tubes in the coenosteum. These larger tubes, which measure about 400 microns and are about 3 to 4 mm apart, have 100 to 200 micron thick walls of epitissue. Unlike the astrorhizae which generally branch upward, the large tubes appear as main trunks to a root system of smaller tubes 100 to 200 microns which spread down, then horizontally. Where two tubes join to form the thick trunk, their common wall creates a control core which extends upward (pl. IV, fig. 1). This pseudocolumn is joined by the tenuous dissepiments which continue horizontally through the main tube, creating "tabulae" (?).

The epitissue of the horizontal and vertical elements is not well preserved. The tissue is murky; locally however melanospheres are superimposed suggesting a microreticulate pattern. The melanospheres are mostly preserved as tattered flecks of dark tissue about 20 to 30 microns in size.

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[1]The preservation determines what appears as microlaminae or dissepiments. In the literature, Stromatopora is described as containing microlaminae and few dissepiments. The species of Stromatopora studied by the author appear to contain dissepiments, as defined elsewhere in this report.

Tangential sections. The sections are characterized by a carpet of closely set dark dots in a background of lighter tissue. About twenty 100 to 150 micron dots occur in one square millimetre. Some dots are connected to form a vermicular network. Dark concentric bands of melanospheric tissue represent transected laminae. Dendritic branching astrorhizal systems are about 3 to 4 mm apart; the tubes are 100 to 200 microns in diameter. Larger oval to round (about 400 microns diameter) tubes are set 3 to 4 mm apart and are surrounded by 100 to 200 microns thick melanospheric tissue. Smaller (200 microns) but similar tubes are irregularly distributed. The melanospheres are clearer in tangential sections; they are 20 to 35 microns in size.

Discussion. The characteristics described are essentially that of the species Stromatopora aspectabilis Yavorsky, 1961. Three characteristics, however, are different; the larger tubes 400 micron diameter with a pseudocolumn have not been recognized in S. aspectabilis; the number of dissepiments is less than in the Russian specimens; and the pillars are smaller in diameter. The last two features are common to S. vorkutensis Yavorsky, 1961, but the species herein has closer set and smaller astrorhizae and the pseudozooidal tubes are larger. Slight differences in structure may be only the result of different preservation or different growth rates. The basic difference between Yavorsky's two species is the separation between astrorhizae and the number of dissepiments. S. aspectabilis has sixteen dissepiments in 2 mm, S. vorkutensis has twenty-two. The species from Brodeur Peninsula has a range of sixteen to twenty in 2 mm. The writer suggests, after making several sections of the same coenosteum, that these three species are the same. It is not certain if the larger tubes in the above specimen are cauno-pores and if they should be given specific importance.

Material and occurrence. S. aspectabilis is found in the Silurian of the Russian Urals. In the Baffin Island collections two specimens were taken from the same large sample, from faunal assemblage IVc of the Brodeur Group, section 8, GSC loc. 58902.

Types. Hypotypes, GSC Nos. 20246, a-n; 20247, a-i.

Stromatopora sp. A

Plate IV, figures 3, 4

Exterior. The coenosteum is a laminar wavy expansion about 6 to 7 mm thick and 10 cm wide. About six latilaminations occur in 1 cm. Surface unknown.

Vertical sections. The diagnostic feature in vertical sections is a regular structure which is essentially like that of microreticulate tissue, but on a larger scale. The horizontal and vertical elements are preserved as beads of tissue 200 microns in diameter, which would be equivalent to the melanospheres in microreticulate tissue. The horizontally disposed beads are set slightly wider apart than the vertical ones, making the vertical elements predominant. Between the vertical elements are the 'pseudozooidal tubes'.

Nearly all resemblance of gallery or interlaminar space is lost except for an intermittent broken structure between 1 mm thick latilaminations. There are eight to ten beads set horizontally or vertically in 2 mm. About 80 per cent of sections is tissue.

The structure is broken by spots of coarse crystallization, some of which are the remains of tubular structures. Some are clearly tangential sections of round tubes, others are longitudinal sections of tubes disposed horizontally in the structure. The tubes (caunopores ?) are 200 to 500 microns in diameter.

Dissepiments or microlaminae are rarely visible. Some have been preserved that measure 25 microns in diameter.

Tangential sections. The sections are characterized by 200 micron dots of tissue which are evenly spaced about 100 microns apart. Preservation has made some of the dots of tissue appear fused. This porous structure is penetrated by remnants of 200 to 500 micron diameter tubes.

Discussion. The tissue structure has not been preserved, but there is a suggestion of melanospheres in otherwise dark compact tissue. Conspicuous dark 50 micron dots are surrounded by a 150 micron thick, light, fibrous halo. These spots occur in almost every bead of tissue. The spots may be diagenetic concentrates of pigment.

The almost perfect reticulate gross structure has not been described in the literature. Since only one specimen has been collected a new species has not been named.

Material and occurrence. The specimen was collected from the base of the Cape Crauford Formation, section 10, faunal assemblage IVa, GSC loc. 58945.

Types. Figured specimen, GSC No. 20248, a, b.

Stromatopora baillargensis n. sp.

Plate IV, figures 5, 6

Exterior. Coenostea are tabular or laminar expansions, about 6 cm thick and more than 10 cm wide. The surface is somewhat undulant and is covered with 1 mm size monticules. Latilaminae are not visible.

Vertical sections. Neither discrete continuous laminae nor pillars are developed in the structure. The horizontal element is composed of relatively closely set dot-like masses of tissue which give off, above and below, similarly thick vertical to curved clumps of tissue. Where the section is slightly oblique to the structure, the horizontal and vertical elements appear as zones of closely set dots, 1 mm across, and short curved bars which alternate with clear zones. Locally, the vertical element spans from one laminae sensu lato to another; laminae are 200 to 250 microns thick and three occur in 2 mm. Undulations in the horizontal elements have wave lengths of 0.8 to 1.5 mm. Between the vertical elements are discontinuous, pseudozooidal tubes; five occur in 2 mm. Dissepiments are rarely preserved in the

specimens collected from Brodeur Peninsula. Other tubes, which may be caunopores, appear as 200 to 400 micron clear holes surrounded by 200 microns of tissue. One longitudinal section of a caunopore tube, with tabulae set 500 microns apart, was seen disposed horizontally in the structure. The tissue is murky and compact, probably due to bad preservation.

Tangential sections. The poorly preserved specimen shows vague dark and light bands of porous tissue. The thick sieve-like structure is marred by irregularly branching tubes. Some 200 micron caunopora tubes are discernable. Locally, tissue appears melanospheric.

Discussion. The finer structural features have apparently been lost in preservation but the gross elements are well enough preserved for specific identification. The new species is named after the Baillarge Formation from which it was collected.

Material and occurrence. Two specimens of this species were collected from the Baillarge Formation, section 5, faunal assemblage III; GSC locs. 58919, 58916.

Types. Holotype, GSC No. 20249, a-c (loc. 58916); paratype, GSC No. 20250, a-e (loc. 58919).

Genus ACTINODICTYON Parks, 1909

Type species A. canadense Parks

1909 Actinodictyon n. gen., Parks, p. 30.
1915 Actinodictyon, Bassler, p. 16.
1928 Actinodictyon, Kühn, p. 25.
1936 Actinodictyon, Parks, p. 113.
1951 Actinodictyon, Lecompte, p. 149.
1957 Actinodictyon, Galloway, p. 453.
1958 Actinodictyon, Flügel, p. 142.
1964 Actinodictyon, Nestor, p. 80.

Diagnosis. Coenosteum cylindrical or a wavy expansion composed of irregularly crumpled laminae and through-going pillars. The laminae resemble dissepiments and are inflected irregularly up and down so that they are impersistent and abut against each other or as in some species of Clathrodictyon. Pillars thick, irregular in cross-section. The compact epitissue and endotissue of the laminae and pillars are amalgamated.

Actinodictyon crispatum n. sp.

Plate IV, figures 7, 8

Exterior. The coenosteum is a wavy laminar expansion, encrusting fossiliferous calcilute. The largest specimen measures 18 x 12 x 5 cm. The surface is hummocky.

Vertical sections. The gross structure is that of regularly spaced, zigzag laminae[1], and somewhat irregularly spaced, stout, slightly curved pillars which extend through several interlaminar spaces. Relatively thin and straight dissepiments pervade the gross structure.

Laterally laminae, either inflect to join with immediately adjacent laminae or extend into the pillars. The laminae gently curve into the points of inflection. This suggests a basic cyst plate structure. At higher magnification, the laminae are seen to be underlain by finer dissepiments. Indeed, the thin dissepiments[2] are the structural base (the endotissue) upon which tissue was secreted to form the thicker laminae. In some thin sections only dissepiments occur. Similarly, the stout pillars are the result of selective secretion of epitissue about an "axis" of downward inflected and joined dissepiments. The pillars, therefore, do not have a microaxis of relatively denser endotissue. The laminae are also joined by relatively small pillars which extend downward from inflections in the laminae. These are really cyst plates or dissepiments upon which little epitissue has been secreted. This structure is amalgamate, for the stout pillars branch into laminae.

Six to eight laminae occur in 2 mm and they are about 50 microns thick. Tissue is compact to flocculent; the flocculent to ragged nature of the epitissue in some areas is probably due to diagenetic effects. Some laminae appear transversely porous; these "pores" are closely-set calcite cleavage planes. At X10 magnification, the tissue could be erroneously interpreted as being maculate or microreticulate.

The conspicuously stout pillars are about 100 microns thick, 0.2 to 1 mm apart, and generally four to five occur in 2 mm. The pillars are not straight but appear to bend so to maintain a perpendicular relationship with the planes of the laminae as they extend in the structure. Pillar tissue is like that of the laminae.

Astrorhizae are obscure in vertical section. They extend within the confines of one interlaminar space and are 200 to 300 microns in diameter. Some clear round areas surrounded by tissue are astrorhizal branches cut by the plane of section.

Galleries are of zigzagged, rectangular form. Relatively straight, to locally imbricating dissepiments appear to extend uninterrupted through galleries and laminae; closer observation shows that they inflect into laminae, stout pillars and minute dissepiment or cyst plate-type pillars. Dissepiments are 1 to 2 microns thick, and 150 to 200 microns apart. About 50 per cent of the section is occupied by gallery space.

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[1]Galloway and St. Jean (1957) and Flügel (1958) refer to the laminae as cyst plates or cysts.

[2]The distinction between microlaminae and dissepiments is difficult to make. Throughout this report, dissepiments are considered as broadly or sharply curved onlapping structures. It is unknown whether these structures are always sheets of endotissue or whether they are sometimes strands or threads which wind their way through the coarser structures. When a relatively fine line of dark endotissue is straight and continuous through the structures it is called a microlamina.

Locally, coarse bioclastic and other foreign matter is enclosed by the growth of the coenosteum.

Tangential sections. Distinct concentric laminae are not visible. The most conspicuous structure is that of the dissepiments which join the minute and stout pillars to form an irregular network. Laminae sensu stricto are poorly developed. Relatively light, laminar dissepimental membranes appear to connect and brace the thicker structures in the coenosteum. In some very thin sections this tissue is seen only as scattered patches of relatively light hue.

The stout pillars are large 100 micron dots of dark tissue or crude star-like forms when the section is at the level where the relatively thick laminae, join the pillars. At this same level, the laminae are pierced by 100 to 200 micron diameter "pores" (Parks, 1909) or astrorhizal tubes which are surrounded by dark tissue. In another section, radiating astrorhizae are conspicuous, but they apparently do not have central canals. Astrorhizal centres are about 6 mm apart and their branches are about 200 microns in diameter.

Discussion. Except for the stout pillars and the numerous dissepiments, the structure of A. crispatum n. sp. is grossly similar to Ecclimadictyon fastigiatum (Nicholson). The relatively thin horizontal to curved elements discussed above are not true microlaminae, but rather membranes of dissepiments. Flügel (1958, p. 143) states that dissepiments are absent in Actinodictyon, but that they are present in Pseudoactinodictyon Flügel, 1958.[1]

In the type species, A. canadense Parks, dissepiments are subordinate in the structure. Flügel suggests that Parks' species A. neptuni and A. canadense are the same. He also states that A. keelei is a Clathrodictyon and only A. lowi Parks, is a valid species. The writer agrees with the possible synonymy.[2]

A. crispatum differs from A. canadense in the following characters; coenosteum is a thin laminar crust; laminae are regularly and more distantly spaced and sharply inflected; dissepiments are very numerous within galleries; and astrorhizal systems are closer together. The species is named crispatum because of the wavy form of both the coenosteum and the laminae-dissepimental elements.

Material and occurrence. Three specimens were collected from the lower part of the Cape Crauford Formation, Section 10, faunal assemblage IVa, GSC loc. 58945.

Types. Holotype, GSC No. 20251, a-e; paratypes, GSC Nos. 20252, a-g, 20253, a-d.

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[1] This latter genus was established by Flügel to separate Devonian species with true laminae from Silurian species without straight, continuous laminae which Parks included together in Actinodictyon.

[2] Flügel's (1958, p. 142) diagrams illustrate the apparent variation in the structure depending upon the relative position of the vertical section.

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- PLATES -

PLATE I

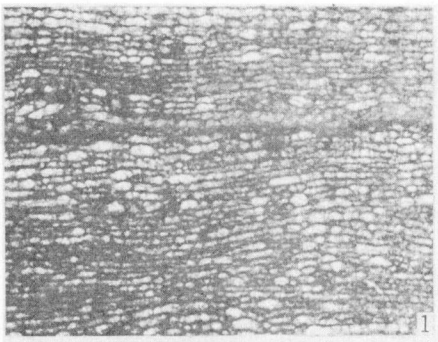
(All figures x 11)

Figures 1, 2. Clathrodictyon lenticulare n. sp. Vertical and tangential sections; 57-207 feet above base of Cape Crauford Formation, seaward-facing cliffs about 5 miles NW of Cape Crauford. Holotype, GSC Nos. 20201b, a.

Figures 3, 4, 4a. Clathrodictyon vajgatschense Yavorsky. Vertical and tangential sections; 1,585-1,596 feet above base of Baillarge Formation, about 18,000 feet SW of Cape Crauford. Hypotypes, GSC Nos. 20204a, b, 20207b.

Figures 5, 6. Clathrodictyon miniapse n. sp. Vertical and tangential sections; 1,470 feet above base of Baillarge Formation, same locality as Figure 3. Holotype, GSC Nos. 20208a, b.

Figures 7, 8. Clathrodictyon linnarsonni Nicholson. Vertical and tangential sections; 1,100-1,110 feet above base of Baillarge Formation, cliffs facing Admiralty Inlet, about 17 miles SW of Cape Crauford. Hypotype, GSC Nos. 20217a, b.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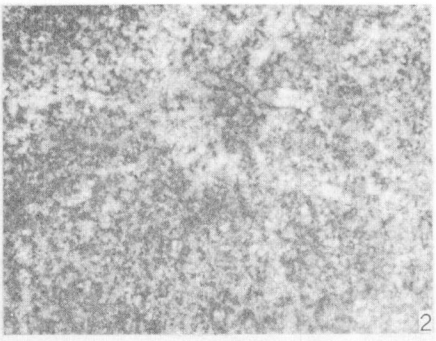
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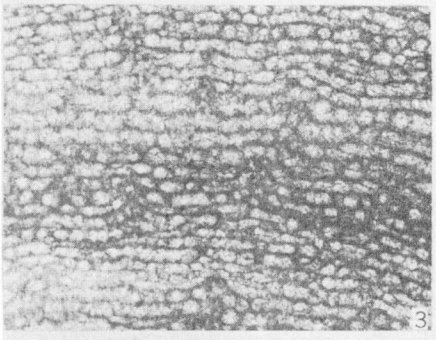
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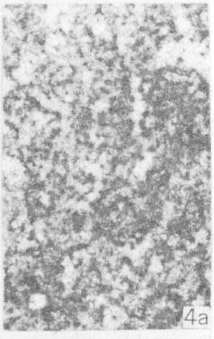
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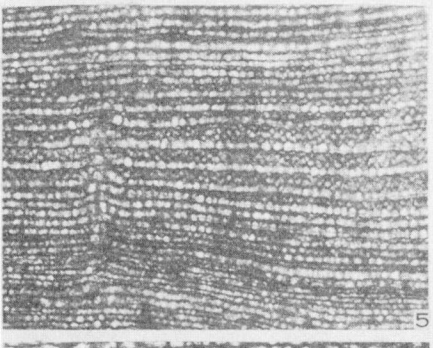
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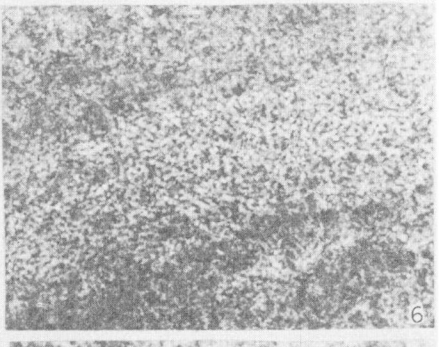
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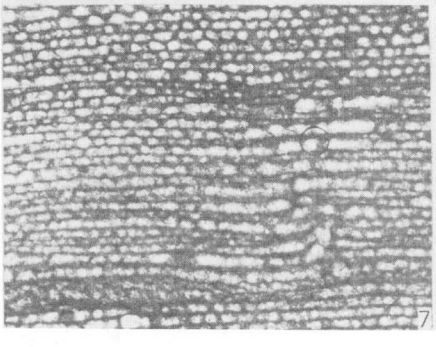
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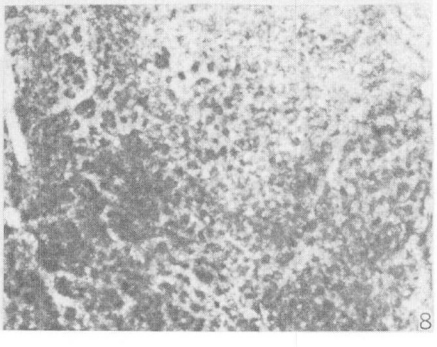
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PLATE II

(All figures x 11)

Figures 1, 2. *Ecclimadictyon fastigiatum* Nicholson. Vertical and tangential sections; 1,585-1,596 feet above base of Baillarge Formation, about 18,000 feet SW of Cape Crauford. Hypotype, GSC Nos. 20228a, b.

Figures 3, 4. *Ecclimadictyon microvesiculosum* Riabinin. Vertical and tangential sections; 1,100-1,110 feet above base of Baillarge Formation, cliffs facing Admiralty Inlet, about 17 miles SW of Cape Crauford. Hypotype, GSC Nos. 20235a, b.

Figures 5, 6. *Ecclimadictyon* sp. A. Vertical and tangential sections; same locality as Figure 3. Figured specimen, GSC Nos. 20238a, b.

Figures 7, 8, 8a. *Intexodictyon brodeurense* n. sp. Vertical and tangential sections; 1,470 feet above base of Baillarge Formation, same locality as Figure 3. Holotype, GSC Nos. 20239a, b; paratype, GSC No. 20240a.

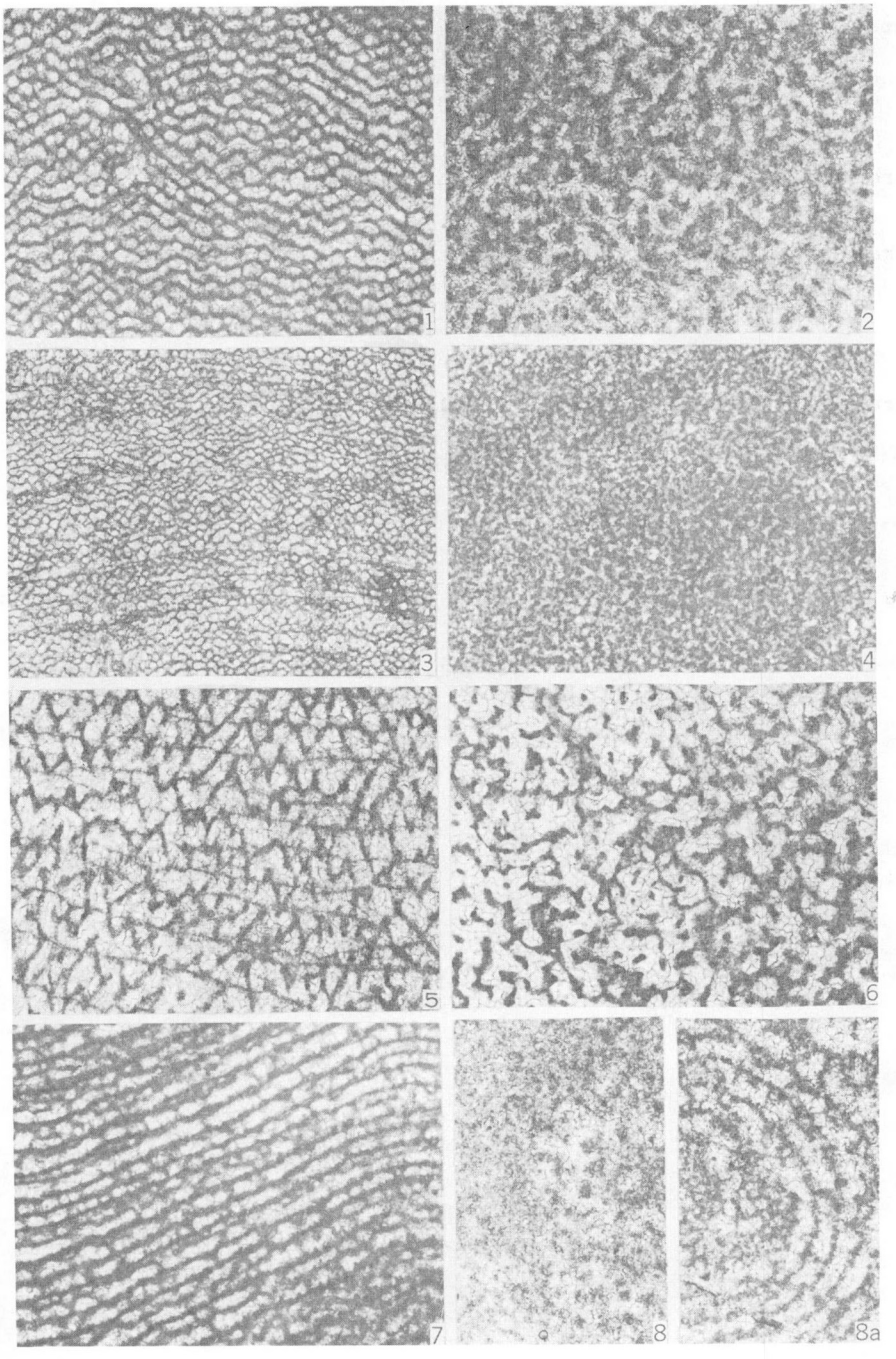
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PLATE III

Figures 1, 2. ? Gerronostroma juvene n. sp. Vertical and tangential sections; x 11; 1,585-1,596 feet above base of Baillarge Formation, about 18,000 feet SW of Cape Crauford. Holotype, GSC Nos. 20241a, b.

Figures 3, 4. Same specimen as Figures 1 and 2; x 20.

Figures 5, 6. Stromatopora baffinensis n. sp. Vertical and tangential sections; x 11; 1,000-1,020 feet above base of Cape Crauford Formation, seaward-facing cliffs about 6,500 feet SW of Cape Crauford. Holotype, GSC Nos. 20243a, b.

Figures 7, 8. Same specimen as Figures 5 and 6; x 20.

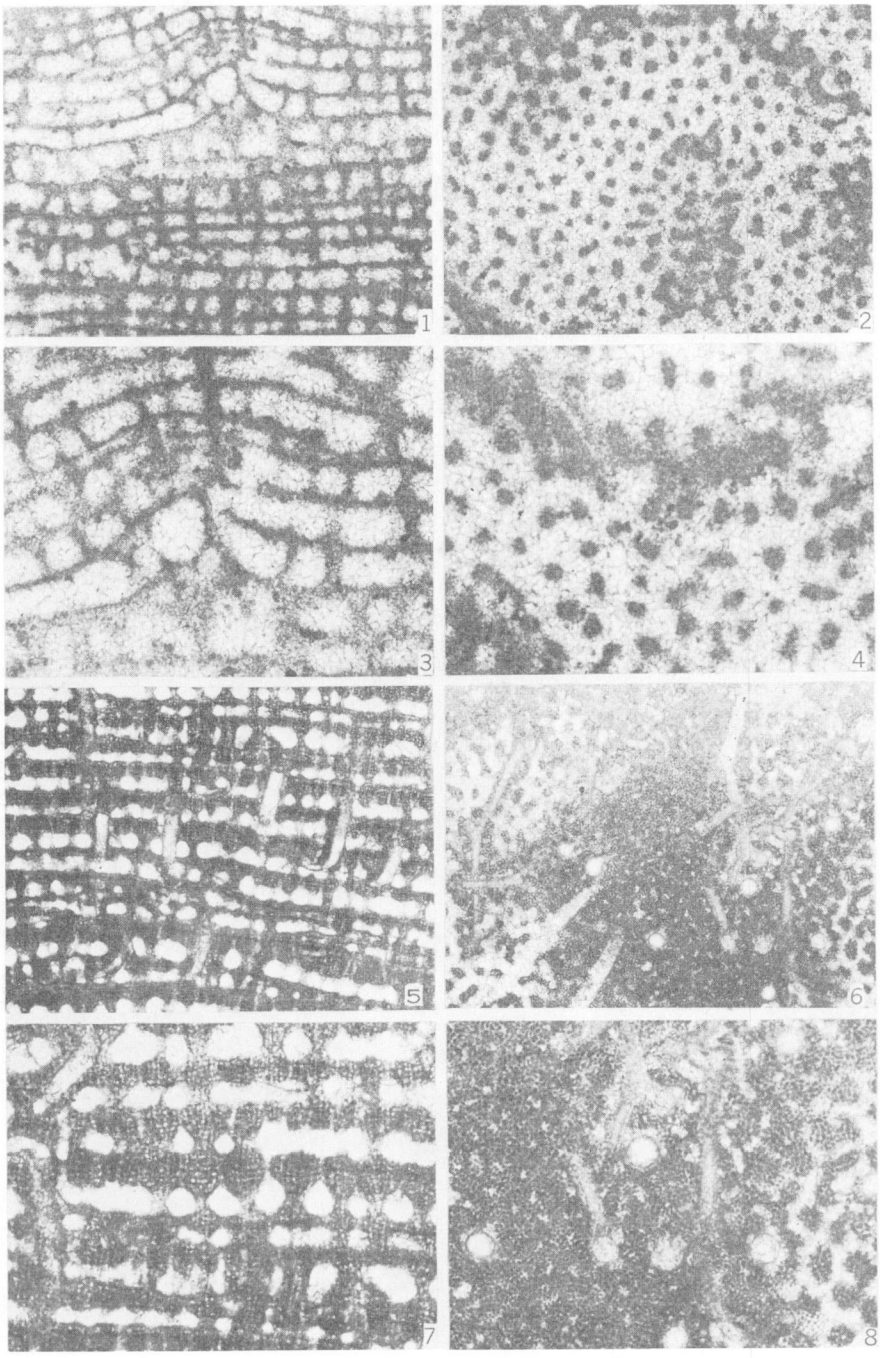
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PLATE IV

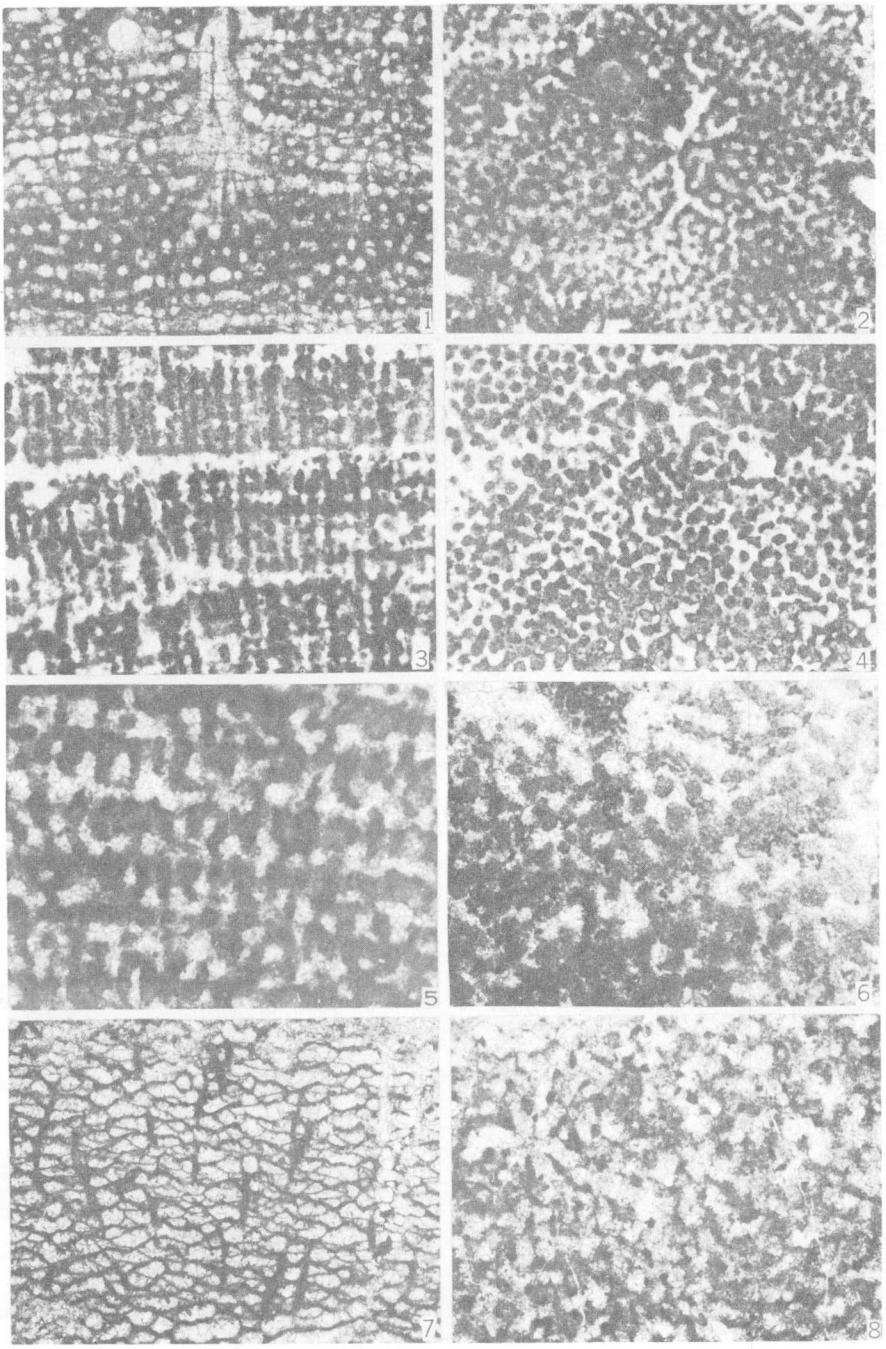
(All figures x 11)

Figures 1, 2. Stromatopora aspectabilis Yavorsky. Vertical and tangential sections; 1,000-1,020 feet above base of Cape Crauford Formation, seaward-facing cliffs about 6,500 feet SW of Cape Crauford. Hypotype, GSC Nos. 20246a, b.

Figures 3, 4. Stromatopora sp. A. Vertical and tangential sections; 1-50 feet above base of Cape Crauford Formation, SW-facing cliffs about 4 miles NE of Jackson Inlet. Figured specimen, GSC Nos. 20248a, b.

Figures 5, 6. Stromatopora baillargensis n. sp. Vertical and tangential sections; 1,585-1,596 feet above base of Baillarge Formation, about 18,000 feet SW of Cape Crauford. Holotype, GSC Nos. 20249b, c.

Figures 7, 8. Actinodictyon crispatum n. sp. Vertical and tangential sections; same locality as Figures 3 and 4. Holotype, GSC Nos. 20251a, b.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APPENDIX

Index of fossil localities, Brodeur Peninsula

Section No. (Fig. 2)	Locality from Trettin, 1965 (Fig. 1)	Localities, stromatoporoid species
1	F	South-facing cliffs and plateau, about 30 miles SW of Cape Crauford, 1/2 mile NW of Admiralty Inlet. No stromatoporoids; GSC loc. 58925; Baillarge Formation.
2	D	South-facing cliffs about 20 miles SW of Cape Crauford, 3 miles NW of Admiralty Inlet. No stromatoporoids; GSC loc. 58947; Baillarge Formation.
3	D	Cliffs facing Admiralty Inlet, about 17 miles SW of Cape Crauford. Clathrodictyon linnarsonni Nicholson GSC loc. 58932 1,100-1,110 feet above base Baillarge Formation, II. 58929 1,176 feet above base Baillarge Formation, II. 58910 1,179 feet above base Baillarge Formation, II. 58934 1,426 feet above base Baillarge Formation, III. Ecclimadictyon microvesiculosum Riabinin GSC loc. 58932 1,100-1,110 feet above base Baillarge Formation, II. Ecclimadictyon sp. A GSC loc. 58932 1,100-1,110 feet above base Baillarge Formation, II.
4	D	South-facing cliffs near Admiralty Inlet, about 16 miles SW of Cape Crauford. Ecclimadictyon microvesiculosum (Riabinin) GSC loc. 58936 1,208 feet above base Baillarge Formation, II.
5	A	About 18,000 feet SW of Cape Crauford, in gullies cut by two adjacent creeks.

		Clathrodictyon linnarsonni Nicholson GSC loc. 58918 1,560-1,570 feet above base Baillarge Formation, III. C. miniapse n. sp. GSC loc. 58917 1,456 feet above base Baillarge Formation, III. 58919 1,470 feet above base Baillarge Formation, III. 58912 1,531 feet above base Baillarge Formation, III. 58918 1,560-1,570 feet above base Baillarge Formation, III. 58913 1,585-1,596 feet above base Baillarge Formation, III. C. vajgatschense Yavorsky GSC locs. 58913, 58916 1,585-1,596 feet above base Baillarge Formation, III. E. fastigiatum Nicholson GSC loc. 58919 1,470 feet above base Baillarge Formation, III. 58911 1,575-1,585 feet above base Baillarge Formation, III. 58913, 58916 1,585-1,596 feet above base Baillarge Formation, III. Intexodictyon brodeurense n. sp. GSC loc. 58919 1,470 feet above base Baillarge Formation, III. ? Gerronostroma juvene n. sp. GSC loc. 58916 1,585-1,596 feet above base Baillarge Formation, III. Stromatopora baillargensis n. sp. GSC loc. 58919 1,470 feet above base Baillarge Formation, III. 58916 1,585-1,596 feet above base Baillarge Formation, III.
6	A	Creek cut about 1/2 mile SW of Cape Crauford. Clathrodictyon miniapse n. sp. GSC loc. 58942 1,550 feet above base Baillarge Formation, III.
7	A	Seaward-facing cliffs, about 6,500 feet SW of Cape Crauford. Clathrodictyon lenticulare n. sp. GSC loc. 58928 170 feet above base Cape Crauford Formation, IVa.

8	A	Seaward-facing cliffs, about 5 miles NW of Cape Crauford. Clathrodictyon lenticulare n. sp. GSC loc. 58905 57-207 feet above base Cape Crauford Formation, IVa. Stromatopora aspectabilis Yavorsky GSC loc. 58902 1,000-1,020 feet above base Cape Crauford Formation, IVc. S. baffinensis n. sp. GSC loc. 58902 1,000-1,020 feet above base Cape Crauford Formation, IVc.
9	B	East-facing cliffs, about 5 miles ESE of Sargent Point. Clathrodictyon lenticulare n. sp. GSC loc. 58935 315 feet above base Cape Crauford Formation, IVa.
10	C	Southwest-facing cliffs, about 4 miles NE of Jackson Inlet. Stromatopora sp. A GSC loc. 58945 1-50 feet above base Cape Crauford Formation, IVa. Actinodictyon crispatum n. sp. GSC loc. 58945 1-50 feet above base Cape Crauford Formation, IVa.