RUGOSE CORALS OF THE LATE ORDOVICIAN TO EARLIEST SILURIAN VAURÉAL, ELLIS BAY AND BECSCIE FORMATIONS, ANTICOSTI ISLAND, QUÉBEC

BY

ADAM A. MELZAK

A Thesis
Submitted to the Faculty of Graduate Studies
in Partial Fulfillment of the Requirements
for the Degree of

DOCTOR OF PHILOSOPHY

Department of Geological Sciences
University of Manitoba
Winnipeg, Manitoba

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

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6 SYSTEMATIC PALEONTOLOGY

6.1 INTRODUCTION

The rugose coral fauna of the Late Ordovician Vauréal and Ellis Bay formations and the Early Silurian Becscie Formation of Anticosti Island includes 19 species belonging to 14 genera and five families. Of these, five species are new: *Streptelasma* n. sp. 1, *Streptelasma* n. sp. 2, *Bodophyllum* n. sp., *Rhegmaphyllum* n. sp. and *Palaeophyllum* n. sp. Three additional species are placed in open nomenclature as there were insufficient data to compare quantitatively with other species. These are: *Amplexoides* sp., *Palaeophyllum* sp. and *Streptelasma* sp.

In all cases, a range of ontogenetic stages was examined as solitary rugose coral species, or even genera, cannot be distinguished solely on the basis of late stage morphologies. Where possible, several astogenetic stages were examined in complete coralla of colonial taxa. Additionally, morphometric data are presented in graphical form and as ranges of values rather than single mean values. Taxonomic and morphologic nomenclature generally follows Neuman (1969, 1977), Laub (1979), Hill (1981), Elias (1982a) and McAuley and Elias (1990).

6.2 BIOMETRIC METHODS

Morphological features were described and measured following common usage for lower Paleozoic solitary rugose corals (e.g., Neuman, 1969), with the exception of the number of nearest neighbours, which is a feature only present in colonial forms and which is similar to the "polygonality" measured in favositids by Young and Elias (1993).

6.2.1 Solitary Taxa: External Characters (Quantitative)

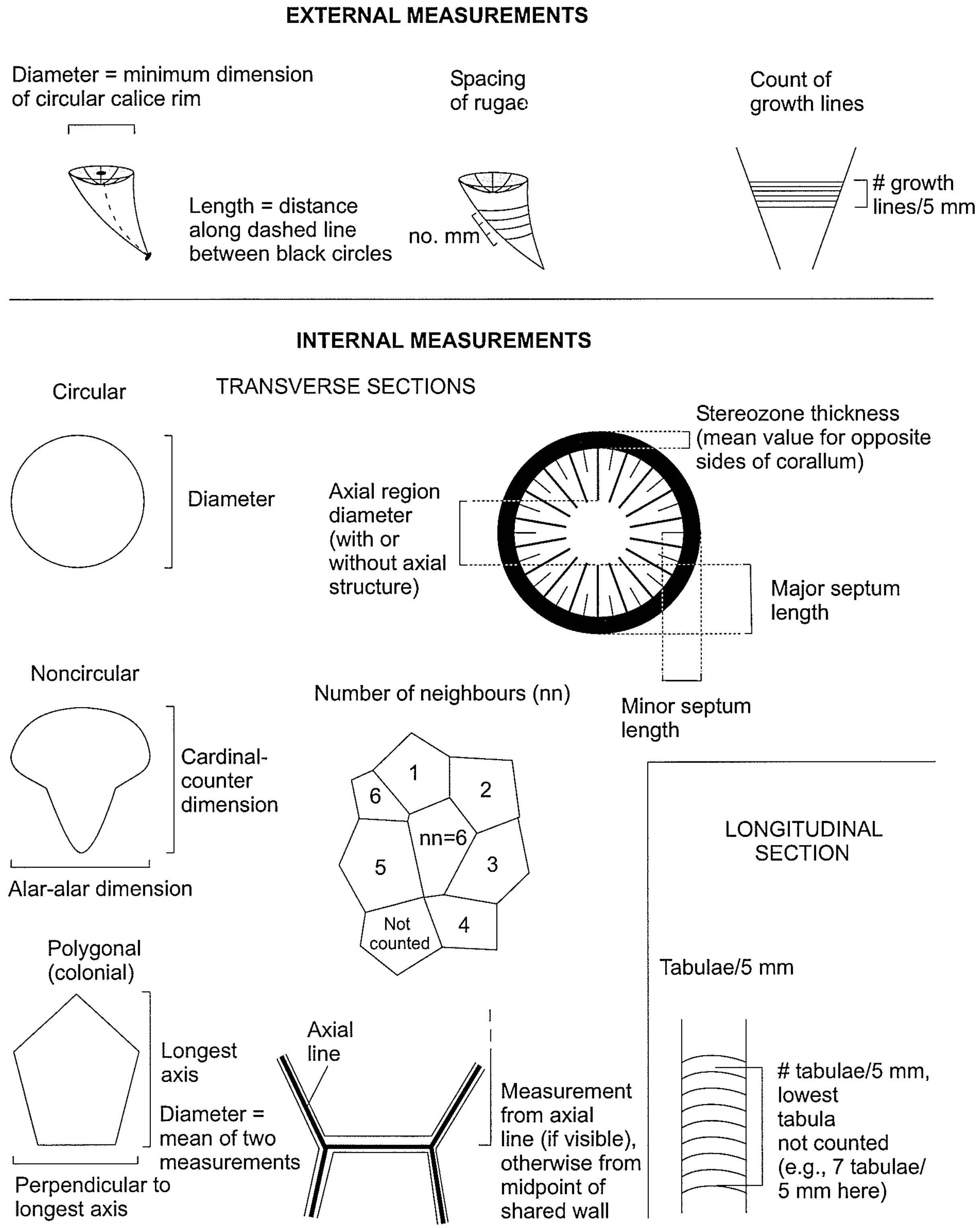
Measurement of the following external morphological characters of solitary coralla was performed with a flexible ruler (length only; maximum precision 0.5 mm) or a micrometer caliper (all other measurements; maximum precision 0.05 mm); see Text-figure 20.

Corallum length (l). Length of an imaginary line through the centre of the corallum from the apex to the top of the calice.

Corallum diameter (D) or cross sectional dimensions (C-C, A-A). This was measured along the minimum diameter if the cross section was generally circular. For taxa with noncircular cross sections (i.e., *Lobocorallium*, *Deiracorallium*, *Bighornia*) both the cardinal-counter dimension and alar-alar dimension were measured. Although corallum diameter is an external character, a separate measurement was taken to indicate the size at the level of sampling, and is distinct from the external corallum diameter.

Spacing of rugae (r). Distance between rugae along a line down the alar side (if possible) of a corallum.

Count of growth lines (gl/5 mm). Number of growth lines per unit distance (5 mm segments if possible, or between a pair of rugae) measured under a stereoscopic microscope.



Text-fig. 20. Measurement methods for solitary and colonial coralla.

6.2.2 Solitary Taxa: External Characters (Qualitative)

The qualitative characters described below, some of which are subjective, were observed on the exterior of rugose corals.

Corallum form. Corallum form was described in terms of expansion rate (e.g., trochoid [Pl. 6, fig. 10], ceratoid [Pl. 1, fig. 1], cylindrical [Pl. 23, fig. 10]) and other terms describing the overall shape (e.g., subcalceoloid [Pl. 5, figs. 1-3]) or cross sectional shape (depressed [Pl. 6, figs. 2, 3], compressed [Pl. 9, figs. 1, 2], trilobate [Pl. 8, figs. 1, 4, 9], angulate [Pl. 8, figs. 10, 11]). This classification is somewhat subjective (e.g., difference between trochoid and ceratoid is in effect a qualitative measurement of the apical angle; see examples in plates).

Corallum curvature. The overall curvature of the corallum was classified as follows: straight (e.g., Pl. 1, figs. 1-3), slightly curved (e.g., Pl. 8, fig. 1), curved (e.g., Pl. 9, figs. 1, 9, 12, 18, 22), or bent (e.g., Pl. 1, fig. 12, Pl. 9, fig. 16). This character is subjective, but significant for taxonomy as well as paleoecologic reconstruction.

Presence/absence of septal grooves and interseptal ridges (gr), and growth lines (gl). These features are generally functions of biostratinomy, but were noted for all taxa as they have some taxonomic significance (e.g., gr present [Pl. 4, fig. 10]; gl present [Pl. 9, figs. 1, 2]; gr/gl absent [Pl. 6, figs. 1, 10, 12]).

Nature of rugae. Rugae were classified as coarse (e.g., Pl. 1, fig. 1) or fine (e.g., Pl. 6, fig. 1), and as single (e.g., Pl. 9, figs. 21, 22) or multiple (e.g., Pl. 23, fig. 10).

Other features. These include distortions of the corallum wall (e.g., Pl. 4, figs. 1, 4, 6-8) or calice (Pl. 2, figs. 6, 7), attachment structures (Pl. 9, fig. 16) and offsets (Pl. 6, figs. 12, 13).

6.2.3 Solitary Taxa: Internal Characters (Quantitative)

The following characters were measured from transverse (unless otherwise stated) thin sections or acetate peels, using micrometer calipers under a stereoscopic microscope or on a microfiche reader projection; see Text-figure 20. Note that for some taxa, certain measurements were omitted (e.g., stereozone thickness in taxa with thin stereozones through ontogeny).

Number of major septa (n). This number includes one or both small septa inserted adjacent to the cardinal septum, provided they project beyond the stereozone.

Stereozone thickness (st). This was measured along the same axis as the diameter in specimens with circular cross sections, on both sides of the corallum, at a position midway between adjacent septa to minimize distortion. The two measurements were then averaged.

Major septum length (Msl). This was measured only in certain taxa. The major septa were measured from the inner edge of the epitheca (or more frequently the outer edge of the wall where the epitheca was missing) on opposite sides of the corallum along the shortest diameter. The two measurements were averaged.

Minor septum length (msl). This was measured only in certain taxa. Measurement method was the same as for major septum length.

Axial region diameter (ard). This was measured along the same axis as the diameter.

Dissepimentarium thickness and/or number of columns of dissepiments (dis). This was measured and/or counted in longitudinal sections.

6.2.4 Solitary Taxa: Internal Characters (Qualitative)

The qualitative characters described below were observed in transverse (unless otherwise stated) thin sections or acetate peels.

Degree of septal dilation. This is classified as: non- (Pl. 1, figs. 4-6, 9, 11, 13, 14), moderately (Pl. 9, figs. 13, 14, 17, 20, 23, 25), greatly (Pl. 7, figs. 4, 5, 11-13, 16) and completely (Pl. 5, figs. 4, 5, 9, 11, 13) dilated. This classification is somewhat subjective (non- and completely dilated are easily defined) but is highly significant to taxonomy.

Nature of major and minor septa. This is a description of morphology in the following nonexclusive classes: straight, wavy, twisted, tapering, straight sided, long or short (if not measured).

Nature of axial region. The nature of the axial region is of critical importance to taxonomy, as most streptelasmatid genera (which make up the bulk of the solitary rugose coral fauna being studied) are differentiated at least partially on the basis of the axial structure. Features studied include: presence/absence, size, complexity, and presence/absence of lobes, lamellae, median lamella, septal palli, dilated axial ends of major septa, and stereome. Additionally, whether or not the axial structure is attached to the cardinal and/or counter septum is important.

Microstructure. This can usually be observed only in thin sections under high magnification, with or without plane polarized light. The characters observed are: presence/absence and orientation of fibres in the septa and axial structure, septal carinae, lamellae in the stereozone or epitheca, sutures in the stereozone, and orientation of fibres (observed in transverse and longitudinal sections).

Features in the cardinal-counter plane. Characters include the presence/absence and size and shape of the cardinal fossula, length of the cardinal and counter septa, degree of dilation of the cardinal septum, or other distortion of the cardinal or counter septum.

Nature of the tabularium. This was examined in longitudinal sections. The tabulae were classified as complete or incomplete, arched (upwards or downwards), flat, or axially indented, and the presence of complementary plates was noted. Additionally, the general spacing of the tabulae was observed (dense, sparse, variable) but not measured in solitary taxa.

Nature of dissepimentarium. The dissepiments were characterized according to size, shape (e.g., tabular, globose, crescentic) and orientation (flat, moderately to steeply inclined) and number of columns and variation in dissepimentarium thickness was noted.

Other. Other characters observed in thin sections include: internal skeletal distortion, offsets, and embedded particles.

6.2.5 Colonial Taxa: External Characters (Quantitative)

Corallum size. Length (maximum dimension perpendicular to growth axis), width (perpendicular to length and growth axis) and height (parallel to growth axis) were measured.

6.2.6 Colonial Taxa: External Characters (Qualitative)

Corallum shape. General categories used were: domical, flattened and irregular (N.B., shape only defined qualitatively as there were virtually no complete coralla from which to make quantitative definitions, cf. Young and Scrutton, 1991).

6.2.7 Colonial Taxa: Internal Characters (Quantitative)

Oliver (1968), Dixon (1974), Scrutton (1989) and Young and Elias (1995) determined that a sample size of 20 corallites per section is sufficient to be representative of each corallum. Their work was mainly focused on tabulate corals; however, the measurements used on tabulates are similar in nature to those used in this study on colonial rugosans. Twenty corallites per section are used here to calculate mean values, and more than one section is used from large or internally variable colonies. For a limited number of specimens, all corallites were measured (for corallite diameter, number of neighbours, number of major septa) to generate histograms for the comparison of coralla. Note that the characters described below were measured in transverse section (thin section or acetate peel) unless otherwise stated; see Text-figure 20.

Corallite diameter (d). Circular or subcircular corallites (in transverse section) were measured along the shortest diameter. Polygonal corallites were measured from the centre of the shared wall (from axial line if visible) to the centre of the opposite wall, along the longest axis and the axis perpendicular to it. The two measurements were then averaged to yield diameter.

Number of neighbours (nn). For each corallite, the number of other corallites sharing a length of its wall was counted. In the case of polygonal corallites, shared corners were not counted. This is comparable to, but not identical to "polygonality" (Young and Elias, 1995) as measured in favositids. Young and Elias measured polygonality for strictly polygonal corallites, while number of neighbours was used in this study for circular and subcircular corallites as well and would thus include pairs of adjacent corallites with only partially shared walls.

Major septum length (Msl). This was measured from the outer edge of the stereozone (or the axial line or centre of the shared wall) to the axial tip of the septum for two opposing septa (circular corallites) or four septa on two axes (polygonal corallites), and averaged.

Minor septum length (msl). This was measured the same way as major septum length (see above). Minor septum length was not measured if shorter than the thickness of the stereozone.

Wall thickness (wt). This was measured along the same diameter as the major septum length, from the outer edge of the epitheca to the inner edge of the stereozone (i.e., total wall thickness) for circular corallites. For polygonal or subpolygonal corallites, measurement was from the axial line separating adjacent corallites to the inner edge of the stereozone; however, in some cases the axial line is obscured and the wall thickness was taken as half of the total thickness of the shared wall. For each corallite, the wall thickness was measured for opposing sides and averaged.

Tabular spacing (ts). The number of tabulae in 5 mm vertical distance (measured and counted in longitudinal sections) was counted with one end of the measuring device being placed on a tabula (that tabula not being included in the count).

6.3 STATISTICAL METHODS

6.3.1 Introduction

Quantitative variability was assessed using the morphological characters mentioned above, usually plotted as bivariate graphs (e.g., diameter vs. number of major septa). For solitary taxa this produced a quantitative measurement of change during ontogeny (for the population as a whole) and intraspecific variability. For colonial taxa, 20 corallites per section were measured, averaged, and plotted as a single point, with more than one section being made from some coralla. The resulting graphs illustrated inter- and intracolonial variability. For graphs of both solitary and colonial morphometric features, the relationship between morphological parameters was quantitatively assessed using a least squares linear regression (using the Golden Software program "Grapher for Windows").

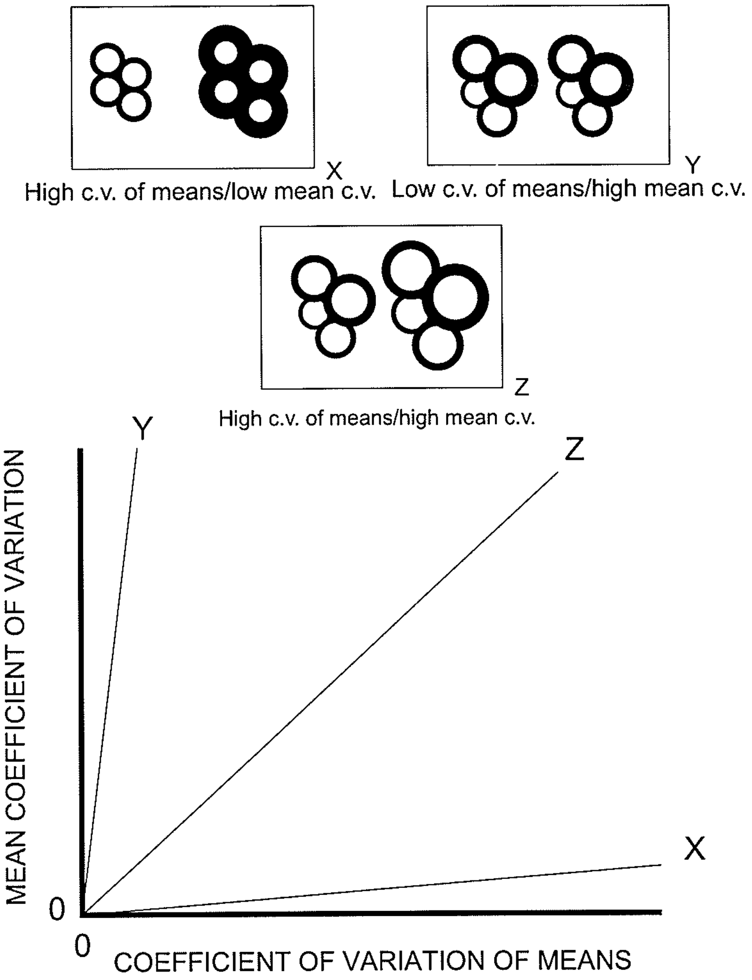
6.3.2 Colonial Taxa

For the colonial taxa, the coefficient of variation statistic (c.v. = 100 x standard deviation/mean) was used to assess the degree of intracolonial variability of the morphometric parameters (Young and Elias, 1995). For the number of neighbours (nn) variable, the c.v. is shown in the present study to be inversely proportional to mean nn, reaching a value in excess of 100 for small mean nn. As mean nn generally varied between 0 and 7, the resulting variability of the c.v. statistic is apparently due to the very low values of mean nn that were possible. It is apparent that the c.v. statistic is of lesser utility where the variable being assessed has values close to zero with a relatively broad range.

For *Palaeophyllum lyterion* and *Palaeophyllum vaurealense*, where relatively large datasets were available, intra- vs. intercolonial variability was assessed using graphs of mean c.v. of the corallite parameters (intracolonial variability) against c.v. of means of the corallite parameters (intercolonial variability). For each species, a straight line with slope near one and a high r^2 value was obtained. This indicates a nearly equal degree of variability within and between colonies. Text-figure 21 shows three pairs of hypothetical colonies, one pair with a high c.v. of means, one with a high mean c.v. and one with both. A plot of mean c.v. against c.v. of means is shown for each pair of colonies in order to be compared with the observed results for *Palaeophyllum*. This method of assessing intra- vs. intercolonial variability will need more testing to ensure its utility. It could, theoretically, be applied to any colonial taxa.

6.4 COLLECTIONS

Four collections of specimens were used in this study: Copper Collection (Paul Copper, Laurentian University), Elias Collection (Robert J. Elias, University of Manitoba), Petryk Collection (Allen Petryk, Québec Ministry of Energy Mines and Resources) and Summer 1994 (Adam Melzak and Robert J. Elias, University of Manitoba; Dong-Jin Lee, Andong



Text-fig. 21. Plot of coefficient of variation of means vs. mean c.v. for the theoretical colonies in X, Y and Z. N.B., only corallite size and wall thickness are variable in the diagrams but it is assumed that other parameters reflecting the same pattern were also measured and included for the theoretical graphs.

National University, Korea). The formats for specimen numbering are as follows: Copper Collection is (A)(locality number)-(specimen number) (N.B., a few of the Copper collections originally had the prefix "C," but, these were all converted to an equivalent "A" prefix locality for this study); Elias Collection is (locality code)-(formation code [plus member code if Ellis Bay Formation])-(specimen number); Petryk Collection is (year code)AP(locality and stratigraphic interval code)-(specimen number); Summer 1994 Collection is (locality code)-(formation and/or member code [only if locality spans two or more members])-(stratigraphic interval code [only if more than one interval collected])-(specimen number). Note that the letter "c" was added to specimen numbers for colonial taxa from localities where large numbers of both solitary and colonial specimens were collected. In specimens of colonial taxa where more than one transverse section was sampled and measured, there is an extra number or code attached to designate a particular section (e.g., MH-V-c2-lg = Main Highway locality, Vauréal Formation, colonial specimen number 2, large section). Additional type specimens were borrowed from the Geological Survey of Canada and the Yale Peabody Museum. See Appendix A for detail on collection numbering and locality information.

6.5 REPOSITORIES

Numbered type specimens of species established in earlier literature are housed at the Geological Survey of Canada (GSC) in Ottawa, the Yale Peabody Museum (YPM) in New Haven, Connecticut, and the Paleontological Institute (PIN) of the Russian Academy of Sciences in Moscow. The other specimens used in the present study are currently housed in the Department of Geological Sciences at the University of Manitoba.

Subclass RUGOSA Milne-Edwards and Haime, 1850

Order STAURIIDA Verrill, 1865

Suborder STREPTELASMATINA Wedekind, 1927

Family STREPTELASMATIDAE Nicholson in Nicholson and Lydekker, 1889

Subfamily STREPTELASMATINAE Nicholson in Nicholson and Lydekker, 1889

Genus *Streptelasma* Hall, 1847

1847 *Streptelasma* Hall, p. 17 (as *Streptoplasma*), and page facing p. 338 (see Laub, 1979, p. 60)

1969 *Streptelasma*; Neuman, pp. 8-10.

1974 *Streptelasma*; McLean, pp. 38-41.

1979 *Streptelasma*; Laub, pp. 59-61.

1982a *Streptelasma*; Elias, p. 52.

1990 *Streptelasma*; McAuley and Elias, pp. 33-34.

Diagnosis. Streptelasmatid with non- to highly dilated long major septa with little or no axial structure early in ontogeny, and moderately dilated to nondilated shortened major septa late in ontogeny, usually leaving an axial space. Cardinal fossula not present. Stereozone narrow to broad, tabulae complete, flat to axially arched.

Discussion. Neuman (1969), McLean (1974) and Laub (1979) discussed the characteristics and affiliation of the genus in detail and Elias (1982a) and McAuley and Elias (1990) added to the range of characters of the genus. *Streptelasma affine* (Billings, 1865b; this study) is typical of the genus, with a narrow to moderately broad stereozone and short, nondilated major septa late in ontogeny. The two new species from this study, *Streptelasma* n. sp. 1 and *Streptelasma* n. sp. 2 extend the genus concept to include species with broad stereozones (both up to 50% of radius). *Streptelasma leemonense* Elias, 1982a has a broader than usual stereozone (20-40% of radius) (McAuley and Elias, 1990), and the stereozone of *S. affine* (Billings, 1865b; this study) is highly variable (3-20% of radius). These examples show that while the stereozones of *Streptelasma* n. sp. 1 and *Streptelasma* n. sp. 2 are beyond the previously known range, there is considerable variability within the genus. The two new species also have subtle to moderately well developed cardinal pseudofossulae, a character found in some species of *Streptelasma* such as *S. subregulare* (Savage, 1913; Elias, 1982a).

The two new species cannot be assigned to *Ullernelasma* Neuman, 1975, as the latter genus has only a few incomplete tabulae. *Borelasma* Neuman, 1969, has a prominent cardinal septum and no pseudofossula. The tabulae of *Crassilasma* Ivanovskiy, 1962 (Neuman, 1977) are rare and its major septa tend not to reach the axis. *Helicelasma* Neuman, 1969 tends to have a narrow stereozone and less dilated major septa through ontogeny, in addition to lacking a cardinal pseudofossula. While these genera all have sets of characters that come close to those of *Streptelasma* n. sp. 1 and *Streptelasma* n. sp. 2, the species are best assigned to *Streptelasma*, despite the broad stereozone and pseudofossula. The sets of characters are insufficiently distinctive to warrant erection of a new genus, although future work might show that a different generic assignment is preferable. Neuman (2003) erected the genus *Fosselasma* to include streptelasmatids with a low degree of septal dilation, little or no axial structure and a true fossula (as opposed to a pseudofossula). As *Streptelasma affine* and *Streptelasma* n. sp. 1 do not possess a fossula, they are not assigned to *Fosselasma. Streptelasma* n. sp. 2 shows occasional development of a fossula (or pseudofossula in some cases), but this feature is not clearly developed in all specimens and the species is retained in *Streptelasma.*

Streptelasma sp. (this study) is known from a single specimen. It is assigned to *Streptelasma* on the basis of the non- to moderately dilated major septa which do not form an axial structure, and complete tabulae. What appears to be a true cardinal fossula would represent a feature unknown in the genus and would suggest that it should be assigned to *Fosselasma* Neuman, 2003 (see above). Lack of variability data, however, makes any definitive assignment difficult and the single specimen is described as *Streptelasma* sp. The concave cardinal side may be a product of distortion, as the lower part of the corallum has talons and a noncircular cross section.

Streptelasma affine (Billings, 1865b)

Plates 1, 2

1865b *Zaphrentis affinis* Billings, p. 430.

1865b *Zaphrentis bellistriata* Billings, pp. 430, 431.

1866 *Zaphrentis affinis*; Billings, p. 7.

1866 *Zaphrentis bellistriata*; Billings, p. 8.

1901 *Zaphrentis affinis*; Lambe, pp. 118, 119, pl. 7, figs. 6, 6a, 6b.

1928 *Zaphrentis affinis*; Twenhofel, pp. 114, 115.

1975 [?]*Streptelasma* sp. cf. *S. primum* Wedekind, 1927; Scrutton, pp. 15, 16, pl. 2, fig. 1.

1981a *Streptelasma affinis*; Bolton, pl. 3, figs. 3-8.

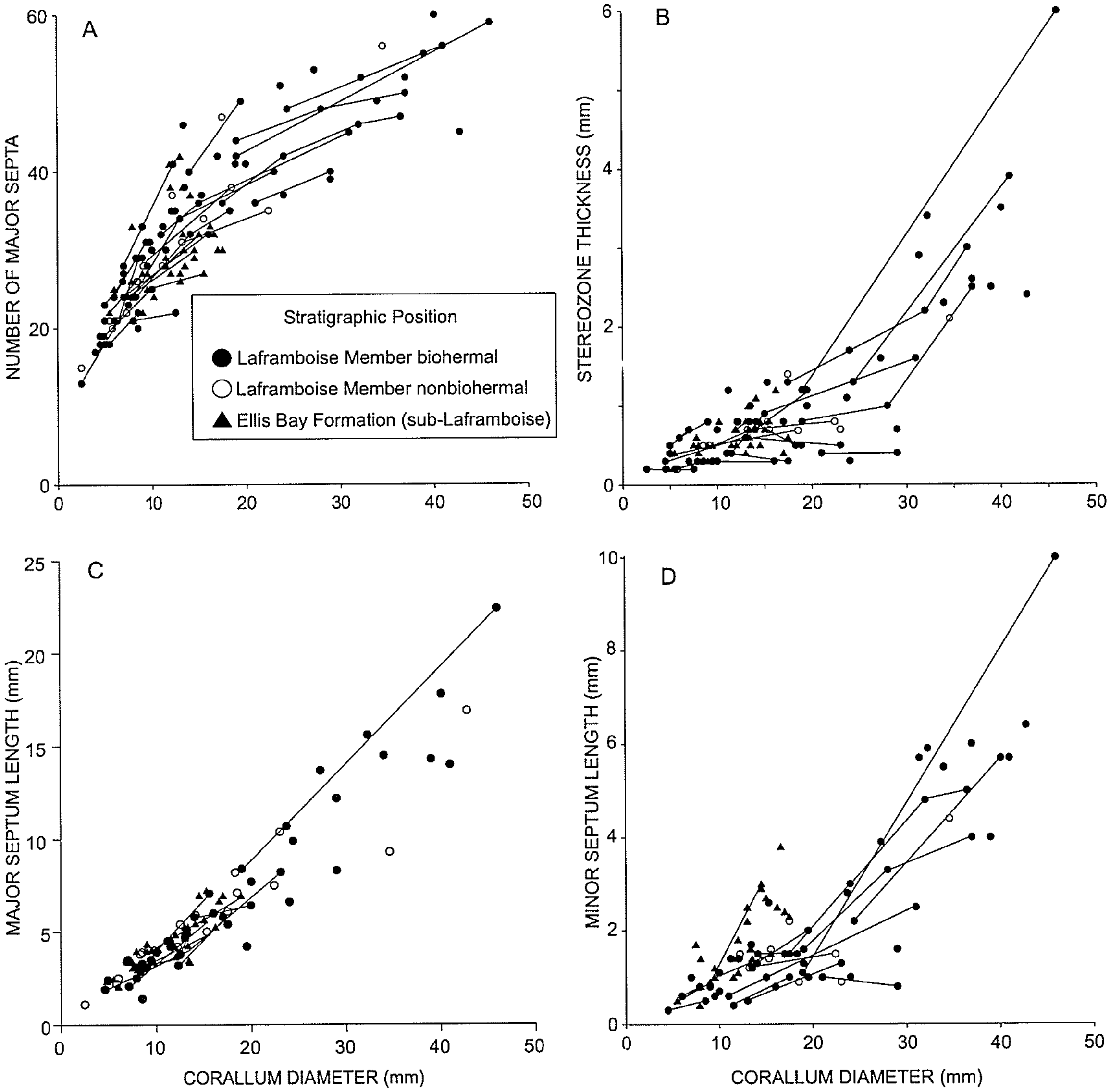
1982a *Streptelasma affine*; Elias, pp. 59, 60, pl. 5, figs. 4-18.

Types. Lectotype GSC 1987, 1987c-e, paralectotypes GSC 1987a, b (Lambe, 1901, pl. 7, figs. 6, 6a), GSC 1987g, i, GSC 1987f, h; designated by Elias (1982a). Type locality was described (in Elias, 1982a) as upper Vauréal Formation, Wreck Point, Anticosti Island. The locality from which these specimens were collected is probably basal Ellis Bay Formation (*sensu* Long and Copper, 1987a).

Diagnosis. Corallum solitary, of moderate to large size. Major septa generally withdrawn from axis in intermediate and late stages, cardinal septum indistinct, no fossula. Degree of dilation of internal elements low in all stages. Minor septa extend beyond stereozone.

Description of coralla. Largest specimen incomplete, 160 mm long, diameter 65 mm at top of calice (N.B., calice broken), 35 mm at broken base. Coralla trochoid or ceratoid and slightly curved (cardinal side convex) in early stage (Pl. 1, fig. 12), subcylindrical and straight in later stages, particularly in larger specimens (Pl. 1, fig. 1). Septal grooves and interseptal ridges well developed on epitheca (if unabraded; Pl. 1, fig. 12), rugae frequently present, spaced at 4-13 mm intervals. Attachment structures (talons or larger distortions) present on some specimens (15% of observed specimens) in early to intermediate stages. Attachment structures generally only distort basal portion of corallum (Pl. 1, figs. 12, 13, Pl. 2, fig. 5). Calice deep, no axial boss developed (Pl. 1, fig. 3).

Ontogeny and internal structures. Major septa moderately dilated to nondilated in early stage (Pl. 1, figs. 4, 7, 13), extending to axis. Major septa moderately dilated to nondilated in later stages, extend to axis (Pl. 2, figs. 1, 2, 5) or withdrawn (Pl. 1, figs. 5, 6, 8, 9, 14, 16, Pl. 2, figs. 4, 6-8), leaving a prominent axial space up to 50 percent of the corallum diameter (see Text-fig. 22C). Little to no axial structure in any stage; small lobes or stereoplasm deposits occasionally developed in late stage (Pl. 2, figs. 1, 2). Major septa straight and minimally tapering in early stage (Pl. 1, figs. 4, 7, 9, 13), slightly wavy to wavy in later stages (Pl. 1, figs. 5, 6, 8, 11, 14, 16, Pl. 2, figs. 1, 2, 4-8) . Axial ends of septa occasionally deflected in later stages, joining in groups of two or three, or forming indistinct counterclockwise axial whorl (Pl. 1, figs. 6, 8, Pl. 2, fig. 2). Number of major septa relative to corallum diameter shown in Text-figure 22A. Cardinal and counter septa generally indistinct except in rare cases where cardinal septum short (Pl.1, figs. 6, 16); no fossula developed, pseudofossula, or lateral deflection of adjacent major



Text-fig. 22. Biometric data for *Streptelasma affine* from Anticosti Island, differentiated by stratigraphic position. A. Number of major septa (132 points, 109 coralla). B. Stereozone thickness (106 points, 91 coralla). C. Major septum length (93 points, 80 coralla). D. Minor septum length (92 points, 72 coralla). X-axis for all plots is corallum diameter. Lines connect multiple data points from the same corallum.

septa in a few specimens (Pl. 2, figs. 1, 2). Septal stereozone formed of dilated abaxial ends of septa, 3-20 percent (mean 11%) of corallum radius; relationship between stereozone thickness and corallum diameter shown in Text-figure 22B. Minor septa confined to stereozone (Pl. 2, fig. 4), short (Pl. 1, figs. 5-7, 11, 14, 16, Pl. 2, fig. 5), or long and minimally dilated, some attached to adjacent major septa (Pl. 2, figs. 1, 2), most not attached (Pl. 1, figs. 9, 16, Pl. 2, figs. 1, 2, 6-8) . Minor septum length from 5-46 percent (mean 22%) of corallum radius; relationship between minor septum length and corallum diameter shown in Text-figure 22D. Tabulae generally complete, rarely incomplete, flat (Pl. 1, figs. 2, 3, Pl. 2, fig. 3) to arched downwards axially and upwards abaxially (Pl. 1, figs. 2, 10) or arched upwards axially (Pl. 1, fig. 15). One specimen highly distorted internally (Pl. 2, figs. 6-8).

Microstructure. In transverse section under plane polarized light, major septa fibrous, if moderately dilated. Microstructure of nondilated septa and tabulae indistinct. Septal fibres oriented obliquely toward axis in transverse section and upwards axially in vertical section. Abaxial ends of adjacent septa separated by a wavy suture in stereozone. Epitheca, where seen, formed of lamellae parallel to outer surface of corallum.

Discussion. Zaphrentis bellistriata (Billings, 1865b), from Anticosti Island, was erected to include specimens that were similar to *Zaphrentis affine*, but had a thinner stereozone and shorter minor septa. Subsequent authors (Lambe, 1901; Twenhofel, 1928; Elias, 1982a) have considered *Z. bellistriata* to be a junior synonym of *Streptelasma affine*.

This study shows that while the degree of scattering of biometric values at smaller diameters is high, the data do not support a distinction between two species. The variability, particularly in minor septum length, may be an ecophenotypic feature (see 3.5.2.5 Intraspecific Variability; *Streptelasma affine*).

Streptelasma affine is distinguished from other species of the genus on the basis of general absence of a cardinal fossula or shortened cardinal septum. The most similar species is *Streptelasma primum* (Wedekind, 1927; Neuman, 1969, pp. 11-17, figs. 7-10) from the Upper Ordovician (Harjuan) Division 5a of Norway and Boda Limestone of Sweden, and the Piirsalu Beds, Pirgu Stage of Estonia. *Streptelasma primum* has a cardinal pseudofossula in later stages, shorter minor septa and more steeply inclined tabulae abaxially, but is otherwise similar to *S. affine*. The single well described specimen of *Streptelasma* sp. cf. *S. primum* from the Upper Ordovician of Greenland fits within the range of variability of *S. affine*, but a weak cardinal pseudofossula is developed (Scrutton, 1975, pp. 15, 16, pl. 2, fig. 1). *Streptelasma* sp. cf. *S. primum* may be conspecific with *S. affine*, but the apparent presence of a pseudofossula (not readily visible in the figure; Scrutton, 1975, pl. 2, fig. 1) and the generally poor quality of the two specimens render any conclusive assignment impossible.

The highly variable species *Streptelasma subregulare* (Savage, 1913) from the Gamachian-Rhuddanian of Oklahoma, Illinois, Missouri and Iowa generally has a shortened cardinal septum and shorter minor septa, but can resemble *S. affine* (Elias, 1982a, pp. 57, 58, pl. 4, figs. 7-22; McAuley and Elias, 1990). *Streptelasma rankini* Elias, 1982a (Elias 1982a, pp. 58, 59, pl. 5, figs. 1-3) from the Ashgill of Maine has withdrawn major septa in late stages, but has distinctive tabulae that are strongly convex upwards at the margins. Other North American species, such as *Streptelasma etnaense* Elias in Elias and Potter, 1984 (Elias and Potter, 1984, pp. 1207-1209, figs. 2A-G) from the Ashgill Horseshoe Gulch unit of California and *Streptelasma leemonense* Elias, 1982a (Elias, 1982a, p. 56, pl. 4, figs. 1-3) from the Gamachian Leemon Formation of Missouri, have an axial structure developed in the later stages, and longer major septa. *Fosselasma unicum* (Neuman, 1975, pp. 207-209, pl. 2, figs. a-e) from the Hirnantian Loka Formation of Sweden has a similar (low) degree of dilation and short major septa but has a well developed cardinal fossula in all specimens.

Occurrence. Grindstone to Laframboise members, Ellis Bay Formation (Gamachian), Anticosti Island, Québec.

Other material. 144 specimens: 83AP18-1-R7-2, 4C; 83AP17-1-bh-2C, 8b, 9, 14A, 15A, B(a, b), 23, 25B, 26B, 27A, 27D, 31, 32A, 35C, 37A, 38C, 42, 43, 44A, 45; 83AP14-1-12-15, 18, 19, 24, 25; 83AP23-1-3, 4 (Petryk Collections); A41-4, 10, 19, 21, 25; A86-1; A135-3; A435-1, 5, 6, 7; A-436-6, 9, 9a, 9b; A438c-1, 2, 4, 5; A468a-11; A894-1 (Copper Collection); CVP-EB1S-m17cm-11, 14; CVP-EB2-85-2, 3; CVP-EB2-120-1; CVP-EB2-125-3; CVP-EB2-135-1a, b, c, 2, 3; CVP-EB2-140-1-(3); CVP-EB2-145-1; CVP-EB2-150-4; CVP-EB2-200-1; CVP-EB2-210-1; CVP-EB2-230-2; CVP-EB2-235-1, 3-7, 9; CVP-EB2-239-1, 2, 4; CVP-EB2-250-1, 2; CF-EB2-LC-2, 3, 5; WC-EB3-125-1; WC-EB4-U1-1; PL-EB5-260-1; PL-EB5-90-1; PL-EB7-BH-1, 4; PL-EB7-SR-L1-1, 2;

PL-EB7-SR-3-3, 15; PL-EB7-RC-L2-7, 11, 16; PL-EB7-RC-L3-2, 4, 9; PL-EB7-RC-U1-10; PL-EB7-RF-L1-3, 5, 6; PL-EB7-RF-U1-3, 14; PL-EB7-RF-U2-8; PL-EB7-IR-L2-8, 9; PL-EB7-IR-L3-2, 5, 8; PL-EB7-IR-U2-3, 10; PL-EB7-IR-U3-5; PL-B1-L5-1 (Elias Collection); FP-LAF-2H-5, 6; FP-LAF-1.5H-1; FP-LAF-1H-1, 2, 16, 18; FP-LAF-BH?-1, 13, 16, 17; POR-OPB-4, 5, 23, 24; POR-BH-4, 5; SR-bbbh-6; SR-BH-5, 6; SR-BH-60-1; SR-BH-A, C, D; SR-B+45-2; LaF-EB7-LI-1; LaF-EB7-TI-5 (Summer 1994).

Streptelasma n. sp. 1

Plate 3, figs. 1-10

Types. Holotype POR-OPB-6, locality 33; paratype A41-2, locality 8; Laframboise Member (Gamachian), Ellis Bay Formation, Anticosti Island.

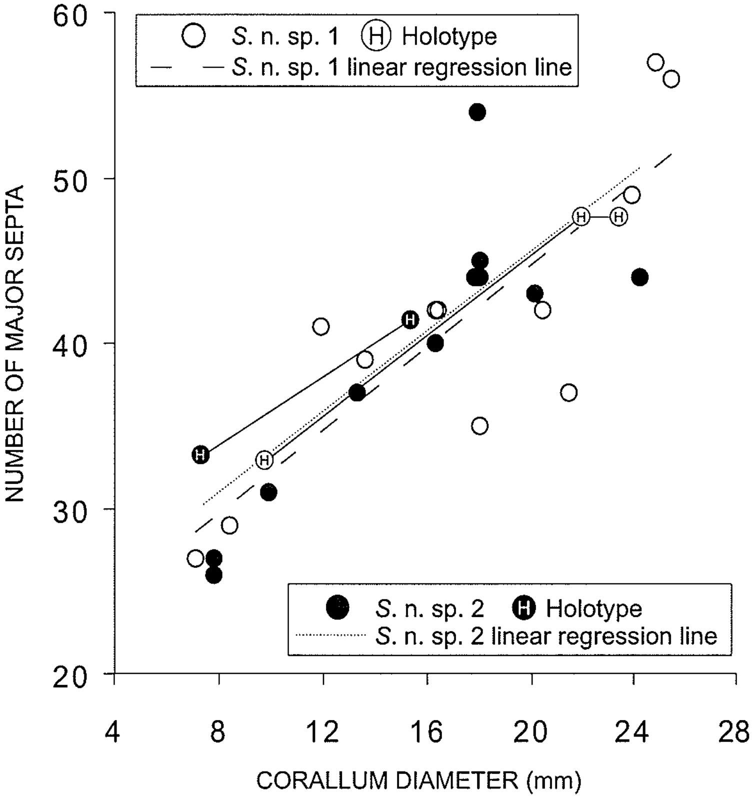
Diagnosis. Streptelasma with broad stereozone, axial structure of dilated septal ends and stereoplasm, pronounced counterclockwise axial whorl of major septa in intermediate stage, minor septa long. Cardinal septum indistinct, small pseudofossula. Complete tabulae axially depressed, steeply inclined abaxially.

Description of coralla. Coralla ceratoid to subcylindrical, straight to slightly curved. Cross sectional shape circular to elliptical. Specimens incomplete, longest fragment ca. 60 mm in length. Septal grooves and interseptal ridges present on some specimens. Rugae developed on some specimens. Base distorted by attachment structures (apparently on cardinal side; Pl. 3, figs.1, 2) in one specimen, missing in others.

Ontogeny and internal structures. Earliest stage unknown. Major septa moderately to greatly dilated, reach axis in intermediate stage (Pl. 3, figs. 1, 2, 4, 8). Axial structure of swollen distal ends of major septa with some stereoplasm deposits, but few lobes present (Pl. 3, figs. 1, 2, 4, 8). Septa nondilated and slightly withdrawn from axis in late stage (Pl. 3, figs. 3, 5, 7, 10). Relationship between diameter and number of major septa shown in Text-figure 23. Major septa smooth sided, tapering gently; pronounced counterclockwise axial whorl in one specimen (Pl. 3, figs. 1-3). Cardinal septum slightly elongate in one small specimen (Pl. 3, fig. 1), small fossula developed in late stage of one specimen (Pl. 3, fig. 7). Counter septum elongate in late stage of two specimens (Pl. 3, figs. 5, 7). Stereozone moderately to extremely broad, up to 50 percent of radius. Minor septa long, narrow, generally confined to stereozone except where dilation low. Tabulae complete, slightly arched upwards with slight axial sag, greatly steepened abaxially, with complementary plates (Pl. 3, fig. 9).

Microstructure. In transverse section, fibres faintly visible in major septa, oriented obliquely toward axis from prominent septal midline (Pl. 3, fig. 6). Broad septal stereozone formed of acutely curved lamellae. Adjacent major and minor septa separated by smooth to irregular suture.

Discussion. Despite the lack of specimens representing the complete ontogeny or range of variability, the later stages are sufficiently distinctive to characterize a new species. *Streptelasma* n. sp. 1 is distinct from all other species of the genus except *Streptelasma* n.



Text-fig. 23. Biometric data for *Streptelasma* n. sp. 1 (small open circles, 15 points, 11 coralla) and *Streptelasma* n. sp. 2 (small solid circles, 13 points, 11 coralla) from Anticosti Island. Plot is corallum diameter vs. number of major septa. Solid lines connect multiple data points from the same corallum.

sp. 2 (this study) in possessing a broad stereozone up to 50 percent of corallum radius. *Streptelasma* n. sp. 1 is distinct from *Streptelasma* n. sp. 2 on the basis of the tapering thin major septa, infrequently developed cardinal pseudofossula, well developed steep sided, axially depressed tabulae and generally circular to slightly elliptical cross section in the former species.

Streptelasma leemonense Elias, 1982a from the Gamachian Leemon Formation of Missouri, has a moderately broad stereozone (but not as broad as *Streptelasma* n. sp. 1), but is otherwise distinct as it is partially colonial, develops an axial structure and lacks the distinctive laterally steepened tabulae (Elias, 1982a, p. 56, pl. 4, figs. 1-3).

Certain specimens of *Bodophyllum englishheadense* from the Vauréal and Ellis Bay formations (this study) are similar to *Streptelasma* n. sp. 1 in possessing a broad stereozone and a relatively weak axial structure. These coralla are, however, part of a continuum with specimens that have well developed axial structures, including median lamellae, and the tabulae are well developed and relatively flat. Additionally, long minor septa as in *Streptelasma* n. sp. 1 are not found in *B. englishheadense*.

Occurrence. Laframboise Member (Gamachian), Ellis Bay Formation, Anticosti Island, Québec.

Other material. 11 specimens: A894 (Copper Collection); PL-EB7-IR-U4-3 (Elias Collection); FP-Laf-EB7-bh?-2; FP-Laf-EB7-bh-1h-3, 5; FP-Laf-EB7-bh-2h-3; FP-Laf-EB7-bh-1.5h-4; POR-ENC-1; POR-OPB-10; SR-BH?-7; SR-BH-180-1 (Summer 1994).

Streptelasma n. sp. 2

Plate 3, figs. 11-13, Plate 4, figs. 1-9

Types. Holotype BB2-v-13, *Virgiana* interval; paratype BB2-av-8, above *Virgiana* interval; Chabot Member (Rhuddanian), Becscie Formation, locality 15, Anticosti Island.

Diagnosis. *Streptelasma* with broad stereozone. Attachment distortions common. Minimal axial structure developed, consisting of median lamella and stereoplasm with few other elements. Minor septa confined to stereozone. Cardinal pseudofossula generally prominent. Tabulae complete to incomplete, arched, with or without complementary plates.

Description of coralla. Coralla trochoid, other details obscured generally. Some corallum bases distorted by large irregular attachment structures on cardinal and alar sides (Pl. 3, figs. 12, 13, Pl. 4, figs. 1, 4, 6-8).

Ontogeny and internal structures. Major septa moderately dilated, reaching axis in early stage, where small axial structure is formed of a few lobes (Pl. 3, fig. 12, Pl. 4, fig. 6). In intermediate stage, septa moderately dilated, reaching axis or slightly withdrawn, with small axial structure of a few moderately dilated lobes and lamellae (Pl. 4, figs. 1, 4, 8, 9) or no axial structure formed (Pl. 4, figs. 2, 5). In late stage, axial ends of septa dilated, withdrawn from axis (Pl. 3, fig. 13, Pl. 4, figs. 3, 7), leaving axial space or small, isolated axial structure, occasionally including median lamella (Pl. 4, fig. 3) . Number of major septa relative to corallum diameter shown in Text-figure 23. Cardinal fossula developed in late stage of some specimens (Pl. 3, fig. 13, Pl. 4, fig. 9) with adjacent major septa bowed away from narrow, long, axially dilated cardinal septum. Counter septum generally indistinct. Minor septa short, confined to stereozone throughout ontogeny. Broad stereozone developed throughout ontogeny, up to 50 percent of corallum radius. Tabulae complete to incomplete, arched axially; flat to concave upward, depressed in cardinal fossula, complementary plates developed abaxially (Pl. 3, fig. 11).

Microstructure. In transverse section, fibres developed in major septa, oriented obliquely toward axis. In vertical section, fibres oriented upward axially.

Discussion. Despite the lack of specimens representing the complete ontogeny or range of variability, the later stages are sufficiently distinctive to characterize a new species. *Streptelasma* n. sp. 2 is distinct from most other species on the basis of its broad stereozone (see discussion of *Streptelasma* and *Streptelasma* n. sp. 1). The high frequency of attachment in *Streptelasma* n. sp. 2 indicates that this feature may be obligate, and thus a characteristic of the species as a whole that distinguishes it from most other species of the genus, including *Streptelasma* n. sp. 1. Corallum diameter relative to number of major septa for both new Anticosti species of *Streptelasma* is comparable (Text-fig. 23), but other features clearly distinguish the two species.

The small axial structure is atypical for the genus but other species have more developed axial structures with more and larger elements: e.g., *Streptelasma* cf. *S.*

primum (Neuman, 1986, pp. 353-358, figs. 5-8, especially fig. 5C) from the Late Ordovician (pre-Hirnantian) of Öland, Sweden, and *Streptelasma cyrtum* Neuman, 1969 (Neuman, 1969, pp. 23-25, figs. 15-19, especially figs. 16B, 17F) from the Late Ordovician Boda Limestone in Sweden. *Streptelasma cyrtum* also has a moderately broad stereozone and a variably developed axial structure that can resemble *Streptelasma* n. sp. 2, but the stereozone is still much narrower than in *Streptelasma* n. sp. 2, and attachment structures and a cardinal fossula are not present (Neuman, 1969, pp. 23-25, figs. 15-19). *Fosselasma unicum* (Neuman, 1975, pp. 207-209, pl. 2, figs. a-e) from the Hirnantian Loka Formation has a cardinal fossula but this is present in all specimens and the species has a narrower sterozone and is not frequently distorted by attachment structures.

Certain specimens of *Bodophyllum englishheadense* from the Vauréal and Ellis Bay formations (this study) are similar to *Streptelasma* n. sp. 2 (see also discussion of *Streptelasma* n. sp. 1) in possessing a broad stereozone, a relatively weak axial structure, and frequent attachment structures, but none of those specimens has a cardinal fossula developed and the tabulae are complete and relatively flat.

Occurrence. Chabot Member, Becscie Formation (Rhuddanian), Anticosti Island, Québec.

Other material. 29 specimens: A96; A843 (Copper Collection); BB2-V-5, 6, 9, 12, 21, 30; BB2-aV-7 (Elias Collection); FP-B+100-3; BB2-425-1, 5a, b; BB2-230-4, 5, 11;

BB2-410-3, 4, 6; BB2-170-4; BB2-loose-c350-3; JR24F-3; JR24SE-M-140-1; JR24SE-M-390-1b; SR16+145-5, 6; SR16+520-1a; SR16+910-1; SR16+1375-2 (Summer 1994).

Streptelasma sp.

Plate 4, figs. 10-14

Description. Corallum solitary, ceratoid, slightly curved, alar side convex, >62 mm long (missing small portion of corallum at base and calice rim broken). Septal grooves and interseptal ridges prominent. Growth lines and rugae present. Basal distortion and attachment talons on cardinal to alar side (Pl. 4, fig. 10).

Major septa nondilated, not reaching axis in early stage (Pl. 4, fig. 12; N.B., earliest stage not preserved), forming subtle counterclockwise axial whorl at tips and leaving a broad axial space (35 major septa, diameter 16.5 mm). In intermediate stage (Pl. 4, fig. 13), major septa slightly dilated, longer than in early stage, still not reaching axis, axial whorl more pronounced, cardinal septum short, adjacent septa slightly deflected (39 major septa, diameter 21.5 mm). Major septa further withdrawn in late stage (Pl. 4, fig. 14), axial ends laterally deflected, cardinal septum short (39 major septa, diameter 24.0 mm). Stereozone narrow in all stages. Minor septa confined to stereozone in early stage, extending a short distance beyond stereozone in intermediate and late stages. Tabulae complete, flat axially, slightly convex upward abaxially on counter side near calice, strongly convex upward abaxially on cardinal side (Pl. 4, fig. 11).

Discussion. A cardinal pseudofossula is found in some species of *Streptelasma*

(Neuman, 1986, p. 352). Neuman (2003) erected the new genus *Fosselasma* for *Streptelasma*-like corals with a true fossula, which would apparently include this specimen, however, due to the lack of data on variability and the currently monospecific nature of *Fosselasma*, this specimen will be considered to belong to *Streptelasma*. The unusual tabular morphology of this specimen is distinctive, as tabulae are flat or slightly arched in most species of *Streptelasma* which lack the distinctive cardinal side abaxial convexity. *Streptelasma primum* (Wedekind, 1927; Neuman, 1969, pp. 11-17, particularly figs. 7G and 8F) displays a somewhat similar abaxial convexity of the tabulae and one longitudinal section of *S. affine* from this study has wavy tabulae with pronounced axial concavity (Pl. 1, fig. 10). This specimen is distinct from *S. primum* on the basis of the development of a cardinal pseudofossula and the pronounced lateral deflection or whorling of the major septa. Some species, particularly *Streptelasma divaricans* (Nicholson, 1875; Elias, 1982a, pp. 52-56, pl. 1, figs. 1-19) and *Streptelasma subregulare* (Savage, 1913; McAuley and Elias, 1990, pp. 34-42, pl. 1, figs. 1-19, pl. 2, figs. 1-12, pl. 3, figs. 1-18, pl. 3, figs. 1-13, pl. 5, figs. 1-10), are highly variable and their range of morphology could extend to include this specimen, although this specimen is far larger than any known specimen of *S. divaricans* (Elias, 1982a). Its isolated occurrence and distinctive tabular morphology, however, indicate that its specific affiliation cannot be established definitively and it may represent a separate species. The convexity of the alar side is unusual although it may represent a growth distortion or ecophenotypic character.

Of the other Anticosti taxa, *Streptelasma* sp. most closely resembles *Streptelasma* *affine*. The single specimen of *Streptelasma* sp. occurs in a collection with a single specimen of *S. affine*, and the latter is clearly distinct based on lack of well developed fossula (with tabular depressions) as opposed to the pseudofossula seen in some specimens of *S. affine*. The nature of whorl development is also distinctive in *Streptelasma* sp. (distinct bend in major septa in this specimen, smooth curving whorl in *S. affine*). These two characters serve to distinguish *Streptelasma* sp. from *S. affine* as a species. No other taxon from the Ellis Bay Formation is comparable. *Streptelasma* n. sp. 1 and *Streptelasma* n. sp. 2 from the upper Ellis Bay and upper Becscie formations respectively both have much broader stereozones, a less prominent cardinal pseudofossula and a higher degree of dilation of major septa early in ontogeny.

Occurrence. Uppermost Grindstone or lowermost Velleda Member, Ellis Bay Formation (Gamachian), Anticosti Island, Québec.

Material. One specimen: A468a (Copper Collection).

Genus *Bighornia* Duncan, 1957

Bighornia patella (Wilson, 1926)

Plate 5, Plate 6, figs. 1-7

1926 *Streptelasma patellum* Wilson, p. 13, pl. 2, fig. 1.

1926 *Streptelasma distinctum* Wilson, pp. 12, 13 [part], pl. 1, fig. 6, [non] pl. 1, fig. 7.

1928 [?]*Streptelasma* aff. *breve* Ulrich *in* Winchell and Schuchert, 1895; Troedsson, p. 109, pl. 26, figs. 6, 7.

1929 *Lindströmia solearis* Ladd, pp. 397-399, pl. 4, figs. 6-12.

1937 [?]*Holophragma scheii* Cox, pp. 15-17, pl. 2, figs. 14-16.

1943 *Holophragma anticonvexa* Okulitch, pp. 68, 69, pl. 1, figs. 11, 12.

1957 "*Holophragma*" sp.; Ross, pl. 37, figs. 3, 5-7.

1957 *Bighornia parva* Duncan, pp. 611-614, pl. 70, figs. 1-18.

1962 *Bighornia parva*; Norford, pl. 6, figs. 12, 16.

1963 *Bighornia patella*; Nelson, pp. 40, 41, pl. 11, figs. 1a-c, 2, 3a-d.

1970 *Bighornia parva*; Norford et al. *in* Douglas, 1970, pl. 5, figs. 3-11.

1975 [?]*Bighornia* sp.; Norford and McQueen, pl. 9, figs. 9, 10.

1975 [?]*Bighornia* sp.; Oliver *in* Oliver et al., pl. 5, fig. 6.

1981 *Bighornia* cf. *B. patella*; Elias, pp. 25-26 [part], [non] pl. 10, figs. 1-21.

1982a *Bighornia* cf. *B. patella*; Elias, pp. 80-82 [part], pl. 14, figs. 17-24, pl. 15, figs. 1-11.

1983 *Bighornia* cf. *B. patella*; Elias, pp. 948, 950-952 [part], figs. 7d, 14e-t, 16a-o.

1985 *Bighornia* cf. *B. patella*; Elias, pp. 40, 41, 43 [part], figs. 16.14-16.16, *non* figs. 16.1-16.13, 17.

1988 *Bighornia patella*; Buttler and Elias *in* Buttler et al., pp. 63-66, pl. 3.2, figs. 7-11, pl. 3.3, figs. 1-12, pl. 3.4, fig. 1.

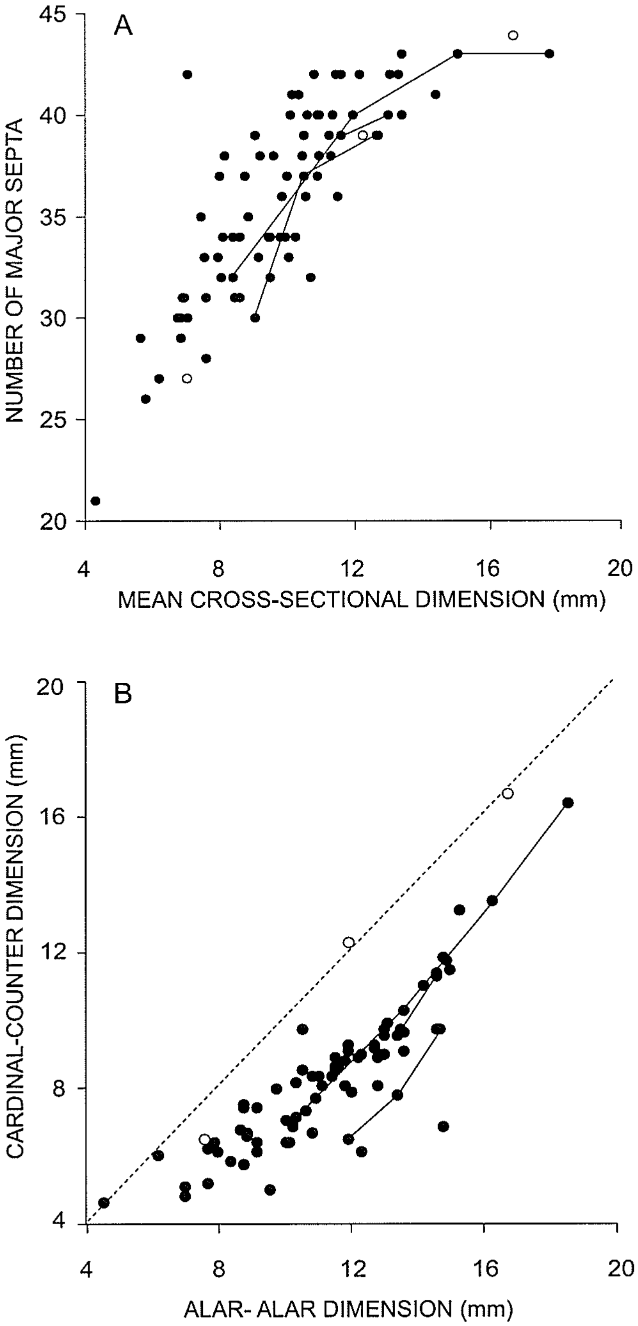
Types. Lectotype GSC 6732 (Wilson, 1926, pl. 1, fig. 6; Buttler et al., 1988, pl. 3.2, fig.

7); *Bighornia-Thaerodonta* Zone, Beaverfoot Formation (Richmondian), GSC locality 7935, Windermere Creek, northern British Columbia; designated by Buttler and Elias (in Buttler et al., 1988).

Diagnosis. Corallum small, trochoid to subcalceoloid, generally curved with cardinal side concave. Major septa greatly dilated until immediately below calice. Cardinal septum short in intermediate and late stages, fossula well developed. Fibres of major septa perpendicular to midline.

Description of coralla. Coralla short, mean length 17 mm; longest specimen exceptional (ca. 40 mm; Pl. 6, fig. 1). Coralla subcalceoloid, typically depressed throughout ontogeny. Plot of cardinal-counter dimension vs. alar-alar dimension (Text-figure 24B) shows that coralla fall in the "depressed field" (i.e., below the line of slope 1:1) with very few exceptions. Cardinal side concave, angulate; counter side convex, flattened or slightly indented (Pl. 5, figs. 10, 11, 15). Cross sectional shape variable, generally triangulate (Pl. 5, figs. 9, 12, 17, Pl. 6, figs. 2, 3, 6), also lunate (Pl. 5, fig. 11) or semicircular (Pl. 5, figs. 4, 5, 16), rarely subrounded (Pl. 5, fig. 13) in early and intermediate stages, becoming more rounded in late stage (Pl. 5, figs. 6, 8, 14, Pl. 6, fig. 5). Faint growth lines and septal grooves and interseptal ridges apparent on nonabraded specimens (Pl. 5, fig. 10). Calicular boss prominent (Pl. 5, fig. 7, Pl. 6, fig. 7).

Ontogeny and internal structures. Septa completely dilated, reaching axis or a median



Text-fig. 24. Biometric data for *Bighornia patella* from Anticosti Island. A. Mean cross-sectional dimension vs. number of major septa (79 points, 73 coralla), B. Cardinal-counter dimension vs. alar-alar dimension (79 points, 73 coralla, dashed line is 1:1). Lines connect multiple data points from the same corallum. Open circles are specimens from the Ellis Bay Formation.

line along the alar-alar plane in early stage (Pl. 5, figs. 4, 16, Pl. 6, fig. 2); minimal axial structure (median lamella) developed. Major septa greatly to completely dilated in intermediate to late stages (Pl. 5, figs. 5, 6, 9, 11-14, 17, Pl. 6, figs. 3, 4, 6) until immediately below calice. Counter septum prominent in intermediate to late stages, long, attached to elongate lenticular median lamella (Pl. 5, figs. 5, 6, 9, 11-14, Pl. 6, figs. 3, 4, 6). Septal lobes and lamellae appear around the median lamella in intermediate to late stages of some specimens (Pl. 5, figs. 8, 14). In highly depressed or lunate specimens, major septa on cardinal and counter sides meet in a linear zone along alar-alar plane, with little or no axial structure developed (Pl. 5, figs. 11, 15). Number of major septa relative to mean cross-sectional dimension shown in Text-figure 24A. Cardinal septum attached to counter septum (apparently via median lamella) in early to intermediate stages (Pl. 5, figs. 4, 5, 16, Pl. 6, figs. 2, 3, 6), subsequently detached and shortened except in a few large specimens where cardinal septum long (Pl. 6, fig. 4). Moderately broad cardinal fossula generally developed in intermediate to late stages (Pl. 5, figs. 6, 8, 9, 11-15, 17, Pl. 6, figs. 3-6) Minor septa short, generally confined to stereozone. Tabulae absent in most specimens (Pl. 5, fig. 7), rarely present (Pl. 6, fig. 7).

Microstructure. In transverse section under plane polarized light, septa fibrous, fibres oriented perpendicular to midline of major septa. Median lamella fibrous, fibres radiating outwards from midline. Abaxial ends of adjacent major and minor septa separated by indistinct wavy suture in the stereozone.

Discussion. Bighornia patella and the relationship with other species of *Bighornia* have been discussed extensively by Elias (1981, 1982a, 1983, 1985) and Buttler et al. (1988). Specimens of *B. patella* from this study are comparable to those described by Elias (1982a, pl. 15, figs. 1-11) from the Vauréal Formation, although tabulae (see Elias, 1982a, pl. 15, fig. 6) were generally not seen. Additionally, the spoon-shaped attachment structure on the cardinal side noted by Elias (1982a) is uncommon, although this could not be determined for most specimens as the exterior is obscured. The data from this study for average cross sectional dimension vs. number of major septa (Text-fig. 24A) and cardinal-counter dimension vs. alar-alar dimension (Text-fig. 24B) are comparable to data for *B. patella* from elsewhere in North America (Buttler et al., 1988, figs. 3.7, 3.8) except for two of the specimens from the Ellis Bay Formation which are approximately circular in cross section (Text-fig. 24B).

The species most closely resembles *Bighornia wilsonae* Buttler and Elias in Buttler et al., 1988 (Buttler et al., 1988, pl. 3.4, figs. 2-5) from the middle Maysvillian Selkirk Member of the Red River Formation of southern Manitoba and the middle Edenian to lowermost Maysvillian Upham Dolomite Member of the Second Value Dolomite of New Mexico and Texas. The two species are differentiated by the presence of a long cardinal septum just below the calice and a microstructure of curved, oblique fibres in the major septa of *B. wilsonae*, in contrast with the short cardinal septum and perpendicular fibres of *B. patella*. Other species of *Bighornia* generally fall into the "large size category" of Buttler et al. (1988), and are distinguishable by larger coralla and greater width to height ratios.

Occurrence. Lavache, Homard and Joseph Point members, Vauréal Formation (Richmondian), Prinsta Member, Ellis Bay Formation (Gamachian), Anticosti Island, Québec; *Bighornia-Thaerodonta* Zone (Richmondian), Beaverfoot Formation, southern Canadian Rocky Mountains, British Columbia and Alberta; Fort Atkinson Formation (Richmondian), Ossian, Iowa; Strandpilaren, Norman Lockyer Island, Princess Marie Bay, Ellesmere Island; Gunn and Penitentiary members, Stony Mountain Formation (middle-upper Richmondian), southern Manitoba; shaly beds at top of Bighorn Dolomite (middle-upper Richmondian), Johnson County, Wyoming; Caution Creek and Chasm Creek formations (middle-upper Richmondian), northern Manitoba.

Other material. 117 specimens: A-595-1, 5, 9 (Copper Collection); WCR-V-1, 2, 3a, b, 4-7, 8a, b, 9-21; CC-V-60-1; CC-V-165-1; CC-V-190-1; CA-V-410-18; CA-V-340-6, 17, 20, 22, 25, 26; CA-V-225-2 (Elias Collection); CC-V-A1-1, 2; CC-V-A2-1; CC-V-A3-1; WCR-V-CB-1-23; WCR-V-CB+37-1, 2-10; WCR-V-CB+48-1, 2-7; WCR-V-CB+54-1, 2-21; WCR-V-CB+57-1, 2, 3a-d, 4a-i (Summer 1994).

Genus *Salvadorea* Nelson, 1981

Salvadorea selecta (Billings, 1865b)

Plate 6, figs. 8-12, Plate 7, figs. 1-16

1865b *Petraia selecta* Billings, p. 429 [part].

1866 *Petraia selecta*; Billings, p. 7 [part].

1895 *Streptelasma rusticum* Whiteaves, p. 113.

1901 *Streptelasma selectum*; Lambe, p. 113 [part], [non] pl. 6, figs. 8, 8a.

1901 *Streptelasma latusculum* Lambe, pp. 114, 115 [part], [non] pl. 6, figs. 9, 9a.

1928 *Streptelasma selectum*; Twenhohel, 1928, p. 113 [part].

1956 [?]*Streptelasma* aff. *latusculum*; Duncan, pl. 21, figs. 1a, 1b.

1957 [?]*Streptelasma* cf. *S. latusculum*; Ross, pl. 37, figs. 4, 8.

1982a *Helicelasma selectum*; Elias, pp. 62, 63, pl. 6, figs. 10-20.

1983 *Helicelasma selectum*; Elias, pp. 934-938, figs 6A-X, 7A.

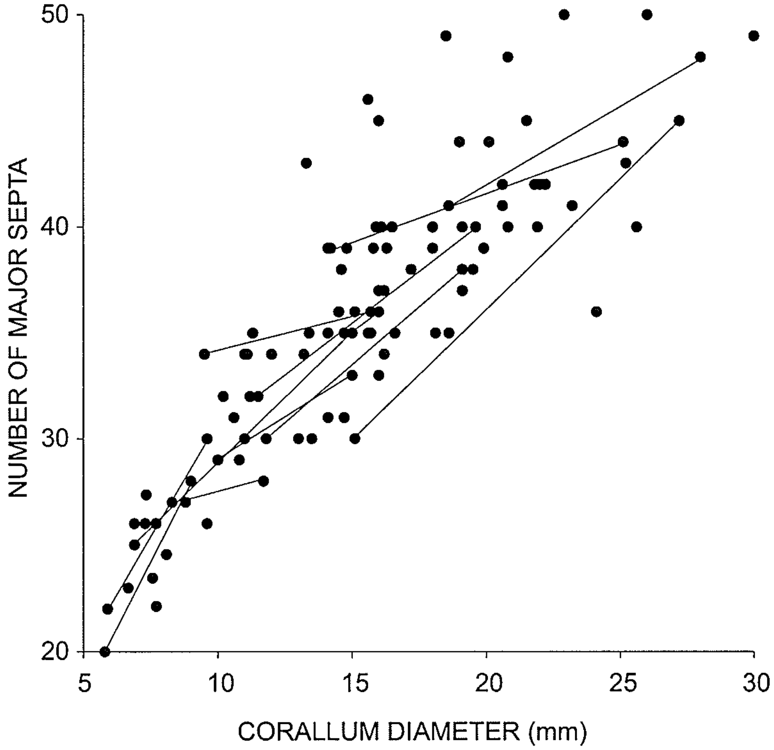
Types. Lectotype GSC 1989a, b (Elias, 1982a, pl. 6, figs. 10, 11), paralectotypes GSC 1989, 1989g, GSC 1989c, d, GSC 1989f; "upper member," Vauréal Formation, west end lighthouse, Anticosti Island; designated by Elias (1982a). The strata exposed at Pointe de l'Ouest are Homard and Joseph Point members.

Diagnosis. Corallum attains moderately large size, cross section circular. Axial structure small to moderate sized, of few septal lobes and lamellae in intermediate to late stages. Septa completely dilated until late stage. Cardinal septum thin in intermediate stage and typically short in late stage; fossula present in intermediate to late stages, becomes moderately broad.

Description of coralla. Longest specimens are two nearly complete coralla (extrapolated for broken calice) ca. 100 mm long (Pl. 7, fig. 2). Diameter of broadest specimen 49 mm.

Coralla trochoid (Pl. 6, figs. 10-12) to ceratoid (Pl. 7, fig. 2), straight to slightly curved; cardinal side convex if curved. Septal grooves and interseptal ridges weakly developed, a few specimens have isolated rugae. Depth of calice up to 50 percent of corallum length in smaller specimens (Pl. 6, fig. 11), much less in larger specimens (Pl. 7, fig. 1). A single specimen shows development of offsets near the apex (Pl. 6, fig. 12) associated with possible reorientation of growth direction.

Ontogeny and internal structures. In early stage, major septa greatly to completely dilated, extend to axis (Pl. 6, fig. 9, Pl. 7, figs. 3, 14). In intermediate stage, dilation great to complete (Pl. 7, figs. 9, 10, 15), or decreasing around the axis with small axial structure of dilated lobes and/or lamellae developed (Pl. 7, figs. 4, 5, 11, 12), or moderately large axial structure of dilated axial ends of major septa (Pl. 7, fig. 16). In late stage, major septa moderately dilated to nondilated, axial structure variable: moderately large with dilated septal lobes and lamellae (Pl. 7, fig. 13), with minimally dilated lobes and lamellae (Pl. 7, fig. 6), or slightly shortened major septa with few, small lobes or isolated lamellae (Pl. 6, fig. 8, Pl. 7, fig. 8). Counter septum particularly dilated in some specimens, with extended axial lobe (Pl. 7, fig. 12). Major septa form counterclockwise axial whorl in middle to late stages in a few specimens (Pl. 7, figs. 4, 5, 12, 13, 15, 16). Number of major septa relative to corallum diameter shown in Text-figure 25. In intermediate to late stages, cardinal septum becomes thin, cardinal fossula appears (Pl. 6, fig. 8, Pl. 7, figs. 4-8, 11, 13, 16). Immediately below calice, cardinal septum short (Pl. 7, figs. 6, 7, 13). Diameter at which dilation decreases (and fossula



Text-fig. 25. Biometric data for *Salvadorea selecta* from Anticosti Island. Corallum diameter vs. number of major septa (97 points, 89 coralla). Lines connect multiple data points from the same corallum.

appears) variable; cardinal septum long in 35 of 48 (73%) specimens with cardinal fossula fully developed. In some specimens, tabular depression associated with the cardinal fossula extends into axial region (Pl. 7, fig. 7). Minor septa confined to stereozone throughout ontogeny. Tabulae complete, nearly horizontal abaxially, slightly arched upward axially, and greatly depressed in cardinal fossula in latest stages of large specimens (Pl. 7, fig. 1). Tabulae incomplete to absent in greatly to completely dilated early and intermediate stages or in small specimens (Pl. 6, fig. 11).

Microstructure. In transverse section, major septa fibrous except along median line. Fibres oriented obliquely toward axis (in transverse section) and upward (in vertical section). U-shaped lamellae, with concave side facing axis, prominent in stereozone. Sutures present between major and minor septa in stereozone. Axial elements and tabulae fibrous. Epitheca thin.

Discussion. Coralla of *Salvadorea selecta* (Billings, 1865b) from Anticosti Island and the *Stenoparaeia* Zone (lower to middle Ashgill) of the White Head Formation near Percé, Québec, are comparable to specimens from this study (i.e., dilation is complete until late stage, axial structure is simple) (Elias, 1982a, pl. 6, figs. 10-20). Elias (1983, fig. 8) showed that the length of coralla of *S. selecta* from the Richmondian Stony Mountain Formation of southern Manitoba generally ranges between 11 and 26 mm with a maximum of 47 mm. The Anticosti specimens include six coralla greater than 60 mm in length and two greater than 90 mm, although the internal morphology is otherwise similar. *Salvadorea selecta* from the Stony Mountain Formation (Elias, 1983, pp. 934-938, figs. 6A-X, 7A, 8-10) is also greatly to completely dilated below the calice, and a cardinal fossula is developed in all specimens. The cardinal septum is long in 42 percent of coralla longer than 30 mm, and 85 percent of coralla shorter than 30 mm. Corallum length data for Anticosti specimens are only available for 13 specimens, all greater than 30 mm long. Of these, nine were sectioned near the calice and only one (8%) has a long cardinal septum. In all specimens from this study in which the fossula was fully developed (i.e., near calice), 35 of 48 (73%) have long cardinal septa. As the data from Anticosti include specimens much longer than those from Manitoba (Elias, 1983, 1985), the low frequency of long cardinal septa is probably a reflection of the same trend observed in Manitoba (shorter specimens tend to have long cardinal septa). The overall result, 73 percent, for Anticosti specimens is identical to the overall results obtained for *S. selecta* from the Gunn Member of the Stony Mountain Formation (Elias, 1985, table 3). A comparison to other species of *Salvadorea* from northern Manitoba and Texas-New Mexico (Elias, 1985, table 3) shows that *S. selecta* and *S. randi* (from which *S. selecta* is considered to have evolved; Elias, 1985) in southern Manitoba have higher frequencies of long cardinal septa. The axial structure is equally variable in specimens from northern Manitoba and Texas-New Mexico. Elias (1983, fig. 10) showed that number of major septa relative to diameter in *S. selecta* from Stony Mountain is comparable to specimens from Anticosti and Percé, although the greater length and diameter of specimens in the present study make it difficult to compare the properties of large specimens.

Salvadorea is known from the Upper Ordovician of North America. *Salvadorea* *selecta* is primarily distinguishable from other species of the genus by the high degree of dilation of major septa in early and intermediate stages. *Salvadorea randi* Elias, 1982a from the Late Ordovician Maquoketa Group of Iowa and Illinois (Elias, 1982a, pp. 61-62, pl. 6, figs. 1-9) and the Selkirk (Elias, 1981, pp. 20, 21, pl. 8, figs. 1-18, pl. 9, figs. 1-11) and Fort Garry (Elias, Nowlan and Bolton, 1988, pl. 1, figs. 4-7) members of the Red River Formation of Manitoba (Maysvillian-Richmondian) is most closely comparable to *S. selecta*, in having a small axial structure of a few lobes and lamellae and a similar fossula, but differs in displaying a lower degree of septal dilation in early to intermediate stages and in having a less prominent cardinal fossula. *Salvadorea distincta distincta* (Wilson, 1926; Buttler et al., 1988) from the *Bighornia-Thaerodonta* Zone (Richmondian) of the Beaverfoot Formation of British Columbia, the Caution Creek and Chasm Creek formations (Richmondian) of northern Manitoba and the Aleman Formation (Maysvillian-Richmondian) of New Mexico and Texas has a considerably lower degree of septal dilation through ontogeny, a more complex axial structure, and a triangulate cross section in some specimens. *Salvadorea distincta cutterensis* Elias, 1985 of the Cutter Dolomite (Richmondian) of New Mexico has a triangulate cross section in some specimens and minor septa that extend beyond the stereozone in most stages, unlike those in *S. selecta*.

Occurrence. *Stenopareia* Zone (lower to middle Ashgill), White Head Formation, Percé, Québec; Gunn and Penitentiary members, Stony Mountain Formation (Richmondian), southern Manitoba; Tower? Member, Vauréal Formation (Richmondian) to Prinsta

Member, Ellis Bay Formation (Gamachian), Anticosti Island, Québec.

Other material. 100 specimens: A219-1; A357(1)-1; A359-12; A364(1)-1, 2-4; A466b(1)-1, 5, 8; A466c-1, 2-5; A468a-1, 2, 4, 5, 7, 16, 23, 24; A595-2, 3, 4, 6, 8 (Copper Collection); CA-V-110-1, 2; CA-V-145-4; CA-V-185-1; CA-V-340-19, 21, 24; CA-V-380-32; CA-V-410-12, 23, 37; CAS-V-245-1; GR-V-1, 3; SPO-V-B1, 2-5; SPO-V-B4-3, 5; SPO-V-B5-1; RSM-V-2, 3 (Elias Collection); Carl-V-FB-1, 2; SPO-V-55-1; SPO-V-95-4, 7, 11, 13; MB-SC+5-1; MB-SC+15-1; MB-SC+40-1; MB-SC+80-1; MB-SC+150-1; MB-SC+215-1; MB-SC+220-1; MB-SC+250-1; MB-SC+260-1, 3; MB-SC+310-1; LSM-V-1a; LC-PM-midU3-1; LC-PM-topU2-1, 2; LC-U2+15-2, 3-8; LC-PM-U2+25-1; LC-PM-U3-103-1; LC-PM-U3-105-1, 2, 4, 5; LC-PM-U3-120-1, 2, 4; LC-PM-U3-20-1; LC-PM-U3-50-1; LC-PM-U3-60-1; LC-PM-U4-75-2, 3; LC-PM-U4-100-2; LC-PM-U2+120-1; LC-PM-U3-210-1;VR-1, 2-4; VR-AU-1; VR-O-1 (Summer 1994).

Genus *Lobocorallium* Nelson, 1963

Lobocorallium trilobatum vaurealense (Twenhofel, 1928)

Plate 7, figs. 17-19, Plate 8, figs. 1-9

1928 *Zaphrentis vaurealensis* Twenhofel, pp. 116, 117, pl. 3, fig. 1.

1980 *Lobocorallium vaurealensis*; Bolton, pl. 2.4, figs. 4, 8, pl. 2.7, figs. 2, 3.

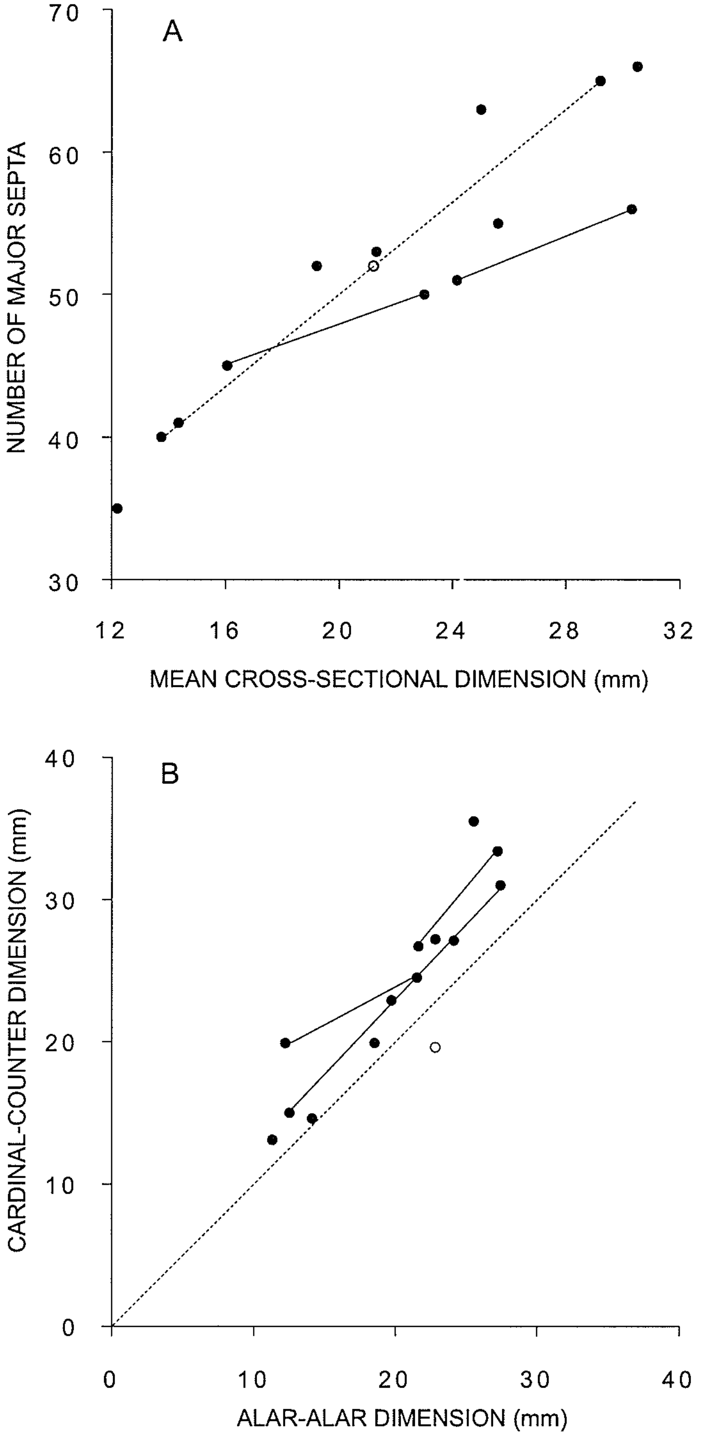
1982a *Lobocorallium trilobatum vaurealense*; Elias, pp. 75, 76, pl. 13, figs. 1-7.

Types. Holotype YPM 20482 (Twenhofel, 1928, pl. 3, fig.1; Elias, 1982a, pl. 13, figs. 1s, 2); Twenhofel's Zone 5 upper member, Vauréal Formation, Vauréal River, Anticosti Island; by original designation. Strata from which this specimen was collected may represent Joseph Point or Mill Bay Member.

Diagnosis. Lobocorallium with comparatively low degree of trilobation, high degree of compression, moderately complex axial structure.

Description of coralla. Corallum large, maximum length 150 mm (Elias, 1982a, pl. 13, fig. 1s), trochoid, moderately curved, compressed and trilobate in cross section in all stages (Text-fig. 26B) (Pl. 8, fig. 1) except for a unique depressed specimen (Pl. 8, fig. 9). Cardinal side convex. Outer wall smooth, with weak growth lines but no well developed rugae or septal grooves and interseptal ridges.

Ontogeny and internal structures. Major septa completely dilated, extend to axis in early stage (Pl. 7, figs. 17, 19, Pl. 8, fig. 3). In intermediate stage, a small axial structure may develop, formed of few lobes and lamellae (Pl. 8, fig. 4). Axial structure minimal in late stage of some specimens (Pl. 8, figs. 6, 8, 9), large and moderately complex in others (Pl. 7, fig. 18, Pl. 8, fig. 5). Septa completely dilated, taper adaxially, until immediately below calice; dilation decreases first on counter side (Pl. 8, figs. 5, 8, 9). Cardinal septum long in all stages, thinning slightly in latest stage where narrow fossula develops (Pl. 7, fig. 18, Pl. 8, figs. 5, 8). Septa on cardinal side impinge upon cardinal septum until



Text-fig. 26. Biometric data for *Lobocorallium trilobatum vaurealense* from Anticosti Island. A. Mean cross-sectional dimension vs. number of major septa (14 points, 10 coralla). B. Alar-alar dimension vs. cardinal-counter dimension (14 points, 10 coralla, dashed line is 1:1). Lines connect multiple data points from the same corallum, open circle is unusually depressed specimen (Carl-V+3.0-1).

degree of dilation drops, immediately below calice. Septa on counter side of alar septa impinge upon alar septa in similar fashion. Relationship between mean corallum dimension (average of alar-alar and cardinal-counter dimensions) and number of major septa shown in Text-figure 26A. Minor septa very short, confined to stereozone throughout ontogeny. Stereozone formed of abaxial ends of septa with adjacent ends of septa separated by well developed, straight suture. Tabulae complete in axial region in later stages, moderately arched upward axially and steeply inclined abaxially on cardinal side (Pl. 8, fig. 2).

Microstructure. In transverse section, septal fibres oriented obliquely and toward the axis from septal midline. In vertical section, fibres inclined upward toward axis.

Discussion. Compared with the present material, the previously described specimens of *Lobocorallium trilobatum vaurealense* from Anticosti Island (Elias, 1982a, pp. 75, 76, pl. 13, figs. 1-7) have a similar cross sectional shape and the axial structures are comparable in complexity, although one illustrated specimen (GSC 66596; Elias, 1982a, pl. 13, fig. 6) has a more complex structure than seen in any specimens from this study.

Only a few specimens of *Lobocorallium trilobatum vaurealense* were collected, so little is added to the known range of variability in the subspecies. The primary distinction between *L. trilobatum vaurealense* and *L. trilobatum trilobatum* from the Richmondian Stony Mountain Formation of southern Manitoba and Bighorn Dolomite of Wyoming (Elias, 1982a, 1983) is the relatively greater alar-alar to cardinal-counter ratio in the latter subspecies. A plot of cardinal-counter dimension vs. alar-alar dimension (Text-fig. 26B) shows that specimens from Anticosti are generally in the compressed field (above the 1:1 line on Text-fig. 26B), except a single specimen that has the relatively broad alar-alar dimension characteristic of *L. trilobatum trilobatum*. *Lobocorallium trilobatum trilobatum* also has a less complex axial structure (Elias, 1983, figs. 14G, M) and more major septa per cross sectional area in later stages (Elias, 1983, fig. 15). Elias described and illustrated the tabulae of the holotype of *L. trilobatum vaurealense*, showing them concave upwards in the axial region, and those in *L. trilobatum trilobatum* as convex upwards (Elias, 1982a, pp. 75, 76, pl. 13, fig. 2, 1983, p. 948). In comparison, tabulae examined in this study (Pl. 8, fig. 2) are convex upward, indicating that tabular morphology may not be stable in *L. trilobatum vaurealense*. The single depressed specimen from this study has a typical number of major septa relative to average cross sectional dimension for this species (Text-fig. 26A). Lacking a larger sample size, the relatively more depressed specimen is assigned to *L. trilobatum vaurealense*. It is possible that further data might show that the two subspecies are not distinct from each other. Elias (1982a, 1983) considered that *Grewingkia robusta*, *G. haysii*, *L. trilobatum vaurealense*, and *L. trilobatum trilobatum* form an evolutionary series of increasing degree of trilobation. Elias (1985) further suggested that *G. robusta*, *G. haysii selkirkensis* and *L. trilobatum vaurealense* form one evolutionary line while *G. haysii haysii* and *L. trilobatum trilobatum* form a separate and distinct evolutionary line. Only a small quantity of new material was examined in this study and therefore the evolutionary position of *L. trilobatum vaurealense* cannot be assessed. The occurrence of a relatively trilobate and depressed specimen of *L. trilobatum vaurealense* may represent an intermediate form between the two subspecies (evolutionary lineages) of *Lobocorallium trilobatum*.

Occurrence. *Stenopareia* Zone (lower to middle Ashgill), White Head Formation, Percé, Québec; Lavache, Homard, Joseph Point and Mill Bay members, Vauréal Formation (Richmondian), Anticosti Island, Québec.

Other material. 15 specimens: CA-V-340-1; CAS-V-lcb-2; SPO-V-b4-1a-c; SPO-V-b4-4; SPO-V-b6-1 (Elias Collection); SCA-V+15-1; CA-V+220-1; Carl-V+3.0-1; RH-V+125-1; SPO-V+85-1; SPO-V+95-3; MHVS-1, 2 (Summer 1994).

Genus *Deiracorallium* Nelson, 1963

Deiracorallium angulatum angulatum (Billings, 1862)

Plate 8, figs. 10-14, Plate 9, figs. 1-9

1862 *Petraia angulata* Billings, p. 103, figs. 90a, 90b.

1901 *Streptelasma angulatum*; Lambe, p. 112.

1928 *Streptelasma angulatum*; Twenhofel, pp. 111, 112, pl. 3, fig. 5.

1937 "*Streptelasma angulatum*"; Cox, p. 4, pl. 1, fig. 5.

1982a *Deiracorallium angulatum*; Elias, pp. 64, 65, pl. 6, figs. 21-33.

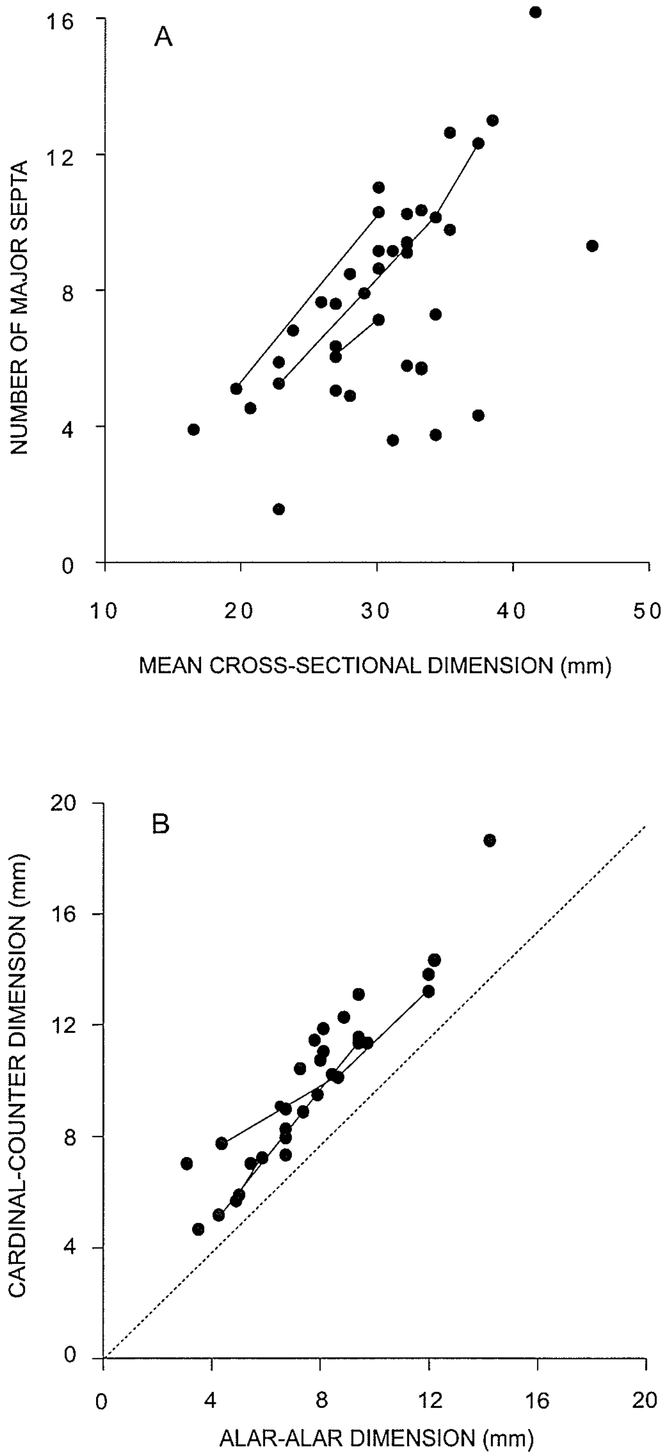
1983 *Deiracorallium angulatum angulatum*; Elias, pp. 941-942.

Types. Lectotype GSC 1984, 1984a (Twenhofel, 1928, pl. 3, fig. 5; Cox, 1937, pl. 1, fig. 5); upper member, Vauréal Formation, 30+ m below top of formation, west end camp, Anticosti Island; designated by Twenhofel (1928). Strata from which this specimen was collected may represent Joseph Point or Mill Bay Member.

Diagnosis. Small *Deiracorallium* with relatively angulate cardinal side. Major septa extend to axis, greatly dilated until immediately below calice. Tabulae rare or absent.

Description of coralla. Coralla compressed (Text-figure 27B), compression decreasing through ontogeny (Pl. 8, figs. 10-12), trochoid to ceratoid, slightly curved (Pl. 9, figs. 1, 2, 9). Cardinal side angulate, convex. Largest specimen 32 mm long (Pl. 9, figs. 1, 2). Fine growth lines on three specimens at mean spacing of 9 per mm (Pl. 9, figs. 1, 2). Rugae at subtle bends in corallum, particularly along cardinal side. Calice depth 20-40 percent of corallum length. No axial boss (Pl. 9, fig. 9).

Ontogeny and internal structures. In early stage, major septa greatly to completely dilated, reach axis or axial line along cardinal-counter plane with no axial structure developed (Pl. 8, fig. 10, Pl. 9, figs. 5, 6). In intermediate stage, septa moderately dilated, generally reach axis or axial line (Pl. 8, figs. 13, 14, Pl. 9, figs. 3, 4, 7). In late stage, septa moderately dilated to nondilated (Pl. 8, fig. 11, Pl. 9, fig. 8). Major septa taper adaxially; septa adjacent to cardinal septum impinge upon it in highly dilated stages (Pl. 9, figs. 4, 6). Number of major septa relative to mean of cardinal-counter and alar-alar



Text-fig. 27. Biometric data for *Deiracorallium angulatum angulatum* from Anticosti Island. A. Mean cross-sectional dimension vs. number of major septa (31 points, 26 coralla). B. Cardinal-counter dimension vs. alar-alar dimension (31 points, 26 coralla, dashed line is 1:1). Lines connect multiple data points from the same corallum.

dimensions shown in Text-figure 27A. Cardinal septum long in early stages, narrowing and shortening in intermediate to late stages leaving narrow cardinal fossula (Pl. 8, figs. 11, 14, Pl. 9, figs. 3, 8). Minor septa short, generally confined to narrow stereozone in early and intermediate stages, short to moderately long in latest stage of large specimens (Pl. 8, fig. 12). Tabulae rare, only in large specimens (Pl. 9, fig. 9).

Microstructure. In transverse section, septa fibrous; fibres oriented towards corallum axis from midline of septa. In vertical section, fibres oriented upward toward axis.

Discussion. Elias (1981, 1982a, 1983) previously discussed the position of *Deiracorallium angulatum angulatum* within the genus. The largest specimen of *D. angulatum angulatum* from this study (32 mm long; Pl. 9, figs. 1, 2) is longer than any previously described specimen (23 mm; Elias, 1982a, p. 64). The previously described specimens from Anticosti Island (Elias, 1982a, p. 64, pl. 6, figs. 21-33) have a degree of compression comparable to specimens examined in this study and the degree of dilation through ontogeny is also comparable.

The subspecies *Deiracorallium angulatum gunni* from the Richmondian Stony Mountain Formation of southern Manitoba differs from *D. angulatum angulatum* in having weaker angulation on the cardinal side, as well as more frequent occurrence of tabulae, and shorter minor septa. As degree of angulation is difficult to quantify due to preservation, statistical tests were not performed, but figured specimens of *D. angulatum gunni* show a less acute cardinal angle (Elias, 1983, particularly figs. 11-c, f-h, p, q, aa-cc). As *D. angulatum angulatum* is shown to occur in a setting with lower energy and a higher sedimentation rate than *D. angulatum gunni*, the subspecies may be ecophenotypes.

Compared with *Deiracorallium angulatum angulatum*, *Deiracorallium delicatum* Elias, 1981 from the Selkirk Member (Maysvillian), Red River Formation, of southern Manitoba, attains larger size and has less dilated major septa, generally complete tabulae and minor septa that extend beyond the stereozone through a greater ontogenetic range (Elias, 1981, pl. 9, figs. 13-24). Additionally, the coralla of *D. delicatum* are less compressed, and the axial structure is moderately complex. *Deiracorallium harveyi* Nelson, 1981 from the Portage Chute and Surprise Creek formations (Edenian? to lower Richmondian) of northern Manitoba has a well developed, complex axial structure (Nelson, 1963, p. 53, pl. 7, figs. 6-9) as does *Deiracorallium giganteum* Nelson, 1963 from the Chasm Creek Formation (Richmondian) of the Churchill River Group of northern Manitoba. *Deiracorallium giganteum* is also larger and has an axial whorl of its major septa. *Deiracorallium prolongatum* (Wilson, 1926) from the Richmondian *Bighornia-Thaerodonta* Zone of the Beaverfoot Formation of the southern Canadian Rocky Mountains in British Columbia and Alberta and the Chasm Creek Formation of northern Manitoba is larger, has a more rounded cardinal angle and has a long cardinal septum in all stages (Buttler et al., 1988, pp. 70-72, pl. 3.7, figs. 1-11, pl. 3.8, figs. 1-3).

Occurrence. Homard (Tower?) Member to Joseph Point Member, Vauréal Formation (Richmondian), Anticosti Island, Québec.

Other material. 64 specimens: CAS-V-3, 4, 5; PO-V-1; RH-V-1; SPO-V-b4-2 (Elias Collection); BMac-V+110-1; BMac-V-lsh-1, 2, 3; BMac-V-bl-1, 2-5; OC-V-loose-1, 2-6; OC-V+120-1a, b, 2-4, 5a, b, 6-12; OC-V+400-1, 2, 3; OC-V-610-1, 2, 3, 4a, b, 5, 6; PO-V-cb-1, 2-7, 9-13; PO-V-CB-10-1, 2, 3; RH-V+60-1, 2; RH-V+80-1; RH-V+95-1 (Summer 1994).

Genus *Eurogrewingkia* Neuman, 2003

2003 *Eurogrewingkia* Neuman, pp. 201, 202.

Diagnosis. Solitary streptelasmatid with complex axial structure of lobes and lamellae, minimally to greatly dilated major septa and no cardinal fossula.

Discussion. Neuman (2003) erected the genus *Eurogrewingkia,* separate from *Grewingkia* (Dybowski, 1873), for corals with "typical *Grewingkia* style" complex axial structures of many lobes and lamellae, and lacking a cardinal fossula. As *E. pulchella* has no fossula (although a pseudofossula is occasionally developed) it is placed in the new genus. Neuman (2003) also described the septal dilation in *Eurogrewingkia* as being minimal throughout ontogeny; the inclusion of *E. pulchella* in the new genus extends the genus concept to include species with great to complete dilation of major septa. As *Eurogrewingkia* includes species which (variably) develop a median lamella, *E. pulchella* extends the range of morphology of the genus to approach *Bodophyllum* Neuman (1969). Those specimens of *E. pulchella* with median lamellae are retained in the genus

Eurogrewingkia because this structure is often associated with other axial elements more typical of *Grewingkia* and *Eurogrewingkia*, and because development of the median lamella is relatively infrequent. Additionally, the median lamella can appear at varying stages of ontogeny and in a few cases a median lamella appears between stages having "typical *Grewingkia*" axial structures. *Eurogrewingkia callahanensis* (Elias in Elias and Potter, 1984) and *E. bilateralis* (Neuman, 1969), also display a median lamella. The prominence of the median lamella and lack of other lamellar development in *Bodophyllum* distinguish that genus from *Grewingkia* (see Elias, 1982a) and *Eurogrewingkia*. As no cardinal fossula is developed in *E. pulchella*, the species would not be assignable to *Dalmanophyllum* Lang and Smith, 1939, which is characterized by development of a median lamella. Like other genera of streptelasmatids, the species of *Eurogrewingkia* can include features characteristic of different genera.

Eurogrewingkia pulchella (Billings, 1865b)

Plate 9, figs. 10-25, Plate 10, Plate 11, figs. 1-7

1865b *Petraia pulchella* Billings, pp. 429, 430.

1865b *Petraia selecta* Billings, p. 429 [part].

1866 *Petraia pulchella*; Billings, p. 23.

1866 *Petraia selecta*; Billings, p. 7 [part].

1901 *Streptelasma selectum*; Lambe, p. 113 [part], pl. 6, figs. 8, 8a.

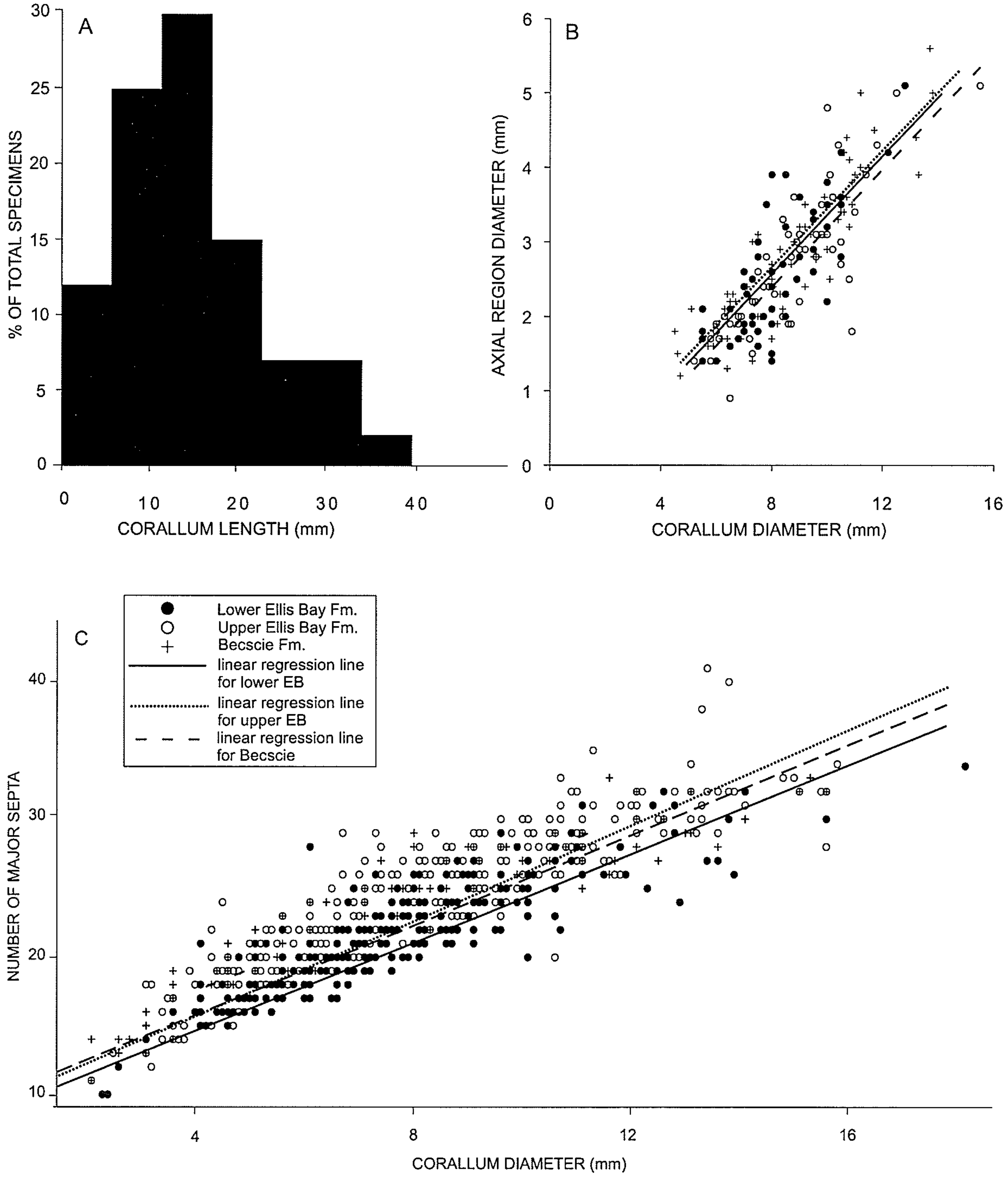
1928 *Streptelasma selectum*; Twenhofel, p. 113 [part].

1982a *Grewingkia pulchella*; Elias, pp. 73, 74, pl. 12, figs. 7-21.

Types. Lectotype GSC 2243, 2243a (Lambe, 1901, pl. 6, figs. 8, 8a); Ellis Bay Formation, Ellis Bay, Anticosti Island; designated by Elias (1982a). The strata from which this specimen was collected may represent Lousy Cove or Laframboise Member.

Diagnosis. Small *Eurogrewingkia*, major septa completely dilated in early stages, moderately dilated in later stages. Axial region highly variable, including large complex porous structures (typical of genus), large or small completely or partially dilated structures, structures with median lamella, and axial regions with minimal axial structure development.

Description of coralla. Corallum small (maximum length 38 mm; see Text-fig. 28A), trochoid (Pl. 9, figs. 12, 16, 18, 21, 22, Pl. 10, figs. 1, 4, 17) to ceratoid (corallum length : calice diameter 1:1 to 12:7, generally higher in longer specimens), straight, slightly curved, moderately curved, or bent (Pl. 9, fig. 16). Of 493 specimens for which external form could be determined, 38.9 percent moderately curved, 42.8 percent slightly curved, 13.4 percent straight and 4.9 percent bent. Cardinal side convex if corallum curved. Bends generally in cardinal-counter plane, although cardinal-counter plane bent in a few specimens (Pl. 9, fig. 16). Septal grooves and interseptal ridges prominent. Minor rugae occasionally developed, particularly at bends (Pl. 9, fig. 18, Pl. 10, fig. 1). Fine growth lines (Pl. 10, fig. 1) spaced 3-5 per mm. Small basal attachment scars present on cardinal side of some specimens (Pl. 9, fig. 16). Calice 30-40 percent of corallum length, calicular boss prominent (Pl. 9, fig. 15).



Text-fig. 28. Biometric data for *Eurogrewingkia pulchella* from Anticosti Island. A. Histogram of corallum length (n = 218). B. Corallum diameter vs. axial region diameter (181 points, 152 coralla). C. Corallum diameter vs. number of major septa (834 points, 723 coralla). Legend on C also applies to B.

Ontogeny and internal structures. Major septa completely dilated in early stage (Pl. 9, figs. 10, 19, 24, Pl. 10, figs. 2, 5, 8, 11, 14, 18, Pl. 11, fig. 4), reach axis; in a few cases, moderately dilated median lamella apparently attached to cardinal and counter septa (Pl. 10, fig. 14). In intermediate to late stages, septa moderately to greatly dilated, with axial structure ranging from nonexistent (Pl. 9, figs. 14, 17) to small and simple with a few lobes and/or palli (Pl. 9, figs. 11, 13, 20, 23, Pl. 10, fig. 9, Pl. 11, fig. 1), to large with solid or nearly solid mass of dilated lobes and lamellae (Pl. 10, figs. 15, 16), or with complex, moderately dilated lobes and lamellae with (Pl. 9, fig. 25, Pl. 10, figs. 6, 13, 20, Pl. 11, figs. 2, 6, 7) or without (Pl. 10, figs. 3, 7, 10, 12, 19, Pl. 11, fig. 3) median lamella (see Variability). Axial region diameter relative to corallum diameter shown in Text-figure 28B. Number of major septa relative to diameter shown in Text-figure 28C. When present, median lamella may be attached to cardinal and counter septa or be free. Cardinal septum generally only distinguishable by deflection of adjacent septa. Minor septa short, often only triangular projections, extending beyond narrow to moderately broad stereozone in late stages only. Tabulae rare or absent (Pl. 9, fig. 15).

Microstructure. In transverse section, septal fibres oriented obliquely adaxially from prominent septal midline. Curved lamellae developed in stereozone. In vertical section, fibres oriented up toward axis.

Variability. Several features of *Eurogrewingkia pulchella* are variable, particularly the axial region, and stratigraphic trends are apparent. Axial structure complexity cannot be easily quantified (or "semi-quantified"; e.g., see Elias, 1982a, study of the axial structures of *Streptelasma divaricans* and *Grewingkia canadensis*). This is because the coralla (and axial structures) are relatively small and the major septa are relatively dilated (obscuring elements of the axial region). As a result, axial elements cannot be as easily distinguished, and the axial structure as a whole is often relatively small. Additionally, semi-quantitative methods would not be useful for differentiating between solid structures in which lobes and lamellae cannot be distinguished, solid structures formed of dilated lamellae and/or palli, and solid structures formed of dilated lobes. Development of the median lamella, which varies stratigraphically, is the most significant individual feature in the variability of *Eurogrewingkia pulchella* (Table VIII) (see 3.5.2.2 Intraspecific Variability; *Eurogrewingkia pulchella*).

Discussion. *Eurogrewingkia pulchella* is distinct from other species of the genus on the basis of its small size, relatively high degree of dilation and occasional development of a median lamella. The specimens of *E. pulchella* described and illustrated by Elias (1982a, pl. 12, figs. 7-21) are the same size and display the same degree of dilation as specimens from this study. The axial structures of the specimens illustrated by Elias (1982a) are moderately to completely dilated and a single illustrated specimen (GSC 1989h; Elias, 1982a, pl. 12, fig. 10) has a median lamella, although the latter structure was not noted in previous descriptions. As analysis of a large sample has shown a continuous range of variability in axial region morphology, all specimens in this study and those previously assigned to *E. pulchella* are retained in a single species.

Eurogrewingkia callahanensis (Elias in Elias and Potter, 1984, pp. 1210-1212, figs. 2M-P) from the Ashgill Horseshoe Gulch unit of northern California is known from only three specimens, all of which show a well developed median lamella. *Eurogrewingkia callahanensis* is significantly different from the forms of *E. pulchella* that develop a median lamella in possessing well developed, steeply abaxially inclined tabulae and an axial structure of distinctly concentric lobes and lamellae. *Grewingkia franklinensis* Elias, 1985 from the Maysvillian-Richmondian Aleman Formation of Texas develops a median lamella, but the corallum is trilobate and therefore clearly distinct from *E. pulchella* (Elias, 1985, pp. 31-33, figs. 11.1-11.7).

Eurogrewingkia bilateralis Neuman, 1969 occurs in the Late Ordovician (Harjuan) Boda Limestone of Sweden (Neuman, 1969, pp. 39-43, figs. 31A-J, 32A-G, 33 A, B). It has an axial structure with a median lamella comparable to some specimens of *E. pulchella*, and overall corallum size is similar, but the major septa are minimally dilated through ontogeny and the number of major septa in *E. bilateralis* reaches 52, considerably higher than any specimen of *E. pulchella*. Although *E. bilateralis* is known from limited material, all specimens display the median lamella, in contrast to *E. pulchella*.

Occurrence. Grindstone Member, Ellis Bay Formation (Gamachian) to lower Fox Point Member, Becscie Formation (Rhuddanian), Anticosti Island, Québec. Unnamed unit (Ashgill), 9 km east of Ashland, Maine.

Other material. 965 specimens: 83AP11-2-8F-1a, b; 83AP14-1-1, 2, 4, 6-8, 10; 83AP18-1-R5-1a, b, 2-5; 83AP18-1-R7-1, 3b, c, e-g, 4a, b, d, f-h; 83AP11-2-9, 10; 83AP17-1-bh-2a, b, 3, 4, 6b-d, 7b, 8a, c, 11a, b, 12b, 14b, c, 18, 24b, d, 26a, c, d(a, b), e, 27c, e-g, i-k, 28, 30, 32c, e, 36c, 38a, 41; 83AP16-1-bh-1, 2; 83AP14-1-22a; 83AP16-1-1B-1b, d, e, 2, 3; 83AP17-1-1B-1b, 2a, b, 3a-c, 4, 5, 8, 14, 15; 83AP16-1-32'+1-1; 83AP19-67-1, 2; 83AP19-1-90-1; 83AP20-2'-102-1, 2-4; 83AP19-108-1; 83AP19-1-115-1; 83AP19-1-119-1, 2, 3; 83AP19-1-120-1; 83AP19-1-130-1, 2; 83AP20-3-142-1, 2-19; 83AP20-3-145-1, 2, 3; 83AP20-3-161-1, 2, 3; 83AP22-1-15T-1, 2, 3; 83AP24-2-48-1; 83AP24-2-54-1; 83AP24-2-57-1; 83AP29-1-23-1, 2; 83AP29-1-30-1a-h, 2a, b; 83AP29-1-34-1b; 83AP33-1-53-1; 83AP33-1-57-1, 2, 3; 83AP33-1-58-1, 2; 83AP33-1-59-1; 83AP33-1-64-1, 2-4; 83AP33-1-72-1; 83AP9-1-100-1; 83AP9-1-113-1; 83AP9-1-115-1, 2, 3 (Petryk Collection); A4-1, 2, 3; A36-1, 2-4; A72-1a, b, 2-5; A74-1, 2; A85-1; A135-1, 2, 4-10; A359-1, 2-6, 7a, b, 8-11, 13-15; A362(2)-1, 2, 3; A430b-1, 2-8; A435(9)-1, 2-9; A435-3, 4, 8; A435a-1, 2-8; A436-5, 9, 21; A438c-5; A439b-1a, b; A468a-14; A590c-2; A597-1, 2; A738(52)-1; C718-1, 2-10 (Copper Collection); RSM-V-2; SGC-V-1a-c, 2, 3a, b, 4-8, 9a, b, 10a, b, 11-13, 14a-o, 15a-m; CVPEB1N-m116cm-1; -m110cm-1; -m106cm-1; -m88cm-1; -m80cm-1, 2; -m17cm-1; -m12cm-1; -m9cm-1, 2; -m8cm-1; CVP-EB1S-m7cm-1; -m10cm-2, 3, 4; -m15cm-1, 2-5; -m17cm-1, 2-7, 9, 10, 13, 15, 16; -m23cm-2; CVP-EB2-80cm-1, 2-5; -80cm-1; -85cm-1, 3-5, 7-13; -125cm-1a, b, 2, 4; -130cm-1a-e, 2, 3a, b, 4, 5a, b, 6; -135cm-4, 5-13; -150cm-1, 2, 3; -155cm-1, 2-4; -165cm-1a, b, 2, 3a-d, 4-9; -180cm-1, 2-6; -195cm-1, 2; -200cm-2, 3, 5, 6a, b, 7-11; -230cm-1, 3-6; -235cm-2, 9-11; -239cm-5, 6, 7; -245cm-1, 2; -250cm-1; CF-EB2-l-1, 4; CF-EB2-u-1, 2; WC-EB2-

m250cm-1, 2; CB-EB3-1, 2-7; WC-EB3-0to80cm-1, 2-5; -230cm-1; WC-EB3-middle-1; WC-EB3m550cm-1; -m270cm-1; WC-EB3-(KB3)-m160to215cm-1, 2; -m185cm-1; -m155cm-1; -m115cm-1; -m95cm-1, 2, 3; -m77cm-1; -m25cm-1; WC-EB4-55cm-1, 2; -115cm-1; -150cm-1; WC-EB4-u-2, 3, 4, 5a, b; PL-EB5-m40cm-1; -m50cm-1, 2, 3; -m60cm-1; -m100cm-1, 2; -m160cm-1; -m200cm-1; -m478cm-1; -m495cm-1, 2, 3; -m505cm-1; -m545cm-1, 2; -m560cm-1; -m590cm-1; -m615cm-1, 2, 3; -m670cm-1; -m700cm-1, 2, 3; -m705-1, 2; -m725cm-1, 2, 3; -m760cm-1; PL-EB7-OPB-2, 4-6; PL-EB7-SR-L1-5; PL-EB7-SR-U1-2, 7, 9, 12, 16-25; PL-EB7-SR-2-1, 2-4, 11-13; PL-EB7-SR-3-4, 5, 7, 8-18, 21, 23, 25-27; PL-EB7-FR-L-2; PL-EB7-FR-U-1, 3, 9, 10, 13; PL-EB7-RC-L2-1, 10; PL-EB7-RC-L3-6; PL-EB7-RC-M1-1, 6; PL-EB7-RC-M2-7; PL-EB7-RC-M3-6, 11; PL-EB7-RC-U1-14, 15; PL-EB7-RC-U2-2, 7, 8; PL-EB7-RF-L1-1, 8, 9; PL-EB7-RF-L2-1, 3-5, 7, 8; PL-EB7-RF-U1-4, 6, 11, 17, 19, 21-23; PL-EB7-RF-U2-1, 4, 6, 7, 9, 11-14, 16, 17; PL-EB7-IR-L1-2; PL-EB7-IR-L2-1, 2, 3, 6, 7; PL-EB7-IR-L3-1, 3, 4, 6, 7, 9; PL-EB7-IR-L4-1, 2, 3; PL-EB7-IR-U1-1, 2, 3; PL-EB7-IR-U2-1, 2, 5-9, 11-14; PL-EB7-IR-U3-1, 2, 4, 6, 7; PL-EB7-IR-U4-1, 2, 4; PL-B1-L1-3; PL-B1-L2-1, 4, 5; PL-B1-L3-1, 2, 3; PL-B1-L4-2; PL-B1-L5-2, 4, 5; PI-B1-b137-1063cm-1; PI-B1-b154-1121cm-1, 2; PI-B1-b160-1143cm-1; PI-B1-b162-1144cm-1, 2; PI-B1-b177-1190cm-1; PI-B1-b178-1204cm-1; PI-B1-b187-1230cm-1; PI-B1-b224-1380cm-1; PI-B1-1735cm-1; PI-B1-1841cm-1, 2 (Elias Collection); CSG-V-1, 2-15; FC-I-1, 2; FC-S-1, 2-6, 9; LaF-EB5mid-1, 2, 3a-c, 4-7; LaF-EB5-30-1; LaF-EB7-TI-1, 2a, b, 4; LaF-EB7-LI-2; LaF-B-hcb-1; LaF-B-t-20-1, 2; LaF-B-t-59-1; LaF-B-t-98-1; LaF-B-t-403-2; LaF-B-t-410-1, 2; LaF-B-t-419-1, 2-5; LaF-B-t-425-1, 2-4, 6-24; LaF-B+89-1, 2, 3; LaF-B-ENC-1, 2; CB-

EB3-A2-2, 3, 4; CB-EB3-KB3-A1-1; CB-EB3-A3-1, 2-5, 6a, b, 7a, b; CB-EB4-A2+0-1; CB-EB4+10-1, 2-4, 6, 7a, b, 8, 9, 11-14, 15a, b, 16; CB-EB4+20-1; CB-EB4+36-1; CB-EB4-+56-1; CB-EB4+75-1; CB-EB4+84-1; CB-EB4+86-1; ROS-?-1, 2-8; ROS-65-1; ROS-115-1, 2, 3, 5-7, 9-13; ROS-125-1, 2, 3; ROS-135-1, 2-5; ROS-145-1, 2; ROS-150-1; ROS-175-1, 2; ROS-435-1, 2-5; ROS-455-1, 2; ROS-510-2, 3, 4; ROS-550-1; ROS-610-1, 2-9; ROS-625-1; ROS-666-1, 2-5; ROS-720-1, 2-4; ROS-790-2, 3; ROS-800-1, 2; ROS-805-1, 2-5; ROS-810-1a, b, 2; ROS-870-1; ROS-875-1; ROS+250-1; LC-PM-BAU3-1; LC-PM-MidU3-2; LC-PM-U2+105-1; LC-PM-U2+115-1; LC-PM-U3-105-3; LC-PM-U4-50-1; LC-PM-U4-70-1, 2; LC-PM-U4-75-1, 4, 5; LC-PM-U4-85-1; LC-PM-U4-90-1, 2; LC-PM-U4-100-1; LC-PM-U4-100-1(?); LC-PM-U4-110-1; LC-PM-U4-130-1; LC-PM-U4-135-1, 2; LC-PM-U4-150-1, 2; LC-PM-U4-190-1; FP-Laf+7BH-1, 2a, b, 3; FP-Laf-1.5hBH-2, 3, 5-15; FP-Laf-10BH-2, 3-9, 10a, b, 11-14, 16-18, 20-24; FP-Laf-1hBH-4a, b, 7-15, 19, 20a, b; FP-Laf-20BH-2; FP-2hBH-2, 4; FP-Laf-BH?-4, 5, 9, 12, 14; FP-Laf-BHT-1, 2, 4, 6-8; FP-B+10-1, 2, 4; FP-B+90-1; FP-B+103-1, 2; FP-B+150-1, 3; POR-BH-2, 6; POR-OPB-1, 2, 11, 15, 17, 19; SR-bbbh-1, 2, 4, 7a-c; SR-BH-180-1; SR-B+45-3, 4; SR-B+390-4; SR-B+419-13a; SR-B+460-1, 5 (Summer 1994).

Genus *Bodophyllum* Neuman, 1969

Bodophyllum englishheadense Elias, 1982a

Plate 11, figs. 8-18, Plate 12, figs. 1-6

1982a *Bodophyllum englishheadense* Elias, p. 79, pl. 14, figs. 10-16.

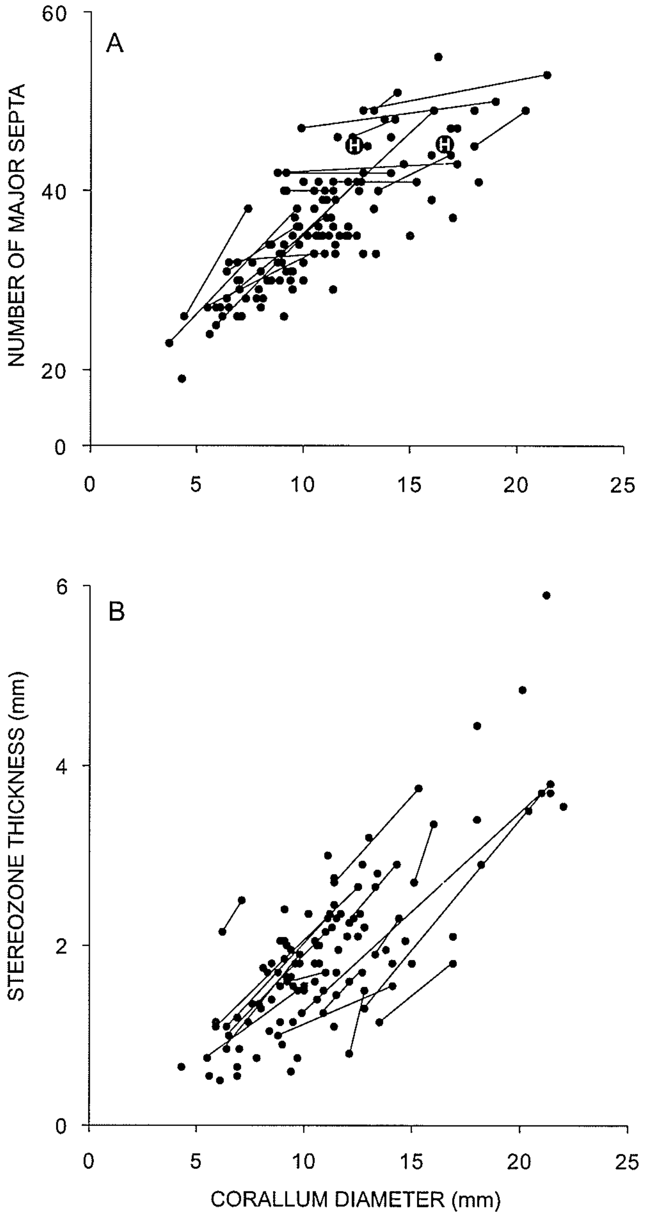
Types. Holotype YPM 28764 (Elias, 1982a, pl. 14, figs. 10-13), English Bay; paratypes YPM 28765, 28766 (Elias, 1982a, pl. 14, figs. 14-16), English Head; paratypes YPM 28767, 28768, White Cliff; "upper member (English Head facies)," Vauréal Formation, Anticosti Island; by original designation. Specimens are probably from Homard Member.

Diagnosis. Corallum solitary, axial structure variable but moderately dense throughout ontogeny, consisting of swollen axial ends of major septa, a median lamella, moderately dilated septal lobes in intermediate and late stages. Stereozone broad in all stages, broadest immediately below calice.

Description of coralla. Longest complete specimen 45 mm long; longest nearly complete specimen approximately 60 mm long (Pl. 11, fig. 8). Maximum diameter of broadest specimen 27 mm (Pl. 11, fig. 9). Coralla ceratoid in early stage to sub-cylindrical in late stage, straight or slightly curved (Pl. 11, figs. 10, 17), cardinal side convex. Cross section circular, commonly distorted by attachment structure on cardinal side in early to intermediate stage (Pl. 11, figs. 11, 13, 16, Pl. 12, figs. 1, 5, 6). Approximately 50 percent of specimens (91 of 188) display well developed attachment structures (N.B., actual percentage possibly higher as several specimens missing bases). Coralla attached on cardinal sides to various skeletal grains, typically bryozoans. Some coralla attached to others of same species, resulting in pairs that grew into lateral contact with each other (Pl. 11, fig. 16, Pl. 12, fig. 5). Septal grooves and interseptal ridges present on nonabraded specimens. Rugae occasionally developed (Pl. 11, fig. 17), isolated pronounced rugae suggestive of rejuvenation (Pl. 11, fig. 17) present on some specimens. Calice depth approximately 35 percent of corallum length (Pl. 11, fig. 8), no axial boss developed.

Ontogeny and internal structures. In early stage, major septa moderately dilated, extend to axis, little or no axial structure other than connecting lamella between cardinal and counter septa (Pl. 11, figs. 11, 15, Pl. 12, figs. 1, 5). Major septa straight, with minimal taper except in latest stage. Number of major septa relative to diameter shown in Text-figure 29A. In intermediate and late stages, axial structure becomes dense, formed of dilated axial ends of major septa with moderately dilated median lamella connecting cardinal and counter septa and a few lobes usually present (Pl. 11, figs. 12-14, 16, 18, Pl. 12, figs. 2-4, 6). Axial structure less dense in latest stages in larger coralla (Pl. 11, figs. 9, 18). Minor septa short, confined to stereozone in all stages. Stereozone narrow (Pl. 11, fig. 15) to moderately broad (Pl. 12, fig. 1) in early stage, thickening to a maximum of 25 percent of corallum diameter in later stage (Pl. 12, fig. 4) (Text-fig. 29B). Tabulae present from early stage, generally complete, slightly arched upward, complementary plates present in some specimens (Pl. 11, fig. 8).

Microstructure. Microstructure of septa generally obscured. Where seen, in transverse section, fibres oriented obliquely toward axis from septal midline; in vertical section, fibres oriented upward axially. Inner stereozone formed of U-shaped lamellae. Outer stereozone formed of lamellae parallel to outer wall (epitheca usually abraded).



Text-fig. 29. Biometric data for *Bodophyllum englishheadense* from Anticosti Island. A. Corallum diameter vs. number of major septa (123 points, 102 coralla), H = holotype. B. Corallum diameter vs. stereozone thickness (117 points, 101 coralla). Lines connect multiple data points from the same corallum.

Discussion. While the current study has added to the known range of variability of *Bodophyllum englishheadense*, the definition of the species has not changed. The specimens described and illustrated by Elias (1982a, p. 79, pl. 14, figs. 10-16) from English Bay and English Head (many specimens from this study were obtained at the same locality) have a broad stereozone, cardinal side distorted by attachment structures and an axial structure formed of a moderately prominent median lamella and dilated axial ends of major septa. Number of major septa relative to corallum diameter in the holotype is comparable to specimens from this study (Text-fig. 29A). The largest specimens from this study have less dilated axial structures than those illustrated by Elias (1982a, pl. 14, figs. 11-16). Otherwise, specimens from this study have identical features to the types.

Stereozone thickness is the primary feature that distinguishes *Bodophyllum englishheadense* as a species (Elias, 1982a). The stereozone is considerably thicker in *B. englishheadense* than in other species of *Bodophyllum* from the Ordovician of North America (e.g., *B. shorti* Elias, 1982a, pl. 13, figs. 10-14, from the Gamachian Leemon Formation of Missouri; *B. neumani* Elias, 1982a, pl. 14, figs. 1-6, from an unnamed Ashgill formation in Maine), and the type species, *B. osmundense* Neuman, 1969, from the Late Ordovician (Harjuan) Boda Limestone of Sweden. *Bodophyllum* n. sp. (this study) from the uppermost Ellis Bay Formation (Gamachian) of Anticosti Island has a narrower stereozone, and a more prominent median lamella in later stages. *Streptelasma* n. sp. 1 (this study), also from the uppermost Ellis Bay of Anticosti, is superficially similar to *B. englishheadense* as it has a broad stereozone, but its narrow, tapering septa, axial whorl in intermediate stage, and minimal development of the axial structure without a median lamella make it distinct.

Occurrence. Lavache?, Homard to Schmitt Creek members, Vauréal Formation (Richmondian), Grindstone/Velleda?, Prinsta, Laframboise members (Gamachian), Ellis Bay Formation, Anticosti Island, Québec.

Other material. 188 specimens: 83AP11-2-12; 83AP17-1-BH-5; 83AP18-1-R6-1 (Petryk Collection); A435a-9; A438-3; A466b(1)-2, 3, 4, 7; A468a-6, 8-10, 12, 13, 15, 17, 20, 21; A595-7 (Copper Collection); CA-V-145-1, 2, 3, 5a, b; CA-V-225-1, 3, 4; CA-V-340-2, 3-5, 7-16, 18, 23, 27-32; CA-V-380-1, 2-12, 14-23, 25, 26, 30, 31, 33; CA-V-410-1, 5, 7-11, 13-17, 19, 20, 24-28, 30, 31, 32a, b, 33-36, 38; CA-V-450-1, 2, 3; CA-V-500-600-1; CAS-V-45-1; GR-V-2; NAF-V-220-1, 2; RSM-V-1, 4, 5; SPO-V-B1-1, 2, 4, 6; SPO-V-B2-1; SPO-V-B3-1, 2, 3; SPO-V-B4-1d; CVP-EB1N-45-1; PL-EB7-RC-U1-1; PL-EB7-RC-L2-13, 14; PL-EB7-RC-M1-4; PL-EB7-RF-U1-13; PL-EB7-IR-U1-4; PL-B1-L2-3; PL-B1-L6-2 (Elias Collection); RH-V-50-1, 3; SPO-V-55-2; SPO-V-70-1; SPO-V-95-2, 5, 6, 8, 10, 12; MB-IB-1, 2, 4, 6-8, 12, 14; MB-OB-1, 2-6, 8-10, 11a, b, 12, 14, 18-33; BMac-V-FB+4-1; LSM-V-2a; MHVS-3, 4; LC-PM-topU2-4; LC-PM-U4-75-2; POR-OPB-3 (Summer 1994).

Bodophyllum n. sp.

Plate 12, figs. 7-26, Plate 13, figs. 1-5

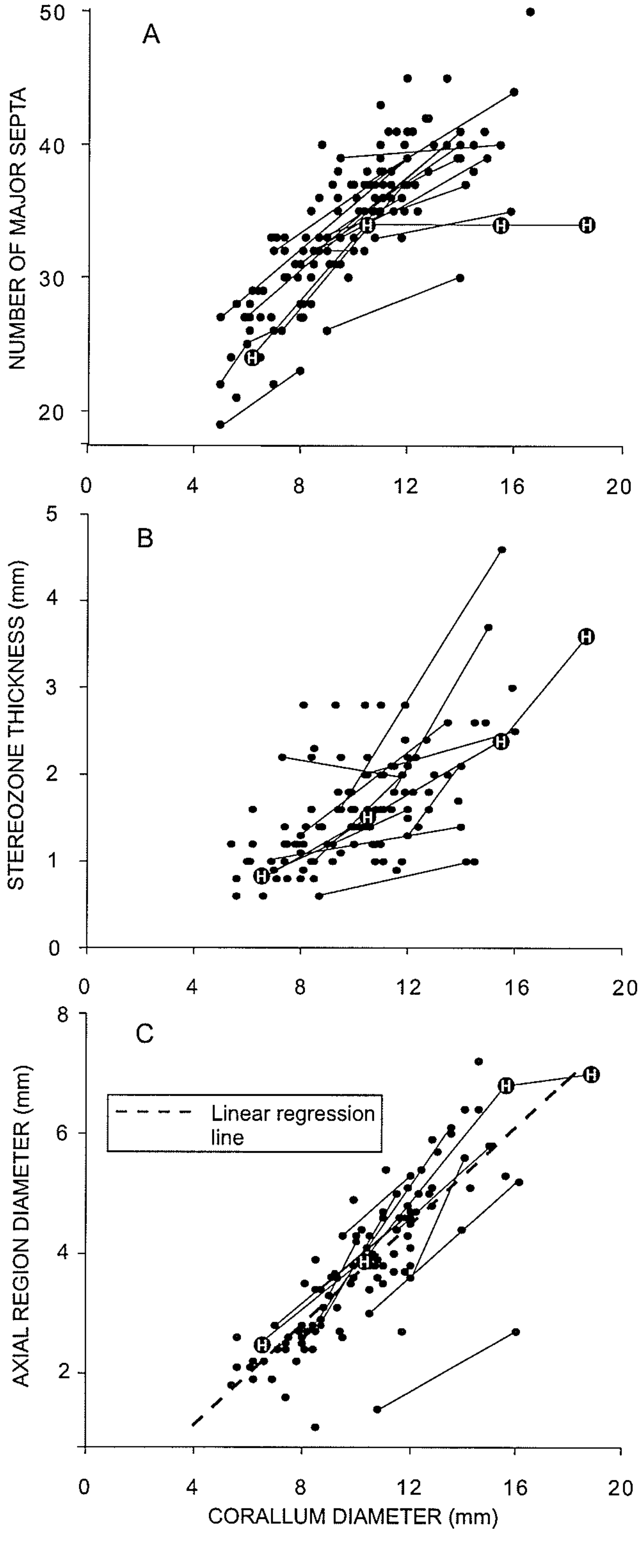
Types. Holotype 83AP17-1-bh-10, paratypes 83AP17-1-bh-38B, 83AP17-1-bh-5;

Laframboise Member, Ellis Bay Formation, locality 6, Anticosti Island.

Diagnosis. Corallum ceratoid to subcylindrical. Axial structure moderately large with prominent lenticular median lamella and few other elements in later stages, calicular boss prominent. Tabulae moderately to steeply inclined abaxially in early stages.

Description of coralla. Coralla solitary, occurring frequently in clusters; no evidence of offsetting or coloniality. Longest fragment 55 mm long, but maximum size probably much greater. Coralla ceratoid to subcylindrical, straight to slightly curved. Cardinal side convex, occasional low angle bends in cardinal-counter plane. Septal grooves and interseptal ridges preserved on exteriors of several specimens. Coarse rugae on many specimens, spacing 4.5 to 6 mm. Some specimens distorted where attached to relatively large clasts (Pl. 12, figs. 12, 24, 26, Pl. 13, fig. 5), or other rugose corals (including same species) (Pl. 12, fig. 23, Pl. 13, fig. 1). Attachment sites on cardinal or alar side. Calice shallow, axial boss formed of prominent median lamella (Pl. 12, fig. 11).

Ontogeny and internal structures. Major septa moderately dilated to nondilated, small axial structure of nondilated to moderately dilated median lamella connecting cardinal and counter septa in early stage (Pl. 12, figs. 7, 19, Pl. 13, fig. 4). Major septa moderately dilated, straight in later stages. Relationship between number of major septa and diameter shown in Text-figure 30A. Axial structure of small to large lenticular median lamella with moderately dilated twisted septal lobes and a few lamellae in intermediate to late



Text-fig. 30. Biometric data for *Bodophyllum* n. sp. from Anticosti Island. A. Corallum diameter vs. number of major septa (140 points, 118 coralla). B. Corallum diameter vs. stereozone thickness (117 points, 103 coralla). C. Corallum diameter vs. axial region diameter (108 points, 96 coralla). Lines connect multiple data points from the same corallum, H = holotype.

stages (Pl. 12, figs. 8-10, 12, 13, 17, 18, 21, 22, 24-26, Pl. 13, figs. 1-3, 5). Septal lobes twisted away from axis, leaving isolated median lamella with few other lamellae. Moderately complex axial structures including lamellae and palli uncommon (Pl. 13, fig. 3). Cardinal and counter septa only distinct by being attached or nearly attached to median lamella (Pl. 12, figs. 7-10, 12, 13, 17-19, 21-26), no fossula developed. Axial region diameter relative to corallum diameter shown in Text-figure 30C. Stereozone narrow to moderately broad in all stages; relationship between corallum diameter and stereozone thickness shown in Text-figure 30B. Minor septa moderately long, extending beyond stereozone in all stages. Tabulae strongly arched upward axially, steeply inclined abaxially and generally incomplete in intermediate stage (Pl. 12, fig. 15), moderately inclined abaxially and complete to incomplete in late stage (Pl. 12, figs. 16, 20). Complementary plates present abaxially (Pl. 12, figs. 15, 16, 20).

Microstructure. In transverse section, septal fibres well developed, oriented obliquely toward axis from septal midline. Outer wall includes thin epitheca (where preserved) of lamellae parallel to outer surface. Stereozone fibrous, formed of dilated abaxial ends of septa. Adjacent major and minor septa separated by well developed suture. Median lamella formed of fibres radiating outward from midline.

Discussion. Bodophyllum n. sp. is distinguishable from other species of *Bodophyllum* due to its long straight cylindrical coralla, prominent median lamella with few other axial features and withdrawn major septa (in late stage). The median lamella is much more prominent than in the type species *Bodophyllum osmundense* Neuman, 1969 from the Late Ordovician (Harjuan) Boda Limestone of Sweden (Neuman, 1969, pp. 56-69, figs. 46A-H, 47A-O, 48), *Bodophyllum shorti* Elias, 1982a from the Gamachian Leemon Formation of Missouri (Elias, 1982a, pl. 13, figs. 10-14), *Bodophyllum neumani* Elias, 1982a from an unnamed formation in the Ashgill of Maine (Elias, 1982a, pl. 14, figs. 1-6) and *Bodophyllum englishheadense* Elias, 1982a from the Vauréal and Ellis Bay formations of Anticosti Island (see discussion of *B. englishheadense*). Additionally, the axial space around the median lamella below the calice is unique within *Bodophyllum*. *Bodophyllum euthum* Neuman, 1969 from the Upper Ordovician Division 5a of Norway possesses a well developed median lamella, but the coralla are smaller, more conical, have nondilated major septa in the late stages and a smaller axial region (Neuman, 1969, pp. 61-64, figs. 52A-F, 53A-H). *Bodophyllum chinense* He, 1985a from the Late Ordovician Guanyinqao Beds of China appears to have a well developed lenticular median lamella (He, 1985a, pl. 3, fig. 11a) with some major septa withdrawn from the axis, but the other illustration of the late stage (He, 1985a, pl. 3, fig. 12b) does not show a similar median lamella and appears to have other elements forming the axial structure (lamellae?). While the axial structures of the late stage of some specimens of *Bodophyllum* n. sp. have elements other than the median lamella, the general morphology of the median lamella (large, lenticular) and its typical isolation show *Bodophyllum* n. sp. to be distinct from *B. chinense*.

The species that most closely resembles *Bodophyllum* n. sp. is *Streptelasma medioseptatum* Neuman, 1986 from Late Ordovician glacial drift boulders of Öland, Sweden. The latter is also ceratoid to subcylindrical and has a similar median lamella and axial region, but its tabulae are generally complete and flatter, major septa are less dilated, and the stereozone is narrower (Neuman, 1986, pp. 352, 353, figs. 2a-q, 3a-i). As only three specimens of *S. medioseptatum* were collected and described (Neuman, 1986), the degree of variability, and hence the relationship to *Bodophyllum* n. sp., cannot be fully assessed.

Occurrence. Laframboise Member (latest Gamachian), Ellis Bay Formation, Anticosti Island, Québec.

Other material. 135 specimens: 83AP11-2-11; 83AP14-1-20, 21, 22b; 83AP16-1-1B-1a; 83AP16-1-bh-4, 5; 83AP17-1-1b-12, 13; 83AP17-1-bh-1, 5, 6a, 10, 12c, 16, 17, 20, 22a, 24c, 27b, 35e, 38b (Petryk Collection); A41-5, 12, 17, 20, 22-24, 30; A86-2; A436-7, 8, 10, 18, 24, 25; A442-1; A738(43) (Copper Collection); PL-EB7-FR-L-1; PL-EB7-FR-U-2, 4, 6-8, 12; PL-EB7-SR-L1-3, 4; PL-EB7-SR-U1-1, 3, 4, 8; PL-EB7-SR-2-6, 7, 9; PL-EB7-SR-3-1, 2, 6, 19, 20, 22, 24; PL-EB7-RC-L2-2, 3-6, 8, 9, 12; PL-EB7-RC-L3-1, 3, 7, 8, 11; PL-EB7-RC-M1-2, 5, 7, 8; PL-EB7-RC-M2-1, 3, 6; PL-EB7-RC-M3-1, 3, 4, 8, 10; PL-EB7-RC-U1-2, 6, 9, 12, 13, 16; PL-EB7-RC-U2-5; PL-EB7-RF-L1-4; PL-EB7-RF-L2-6; PL-EB7-RF-U1-1, 2, 5, 7, 9, 10, 12, 13, 15, 16, 18, 20; PL-EB7-RF-U2-2, 3, 5, 15; PL-EB7-IR-L1-1; PL-EB7-IR-L2-5; PL-EB7-IR-L3-6; PL-EB7-IR-U4-3, 5; PL-B1-L5-3 (Elias Collection); FP-Laf-bh-10-1; FP-Laf-bh?-3, 6-8, 11, 15; FP-Laf-bh-20-1; FP-Laf-bh-1h-6; FP-Laf-bh-5-1; Laf-EB7-bh-2b; Laf-EB7-bh-TM-3c; POR-OPB-21; POR-BH-3;

SR-BH-ts1; SR-BH?-8 (Summer 1994).

Genus *Dinophyllum* Lindström, 1882

1882 *Dinophyllum* Lindström, p. 21.

1900 *Scenophyllum* Simpson, p. 210.

1974 *Dinophyllum*; McLean, p. 39.

1979 *Dinophyllum*; Laub, pp. 63, 64.

Diagnosis. Solitary streptelasmatid with no axial structure, a prominent axial whorl of major septa, and generally incomplete tabulae.

Discussion. As previously recognized, the defining characters of *Dinophyllum* are: lack of an axial structure, counterclockwise whorl of the major septa and axially convex incomplete tabulae. *Dinophyllum hannah* has no axial structure and develops a whorl but its tabulae, apparently incomplete, are axially depressed, in contrast to the previous generic definition. It could be assigned to *Streptelasma* or *Salvadorea*, but its tabulae appear generally incomplete, while those in *Streptelasma* and *Salvadorea* are complete. This may be an artifact of slightly off-centre longitudinal sections in which tabular intersections with major septa appear to be discontinuities in the tabulae. Specimens illustrated by Bolton (1981a, see discussion of *D. hannah*, below) do show some complete tabulae. Since proposing a new genus for this specific permutation of streptelasmatid characters seems unnecessary, *D. hannah* is retained in *Dinophyllum*, thereby expanding the genus to include an additional species with concave, possibly incomplete tabulae (cf. *D. hoskinsoni* [Foerste, 1890]; Laub, 1979). McLean (1974) considered that *Streptelasma* and *Dinophyllum* were closely related and that future work may show that the two genera (and *Porfirieviella*) are synonyms. The species *D. hannah*, while possibly possessing morphological characteristics intermediate between *Dinophyllum* and *Streptelasma*, is not sufficiently informative to allow synonymy of the genera.

Dinophyllum hannah (Twenhofel, 1928)

Plate 13, figs. 6-26

1928 *Zaphrentis hannah* Twenhofel, p. 115, pl. 2, figs. 8, 9.

1981a *Dinophyllum anticostiensis* (Twenhofel, 1928); Bolton, pl. 8, fig. 1.

1981a *Dinophyllum* sp. aff. *D. hannah*; Bolton, pl. 8, fig. 2.

1981a [?]*Dinophyllum hannah*; Bolton, pl. 9, fig. 2.

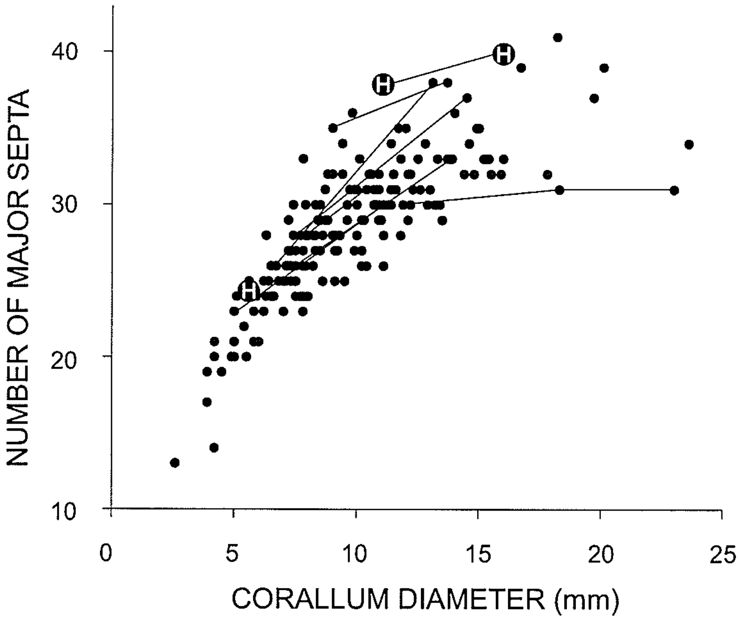
Types. Holotype YPM 10406 (Twenhofel, 1928, pl. 2, fig. 9), paratype YPM 38302 (Twenhofel, 1928, pl. 2, fig. 8); Gun River Formation, Hannah Cliff, Anticosti Island; by original designation.

Diagnosis. Relatively small, trochoid to ceratoid *Dinophyllum* with narrow stereozone, small, straight sided cardinal fossula and axially concave tabulae.

Description of coralla. Coralla trochoid to ceratoid, slightly curved or straight, cardinal side convex if corallum curved. Maximum length of large broken specimens ca. 60 mm, most specimens 35-55 mm. Septal grooves and interseptal ridges present on nonabraded specimens (Pl. 13, fig. 11). Subtle rugae occasionally developed. Calice deep, up to 50 percent of corallum length (Pl. 13, figs. 9, 26). Corallum form variation shown in Table IX.

Ontogeny and internal structures. Major septa moderately (Pl. 13, figs. 10, 22) to greatly (Pl. 13, fig. 6) dilated in early stage, reaching or nearly reaching axis, generally forming counterclockwise axial whorl (but no axial structure). In intermediate stage, major septa less dilated, tapering adaxially, generally reaching axis, usually forming counterclockwise whorl (Pl. 13, figs. 7, 8, 12-16, 18-20, 25). In late stage, major septa withdrawn leaving prominent axial opening (Pl. 13, figs. 17, 23); few nondilated lobes and intersections of tabulae near axis occasionally form small axial structure (Pl. 13, fig. 21). Number of major septa relative to diameter shown in Text-figure 31. Stereozone relatively narrow in all stages. Minor septa generally short, confined to stereozone except in late stages. Subtle cardinal fossula (detectable by sediment infilling of tabular depression) developed in intermediate to late stage (Pl. 13, figs. 8, 14, 16, 19, 21). Tabulae apparently incomplete (see discussion of genus, above), depressed axially, flat or inclined away from the axis peripherally, slightly depressed in cardinal fossula (Pl. 13, figs. 9, 26).

Microstructure. In transverse section, fibres developed in septa, oriented obliquely



Text-fig. 31. Biometric data for *Dinophyllum hannah* from Anticosti Island. Corallum diameter vs. number of major septa (183 points, 175 coralla; H = holotype). Lines connect multiple data points from the same corallum.

toward axis. In vertical section, fibres oriented upward axially, subhorizontal abaxially.

Discussion. Dinophyllum hannah differs from other species of *Dinophyllum* on the basis of its axially concave tabulae (see discussion of *Dinophyllum*). Longitudinal sections of *D. hannah* prepared during this study are slightly off-centre, causing tabulae to appear disjointed due to intersections with major septa (especially in specimens or parts of specimens with highly dilated septa). Examination of the longitudinal sections of *Dinophyllum* sp. aff. *D. hannah* from the Becscie Formation illustrated by Bolton (1981a, pl.8, fig.2) shows some complete tabulae near the calice and incomplete tabulae below, so it is apparent that *D. hannah* does have some complete tabulae. *Zaphrentis hannah* Twenhofel, 1928 closely matches coralla from this study, particularly in possessing an axially concave tabularium (Twenhofel, 1928, p. 115, pl. 2, figs. 8, 9). Twenhofel's specimens included coralla more trochoid than found in this study (calice diameter as great as, or greater than, corallum length). Twenhofel also described *Zaphrentis anticostiensis* from Anticosti Island (Twenhofel, 1928, p. 115, pl. 1, figs. 6-8), which he differentiated from *Z. hannah* due to the latter species having a lower expansion rate (less trochoid) and weaker development of septal grooves and interseptal ridges. As the latter character is frequently affected by the degree of abrasion, it must be used with caution in delineating species. Twenhofel (1928, pp. 114, 115) did not discuss degree of abrasion of his specimens, and an examination of the holotype of *D. hannah* showed that it does not have a well preserved exterior surface.

An examination of the types of both Twenhofel species showed that the transverse section taken from the holotype of *Zaphrentis anticostiensis* (YPM 10387; Pl. 13, fig. 24) is not particularly useful in identifying the species (or even the genus). The section is either from the calice (major septa 50% of radius) or is more likely from a genus other than *Dinophyllum* (e.g., *Streptelasma* or *Amplexoides*), as the major septa are considerably shortened. *Amplexoides* sp. from the uppermost Becscie or lowermost Merrimack Formation on Anticosti Island (Pl. 14, figs. 18, 19) has similarly shortened major septa, but tabular intersections are prominent. The two specimens (YPM 10387 and the single specimen of *Amplexoides* sp.) may be conspecific but more data would be required to confirm this. Additionally, the frequent tabular intersections seen in *D. hannah*, and in other species of *Dinophyllum*, are not seen in the holotype of *Z. anticostiensis*, indicating that tabulae are either flat, absent or widely spaced. McLean (1974, p. 40) considered that *Z. anticostiensis* probably belongs to *Streptelasma*. The longitudinal section from the paratype of *Z. anticostiensis* (YPM 38300) from the Gun River Formation on Anticosti Island shows an axial depression of the tabularium comparable to specimens from this study and cannot be distinguished from *D. hannah*. The holotype of *D. hannah* is comparable to specimens from this study, particularly to those from locality 12, having similar degree of dilation, whorling, and cardinal fossula development (Pl. 13, fig. 12). Biometric data from the holotype of *D. hannah* are plotted with data from this study. Values for the holotype are at the upper end of the range on the plot of diameter vs. number of major septa for the species as a whole (Text-fig. 31). As the holotype of *Z. anticostiensis* (which would have priority over *D. hannah*) is apparently not a *Dinophyllum*, all specimens from this study and previously figured specimens of *Zaphrentis hannah* from Twenhofel, are assigned to *D. hannah*. The paratype and other specimens assigned to Z. *anticostiensis* (other than the holotype and Twenhofel, 1928, pl. 1, fig. 7) are left unassigned, but some may belong to *D. hannah*.

Bolton (1981a) figured specimens which he identified as *Dinophyllum anticostiensis* (Bolton, 1981a, pl. 8, fig. 1) from the Becscie Formation, *D. hannah* (Bolton, 1981a, pl. 9, fig. 2) from the Gun River Formation and *Dinophyllum* aff. *D. hannah* (Bolton, 1981a, pl. 8, fig. 2) from the Becscie Formation of Anticosti Island. An examination of this material revealed that the specimen of *Dinophyllum* aff. *D. hannah* has an identical tabularial structure to specimens from this study (i.e., axially depressed). The specimen of *D. anticostiensis* is not sectioned, but it matches the exterior details of *D. hannah* from the Twenhofel types and from this study. The specimen from the Gun River Formation, which Bolton identified as *D. hannah*, has tabulae that are flat axially. The transverse sections of this specimen show it to be highly abraded, and it cannot be easily compared to *D. hannah*.

Dinophyllum semilunum Laub, 1979 from the mid-Llandovery Brassfield Formation of Ohio is similar in size to *D. hannah* but has steeply convex tabulae and a relatively high degree of septal dilation on the cardinal side (Laub, 1979, pp. 76-79, pl. 1, figs. 8-11, pl. 13, fig. 7, pl. 14, figs. 1-7). Laub (1979) considered that *D. semilunum* and *D. hannah* could be separated on the basis of the septal dilation of the cardinal side, but that the two species may be congeneric. *Dinophyllum stokesi* (Milne-Edwards and Haime, 1851, cited in Twenhofel, 1928, p. 110; Laub, 1979, pp. 69-76, pl. 1, figs. 1-7, pl. 12, figs. 11, 12, pl. 13, figs. 1-3) of the Lower Silurian of eastern North America, including the Jupiter and Chicotte formations of Anticosti Island, is larger and has more major septa than *D. hannah* in addition to having axially convex tabulae.

Occurrence. Lower Becscie Formation (Rhuddanian) to Gun River Formation (Aeronian), Anticosti Island, Québec.

Other material. 263 specimens: 1.9.75-3=2-1, 2; 1.9.75-3=3-1 (Petryk Collection); A96-2; A142-2; A149-2, 4, 5, 8; C677-1 (Copper Collection); BB2-V-1, 3, 4, 11, 15-17, 19, 20, 22, 25-28, 31, 32; PL-B1-L1-2 (Elias Collection); CO-A2-1-20; -TS-1, 2; CO-A1-200-1-15; CA-B-mid-1; CO-BA150-2; FP-B+38-1; FP-B+100-1, 2; FP-B+103-3; FP-B+105-1; FP-B+135-1, 2; FP-B+140-1, 3; FP-B+150-2; FP-B+200-1, 2; JR24-w-1a, 2, 3a; JR24-F-1, 4, 6, 7, 8a, c-f; JR24-V-1, 2; JR24-V+60-1; JR24SE-m-115-1; JR24SE-m-118-1; JR24SE-m-120-1a, b, 2, 3; JR24SE-m-130-1; JR24SEm-145-1; JR24SE-m-160-1, 2-4; JR24SE-m-165-1; JR24SE-m-235-1, 3, 4, 5a-c, 6a; JR24SE-m-300-1a-c, 2; JR24SE-m-345-1, 4; JR24SE-m-350-1; JR24SE-m-365-1, 2; JR24SE-m-390-1a, 3; BB2-l-c350-1; BB2-230-2; LLR-11.5-1, 3; LLR-16.1-1, 3-6, 7a, b, 8-12, 18-20, 21a-c; SR-ENC+20-1; SR-ENC+25-1; SR-ENC+30-1; SR-ENC+60-1; SR-B+45-1, 3, 4, 6; SR-B+60-1, 2; SR-B+75-1, 2-5; SR-B+350-3; SR-B+360-1, 3; SR-B+390-1, 2, 3, 7, 8; SR-B+397-1, 2; SR-B+408-1, 2-4; SR-B+419-1, 2, 3, 9, 11, 12, 13b, 16-18, 21, 23; SR-B+460-6, 7b; SR16+387-1; SR16+430-1; SR+450-1; SR16+520-1c; SR16+1375-1, 3, 5; SR16+1780-1, 3-7, 9, 10, 12, 15, 16; SR16+1920-2, 3; SR16+2090-1c, 2, 3, 6a-d; SR16+2190-1; SR16+2295-2, 3-13; SR16+2300-2, 3, 4; SR16+2500-1, 2, 3, 5, 6, 8a, b, 10-16, 18a-c, 19, 20a, b; SR16+2530-2, 3; SR16+2635-1, 2-4; SR16+2715-1, 2-6, 8 (Summer 1994).

Genus *Rhegmaphyllum* Wedekind, 1927

1927 *Rhegmaphyllum* Wedekind, pp. 14, 74.

1940 *Rhegmatophyllum* Lang, Smith and Thomas, p. 114.

1974 *Rhegmaphyllum*; Weyer, pp. 159-162.

1977 *Rhegmaphyllum*; Neuman, p. 73.

1979 *Rhegmaphyllum*; Laub, pp. 92-95.

Diagnosis. Corallum small, major septa generally dilated and extending to axis early in ontogeny, slightly withdrawn in later stages, little or no axial structure developed. Cardinal septum short in late stage, pseudofossula developed. Major septa formed of subperpendicular fibres and develop septal carinae in most species.

Discussion. In its original sense (Wedekind, 1927), and as redescribed by Weyer (1974), Neuman (1977) and Laub (1979), *Rhegmaphyllum* does not differ in general detail from *Ullernelasma* Neuman, 1975, *Borelasma* Neuman, 1977 and *Helicelasma* Neuman, 1969, as all four genera are characterized by lack of an axial structure and a high degree of dilation in early stages. *Rhegmaphyllum* is distinct on the basis of its cardinal fossula development and microstructure. It generally possesses a well developed tabularium, a feature absent in *Ullernelasma*. *Rhegmaphyllum* also resembles species of *Salvadorea*

Nelson, 1963 in which dilation is great until the late stage, and little or no axial structure is developed. *Salvadorea*, however, has major septa with no carinae. The particular permutation of streptelasmatid features that characterizes the genus *Rhegmaphyllum* is not strongly distinctive, but the carination and septal microstructure (subperpendicular fibres) are.

Rhegmaphyllum n. sp. is assigned to the genus *Rhegmaphyllum* on the basis of its high degree of dilation in early stages and lack of an axial structure, and most importantly on the basis of the distinctive microstructure. Although carinae are rare in specimens of *Rhegmaphyllum* n. sp., their occurrence rules out assignment to the other streptelasmatid genera mentioned above. As with some of the other streptelasmatid genera discussed in this study, some of the generically "diagnostic" features are found in other taxa. The frequency of carination is not known for the Anticosti specimens (only two specimens are shown to have carinae), but all transverse sections were shown to have subperpendicular fibres in the major septa.

Rhegmaphyllum n. sp.

Plate 14, figs. 1-17

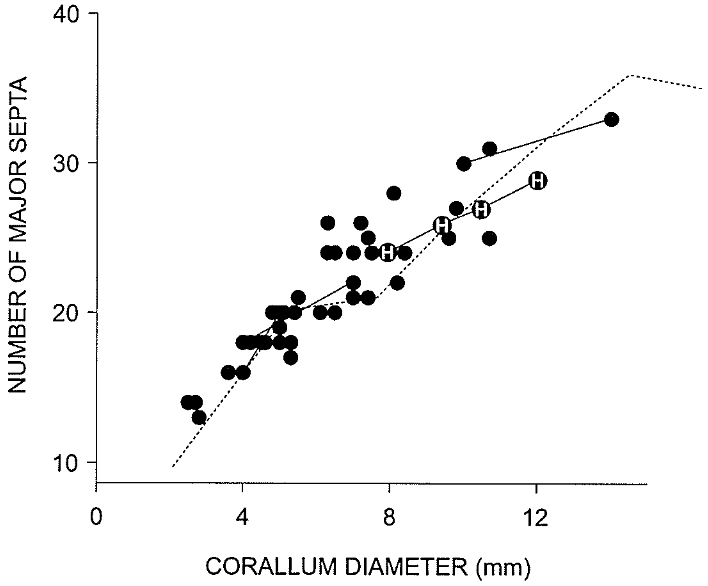
Types. Holotype 83AP17-1-1B-10, basal Fox Point Member, locality 6; paratype SR-B+460-7a, lower Fox Point Member, locality 7; paratype 83AP29-1-34-1a, lower Fox Point Member, locality 8; Becscie Formation, Anticosti Island.

Diagnosis. Small trochoid *Rhegmaphyllum* with carinae rarely developed below calice.

Major septa greatly to completely dilated in early to intermediate stages. Cardinal septum shortened only in late stage. Counter septum elongate and dilated in intermediate to late stages. Axial whorl generally not developed.

Description of coralla. Corallum small, 6-16 mm long for complete specimens (some incomplete and/or mainly covered specimens approximately 20-22 mm long), trochoid (maximum diameter 14.0 mm), straight to slightly curved. Septal grooves and interseptal ridges developed.

Ontogeny and internal structures. Major septa completely dilated in early stage, reaching axis (Pl. 14, figs. 1, 8, 16). In intermediate stage, major septa less dilated, slightly withdrawn from axis except for cardinal and counter septa, both of which are generally more dilated than other septa (Pl. 14, figs. 5, 6, 9, 10, 13) . Septa completely dilated but slightly withdrawn from axis in early to intermediate stage of one specimen (Pl. 14, fig. 2). In late stage, septa generally withdrawn from axis, moderately to greatly dilated (Pl. 14, figs. 3, 7, 17). Parallel-sided cardinal fossula developed in intermediate to late stage of some specimens (Pl. 14, figs. 13, 15, 17), cardinal septum becomes narrow in intermediate stage and short only in latest stage of some specimens (Pl. 14, figs. 7, 17). Cardinal and counter septa attached in some specimens (Pl. 14, figs. 8, 9). Counter septum elongate and occasionally dilated in intermediate to late stages (Pl. 14, figs. 2, 3, 9, 17). Number of major septa relative to diameter shown in Text-figure 32. Minor septa short, wedge shaped, generally confined to stereozone except in latest stage of a few



Text-fig. 32. Biometric data for *Rhegmaphyllum* n. sp. from Anticosti Island and comparative data from Ohio. Corallum diameter vs. number of major septa (43 points, 37 coralla, H = holotype). Solid lines connect multiple data points from the same corallum. Dashed line connects data from large specimen of *Rhegmaphyllum daytonensis* Laub, 1979 from Brassfield Formation of Ohio.

specimens (Pl. 14, fig. 7). Stereozone moderately broad in intermediate and late stages, narrowing through ontogeny; single specimen shows extremely broad stereozone at relatively large diameter, no cardinal fossula (Pl. 14, fig. 3). Tabulae complete, flat or slightly inclined near axis, steeply inclined in cardinal fossula (Pl. 14, figs. 11, 12).

Microstructure. In transverse section, major septa distinctly fibrous, particularly where microstructure is diagenetically enhanced. Fibres subperpendicular to long axis of major septa, oriented slightly toward corallum axis (Pl. 14, fig. 14). Septal stereozone of dilated abaxial ends of major septa, with similar microstructure. Carinae visible in an oblique section from high in calice (Pl. 14, fig. 4) and in a transverse section in the stereozone (Pl. 14, fig. 7).

Discussion. Rhegmaphyllum n. sp. is distinct from other species of the genus on the basis of its small size and its comparatively long cardinal septum in the late stage. The type species, *Rhegmaphyllum conulus* (Lindström, 1868) (Weyer, 1974, pp. 162-165, pls. 1-5, pl. 6, fig. 1) from the Early to Middle Silurian (Llandovery-Wenlock) of Götland, Estonia, and Siberia, is generally larger (maximum size 40 mm long, 23 mm wide for Siberian specimens; 55 mm long for Götland specimens [Laub, 1979]). Laub (1979) considered corallum growth form to be a useful distinguishing factor between *R. daytonensis* (Foerste, 1890) (straight) and *R. conulus* (curved). However, the other distinguishing characters (lack of axial space and lateral deflection of septa adjacent to cardinal fossula in *R. daytonensis*) are considered to be more useful, as growth form may be an ecophenotypic response.

Rhegmaphyllum daytonensis from the mid-Llandovery Brassfield Formation of Ohio and Kentucky is characterized by a trochoid to turbinate external form and a relatively solid axial region formed of dilated axial ends of major septa (Laub, 1979). The axial region is apparently distinct from that of *Rhegmaphyllum* n. sp., in which generally only the counter septum, or a few isolated other major septa, is dilated. *Rhegmaphyllum daytonensis* has a prominent whorl in several specimens (Laub, 1979, pl. 16, figs. 1, 12; whorl frequency data not published). As in *Rhegmaphyllum* n. sp., the counter septum is frequently elongate and/or dilated, projecting into the cardinal fossula. Unlike *Rhegmaphyllum* n. sp., in which the cardinal septum is long until relatively late, the cardinal septum of *R. daytonensis* becomes increasingly short through ontogeny. *Rhegmaphyllum* n. sp. is also distinct on the basis of the greater degree of septal dilation in the intermediate stage of growth. Complete biometric data for *R. daytonensis* were not published, but the largest illustrated specimen has a diameter of ca. 19.5 mm and 40 major septa, both numbers considerably higher than the largest specimen from Anticosti Island. Another specimen of *R. daytonensis* was sectioned serially and the published values for diameter and number of major septa plot within the cluster for *Rhegmaphyllum* n. sp., but extend beyond it (Text-fig. 32); while the species are similar, *R. daytonensis* is larger than the Anticosti specimens. Laub (1979) synonymized a number of previously described species assigned to *Rhegmaphyllum* and other genera (e.g., *Briantelasma*, *Leolasma*) with *R. daytonensis*.

Rhegmaphyllum estonicum Weyer, 1974 of the Silurian (Wenlock) Jaani Horizon of Saaremaa Island, Estonia, has an elongate counter septum in some sections, but the cardinal septum is shortened relative to other septa (Weyer, 1974, pp. 165-167, pl. 6, figs. 2-6, pl. 7). In this respect it is similar to *R. conulus*, but different from *Rhegmaphyllum* n. sp.

Rhegmaphyllum sp. of Buttler and Elias (1988, pl. 3.8, figs. 12-15) is represented by six specimens from the latest Ordovician (Gamachian) to lowermost Silurian (Llandovery) "poorly fossiliferous interval" and *Eostropheodonta* Zone of the Beaverfoot Formation of British Columbia. The illustrated specimens show that the cardinal septum is relatively long until all septa are withdrawn, but, unlike *Rhegmaphyllum* n. sp., a moderate axial whorl is developed. Additionally, the degree of dilation in the smallest illustrated section (Buttler et al., 1988, pl. 3.8, fig. 12) is generally greater than for sections of a comparable size from *Rhegmaphyllum* n. sp. Microstructure was not described. These specimens may be conspecific with *Rhegmaphyllum* n. sp., but more data would be required to make such a determination.

Rhegmaphyllum sp. of McAuley and Elias (1990, p. 49, pl. 12, figs. 7-11, pl. 13, figs. 1-9) is known from only a few specimens from the latest Ordovician (Gamachian) Cason oölite of north-central Arkansas, and Early Silurian (late Early Llandovery) Bowling Green Dolomite of northeastern Missouri, Elwood Formation of northeastern Illinois and Mosalem Formation of northwestern Illinois. These specimens show a cardinal septum that becomes shortened at the base of the calice, similar to that in *Rhegmaphyllum* n. sp. The stereozone developed in the American specimens is generally narrower (although abrasion may have removed some of the stereozone from the illustrated specimens). The lengthened counter septum is characteristic of *Rhegmaphyllum* n. sp. as well as *R. daytonensis* (Foerste, 1890; Laub, 1979) and *R. estonicum* Weyer (1974). As few specimens were found, it is difficult to determine the similarity to the dilated counter septum found in *Rhegmaphyllum* n. sp. The development of attachment structures in specimens of *Rhegmaphyllum* sp. from the Cason oölite (McAuley and Elias, 1990, p. 49, pl. 12, figs. 7, 11) is apparently unique for the genus and may indicate that it is distinct from *Rhegmaphyllum* n. sp. More data are necessary to determine the taxonomic affiliation of these specimens.

Bolton (1981, pl. 10, fig. 5) figured *Rhegmaphyllum* sp. from the Jupiter Formation on Anticosti Island. The size and corallum shape are comparable to *Rhegmaphyllum* n. sp., but specific comparison is impossible as this specimen was not sectioned.

Specimens of *Rhegmaphyllum* n. sp. are similar to *Eurogrewingkia pulchella* in the fully dilated early stage of growth where the latter species has not developed an axial structure. These species co-occur in the lowermost Becscie Formation and can sometimes be distinguished only on the basis of the distinctive microstructure of subperpendicular fibres in *Rhegmaphyllum* and obliquely oriented fibres in *E. pulchella.*

The apparent rarity of carinae in *Rhegmaphyllum* n. sp. is possibly a preservational feature as the calices are usually missing and/or silicified. The lack of an axial whorl and the relative lengths and degree of dilation of the cardinal and counter septa are apparently useful characters in distinguishing between species, but even these characters vary in *Rhegmaphyllum* n. sp. and other species.

Occurrence. Lowermost Fox Point Member to middle Chabot Member, Becscie Formation (Rhuddanian), Anticosti Island, Québec.

Other material. 91 Specimens: 83AP16-1-1B-1c; 83AP24-2-35-1; 1.9.75-3=3-2 (Petryk Collection); A142-1; A149-1, 3, 7 (Copper collection); PL-B1-L3-3; PL-B1-L5-5 (Elias Collection); CA-B+250-1; FP-B+5-1, 2-4; FP-B+10-3; FP-B+140-4; LAF-B+235-9, 10; LLR-5.9-1, 3, 4a-c, 5, 6; SR-B+45-2, 7, 8; SR-B+75-3, 4; SR-B+350-1, 2, 4; SR-B+380-1; SR-B+390-5, 6; SR-B+419-4, 5-8, 14, 15, 19, 20; SR-B+460-2, 3, 4, 8; SR-B+495-1a, b; SR16+115-1; SR16+145-2, 4; SR16+165-2, 4, 5, 6a, b; SR16+198-1, 2; SR16+250-1, 2-8; SR16+370-2; SR16+420-1, 2, 3; SR16+430-2; SR16+450-2, 3, 5, 7, 8a, b, 9a, b; SR16+520-1b, d, 2a, b, 3, 5a, b, 6a; SR16+1375-4 (Summer 1994).

Family MUCOPHYLLIDAE Hill, 1940

Genus *Amplexoides* Wang, 1947

Amplexoides sp. Bolton, 1981a

Plate 14, figs. 18, 19

1981a *Amplexoides* sp. Bolton, pl. 8, figs. 9, 10.

Description. Corallum solitary, trochoid, slightly curved, alar side convex, >60 mm long (measured after sectioning, calice rim broken). Septal grooves and interseptal ridges, and rugae, present.

Major septa nondilated, not reaching axis in lower transverse section (ca. 20 mm diameter, ca. 33 major septa [small area of wall and major septa missing]; Pl. 14, fig. 18), shorter in higher transverse section (ca. 45 mm diameter, 37 major septa; Pl. 14, fig. 19) leaving open axial region in both stages. Major septa truncated against tranverse tabular intersections, apparently amplexoid. Minor septa very short to absent. Apparent tabular distortion around short cardinal septum in earlier stage, cardinal septum less distinct in later stage. Stereozone narrow in all stages. In longitudinal section, tabulae complete, flat, slightly convex upward abaxially.

Discussion. The single moderately preserved specimen is insufficient for species assignment, especially in a specimen (and a genus) with generally simple features (low degree of dilation, flat tabulae, lack of axial structure and dissepiments). No other species of *Amplexoides* have been reported from Anticosti Island. *Amplexoides severnensis* (Parks, 1915) from the Rhuddanian-Aeronian Fisher Branch Formation and the Telychian Cedar Lake Formation of southern Manitoba differs from *Amplexoides* sp. of Anticosti in being much smaller (maximum diameter 6-8 mm) and in possessing a subcylindrical corallum and shorter major septa in all stages (Stearn, 1956, p. 79, pl. 7, fig. 6). Specimens of *Amplexoides* from the Lower Silurian (mid to late Llandovery) Shiniulan Formation of China (He, 1985b) including *A. tryplasmoides* He, 1985b (see He, 1985b, pl. 1, figs. 2a-c), *A. pilophylloides* He, 1985b (see He, 1985b, pl. 1, figs. 3a, b), *A.*

irregularis He, 1978 (see He, 1985b, pl. 1, figs. 4a, b), *A. sinanensis* He, 1985b (see He, 1985b, pl. 1, figs. 5a, b), *A. liangshuijingensis* He, 1985b (see He, 1985b, pl. 1, figs. 7a, b, 8a, b) and *A. intermedius* He, 1985b (see He, 1985b, pl. 1, figs. 9a, b, 10) all appear to have ceratoid to cylindrical coralla and shorter major septa and the illustrated cross sections are all smaller than *Amplexoides* sp. from the Becscie Formation. *Amplexoides gephyra* McLean, 1985 from the late early to early middle Llandoverian Bridge Creek Limestone Member of southeastern Australia has a comparable maximum diameter (to *Amplexoides* sp.) but is more ceratoid and has more major septa ("80-90" total septa) which are generally shorter in all stages (McLean, 1985, figs. 4a-j). Additionally, the cardinal fossula in *Amplexoides* sp. is more pronounced. *Amplexoides poulseni* McLean, 1977 from the Late Llandovery Offley Island and Cape Schuchert formations of western Greenland is smaller and has more highly dilated septa and a broader stereozone in late stages (McLean, 1977, pl. 8, figs. 13-16, pl. 9, figs. 4, 5, 7-14).

Occurrence. Uppermost Becscie or lowermost Merrimack Formation (Rhuddanian) (GSC loc. 66762), Anticosti Island, Québec.

Material. One specimen, GSC 66864.

Order STAURIIDA Verrill, 1865

Suborder STAURIINA Verrill, 1865

Family STAURIIDAE Milne-Edwards and Haime, 1850

Genus *Palaeophyllum* Billings, 1858

1858 *Palaeophyllum* Billings, p. 168.

1950 *Palaeophyllum*; Bassler, p. 274.

1950 *Palaeophyllum*; Wang, p. 213.

1961 *Palaeophyllum*; Strusz, p. 340.

1961 *Paleophyllum*; Flower, pp. 88, 89.

1972 *Palaeophyllum*; Webby, pp. 151, 152.

1981 *Palaeophyllum*; Hill, pp. 138-140.

Diagnosis. "Corallum phacelocerioid or phaceloid, commonly with marginal (lateral) increase; corallites with narrow peripheral stereozone formed by thickening of peripheral ends of septa; short minor septa alternate with long and somewhat wavy major septa that thin rapidly just inside stereozone, then attenuate more slowly as they approach axis, which they reach, or almost reach, their axial edges being without palliform lobes; tabulae complete, commonly with axial depression and slightly downturned edges; dissepiments absent; cardinal fossula not distinct" (from Hill, 1981, pp. 138-140). Increase nonparricidal or parricidal.

Discussion. Palaeophyllum Billings, 1858, *Cyathophylloides* Dybowski, 1873, and *Favistina* Flower, 1961 are generally differentiable from the rest of the Stauriidae on the basis of simple nondilated septal structures, lateral budding, lack of well defined axial structures, lack of distinctiveness of the cardinal-counter axis, and lack of dissepiments. These three genera are probably the most primitive stauriids as they are among the oldest (all originated in the Ordovician) and morphologically the simplest.

Previous authors have alluded to the strong affinity between *Cyathophylloides* and *Favistina*, and also between those two genera and *Palaeophyllum* (Flower, 1961; Flower and Duncan, 1975; Bolton, 1979; Webby, 1988). *Cyathophylloides* and *Favistina* are both cerioid (generally) and are separated primarily on the basis that the major septa in *Cyathophylloides* reach the axis (as do major septa in most species of *Palaeophyllum*) while they are somewhat withdrawn in *Favistina* (Flower, 1961; Webby, 1988). Bolton (1979) further refined this definition by including in *Favistina* those species with septa that may reach the axis but do not fuse or twist. Bolton also distinguished the two genera on the basis of tabular morphology: *Favistina* has tabulae with slightly downturned edges and only minimal arching or development of a median depression, while *Cyathophylloides* has well developed arching. Browne (1965) and Hall (1975) considered that sufficient intermediates exist to warrant inclusion of *Favistina* in *Cyathophylloides* and even Bolton (1979, p. 4) referred to the "*Favistina*-*Cyathophylloides* lineage." The range of variation in major septum length exhibited by *Favistina* tends to suggest that *Cyathophylloides* is an "end member" of that range. Webby (1988) examined previously described "intermediate" forms (*Cyathophylloides* *kiaeri* Spjeldnaes, 1964; *C. wellsi* Browne, 1965) but considered that they belong to *Favistina* on the basis of lack of uniformly long major septa and lack of an axial structure. Additionally, while previous authors (e.g., Bolton, 1979; Webby, 1988) have cited a "lack of intermediates" between the two genera, they did not consider that there are "intermediate forms" within the genus *Favistina* itself (Hall, 1975). The differences in tabular morphology (i.e., flat in *Favistina* vs. arched in *Cyathophylloides*; Bolton, 1979) appear to be part of a gradational spectrum, as Flower (1961) noted considerable variation in the tabulae of *Favistina*. Flower (1961) and Bolton (1979) also cited the lower number of septa in *Favistina* (usually 10-12) as a point of differentiation, but *Cyathophylloides burksae* Flower, 1961 was described as having 10-12 major septa. As septal morphology and number, and differences in tabular morphology appear to be matters of degree, not kind, there is insufficient basis for separation of the two genera and *Favistina* is herein considered to be part of *Cyathophylloides*.

Palaeophyllum has been considered distinct from *Cyathophylloides* (and *Favistina*) in having a phaceloid-cateniform growth form. Growth form is variable in many species of *Palaeophyllum*, from dendroid to at least locally subcerioid (e.g., *P. vaurealensis*, *P. lyterion* [Bolton, 1979; this study]). Flower (1961) described several species of *Cyathophylloides* (and *Favistina*), including three (*F. calicina*, *F. paleophylloides* and *C. burksae*) with cerioid bases but peripheral regions of rounded corallites in a phaceloid arrangement. Flower described *F. paleophylloides* as "on the one hand a *Paleophyllum* (sic) with early cerioid stages, and on the other a *Favistina* with a late phaceloid stage" (Flower, 1961, p. 35), and noted that it would be possibly the oldest example of either genus. *Palaeophyllum vaurealense* (Twenhofel, 1928; Bolton, 1979; this study) has a wide range of variability of form, from loosely phaceloid to cateniform and tollinaform to subcerioid. *Palaeophyllum lyterion* Bolton, 1979 is dominantly cerioid but can be almost completely phaceloid, and this variation can occur at different levels within a colony or even laterally in a single section within a colony (this study). It appears that the range of colony forms within *Palaeophyllum* (particularly *P. lyterion*) overlaps with some species of *Cyathophylloides* (see Discussion of *P. lyterion*).

Flower (1961) described a progressive modification of the wall structure of corallites from a simple form in *Foerstephyllum* Bassler, 1941, with fibres all aligned radially and the septal spines consisting of locally lengthened fibres, to an intermediate form in *Favistina-Cyathophylloides*, where actual septa are formed of parallel series of fibres that curve inwards from the wall in a continuous line, to *Palaeophyllum*, where there is a progression towards septa formed of fibres in parallel series similar to *Favistina-Cyathophylloides*, but with a distinct separation between the peripheral fibres of the septa and adjacent fibres of the wall which are discordant (Flower, 1961, pp. 34-36, fig. 5). Flower (1961) noted that this feature is variable in the three species of *Palaeophyllum* that he observed from the Second Value Formation of Texas and New Mexico (*P. gracile*, *P. margaretae*, *P. cateniforme*). In the smallest species (*P. gracile*), the fibres of the septa appear to run into the wall in a continuous series (as in *Favistina-Cyathophylloides*) while in the larger species (*P. margaretae* and *P. cateniforme*), septa have defined terminations within the wall and are, therefore, primary, with the wall being formed of extensions of septal ends. This feature (septa "primary" with discordant fibres), while significant, may not be usable as a distinction between *Palaeophyllum* and *Favistina-Cyathophylloides* as it is not developed in all species of *Palaeophyllum* (e.g., *P. gracile* Flower, 1961). Additionally, data on the nature of fine microstructure are lacking from most reported species of *Palaeophyllum* and *Cyathophylloides*. The microstructure is visible in the species of *Palaeophyllum* from the western Ellis Bay Formation reefs (this study), which has larger corallites and thicker walls than the other three species from Anticosti. The septa are apparently "primary" although, as with smaller species examined by Flower (1961), the smaller species from this study do not display the microstructure well. It is possible that diagenesis erased this feature in smaller species. Until this feature is more fully analysed in other species of *Palaeophyllum* and *Cyathophylloides*, the two genera should be considered distinct.

Palaeophyllum lyterion (Bolton, 1979)

Plates 15-17, Plate 18, figs. 1-4

1972 *Cyathophylloides* sp. Bolton, pl. 3, figs. 2, 10.

1979 *Cyathophylloides lyterion* Bolton, p. 4, pl. 1.4, figs. 1, 4, 6, 7.

1979 *Palaeophyllum clion* Bolton, pp. 7, 8, pl. 1.4, figs. 2, 3, 5.

Types. Holotype GSC 61625 (Bolton, 1979, pl. 1.4, figs. 1, 4), Prinsta Member, Ellis Bay Formation, Vauréal River; paratype GSC 61626 (Bolton, 1979, pl. 1.4, fig. 6), Laframboise Member, Ellis Bay Formation, Vauréal River; paratypes GSC 61627 (Bolton, 1979, pl. 1.4, fig. 7), GSC 61628, GSC 61629, Laframboise Member, Ellis Bay

Formation, Salmon River 8 Mile Pool; paratype GSC 61630, Laframboise Member, Ellis Bay Formation, Salmon River; Anticosti Island; by original designation. Paratype GSC 29588, Mill Bay Member (?), Vauréal Formation, main highway, Anticosti Island, is actually *Palaeophyllum vaurealense*.

Diagnosis. Palaeophyllum with phaceloid to cerioid corallite arrangement, varying within and among coralla. Major septa thin, nondilated, minor septa long. Corallum mean corallite diameter 3.3-5.3 mm, corallum mean number of major septa 15-18. Internal parameters (number of neighbours, major septum length, minor septum length) highly variable. Tabulae vary from nearly flat to strongly arched with median depression. Increase lateral or peripheral, nonparricidal.

Corallum description. Colony form irregular to moderately high domical, with coralla reaching 275 x 205 x 165 (height) mm. Corallites in phaceloid (loose) to cerioid (polygonal, closely packed) arrangement; generally loosest at corallum base and periphery, closest packed in core. Some coralla laterally notched (Pl. 16, fig. 9). Increase lateral (Pl. 15, figs. 5, 8) or peripheral, nonparricidal.

Corallite description. Corallites cylindrical to subcylindrical in lowest, reptant, portions of coralla (Pl. 17, fig. 5), and where loosely packed (Pl. 15, fig. 6, 7, Pl. 16, figs. 6, 7, Pl. 18, figs. 1, 2), subpolygonal to polygonal in cross section in cerioid portions of coralla (Pl. 15, figs. 2, 3, Pl. 16, figs. 1-4, 8, Pl. 17, figs. 1-4, Pl. 18, figs. 1, 3). Corallites relatively straight in longitudinal section (Pl. 15, figs. 1, 5, Pl. 16, figs. 5, 9, Pl. 17, fig. 5, Pl. 18, fig. 4). Mean corallite diameters 4.1-5.3 mm; overall mean diameter 4.3 mm (see Table XII for biometric data).

Epitheca very thin, abraded in most specimens; faint growth lines visible on some corallites. Corallum mean wall thickness 0.1-0.2 mm (3.7-8.7% of corallite radius; Table XII). Major septa 1.6-2.3 mm long (mean values; Table XII), 88 percent of corallite radius, although some septa reach axis. Very small axial structure (weakly dilated lobes; Pl. 15, fig. 3) or axial dilation of major septa rare; some major septa join adaxially in groups of two or more (Pl. 15, fig. 7, Pl. 18, figs. 2, 3). Corallum mean number of major septa 14.5-20.5 (Table XII, Text-fig. 33A), up to 23 in individual corallites.

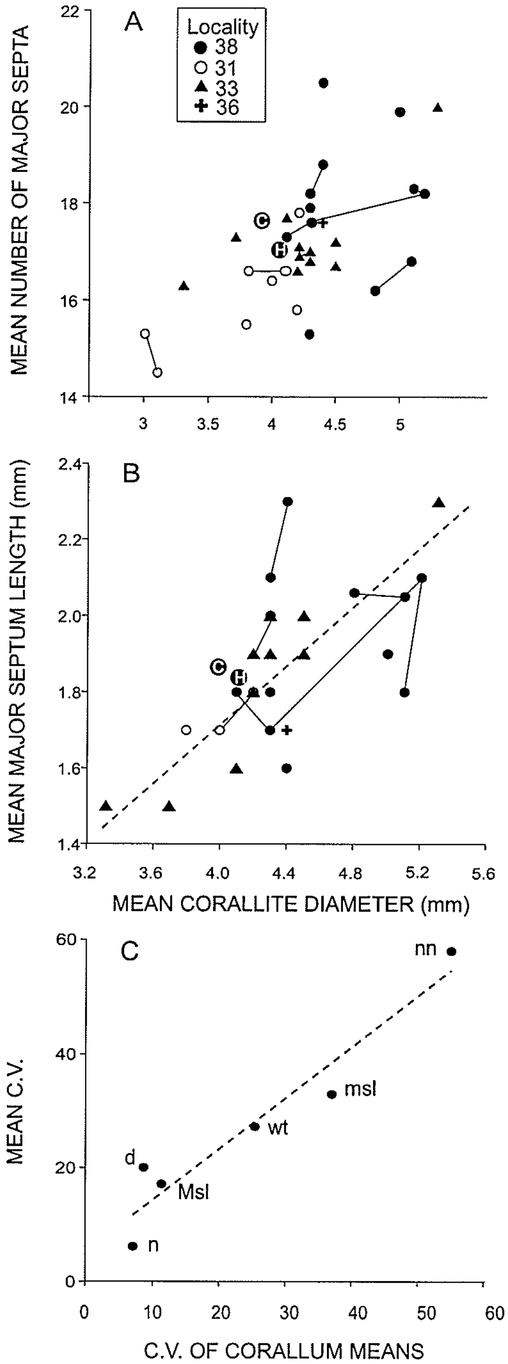
Plot of corallite diameter vs. major septum length shows a linear pattern with a strong positive correlation between the variables ($r^2 = 0.75$) (Text-fig. 33B). Minor septa always present; nondilated, 0.16-0.66 mm long (Table XII), 7-25 percent of major septum length (most around 20%).

Tabulae complete, nondilated; nearly flat, arched slightly upward, arched strongly upward with median depression, or arched slightly downward with median depression (Pl. 15, figs. 1, 5, Pl. 18, fig. 4). Tabulae most frequently arched slightly upward with median depression. Corallum mean number of tabulae in 5 mm 3.7-8.1, overall mean 6.0 (Table XII).

Astogeny. Corallites initially radiate horizontally in reptant pattern, loosely packed and rounded (Pl. 17, fig. 5). Single large corallites with unusually large number of neighbours

Table XII. Corallum mean biometric data for *Palaeophyllum lyterion*. n = number of major septa, d = corallite diameter, nn = number of neighbours, wt = wall thickness, Msl/msl = major/minor septum length, tab/5 mm = tabulae/5 mm, c.v. = coefficient of variation (all measurements in mm). Mean values for 20 corallites/transverse section except for tab/5mm (number of measurements in parentheses). Section numbers with identical prefixes are from the same corallum. Overall mean and c.v. for all sections.

Section	Mean n	c.v. n	Mean d	c.v. d	Mean nn	c.v. nn	Mean wt	c.v. wt	mean Msl	c.v Msl	mean msl	c.v. msl	tab/5mm
src1	19.9	5	5	20	0.7	133	0.17	15	1.9	12	0.39	13	-
src2-1	17.3	8	4.1	27	3.6	34	0.12	23	1.8	25	0.4	22	4.9 (8)
src2-2	17.6	7	4.3	19	2.2	71.2	0.12	27	1.7	22	0.44	19	-
src2-3	18.2	5.2	5.2	13.2	2.5	44	0.11	24	2.1	16	0.38	25	-
src2-4	18.3	5.3	5.1	10.9	6	28	0.12	35	1.8	17	0.33	35	-
src3	-	-	-	-	-	-	-	-	-	-	-	-	5.1 (11)
src4	20.5	5.8	4.4	25	3	44	0.1	40	1.6	29	0.36	45	5 (2)
src5-1	18.8	5.2	4.4	23	5	29	0.12	39	2.3	16.5	0.47	30	-
src5-2	18.2	7	4.3	26	2.3	63	0.15	30	2.1	14.1	0.66	36	6.5 (6)
src7	-	-	-	-	-	-	-	-	-	-	-	-	5 (2)
src8-1	16.8	6	5.1	19	1.7	82.3	0.19	26	2.05	15.6	0.19	49	-
src8-2	16.2	6.9	4.8	18	1.8	66.8	0.2	2	2.06	8.5	0.16	53	6.2 (12)
src9	15.3	7.7	4.3	26	6.5	27.6	0.16	26.1	2	23.5	0.62	30.3	-
src10	17.9	5.4	4.3	17.9	3.6	46.3	0.18	29.5	1.8	18.6	0.6	18.3	6.2 (5)
rpjc-1	-	-	-	-	-	-	-	-	-	-	-	-	7.2 (12)
rpjc-2	16.4	8.7	4	23.7	6.1	19.1	0.13	19.3	1.7	26	0.6	22.4	8.1 (8)
rpjc-3-1	14.5	9.9	3.1	29.4	5.8	26.6	-	-	-	-	-	-	-
rpjc-3-2	15.3	17.6	3	36.2	5.6	28.3	-	-	-	-	-	-	-
rpjc-5	15.8	7.4	4.2	23.6	6.7	19.4	0.08	20	1.8	26.1	0.5	43.3	-
rpjc-7	17.8	8.7	4.2	20.2	4.3	45.7	0.15	38.8	1.8	21.7	0.4	45.5	-
rpjc-8lg	16.6	7.7	3.8	18.8	4.7	52.8	0.17	28.4	1.7	21.8	0.5	25.6	7 (1)
rpjc-8sm	16.6	7.8	4.1	24.1	5.4	56.7	0.13	28.4	1.8	23.5	0.4	29.1	-
rpjc-9	15.5	5.7	3.8	15.7	5.8	31.3	0.07	17.6	1.7	15.4	0.5	38.9	6.5 (2)
porc-1	17.1	8.4	4.2	24.1	5.8	24.5	0.12	31.4	1.9	25	0.5	31.1	-
porc-2	16.8	8.2	4.3	23.6	3.9	43	0.2	35.8	1.9	25	0.5	30	-
porc-4sm	17	4.7	4.3	18.2	5.1	35.8	0.15	32.4	2	17.1	0.6	25.2	-
porc-4lg	16.9	7.7	4.2	24	5.5	30.4	0.1	24.8	1.9	26	0.5	35.3	-
porc-5	17.2	5.9	4.5	17.1	5.1	29.3	0.13	29.7	1.9	19.2	0.5	26.5	7.5 (2)
porc-6	16.7	10.1	4.5	22	6.9	24.8	0.1	48.3	2	24.3	0.4	52.8	6 (4)
porc-10	17.3	10.6	3.7	26	5.7	20.6	0.1	42	1.5	26.6	0.4	29.5	-
porc-13	20	15.5	5.3	20	6.5	22.2	0.1	31.1	2.3	19.5	0.5	26.7	5 (1)
porc-14	-	-	-	-	-	-	-	-	-	-	-	-	5.9 (14)
porc-17	17.7	10.2	4.1	27.6	5.1	27.6	0.08	29.5	1.6	20.9	0.4	29.7	5.4 (10)
A737-1	16.3	12.4	3.3	29.7	6.2	36.1	0.1	45.5	1.5	32.5	0.4	37.5	-
A737-2	16.6	10.5	4.2	26.3	5.7	30	0.1	23.7	1.8	30.6	0.5	29.7	-
A892-1	17.6	7.3	4.4	20	5.5	43	0.19	39	1.7	13.6	0.28	32	3.7 (7)
mean (overall)	**17.2**	**8.1**	**4.3**	**22.4**	**4.7**	**41.1**	**0.13**	**29.5**	**1.9**	**17.2**	**0.37**	**33**	**6.0 (107)**
c.v. (overall)	**7.9**	-	**12.7**	-	**35.5**	-	**28.5**	-	**11.3**	**34.6**	**37**	**38.8**	-



Text-fig. 33. Biometric data for *Palaeophyllum lyterion* from Anticosti Island. A. Corallum mean corallite diameter vs. number of major septa (32 points, 24 coralla). B. Corallum mean corallite diameter vs. major septum length (26 points, 19 coralla; dashed line is linear regression line). C. Coefficient of variation (c.v.) of means vs. mean c.v. (each point represents one measured variable, dashed line is linear regression line). H = holotype of *P. lyterion*, C = holotype of *P. clion*. Lines in A and B connect data points from the same corallum (i.e., multiple sections). For abbreviations in C, see Table XII. N.B., corallite diameter axes in A and B are different because ranges of values are different.

(nn) occur near corallum base (Pl. 16, figs. 1-4, Pl. 17, figs. 1, 2). Two specimens with moderately well preserved bases show localized thickening of corallite walls (Pl. 16, figs. 3, 4). In one specimen, section near base of corallum (Pl. 16, figs. 3, 4) shows thickening localized near centre of corallum, as plane of section intersects apparently curved growth surface band. Second section, approximately 10 mm below first, shows lack of dilation in centre of corallum, indicating that thickening is localized vertically as well as laterally (Pl. 16, figs. 1, 2). Sections through lower part of another corallum, 15 mm (Pl. 17, fig. 1) and 25 mm (Pl. 17, fig. 2) above base, show similar pattern of thickening in central portion of section and high nn values locally (indicating localized high rate of increase), but thin walls in parallel section, 10 mm apart. Third section, 55 mm above base of corallum, shows more consistent corallite morphology with less localized variability in nn and wall thickness (Pl. 17, fig. 3). Pattern indicated by two specimens with relatively well preserved bases (as well as by better preserved complete coralla) is one of initial increase concentrated in central portion of corallum and outward growth, followed by upward growth. Higher in corallum, corallites grew outward and generally vertically. Vertical section through base of one corallum appears to show protocorallite (corallite at bottom left of Pl. 15, fig. 8) that grew obliquely upward and reproduced laterally, nonparricidally; subsequent corallite growth radiated upwards.

Microstructure. Skeletal elements generally nondilated, moderately recrystallized, therefore microstructure difficult to distinguish. Isolated fibres oriented perpendicular to outer wall visible in transverse sections in plane polarized light. Fibres faintly distinguishable in abaxial portion of septa, radiating out from base of each septum. Wall structure generally homogenized, although dark line visible in midwall where adjacent corallites in contact.

Variability. Intraspecific variability involves corallite size, number of major septa, and particularly corallite arrangement and number of neighbours. As all specimens were obtained from bioherms of the uppermost Ellis Bay Formation of east-central Anticosti Island, there is no temporal range that could be correlated with variability, but the species does demonstrate spatial variability. Both internal corallite parameters and corallum (or intercorallite) parameters are variable (see Table XII).

Plots of corallum mean values were used to assess intraspecific variability. A plot of corallum means of corallite diameter vs. number of major septa per corallite (Text-fig. 33A) shows scattered values with relatively weak correlation ($r^2 = 0.39$). Different localities yield distinct fields of data.

The number of neighbours (nn) is highly variable, both within and between coralla (mean coefficient of variation = 41.1; Table XII). Variability appears to be a function of position within the corallum (basal and terminal corallites being more loosely packed) and of local environmental events that caused partial mortality of the colony's surface (possibly storm deposition). A section through corallum A892-1a (Pl. 18, fig. 1) shows that the internal portion of the corallum at this level is completely cerioid, with a subtle gradation towards the edges of the corallum where corallites become subpolygonal to subrounded and partially free. Some sections of coralla are dominantly cerioid (e.g., Pl.

16, figs. 1-4) and some are dominantly phaceloid (e.g., Pl. 15, figs. 6, 7), but most are variable.

The regression line of coefficient of variation of means vs. mean coefficient of variation for all biometric variables (Text-fig. 33C) shows a slope slightly below 1 (0.89), suggesting a comparable degree of variability between and within coralla. For further discussion, see 3.5.2.7 (Intraspecific Variability; *Palaeophyllum lyterion*).

Discussion. There is some difficulty in comparing *Palaeophyllum lyterion* to other species of *Palaeophyllum*, and to *Favistina* and *Cyathophylloides*, due to the lack of discussion of quantitative methods and intraspecific variability in previous publications. The packing (corallite arrangement) and its variability are the most important features characterizing this species. Among species of *Palaeophyllum*, none has comparable cerioid arrangement over large areas of the corallum and this has been one of the features by which the genus has been distinguished from *Cyathophylloides* and *Favistina*. A similar observation can be made about species of *Cyathophylloides*: none has comparable phaceloid arrangement over large areas of the corallum. Nevertheless, *P. lyterion* is placed in *Palaeophyllum* due to: variability in colony form, occurrence of phaceloid corallite arrangement in every specimen (not all specimens develop cerioid growth form) and, as *Cyathophylloides* and *Palaeophyllum* (and *Favistina*) should probably be synonymized (see discussion of *Palaeophyllum*), *Palaeophyllum* has priority. Specimen A14 of *P. vaurealense* (this study), and specimens of *P. vaurealense* figured by Bolton (1979, pl. 1.3, fig. 1) all have tollinaform to subcerioid arrangement locally, but other specimens of *P. vaurealense* show only localized cerioid arrangement at the core of a colony, or where several chains join.

Palaeophyllum clion Bolton, 1979, which was reported by Bolton (1979) from the same localities and same stratigraphic position as *P. lyterion*, is here considered to be a junior synonym of *P. lyterion*. The published size range of *P. clion* (corallite diameters "between 5.2 and 6.5 mm"; Bolton, 1979, p. 7) and number of major septa (18-19) overlap the observed range for *P. lyterion* (this study). The corallites of *P. clion* were described by Bolton (1979, p. 4) as "close together, round to subpolygonal when compressed," a description which would be suitable for *P. lyterion* as a whole. The length of the major septa (and resulting "axial structure") was described by Bolton (1979, p. 4) for *P. lyterion* as "...major septa either almost reach the centre, frequently their tips joining in groups of two or three, or actually reach the centre of a corallite where the tips meet and twist slightly," and for *P. clion* as "...major septa extend to near centre of a corallite, tips either uniting in groups of two or three or individually twisting slightly." The published descriptions and an examination (during the present study) of the illustrated specimens of *P. lyterion* (Bolton, 1979, pl. 1.4, figs. 1, 4, 6, 7) indicate that *P. lyterion* and *P. clion* are conspecific and belong to *Palaeophyllum* (see above and discussion of genus). An examination of the holotype of *P. lyterion* shows that some major septa reach the axis but no axial structure is formed. Additionally, some corallites in the holotype of *P. lyterion* (Pl. 15, fig. 2) are subrounded. The axial structure typical of *Cyathophylloides*, as described by Webby (1988), is apparently not developed in *P. lyterion*. Specimen GSC 29588 from the upper Vauréal Formation (Bolton, 1979), a paratype of *P. lyterion*, is actually *Palaeophyllum vaurealense*. *Palaeophyllum lyterion* is retained as the senior synonym.

The more cerioid specimens of *Palaeophyllum lyterion* from this study resemble several species of *Favistina* and *Cyathophylloides*. *Favistina calicina* (Nicholson, 1875; Flower, 1961, pl. 40, figs. 1-6) and *Favistina stellata* (Hall, 1847) from the Upper Ordovician of Kentucky (Flower, 1961, pl. 38, figs. 1-11, 12, 13, pl. 39, figs. 1-10, pl. 40, figs. 1-9) have corallite diameters "ranging from 5-9 mm," which may indicate that the corallites are generally larger than those of *P. lyterion*; however, the lack of more detailed quantitative data makes direct comparison difficult. Neither of these species shows large scale development of phaceloid corallites and both have more closely spaced tabulae than *P. lyterion*. *Cyathophylloides burksae* Flower, 1961 (Flower, 1961, pl. 43, figs. 1-10, pl. 44, figs. 1-5) from the Upper Ordovician of New Mexico is also cerioid throughout and the number of major septa fits within the range of *P. lyterion*, but the tabulae display cyclic crowded zones which are not seen in *P. lyterion,* and phaceloid corallites are not common (Flower, 1961). *Cyathophylloides kiaeri* Spjeldnaes, 1964 from the Upper Ordovician *Tretaspis* Beds of Norway is similar to the cerioid form of *P. lyterion*, but corallites are generally smaller and have fewer major septa.

Occurrence. Prinsta Member and biohermal Laframboise Member, Ellis Bay Formation (Gamachian), Anticosti Island, Québec.

Other material. 35 specimens: A731; A737; A892c-1, 2 (Copper collection); SRc-1, 2-9;

PORc-1, 2-6, 8-10, 13, 14, 16-18; RPJc-1, 2-6, 7, 9 (Summer 1994).

Palaeophyllum vaurealense (Twenhofel, 1928)

Plate 18, figs. 5-7, Plates 19, 20

1928 *Columnaria*[?] (*Palaeophyllum*) *vaurealensis* Twenhofel, p. 122, pl. 4, fig. 1.

1972 *Palaeophyllum vaurealensis*; Bolton, pl. 3, figs. 6, 11.

1976 *Palaeophyllum vaurealensis*; Fedorowski and Jull, p. 64, pl. 8, figs. 4a-c, pl. 9, figs. 1a-p.

1976 *Palaeophyllum* cf. *vaurealensis*; Fedorowski and Jull, p. 61, pl. 8, figs. 3a, b, pl. 10, figs. 1a-s.

1976 *Palaeophyllum* sp.; Fedorowski and Jull, p. 66, pl. 8, figs. 5a, b, pl. 9, figs. 2a-g.

1979 *Palaeophyllum vaurealensis*; Bolton, p. 7, pl. 1.3, figs. 1-10.

Types. Holotype YPM 20495 (Twenhofel, 1928, pl. 4, fig. 1), zone 5, Vauréal Formation, Vauréal River; paratype YPM 7845, zone 12, Vauréal Formation, MacDonald River; Anticosti Island; designated by Twenhofel (1928).

Diagnosis. *Palaeophyllum* with loosely phaceloid to cateniform to subcerioid corallite arrangement. Corallum mean corallite diameter 2.5-3.5 mm, corallum mean number of major septa 14-16, but considerable variation among coralla. Minor septa approximately 25 percent of length of major septa. Tabulae arched upwards, flattened axially, average spacing 8.1 in 5 mm. Increase generally lateral, occasionally peripheral (after Fedorowski and Jull, 1976).

Corallum description. Only one nearly complete corallum collected (Pl. 19, fig. 1). Corallum low domical, diameter 280 mm, more than 120 mm high (approximately 40 mm missing at base). Other coralla fragmentary; some as large as ca. 80 x 80 x 80 mm. Coralla "up to several feet in diameter" reported by Twenhofel (1928, p. 122). No colony bases or protocorallites collected. Corallite packing from loosely phaceloid to subcerioid.

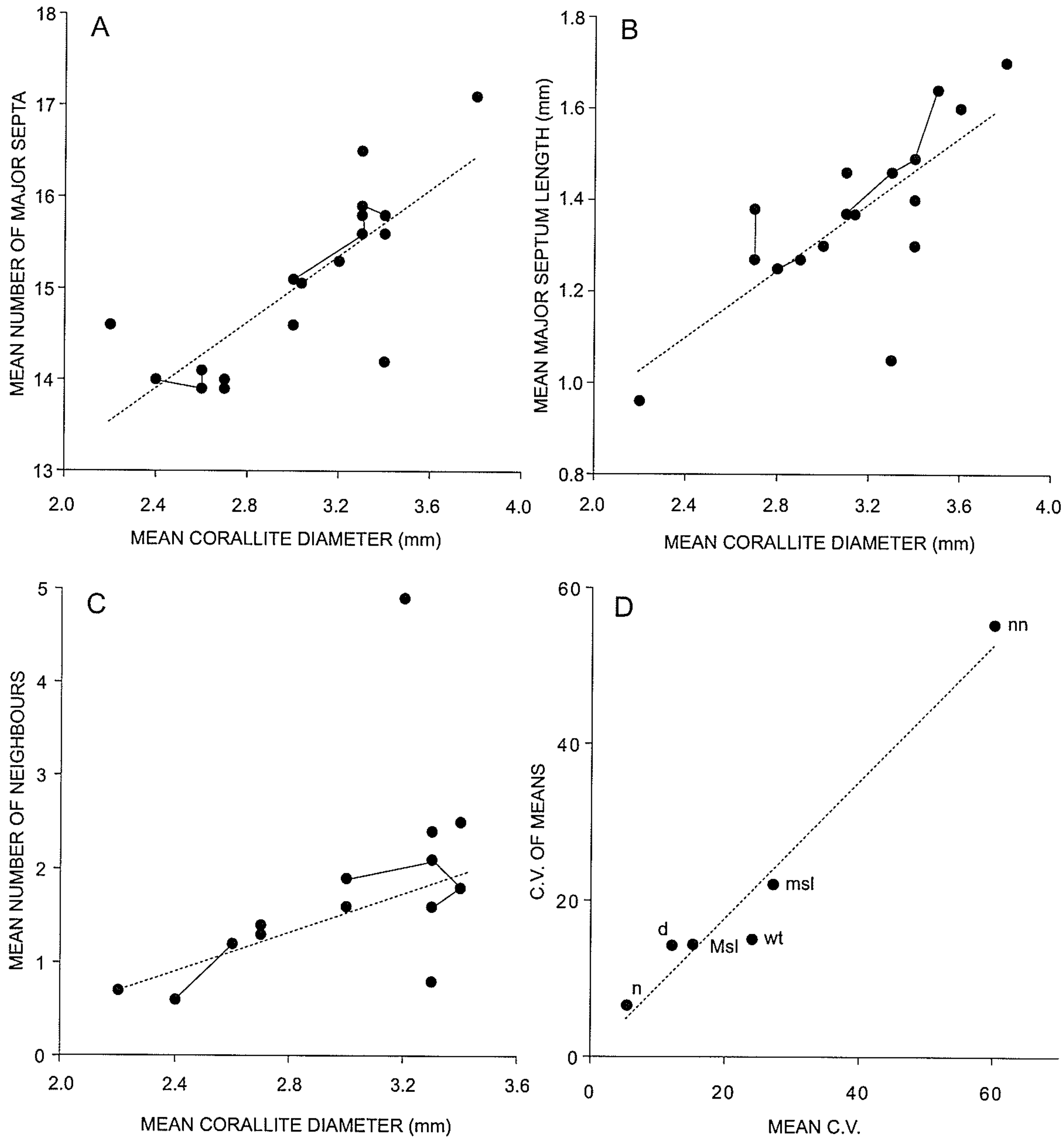
Table XIII summarizes corallum mean data. Coralla almost completely phaceloid (mean nn < 1; Pl. 20, figs. 5, 6) to tollinaform/subcerioid (nn > 4; Pl. 20, figs. 7-9). Phaceloid to cateniform most common; overall mean nn = 1.8 (Table XIII; Text-fig. 34C). Increase lateral (for complete discussion of reproduction in *P. vaurealense*, see Fedorowski and Jull, 1976).

Corallite description. Corallites cylindrical to subcylindrical when free, compressed to polygonal cross section in subcerioid portions of coralla (Pl. 20, figs. 7-9). In longitudinal section, corallites moderately sinuous; straight in short sections (Pl. 19, fig. 2, Pl. 20, fig. 2). Mean corallite diameter 3.0 mm (Table XIII).

Corallite epitheca thin where present, missing in many specimens due to abrasion. Outer surfaces of corallites display fine growth lines (Pl. 19, fig. 2), mean spacing 6 per mm, and weak septal grooves and interseptal ridges (Pl. 19, fig. 2). Septal stereozone variable in thickness, relatively narrow in most corallites. Corallum mean wall thickness (epitheca plus stereozone) 0.10 to 0.20 mm, up to 0.35 mm in individual corallites. Wall

Table XIII. Corallum mean biometric data for *Palaeophyllum vaurealense*. See Table XII for abbreviations. d(wt/Msl) = corallite diameter relative to wt and M/msl if different corallites than for n and nn. Mean values for 20 corallites/transverse section except tab/5 mm (number of measurements in parentheses). Section numbers with identical prefixes are from the same corallum. Overall mean and c.v. for all measured sections.

Section	Mean n	c.v. n	Mean d	c.v. d	Mean nn	c.v. nn	Mean wt	c.v. wt	Mean Msl	c.v. Msl	mean msl	c.v. msl	d(wt/Msl)	tab/5mm
RHc-1-1	15.1	8.3	3	16.2	1.9	53.4	0.17	26.2	1.2	15.2	0.28	20.5	3.1	8.4(6)
RHc-1-4	15.8	3.3	3.4	8.5	1.8	44	0.16	32.5	1.3	15.8	0.31	26.6	3.3	-
RHc-OB	15.6	5.7	3.3	16.8	2.1	30.5	0.19	15.4	1.3	9.7	0.49	31.9	3.4	-
RHc-Pe	15.9	3.1	3.3	5.4	1.6	55.2	0.14	19.3	1.5	14.4	0.3	25.7	3.5	-
LSMc-1	14.6	5.7	2.2	12.5	0.7	81.6	0.16	36.2	0.8	15.5	-	-	2.2	-
MHc1	14.6	5.6	3	8.2	1.6	57	0.16	17.4	1.3	9.1	0.37	27.6	3.1	8.75(4)
MHc2-sm	13.9	5.4	2.7	10.3	1.4	42.7	0.15	34	1.1	13.9	0.29	22	2.8	10(3)
MHc2-lg	14	3.3	2.7	7.2	1.3	81.6	0.17	17.1	1.1	5.9	0.34	28.4	2.9	-
MHc4-1	14.1	7.7	2.6	13.7	1.2	76	0.18	21	1.2	14	0.38	27.5	2.7	-
MHc4-2	13.9	5.2	2.6	13	1.4	72	-	-	-	-	-	-	-	-
MHc4-3	14	5.4	2.4	9.8	0.6	126	0.17	28.4	1.1	9.7	0.35	19	2.7	-
MBsc-15	14.2	8	3.4	19.4	2.5	49.4	0.2	41.6	1.4	24.7	-	-	3.6	-
MBtop	16.5	4	3.3	17.4	0.8	77.9	0.2	9.7	1.2	19	0.32	18.2	3.4	-
A14	15.3	6.3	3.2	14.7	4.9	22.8	0.1	18.7	1.2	16.9	0.36	20	3	-
A35	17.1	5.5	3.8	8.1	1.8	60.6	0.18	23.3	1.7	9.6	0.44	17.1	3.8	5.3(7)
A80	15.6	4.4	3.4	13.2	2	51.3	0.15	24.8	1.3	20	0.3	35.9	3.4	-
A466b-2	15.8	5.8	3.3	11.9	2.4	39.2	0.15	24.8	0.9	30.7	0.18	60	3.3	-
Mean (overall)	**15.1**	**5.5**	**3**	**12.1**	**1.8**	**60**	**0.16**	**24.5**	**1.4**	**15.3**	**0.33**	**27.2**	**3.1**	**8.1**
c.v. (overall)	**6.6**	**28.5**	**14.3**	**32.8**	**55.3**	**40.6**	**15.1**	**34.8**	**14.4**	**42**	**22**	**40.2**	-	-

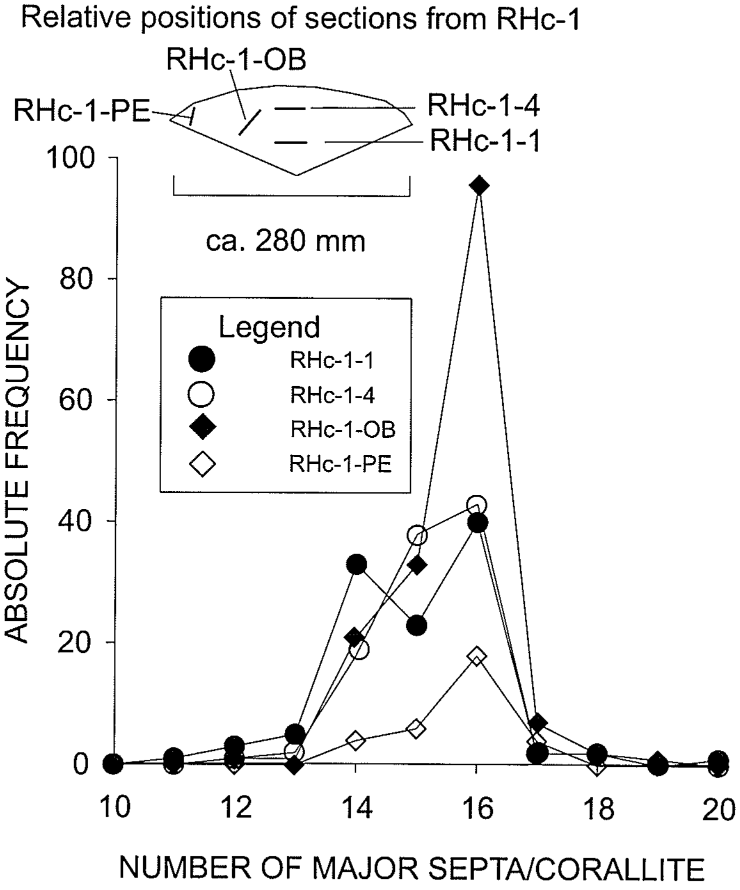


Text-fig. 34. Biometric data for *Palaeophyllum vaurealense* from Anticosti Island. A. Corallum mean corallite diameter vs. number of major septa (18 points, 11 coralla). B. Corallum mean corallite diameter vs. major septum length (18 points, 11 coralla). C. Corallum mean corallite diameter vs. number of neighbours (17 points, 11 coralla). D. Mean coefficient of variation (c.v.) vs. c.v. of means. Solid lines on A-C connect data points from the same corallum (multiple sections), dashed lines are linear regression lines (N.B., Linear regression lines in B and C do not include single extreme values). For abbreviations in D, see Table XII.

thickness approximately 10-15 percent of corallite radius. Major septa moderately long (0.8-1.7 mm, 65-95% of corallite radius [corallum means]), frequently reaching axis; mean value 91 percent of corallite radius, value for one specimen (A466b-2; 65%) exceptionally low (Pl. 20, fig. 3) (Table XIII; Text-fig. 34B). Mean number of major septa per corallite 15.1, individuals range from 10-21; 14-16 typical (Table XIII; Text-fig. 34A). Major septa peripherally thickened and tapering axially, with most taper occurring just inside stereozone (Pl. 18, fig. 6, Pl. 19, figs. 7, 8, Pl. 20, fig. 6). Major septa straight to wavy or bent irregularly, frequently bending at axial ends, joining in groups of two or more (Pl. 19, figs. 7, 8). No axial structure formed. Axial ends of major septa occasionally slightly dilated. Minor septa confined to narrow stereozone in some coralla, otherwise short, thin, tapering abruptly; mean lengths mostly 10-15 percent of major septum length.

Tabulae complete, nondilated, highly arched with flattened axial region (Pl. 20, fig. 2). Spacing relatively consistent, average 8.1 tabulae in 5 mm, range 7-11 (Table XIII). No apparent local crowding or thickening of elements indicative of cyclomorphic variation.

Astogeny. No corallum bases collected. Corallites in mature portions of coralla diverging, with no apparent crowding or thickened zones indicative of cyclomorphic variation. Most corallite parameters remain constant throughout mature growth of corallum although histogram of number of major septa per corallite for four sections from the most complete corallum (Text-fig. 35) shows reduction (lower frequency) of left hand



Text-fig. 35. Frequency histogram of number of major septa for *Palaeophyllum vaurealense* specimen RHc-1. Each dataset represents a transverse section, see schematic longitudinal section of the corallum (top) for relative position of the sections.

tail of distribution from base to top and from axis to periphery; basal axial section shows greatest frequency of (presumably) immature corallites, suggesting that increase may have been most frequent in early stages of corallum growth. There is a greater proportion of smaller corallites in the basal axial section, which indicates that there were more new corallites and the difference between basal and higher sections is not merely a function of smaller average size.

Microstructure. Skeletal elements generally non- to minimally dilated and moderately recrystallized. Fibres not visible in transverse section. Isolated lamellar structures parallel to outer wall found in stereozone. Weakly defined sutures occasionally present between abaxial ends of adjacent septa.

Variability. There is considerable intraspecific variability in many characters, both within and among coralla. There are, however, too few specimens to characterize variability fully in terms of spatial or temporal differentiation. Variability affects single corallite parameters (diameter, number of major septa) as well as number of neighbours (nn) (see Table XIII).

Bivariate plots of corallum mean values for various parameters are used for analysis of intraspecific variability. The graph in Text-figure 34A shows a moderate positive correlation ($r^2 = 0.48$; least squares linear regression method used here and throughout) between diameter and number of major septa. The number of neighbours varies considerably from specimen to specimen, reflecting the range of corallite arrangement from phaceloid to subcerioid. A plot of corallum mean corallite diameter vs. number of neighbours shows a relatively weak positive correlation ($r^2 = 0.22$), suggesting that absolute corallite size is not an important factor in determining corallite arrangement. There is, however, an extreme value and, when this is removed, the resulting linear regression has a moderately high r^2 value of 0.53 (Text-fig. 34C), which would indicate that corallite arrangement, as represented by nn, is related to corallite diameter. In contrast, nn in *Palaeophyllum lyterion* appears to be a function of external variables (see Intraspecific Variability and Discussion of *P. lyterion*).

Wall thickness is somewhat variable in specimens of *Palaeophyllum vaurealense*, but the precision of measurement (0.05 mm) is nearly as great as the range of mean values (0.1 mm, with all but one section falling in a range of 0.06 mm) (Table XIII). Qualitatively, the lowest value was found in tollinaform/subcerioid coralla, and the wall thickness in general appeared to be less in corallites with polygonal shape and high number of nearest neighbours.

A plot of mean major septum length (Msl) and mean corallite diameter shows a moderately strong positive correlation, as demonstrated by the graph in Text-figure 34B ($r^2 = 0.56$). There is a single extreme value (A466-b) with atypically short major septa. When this value is removed, the r^2 value rises to 0.83, indicating a strong correlation. The coefficient of variation of Msl is low (14.4) (Table XIII).

A plot of coefficient of variation (c.v.) of mean values for each parameter (d, n, nn, wt, Msl, msl) vs. the mean c.v. for each shows a strong positive correlation ($r^2 = 0.96$) with a slope of 0.88 and the y-intercept near 0 (Text-fig. 34D). This suggests that the colonies and the individuals (corallites) have similar degrees of variability.

Discussion. Comparison of species of *Palaeophyllum* is limited by the degree of discussion of quantitative methods and intraspecific variability in previous works. Bolton (1979) discussed the position of *Palaeophyllum vaurealense* within the genus. This species has smaller corallites than most other species of *Palaeophyllum* having nonparricidal increase. The two most closely comparable species are *P. pasense pasense* Stearn, 1956 (Stearn, 1956, pl. 16, fig. 7) from the Ordovician (Richmondian-Gamachian) Stonewall Formation of southern Manitoba, which has shorter minor septa than *P. vaurealense*, and *P. raduguini* Nelson, 1963 (Nelson, 1963, pl. 6, fig. 7) from the Caution Creek and Chasm Creek formations (Richmondian) of northern Manitoba, which has shorter minor septa and flatter, more closely spaced tabulae than those in *P. vaurealense*. Most other species of *Palaeophyllum* (see e.g., Flower, 1961; Webby, 1972; Bolton, 1979; Pandolfi, 1985) have larger corallites with more major septa per corallite (although their ranges may overlap slightly with *P. vaurealense*) and/or reproduce by parricidal axial increase (e.g., *P. proliferum* Webby, 1972). *Palaeophyllum lyterion* (Bolton, 1979; this study), which occurs in the uppermost Ellis Bay Formation (Gamachian) on Anticosti Island, displays a partially to fully cerioid habit and also has slightly larger corallites and more major septa per corallite. Additionally, its major septa are generally less dilated. *Palaeophyllum* n. sp. (this study), also from the uppermost Ellis Bay Formation, has considerably larger corallites and reproduces parricidally.

Occurrence. Homard to Mill Bay members (Richmondian), Vauréal Formation, Prinsta Member (Gamachian), Ellis Bay Formation, Anticosti Island, Québec.

Other material. Thirteen specimens: A14; A35; A80; A466b-2 (Copper collection); RHc; MHc-1, 2-4; LSMc-1, 2; MBSC-15; MBtop (Summer 1994).

Palaeophyllum n. sp.

Plate 21, figs. 1-7

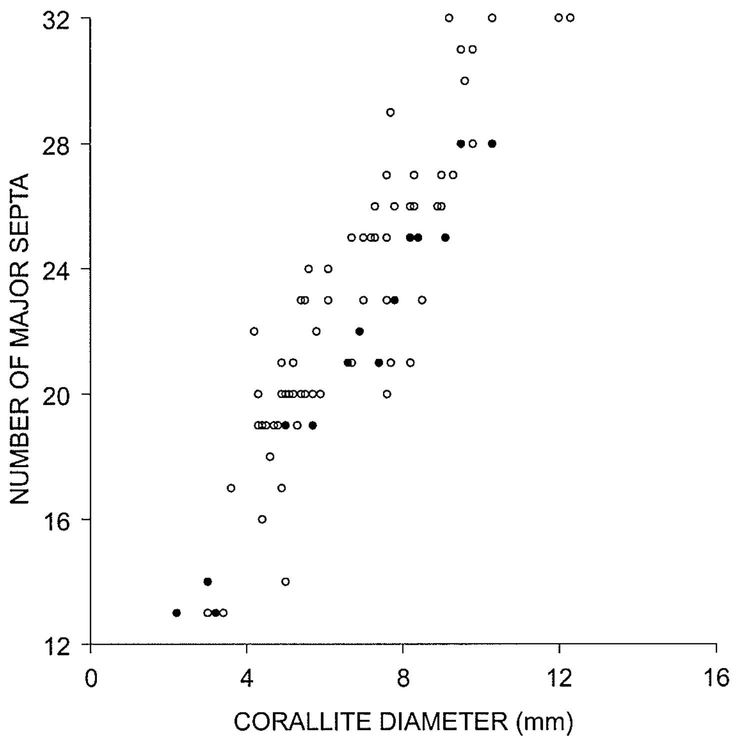
Types. Holotype LaF-bh-tm-4, paratype 83AP14-16-F-1; Laframboise Member (Gamachian), Ellis Bay Formation, locality 6, Anticosti Island.

Diagnosis. Dendroid *Palaeophyllum* with large corallites. A few septal lobes in axial region of larger corallites. Increase generally octipartite, parricidal ("entellophylloid") as well as lateral. Tabulae incomplete with complementary plates, or complete.

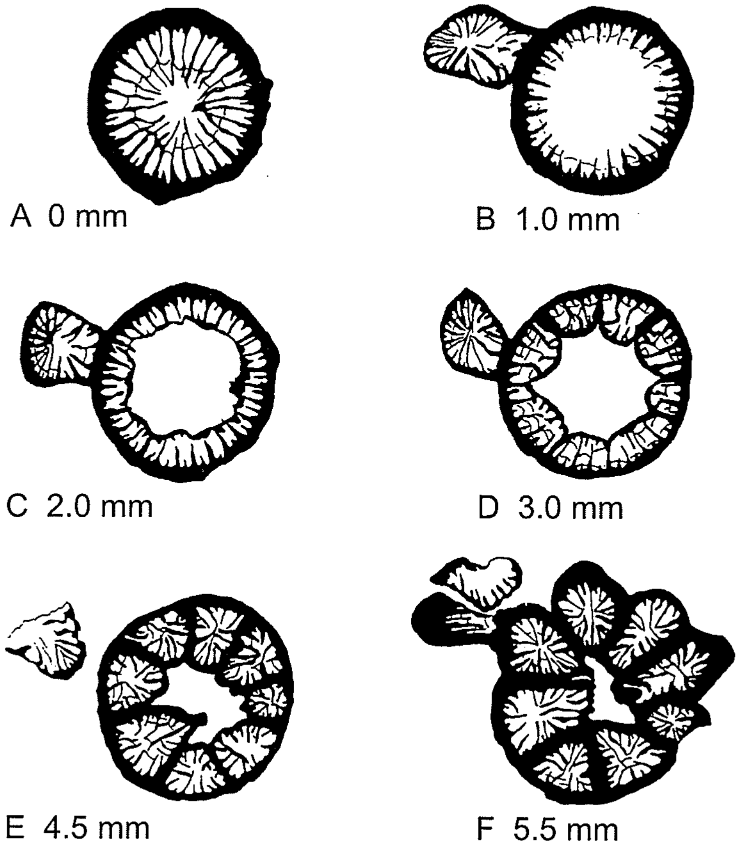
Corallum description. Corallum form indeterminate, apparently dendroid, single complete specimen fragmented upon collection.

Corallite description. Corallites straight, cross section generally circular. Mean diameter (for all corallites) 5.6 mm, maximum diameter 12.0 mm (Pl. 21, fig. 7). Major septa moderately dilated to nondilated, reaching corallite axis, frequently joining in groups axially (Pl. 21, fig. 4), or slightly withdrawn (Pl. 21, figs. 1, 7). In larger corallites, septa sinuous. Number of major septa per corallite generally 20-25 (Text-fig. 36). Minor septa short, usually projecting beyond moderately broad stereozone. Tabulae complete or incomplete with complementary plates, generally arched upwards strongly and flattened axially (Pl. 21, figs. 2, 3).

Astogeny and increase. No complete coralla or corallum bases collected, therefore details on astogeny limited. Increase generally peripheral and parricidal. Serial sections through increase event (Text-fig. 37) show parent corallite with septa nearly reaching axis (A), initial retreat of major septa (B), followed by upfolding of tabula forming inner wall (C). Inner wall and septa subdivide corallite periphery into eight regions (D), then wall becomes more convex (axially) and expands area occupied by new corallites (E), with septa forming on new section of wall (note that septa from original corallite are directly incorporated into new corallites). New corallites, with both orders of septa developed, then erupt from original calice, leaving no trace of parent corallite (F). Transverse sections of coralla show localized clusters of small corallites (Pl. 21, fig. 1) or peripherally subdivided large corallites (Pl. 21, fig. 4), indicating recent increase events. A single intracalicular bud or contracted corallite (rejuvenescence was not found in any other specimens of *Palaeophyllum* n. sp.) occurs in one specimen (Pl. 21, fig. 6). Packing and corallite arrangement are, in large part, result of proximity to points of increase. At least three incidences of octipartite (8 new corallites counted) increase noted; two similar events noted, but corallites uncountable due to breakage.



Text-fig. 36. Biometric data for *Palaeophyllum* n. sp. from Anticosti Island. Corallite diameter vs. number of major septa (76 points, 76 corallites), solid circles are corallites from the holotype.



Text-fig. 37. Parricidal reproduction in *Palaeophyllum* n. sp. (holotype LaF TM-4). Tracings of serial peels (all figures at same relative orientation, height above section A specified; magnification x6).

Microstructure. In transverse section, fibres visible in abaxial ends of major septa in stereozone, oriented toward axis from septal midline. Axial ends of septa thin, microstructure indistinct. Septal stereozone divided by well defined sutures between abaxial ends of adjacent major and minor septa.

Discussion. Despite the limited amount of material, the large size of the corallites and the nature of the tabulae and mode of increase are sufficiently distinctive to warrant the erection of a new species. *Palaeophyllum* n. sp. is most similar to *Palaeophyllum major* He (1985b, pl. 2, figs. 4, 5) from the mid-Llandovery Shiniulan Formation of China in which increase is also entelophylloid (with nine offsets in the illustrated specimen). *Palaeophyllum major* has more major septa (up to 29) than *Palaeophyllum* n. sp. and its corallites do not grow as large (maximum 9 mm vs. 12 mm in *Palaeophyllum* n. sp.) although the mean corallite diameter is comparable. Additionally, the corallite arrangement in *P. major* is not as crowded as in *Palaeophyllum* n. sp., although that could be a function of environment. The illustrations in He (1985b) are not very clear, except the illustration of the transverse section of an offsetting corallite (He, 1985b, pl. 2, fig. 5), making comparison difficult. The major septa in *P. major* appear to be generally shorter and/or less dilated that in *Palaeophyllum* n. sp.

The corallites of *Palaeophyllum* n. sp. are considerably larger than those of other Anticosti species of *Palaeophyllum* and of most species of the genus from the Ordovician of North America. *Palaeophyllum margaretae* Flower, 1961 (Flower, 1961, pl. 47, figs. 10, 11, pl. 48, figs. 1-8), from the Late Ordovician (Edenian-Maysvillian) Second Value

Formation of Texas and New Mexico, has smaller corallites, ranging "commonly from 4.0 to 4.5 mm and rarely to 5.0 mm across" (Flower, 1961, p. 90), with between 20 and 24 major septa. *Palaeophyllum cateniforme* Flower, 1961 (Flower, 1961, pl. 49, figs. 1-6, pl. 50, figs. 1-5), also from the Second Value Formation, has corallites around 6 mm in diameter but has a well defined, distinctly cateniform, growth form and between 22 and 26 major septa. Neither of Flower's (1961) species display parricidal reproduction. *Palaeophyllum proliferum* Webby, 1972 from the Late Ordovician of Australia has relatively large corallites (within the range of variation of *Palaeophyllum* n. sp.) and reproduces by parricidal increase, but the mode of increase is axial and quadripartite, and therefore distinct from *Palaeophyllum* n. sp. *Palaeophyllum lyterion* (Bolton, 1979; this study), from the same stratigraphic interval on Anticosti Island as *Palaeophyllum* n. sp., but from more easterly sections, has smaller corallites, a generally subcerioid growth form and reproduces laterally.

Occurrence. Laframboise Member (Gamachian), Ellis Bay Formation, Anticosti Island, Québec.

Other material. 37 specimens: 83AP17-1-bh-12d, 22c, 22d, 24a, 24e, 32d, 35a, 35d; 83AP18-R7-4e; 83AP17-1-1b-4 (Petryk Collection); A41-1, 9, 13, 14, 22; A436-12, 31, 35, 37 (Copper Collection); PLEB7-6a; PLEB7-SR-U1-13, 15, 23; PLEB7-RC-M3-2; PLEB7-RF-L1-2, 7; PLEB7-SR-2-10 (Elias Collection); LaF-EB7-M-1; LaF-EB7-TM-3a, 3b, 3d; LaF-EB7-LI-2a, 2b, 2c, 2d, 2e; LaF-EB7-TI-2 (Summer 1994).

Palaeophyllum sp. Bolton, 1981a

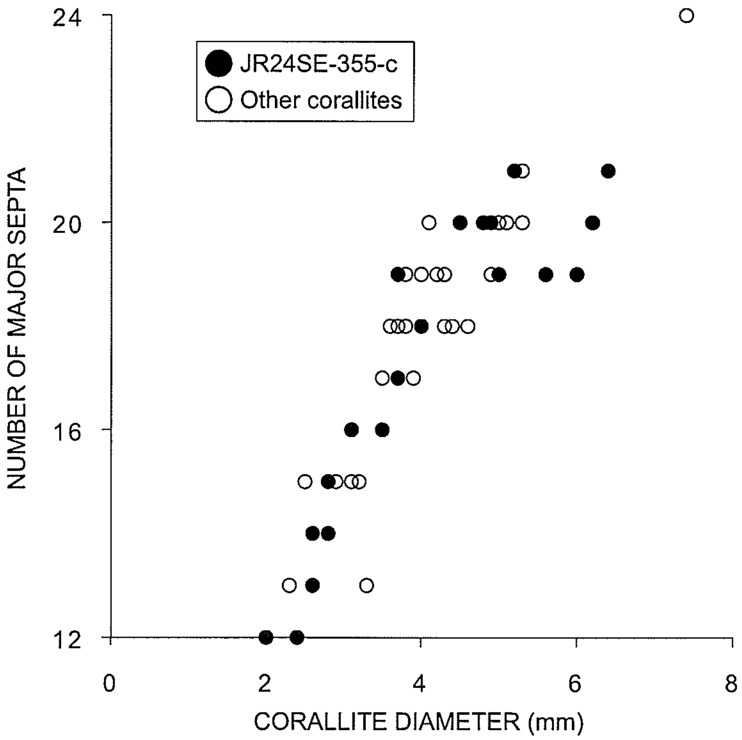
Plate 21, fig. 8, Plate 22, figs. 1-3

1981a *Palaeophyllum* sp. Bolton, pl. 5, figs. 1-3, 6, 8-11.

Corallum description. Single large corallum fragment (ca. 240 x 150 x 50 mm [height]; Pl. 21, fig. 8) and isolated fragments collected. Large fragment flat, irregularly shaped, missing indeterminate amount from base. Corallite arrangement phaceloid to cateniform (Pl. 22, figs. 2, 3); corallites generally oriented vertically, with no apparent divergence.

Corallite description. Corallites cylindrical to subcylindrical except where distorted by contact with other corallites. Corallites straight to bent in vertical section. Septal grooves and interseptal ridges seen on isolated well preserved corallites. Average diameter 4.1 mm, range 2.0-7.4 mm, mostly 3.5-5.5 mm. Major septa thin, taper slightly, nearly reaching axis (mean length 86% of corallite radius), occasionally joining in groups or twisting (Pl. 22, fig. 2). Wall and major septa relatively thin and nondilated in all corallites. Minor septa well developed in most corallites, mean length 27 percent of major septa. Number of major septa generally 17-21, number relative to corallite diameter shown in Text-figure 38. Tabulae complete, arched upward, axially flat (Pl. 22, fig. 1). Tabular spacing 4.5 in 5 mm.

Astogeny and increase. Insufficient material to describe astogeny (no complete coralla and no corallum bases found). Increase lateral.



Text-fig. 38. Biometric data for *Palaeophyllum* sp. from Anticosti Island; corallum diameter vs. number of major septa (48 points, 48 corallites).

Microstructure. Material altered at fine level, microstructure obscured.

Discussion. There is insufficient material for determination of the range of variability and species affiliation. *Palaeophyllum* sp. Bolton (1981a), as originally documented from the Rhuddanian Becscie Formation of Anticosti Island, was only illustrated, not described, but the simple tabular morphology (Bolton, 1981a, pl. 5, figs. 1, 3, 11) and low degree of dilation of skeletal elements appear to be similar to those of the specimens described here from the same unit. *Palaeophyllum* sp. may represent a new species, but more material is required to quantify intraspecific variability for comparison purposes. The skeletal elements of *Palaeophyllum lyterion* (Bolton, 1979; this study) are similarly nondilated and the range of values for diameter and number of major septa overlap, but *P. lyterion* generally occurs in a subcerioid pattern and its tabulae are axially depressed. The values of diameter (d) and number of major septa (n) are generally higher than for *P. vaurealense* (Twenhofel, 1928) from the Vauréal and Ellis Bay formations (this study) and the septa are less dilated. Many other species of *Palaeophyllum* are generally similar to the specimens identified here as *Palaeophyllum* sp. Bolton, 1981a, in displaying a phaceloid to locally cateniform corallite arrangement and d and n values that are comparable. *Palaeophyllum raduguini* Nelson, 1963 (Nelson, 1963, pl. 6, fig. 7) from the Richmondian Caution Creek and Chasm Creek formations of northern Manitoba has longer major septa and slightly narrower corallites. *Palaeophyllum pasense pasense* Stearn, 1956 (Stearn, 1956, pl. 16, fig. 7) from the Richmondian-Gamachian Stonewall Formation of southern Manitoba has longer major septa that reach the axis and shorter minor septa. *Palaeophyllum trelawneyense* Hall, 1975 (Hall, 1975, pl. I, figs. o-q) from the Late Ordovician Trelawney Beds of New South Wales has corallites of comparable size but has no minor septa, a thicker wall and more closely spaced tabulae.

Occurrence. Chabot Member, Becscie Formation (Rhuddanian), Anticosti Island, Québec.

Material. Seven specimens; JR24SE-345-3, JR24SE-390-2, JR24SE-355-1, 2-4, c (Summer 1994).

Suborder CYATHOPHYLLINA Nicholson in Nicholson and Lydekker, 1889
Family PTYCHOPHYLLIDAE Dybowski, 1873

Genus *Cyathactis* Soshkina, 1955

Cyathactis euryone (Billings, 1862)

Plate 22, figs. 4-12, Plate 23, figs. 1, 2

1862 *Cyathophyllum euryone* Billings, p. 110.

1866 *Cyathophyllum euryone*; Billings, p. 34.

1901 *Cyathophyllum euryone*; Lambe, p. 136, pl. 11, figs. 15, 16.

1928 *Cyathophyllum euryone*; Twenhofel, p. 119.

1981a *Cyathactis* sp.; Bolton, pl. 8, figs. 3, 4.

1981a [?]*Cyathactis* sp. aff. *C. cormorantense*; Bolton, pl. 8, figs. 7, 8.

1981a [?]*Cyathactis* sp.; Bolton, pl. 9, fig. 3.

1981a *Cyathactis euryone*; Bolton, pl. 9, figs. 4, 5.

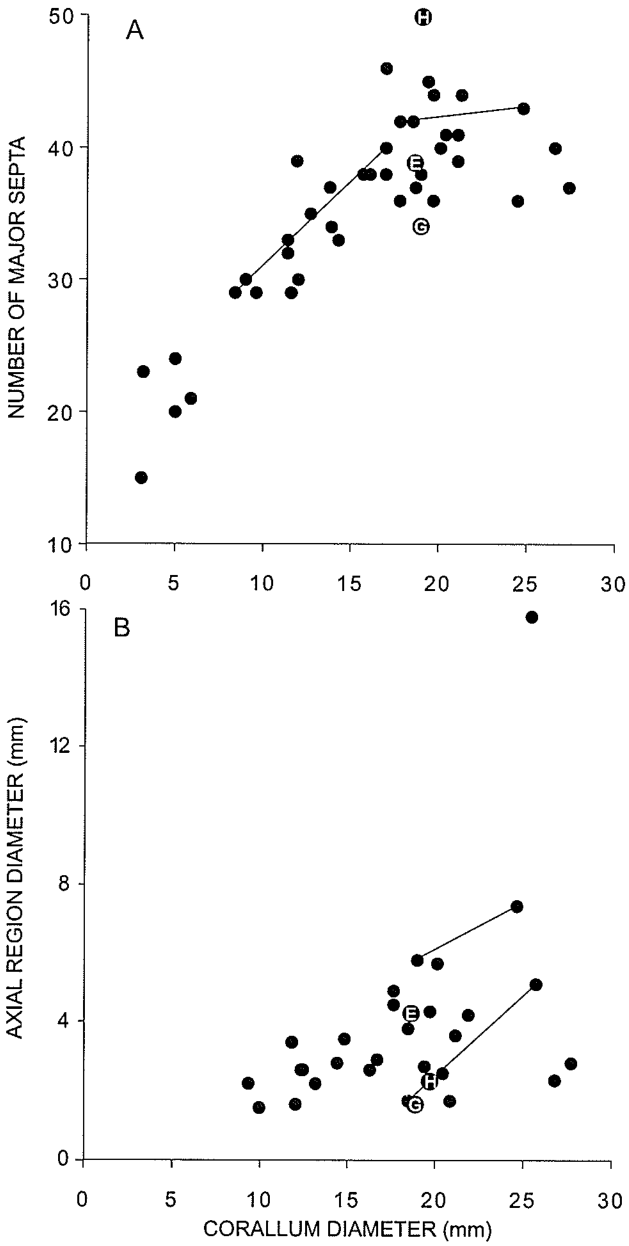
1981b *Cyathactis* sp.; Bolton, pl. 4, figs. 5, 6.

Types. Holotype GSC 2491 (Billings, 1862, p. 110), Jupiter River, by original designation; hypotype GSC 66871 (Bolton, 1981a, pl. 9, figs. 4, 5), Jupiter River near 12 mile lodge, designated by Bolton (1981a); Gun River Formation, Anticosti Island.

Diagnosis. Corallum small, cylindrical. Tabularium broad. Counter septum indistinct, cardinal fossula minimal or absent. Small, nondilated axial structure formed in some specimens.

Description of coralla. Coralla cylindrical to ceratoid (Pl. 22, fig. 8), maximum length greater than 60 mm. Growth lines rarely seen on outer surface (all specimens either abraded or covered by epibionts). Some specimens have basal attachment structures with associated distortion of internal structures (Pl. 22, figs. 9, 10, Pl. 23, fig. 1).

Ontogeny and internal structures. Major septa long and nondilated through ontogeny, reaching (Pl. 23, fig. 1) or nearly reaching (Pl. 22, figs. 5, 9) axis in early stage, slightly withdrawn in later stages (Pl. 22, figs. 4, 6, 7, 10, 11, Pl. 23, fig. 2). Relationship between number of major septa and diameter shown in Text-figure 39A. Minimal or no



Text-fig. 39. Biometric data for *Cyathactis euryone* from Anticosti Island. A. Corallum diameter vs. number of major septa (39 points, 36 coralla). B. Corallum diameter vs. axial region diameter (30 points, 28 coralla). H = hypotype GSC 66871, E = specimen figured as *C. euryone* by Bolton (1981a), G = specimen of *Cyathactis* sp. figured by Bolton (1981b) from Gaspé. Lines connect multiple datapoints from the same corallum.

axial structure; if present, of nondilated septal lobes (Pl. 22, figs. 4, 7, 11). Relationship between corallum and axial region diameter shown in Text-figure 39B. Wall very thin, of narrow epitheca with little or no stereozone. Minor septa long, generally 30-40 percent of corallum radius. Shortened cardinal septum in late stage forming small fossula or pseudofossula in one specimen (Pl. 23, fig. 2) (not seen in other specimens but many missing parts of wall and abaxial ends of major septa, making such a feature difficult to recognize). Broad dissepimentarium in all stages formed of 7 or 8 columns of small, globose convex upwards dissepiments tilted downward at approximately 50-60 degrees toward axis (Pl. 22, fig. 12). No lateral zonation of dissepimentarium, but isolated larger dissepiments developed. Tabulae incomplete, upwards arched with slight axial depression. Convex upward complementary plates developed peripherally in narrow moat between tabularium and dissepimentarium (Pl. 22, fig. 12).

Microstructure. Microstructure obscured by silicification of very thin skeletal elements.

Discussion. *Cyathactis euryone* (Billings, 1862) from the Gun River and Jupiter formations of Anticosti Island is approximately cylindrical in external form (Twenhofel, 1928, p. 119; Bolton, 1981a, pl. 9, figs. 4, 5) and has a relatively broad tabularium with no cardinal fossula. An examination of the holotype GSC 2491 (cut, but not thin sectioned) showed its external form to be generally comparable to specimens collected for this study. The internal structures of the holotype are somewhat difficult to determine, the illustration in Lambe (1901, pl. 11, figs. 15, 16) having been made from a touched up polished section. The hypotype (Bolton, 1981a, pl. 9, figs. 4, 5), despite abrasion and minor silicification, is more clearly comparable to *C. euryone* from this study, as it shows the low degree of dilation, minimal axial structure and indistinct cardinal region lacking a fossula. Diameter relative to number of major septa and axial region diameter for the hypotype and the other figured specimens from Anticosti Island and Gaspé are comparable to the observed range in this study (Text-figs. 39A, B). The hypotype is relatively large and on the high end of the scale of number of major septa. The cardinal septum is somewhat lengthened but otherwise the structures are identical to those found in specimens from this study. The diameter, dissepimentarium size, and lack of cardinal fossula of *C. euryone* (Bolton, 1981a, pl. 9, figs. 4, 5) from the Gun River Formation are comparable to *C. euryone* from this study. While the holotype cannot be fully assessed, the general morphology (small cylindrical corallum, broad tabularium, minor axial structure) of the types and the specimens from this study are comparable and the latter are assigned to *C. euryone*.

Cyathactis sp. of Bolton (1981a, pl. 8, figs. 3, 4) from the Becscie Formation of Anticosti Island is similar to *Cyathactis euryone* from this study, apparently displaying a moat between the tabularium and dissepimentarium, although only one specimen was illustrated (transverse and vertical sections). The illustrated specimen of *Cyathactis* sp. (Bolton, 1981b, pl. 4, figs. 5, 6) from the Lower Silurian La Vieille Formation of Gaspé also appears to be conspecific with *C. euryone*. Bolton (1981a, pl. 8, figs. 7, 8) illustrated a specimen identified as *Cyathactis* sp. aff. *C. cormorantense* from the Becscie Formation, which, while not displaying a moat between dissepimentarium and tabularium, appears to be similar in size and dissepimentarial characteristics to *C. euryone*. Additionally, Bolton's (1981a) illustrated specimen has a low dissepimentarium width to tabularium width ratio, characteristic of *C. euryone* and in contrast to *C. cormorantense* (Twenhofel, 1928, pp. 118, 119, pl. 3, figs. 2-4). Bolton (1981a, pl. 9, fig. 3) illustrated an unsectioned specimen of *Cyathactis* sp., the taxonomic affiliation of which cannot be assessed. The specimens of *Cyathactis* sp. and *Cyathactis* sp. aff. *C. cormorantense* illustrated by Bolton (1981a, 1981b) may all belong to *C. euryone*, although only those listed without a [?] in the synonymy are definitively assigned to that species.

Cyathactis cormorantense (Twenhofel, 1928, pp. 118, 119, pl. 3, figs. 2-4) from the Jupiter Formation of Anticosti Island is considerably larger than *C. euryone*, reaching a maximum size of 160 mm long and 60 mm wide (cf. maximum dimensions of 60 [incomplete] mm x 37 mm for *C. euryone* from this study) and has a broader dissepimentarium and narrower tabularium. Bolton (1981a, pl. 12, figs. 7, 8) illustrated a specimen identified as *Cyathactis euryone* from the Jupiter Formation; the dissepimentarium in this specimen is much broader and the tabularium is much narrower than in *C. euryone*. The high dissepimentarium width to tabularium width ratio is comparable to *C. cormorantense* (Twenhofel, 1928), which also occurs in the Jupiter Formation, and the illustrated specimen probably belongs to that species. The type species, *Cyathactis typus* Soshkina, 1955 from the Llandovery of the Siberian Platform and the mid-Llandovery Brassfield Formation of Kentucky has, compared to *C. euryone*, longer minor septa, an elongate counter septum, a cardinal fossula that connects to the axial space and major septa that do not reach the axis or form even a minimal axial structure in any stage (Soshkina, 1955, p. 123, pl. 9, fig. 2, pl. 11, figs. 1a, 1b; Laub, 1979, pp. 143-147, pl. 5, figs. 6, 7, pl. 36, figs. 1-3). *Cyathactis sedentarius* (Foerste, 1906, pp. 315, 316, pl. 6, figs. 3a-c; Laub, 1979, pp. 147-154, pl. 5, figs. 8-11, pl. 21, figs. 1-3, pl. 38, figs. 1-3) of the mid-Llandovery Brassfield Formation of Kentucky is distinct from *C. euryone*, having larger dissepiments, elliptical cross-section, and moderate dilation of some major septa (Laub, 1979, pl. 38, fig. 1), although the development of the moat floored by complementary plates is similar.

Occurrence. Upper Becscie Formation (Rhuddanian), Gun River Formation (Aeronian) and Jupiter Formation (Aeronian), Anticosti Island, Québec; La Vieille Formation (Llandovery), Gaspé, Québec.

Other material. 70 specimens: A96a-1a; A504-1 (Copper Collection); BB2-aV-1, 2-6, 9-15, 18, 20; BB2-V-24 (Elias Collection); BB2-20-1, 2; BB2-100-1a, b, 3; BB2-170-3; BB2-200-3, 4-6, 8-12; BB2-230-1, 3, 7-9, 13, 15, 17a, 19-24; BB2-loose-c350-2; BB2-350-1, 2; BB2-400-2, 4a; BB2-410-2; BB2-425-3, 4, 5c; BB2-440-1, 2; BB2-450-1, 3; BB2-loose-2, 3; CO-B2-A2-21; CO-B2-BB-3; JR24-F-2, 5; JR24-w-1b; JR24SE-M-355-5; SR16+520-4, 6b (Summer 1994).

Genus *Paliphyllum* Soshkina, 1955

1955 *Paliphyllum* Soshkina, pp. 121, 122.

1968 *Paliphyllum*; Neuman, pp. 230, 231.

1979 *Paliphyllum*; Laub, p. 123.

1982a *Paliphyllum*; Elias, p. 82.

Diagnosis. Solitary, rarely colonial, with nonlonsdaleoid dissepimentarium. Dilation low to moderate in all stages. Axial structure of lobes and lamellae, with median lamella commonly developed in some stage. Minor septa long. Tabulae generally present, convex axially.

Discussion. *Paliphyllum* was discussed in detail in Laub (1979). The inclusion of *P. ellisense* has extended the range of the genus to include colonial forms. The internal structures of *P. ellisense* are otherwise characteristic of *Paliphyllum* and hence the species is retained in the genus. *Petrozium* Smith (1930) is a simple, exclusively colonial, dissepimentate genus, but the major septa are generally carinate and axial structure development is minimal. *Entellophyllum* has a similar overall form but has a much broader dissepimentarium, carinate septa and londaleoid dissepiments in some cases. *Donacophyllum* Dybowski,1873 (Jell and Sutherland, 1990) is a relatively simple colonial dissepimentate rugosan that is generally similar to *Paliphyllum ellisense*, but the dissepiments are lonsdaleoid (according to Jell and Sutherland, 1990; Cotton, 1973 described the dissepiments as nonlonsdaleoid), no axial structure is developed, and the tabulae have a distinct periaxial trough. Among solitary rugosan genera, *Cyathactis* Soshkina (1955) is characterized by the lack of an axial structure, nondilated septa, and a generally broader dissepimentarium than *Paliphyllum*. *Protocyathactis* Ivanovskiy, 1961 is differentiated from *Cyathactis* on the basis of dilated internal elements, although Laub (1979) considered that they may be congeneric, while Ivanovskiy (1970) considered *Protocyathactis* and *Paliphyllum* to be synonymous. Elias (1996) pointed out that an illustration of the type species of *Protocyathactis*, *P. cybaeus* Ivanovskiy, 1961, shows a median lamella extending across the axial region, a characteristic of *Paliphyllum*.

Paliphyllum ellisense (Twenhofel, 1928)

Plate 23, figs. 3-15, Plate 24

1928 *Cyathophyllum ellisense* Twenhofel, p. 119, pl. 2, figs. 10-13.

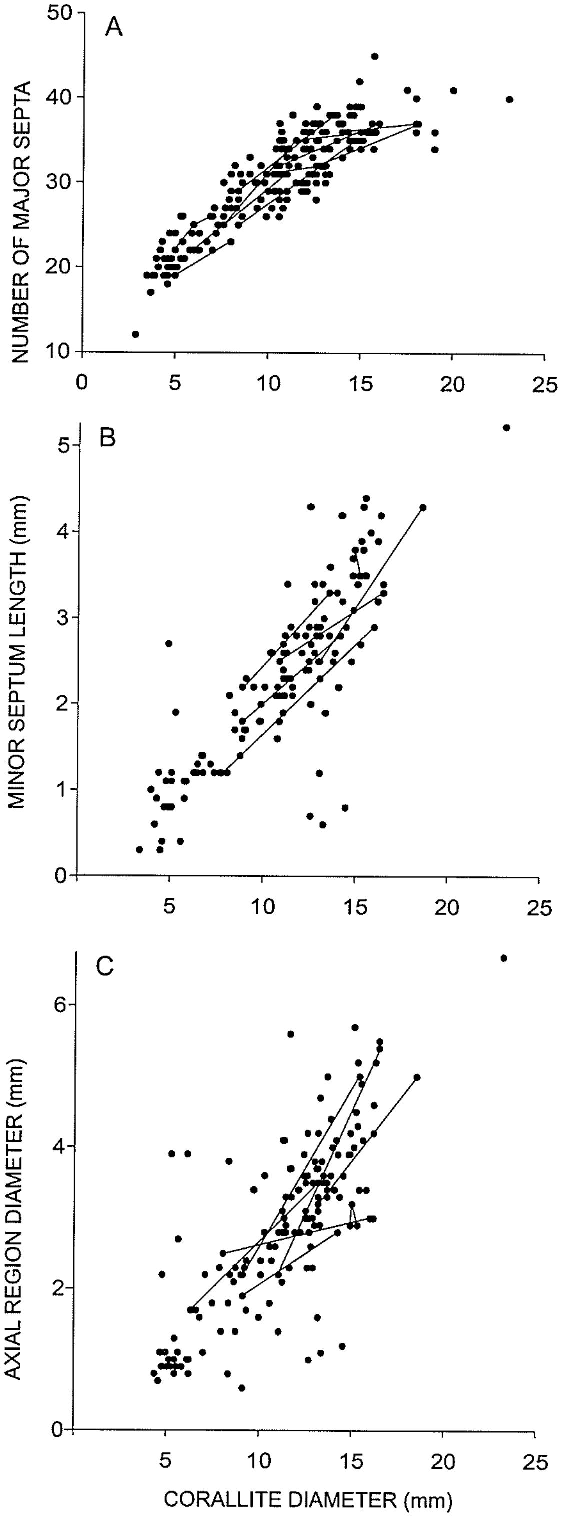
1982a *Paliphyllum ellisense*; Elias, pp. 82, 83, pl. 15, figs. 12-22.

Types. Holotype YPM 10388a (Twenhofel, 1928, p. 119, pl. 2, fig. 10), unnumbered paratype (Twenhofel, 1928, pl. 2, fig. 11) missing and presumed lost (Elias, 1982a); Twenhofel's Zone 9 (Laframboise Member?), Ellis Bay, Anticosti Island; by original designation.

Diagnosis. Colonial (and solitary?) *Paliphyllum* with subcylindrical corallites. Dissepimentarium of one to three columns of large, steeply inclined globose dissepiments. Axial structure complex with lobes, palli, and median lamella, approximately one quarter of corallite diameter.

Description of coralla. No complete or nearly complete coralla found, most specimens isolated cylindrical fragments. Largest corallum fragment greater than 200 mm high (broken), 200 mm wide (Pl. 24, fig. 4). Coralla dendroid to phaceloid, corallites generally parallel between episodes of increase. Isolated cylindrical fragments up to 170 mm long (Pl. 23, fig. 10). Isolated fragments may be solitary coralla, but distinct attachment structures or corallum bases not found.

Description of corallites. Corallites circular in cross section if not crowded (Pl. 24, fig. 5); frequent distortion on all sides associated with increase or localized close packing. Septal grooves and interseptal ridges present on exterior of corallites where not abraded. Regularly spaced rugae (3.5-8 mm on largest coralla) present on surface, accompanying repeated rejuvenescences (Pl. 23, fig. 10). Major septa slightly dilated in early stage, reaching axis or slightly withdrawn with small axial structure (Pl. 23, figs. 3, 6). In later stages, major septa slightly dilated to nondilated, slightly withdrawn from axis (Pl. 23, figs. 4, 7, 8, 11-14, Pl. 24, figs. 1-3, 5). Number of major septa relative to corallite diameter shown in Text-figure 40A. Axial structure in late stage formed of moderately dilated to nondilated lobes and lamellae with narrow median lamella (Pl. 23, fig. 7, Pl. 24, figs. 1-3 [corallite on right side of figure]) or without distinct median lamella (Pl. 23, figs. 4, 8, 9, 11-14, Pl. 24, figs. 1-3 [corallite on left]); variable in size and degree of complexity, but generally about 25 percent of corallite diameter. Diameter of axial region

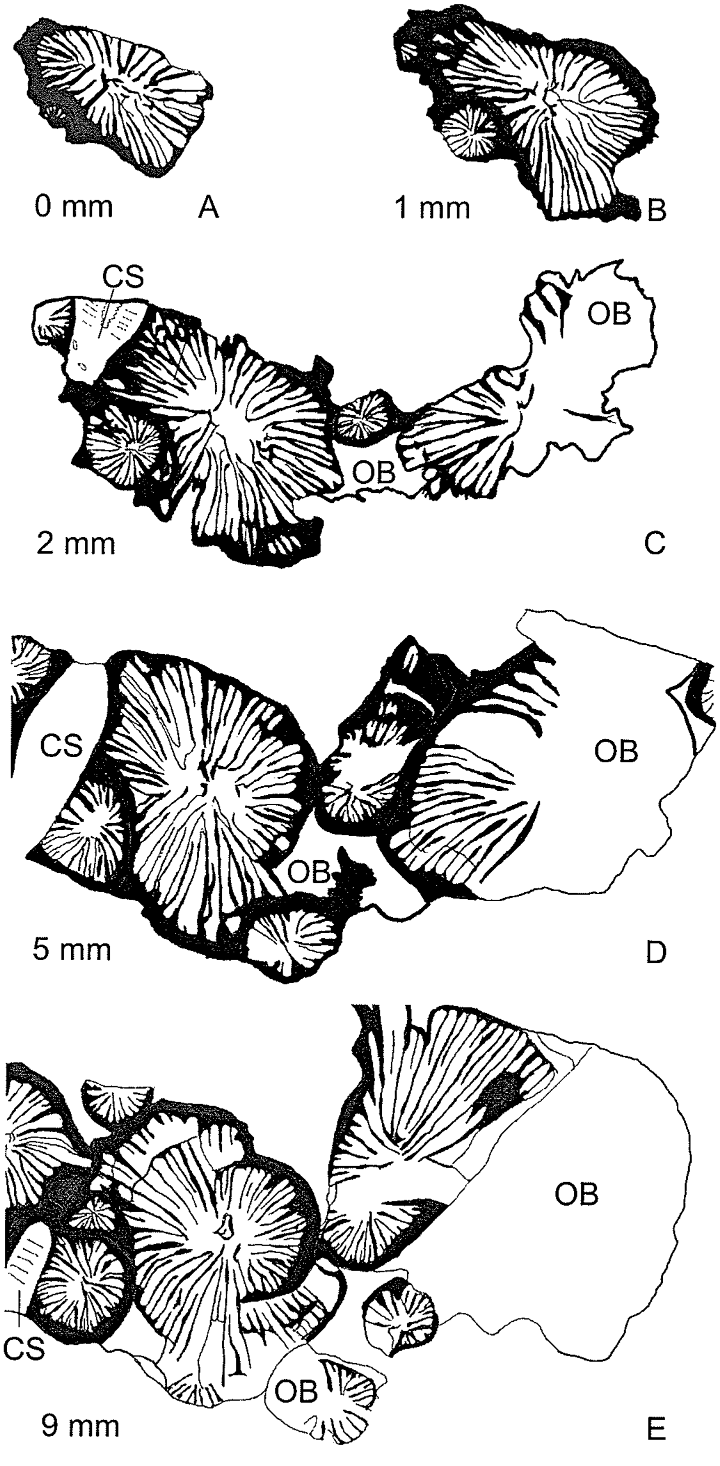


Text-fig. 40. Biometric data for *Paliphyllum ellisense* from Anticosti Island. A. Corallite diameter vs. number of major septa (202 points, 184 corallites). B. corallite diameter vs. axial region diameter (143 points, 134 corallites). C. Corallite diameter vs. minor septum length (143 points, 134 corallites).

relative to corallite diameter relatively constant (Text-fig. 40C). Minor septa very long, 30-40 percent of corallite radius (see Text-fig. 40B). Tabularium formed of upward arched complete and incomplete tabulae that incline steeply abaxially forming a periaxial moat at some levels (Pl. 23, fig. 15). Complementary plates common. Dissepimentarium in all but earliest stage, of variable width, generally of one to three columns of large globose convex upward, adaxially inclined dissepiments (Pl. 23, fig. 15).

Astogeny and increase. Description of astogeny based on single nearly complete corallum base (Text-fig. 41). Single offset from protocorallite formed in initial stage (A). Second offset appears 1 mm above initial section (B), formed by peripheral increase. Several offsets, including one comparable in size to protocorallite, appear 1 mm higher (C). No new offsets at 5 mm (D). Four peripheral increase events at 9 mm (E), of which at least three are direct offspring of protocorallite; protocorallite wall position shifted on one side, indicating rejuvenescence. Crinoid stem incorporated into corallum (C-E), fit of crinoid stem into corallites indicates that calices of *Paliphyllum ellisense* could deform to accommodate both adjacent corallites and foreign objects.

In larger coralla (missing bases) growth is in upward arc, corallites diverging from base, followed by generally parallel growth (Pl. 23, fig. 5, Pl. 24, fig. 4). Increase at all levels is both parricidal, producing multiple offsets (Pl. 23, fig. 5), and lateral (Pl. 23, figs. 10-14). Lateral increase event may be accompanied by localized distortion of marginarium and abaxial ends of septa (Pl. 24, figs. 1-3). Increase apparently more frequent near corallum base (although data are limited); increase in large specimens (later



Text-fig. 41. Astogeny of *Paliphyllum ellisense*. Tracings of serial transverse sections near base of specimen PORc-6. Height above section A specified. CS = crinoid stem, OB = area obscured (by diagenesis). Magnification x1.5 for all sections, relative orientation constant.

stage of astogeny) infrequent, corallites long, straight, parallel, producing transverse sections with corallites of comparable size and little lateral contact (Pl. 24, fig. 5).

Microstructure. In transverse section, septal fibres developed, oriented obliquely toward axis from septal midline.

Discussion. Paliphyllum ellisense is clearly differentiated from other species of the genus by its colonial growth habit and long cylindrical corallites. Internally, the axial structure and dissepimentarium are typical of the genus. Copper (in Copper and Long, 1998, pp. 67-69) identified large phaceloid coralla, from localities in the Laframboise Member of the Ellis Bay Formation of Anticosti Island that were examined in this study, as *Donacophyllum.* These specimens are probably *P. ellisense*, which generally matches the given description. In addition, specimens collected by Copper from localities cited in Copper and Long (1998) (and fitting the general description of the coralla given in Copper and Long, 1998) were examined in this study; they are *P. ellisense.*

The type species, *P. primarium* Soshkina,1955 from the Late Ordovician (Caradoc-Ashgill) Dolbor Formation of the Siberian Platform and the mid-Llandovery Brassfield Formation of Ohio (Soshkina, 1955, p. 122, pl. 10, figs. 3a, b; Laub, 1979, pp. 124-133, pl. 18, figs. 1-3) has a considerably greater diameter and more major septa than *P. ellisense. Paliphyllum regulare* Laub, 1979 from the mid-Llandovery Brassfield Formation of Ohio is similar to *P. ellisense* but is larger, has a greater number of major septa, a longer median lamella, and a slightly dilated cardinal septum (Laub, 1979, pp.

133-137, pl. 20, figs. 3-5). *Paliphyllum norfordi* Elias, 1996 from the Middle Ordovician Advance Formation of British Columbia has a smaller axial structure, a broader dissepimentarium, and is apparently solitary (Elias, 1996, pp. 84-86, pl. 2, figs. 4-12). Both *P. suecicum suecicum* Neuman,1968 from the Late Ordovician Boda Limestone of Sweden (Neuman, 1968, pp. 231-237, figs. 1a-c, 2a-f, 3a-g) and *P. suecicum brassfieldense* Laub, 1979 from the mid-Llandovery Brassfield Formation of Ohio (Laub, 1979, pp. 137-142, pl. 4, figs. 8, 9, pl. 19, figs. 1-3, pl. 36, figs. 4, 5) are larger and more conical than *P. ellisense* and have smaller axial structures. *Paliphyllum stummi* (Nelson, 1963) from the Richmondian Caution Creek and Chasm Creek formations of northern Manitoba has more, smaller, dissepiments and a cardinal fossula (Nelson, 1963, pp. 43, 44, pl. 13, figs. 7, 8a-d, 9-12).

Occurrence. Laframboise Member (latest Gamachian), Ellis Bay Formation, Anticosti Island, Québec.

Other material. 136 specimens: 83AP14-1-11, 17a-c, 22b, 23; 83AP16-1-bh-3; 83AP17-1-1b-13; 83AP17-BH- 6e (a, b), 19, 22b, 24c, 24f, 25a, 25c(a), 25c(b), 27h, 29, 34, 36a, 37b, c, 39, 40, 44b; 83AP18-1-R6-1; 83AP18-1-R7-3a (Petryk Collection); A41-3a, b, 6, 8, 11a, b, 16, 18; A86-3, 4, 6; A436-1, 2, 4, 11, 13, 15-17, 19, 20, 23, 26, 29, 30, 32, 34; A737-1, 2-6; A738(42) (Copper Collection); PL-B1-L1-1; PL-B1-L4-1; PL-B1-L6-1; PL-EB7-RC-L2-5, 9, 12; PL-EB7-BH-2, 3, 5; PL-EB7-RC-U1-3, 4, 7; PL-EB7-RC-U2-3, 4, 6; PL-EB7-IR-U2-4; PL-EB7-SR-U1-6, 10; PL-EB7-SR-2-5 (Elias Collection); FP-Laf-bh-5-1, 2; LaF-EB7-BH-TM-1a-j, 2a-c, 5a-j; LaF-EB7-I-1a; LaF-EB7-UI-1a-e; LaF-EB7-BH-M-2; LaF-EB7-BH-2a, d; POR-OPB-8, 9, 12, 14, 16, 18, 21, 22, 25, 27; POR-ENC-2; SR-EB7-BH-E(1, 2-6, 8, 10) (Summer 1994).

Suborder COLUMNARIINA Rominger, 1876

Family CHONOPHYLLOIDAE Holmes, 1887

Subfamily ENDOPHYLLINAE Torley, 1933

Genus *Strombodes* Schweigger, 1819

Strombodes socialis (Soshkina, 1955)

Plate 25, figs. 1-4

1876 [?]*Diphyphyllum huronicum* Rominger, p. 121, pl. 45, fig. 1.

1955 *Cyathactis socialis* Soshkina, pp. 124, 125, pl. 12, figs. 2a, b.

1970 *Strombodes* (*Strombodes*) *socialis*; Flügel and Saleh, pp. 280, 281, pl. 2, figs. 1, 2.

1972 *Strombodes* sp.; Bolton and Copeland, p. 30, pl. 4, figs. 5, 6.

1979 *Strombodes socialis*; Laub, pp. 185-191, pl. 7, fig. 1, pl. 23, figs. 1-4, pl. 24, figs. 6, 7.

1981a *Strombodes socialis*; Bolton, pl. 7, figs. 1, 2.

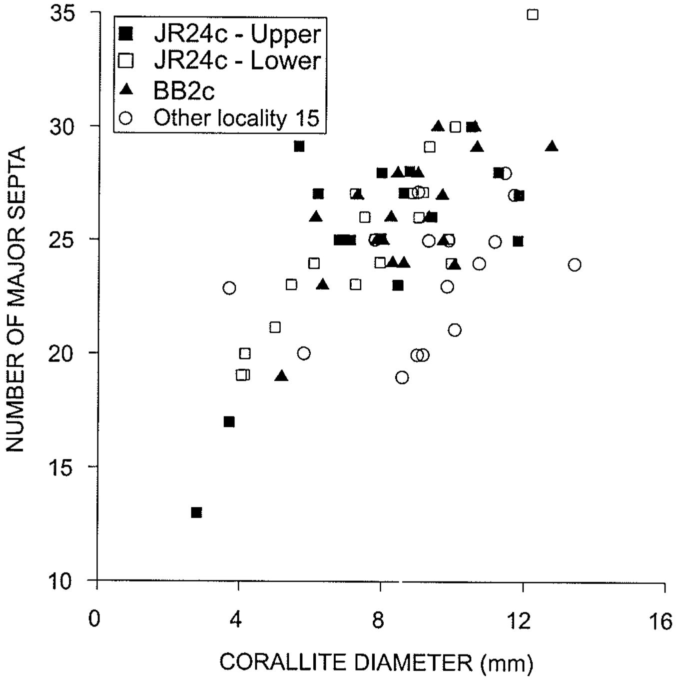
1981a [?]*Petrozium*? *pelagicum*, Bolton, pl. 6, figs. 9, 10 [only].

Types. Holotype PIN 587/2465; Kochumdeskoy Suite, layer B5, right bank, Podkamennaya Tunguska River, Siberian Platform; by original designation.

Diagnosis. *Strombodes* with broad dissepimentarium (up to 2/3 of radius), dissepiments variable in size; tabulae from gently concave upward axially between corallite expansions to concave upward with axial pit.

Description of coralla. Only one moderately complete, well preserved large corallum fragment found, ca. 180 x 140 x 240 mm (height). Small complete corallum ca. 60 x 60 x 35 mm (height) also found. Coralla dendroid to phaceloid, locally subcerioid. Corallites generally parallel, straight, connected laterally by localized repeated expansions (Pl. 25, figs. 1, 3, 4).

Description of corallites. Corallites generally straight, circular in cross section in dendroid to phaceloid zones (Pl. 25, fig. 3), subpolygonal to irregular in subcerioid zones (Pl. 25, fig. 2). Growth lines prominent on some specimens (Pl. 25, fig. 4), septal grooves and interseptal ridges faint (Pl. 25, fig. 4). Major septa nondilated, long in all stages, reaching or nearly reaching axis. No axial structure developed (Pl. 25, figs. 2, 3). Number of major septa relative to corallite diameter shown in Text-figure 42. Minor septa thin, mean length 25 percent of major septum length. Between expansions, dissepimentarium of single narrow column of convex upward equidimensional to slightly elongate (laterally) dissepiments stacked flat to obliquely (Pl. 25, fig. 1). At expansions, dissepimentarium of up to eight inclined (50-60 degrees) columns of elongate convex



Text-fig. 42. Biometric data for *Strombodes socialis* from Anticosti Island. Corallite diameter vs. number of major septa for large specimen (two sections), single corallum (BB2c) and loose corallites from locality 15 (73 points).

upward dissepiments that are larger at the greatest extent of the expansions and smaller at upper and lower limits. Dissepiments locally lonsdaleoid in expansions (Pl. 25, fig. 2), but major septa generally longitudinally continuous. Thin wall always present between adjacent dissepimentaria at points of lateral contact between corallites (Pl. 25, fig. 2). Tabularium 60-70 percent of corallum diameter between expansions; tabulae incomplete, arched upwards axially with periaxial moat floored with complementary plates. In expansions, tabularium 35-50 percent of corallite diameter; tabulae chaotic, flattened to sharply concave upwards with axial pit (Pl. 25, fig. 1).

Astogeny and increase. As no complete coralla found, astogeny cannot be properly analyzed. Increase lateral, nonparricidal, generally at expansions (dissepimentarial?).

Microstructure. Fine structural elements moderately to completely silicified, microstructure obscured.

Variability. Two sections 10 mm apart vertically, one between expansions and one through an expansion, show the difference in corallite arrangement and width of dissepimentarium (Pl. 25, figs. 2, 3). The dendroid to phaceloid section (between expansions) has a mean number of neighbours (nn) of 1.17 and only two of 18 corallites are considerably distorted (noncircular), while the expansion section has a mean nn of 2.05 and 8 of 19 corallites are distorted. The expansions are laterally continuous.

Discussion. Bolton (1981a, pl. 7, figs. 1, 2) illustrated *Strombodes socialis* from the Becscie Formation. This specimen appears to have the variable dissepimentarium found in this study (and discussed by previous authors; e.g., Laub, 1979), with the resulting circular to irregular cross-sections of corallites. The longitudinal section illustrates the regularity of expansions and the simultaneous occurrence of expansions on adjacent corallites. While the tabularium cannot be assessed fully, in all other aspects Bolton's specimen matches those found in this study. Bolton (1981a, pl. 6, figs. 9, 10) illustrated a specimen identified as *Petrozium pelagicum* from the Becscie Formation, which shows multiple columns of dissepiments and distinctly noncircular corallite cross sections. While the tabularium cannot be seen clearly, this specimen is probably *Strombodes socialis*, and is, in any event, definitely not *Petrozium pelagicum.*

Laub (1979) discussed the position and variability of *Strombodes socialis* in great detail, and he considered specimens from Ohio, Ontario, Michigan and Iran to be conspecific with the type specimens from Siberia. The main difference between these specimens, particularly the reillustrated specimens from Michigan (Laub, 1979, pl. 24, figs. 6, 7), and those from this study, is that they have a broader dissepimentarium in the expansions (up to 66% of corallite diameter vs. maximum of 50% of diameter in specimens from Anticosti Island). It is possible that the Michigan specimens are not conspecific as they appear to have more lonsdaleoid dissepiments than the Brassfield specimens (Laub, 1979, pl. 23, figs. 2, 4) or the specimens from this study in which septa are generally continuous. Additionally, the specimens from Michigan have a limited development of an axial structure not seen in any of the others, and the lateral projections of the dissepimentaria are generally on one side of the corallite (Rominger, 1876, p. 121; Laub, 1979, pp. 186, 187), a feature which is not apparent in the other specimens. *Strombodes* sp. (Bolton and Copeland, 1972, p. 30, pl. 4, figs. 5, 6), from the Thornloe Formation (late Llandovery-early Wenlock) of Mann Island, near Lake Timiskaming in Ontario, was synonymized with *S. socialis* by Laub (1979), although Laub noted certain minor differences in dissepiment size and number of major septa at a given diameter.

Strombodes magnus Strelnikov (1973, pp. 168-170, pl. 3, figs. 3a-d) from the "supra-Ludlovian" of the Chernov Uplift of northern Russia has dissepiments that are the same size as those of *S. socialis*, but has larger corallites. Additionally, the dissepiments are of a more consistently lonsdaleoid nature. *Strombodes infractus* McLean, 1977, of the early Late Llandovery Cape Schuchert Formation of Greenland has longer minor septa and flatter tabulae than *S. socialis*, but is most distinct in lacking the regular prominent expansions of the dissipementarium (McLean, 1977, pp. 26, 27, pl. 7, figs. 5, 6, 8, 9, pl. 8, figs. 1-3, 5).

Occurrence. Chabot Member, Becscie Formation (Rhuddanian), Anticosti Island, Québec; layer B5, Kochumdeskoy Suite (middle to late Llandovery), Siberian Platform; Brassfield Formation (mid-Llandovery), Ohio; Niur Formation (middle to late Llandovery), east Iran; Fiborn Limestone Member, Hendricks Dolomite (mid-Llandovery), northern Michigan; Thornloe Formation (late Llandovery or early Wenlock), Lake Timiskaming, Ontario.

Other material. 7 specimens: A292, A504 (Copper Collection); JR24c, BB2-tf, BB2-230 SR16+75, SR16+2500-9 (Summer 1994).

Family ARACHNOPHYLLIDAE Dybowski, 1873

Subfamily ARACHNOPHYLLINAE Dybowski, 1873

Genus *Petrozium* Smith, 1930

Petrozium pelagicum (Billings, 1862)

Plate 25, figs. 5-7

1862 *Cyathophyllum pelagicum* Billings, p. 108.

1865a *Cyathophyllum pelagicum*; Billings, p. 108.

1874 *Donacophyllum losseni* Dybowski, 1873, pp. 50, 51, pl. 4, figs. 6, 6a, 6b.

1901 *Diphyphyllum caespitosum* (Hall) Lambe, p. 158, pl. 13, figs. 3, 3a, 3b; [non] *Diplophyllum caespitosum* Hall, 1852.

1958 *Petrozium losseni*; Kaljo pp. 114, 115, pl. 4, figs. 11-17.

1979 *Petrozium pelagicum*; Laub, pp. 202-206, pl. 7, fig. 8, pl. 22, figs. 11-14, pl. 25, figs. 2, 4.

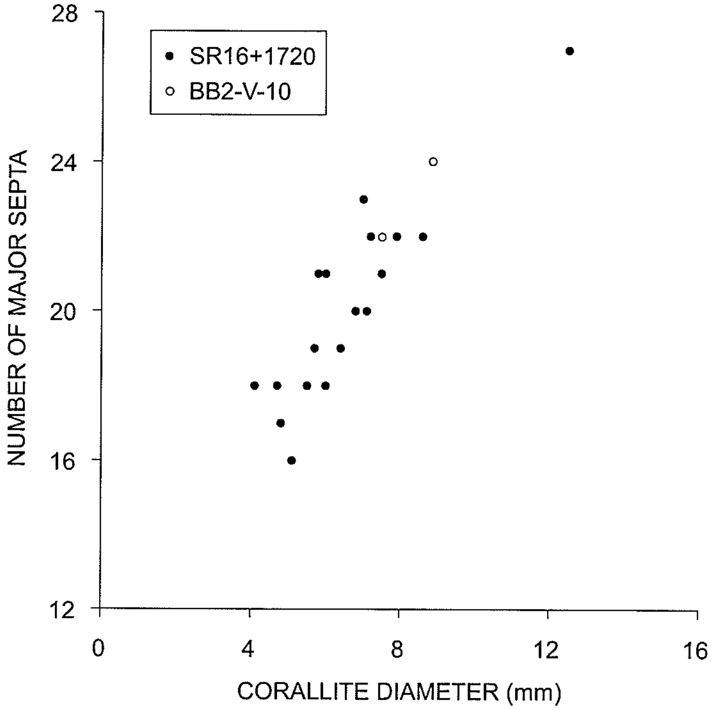
1981a *Petrozium*? *pelagicum*; Bolton, [part] pl. 5, figs. 4, 5, pl. 6, figs. 1-8, 11, [non] pl. 6, figs. 9, 10.

Types. Holotype missing; lectotype GSC 2351a (Bolton, 1960, p. 37; Laub, 1979, pl. 25, figs. 2, 4; Bolton, 1981a, pl. 5, figs. 4, 5), Chabot Member, Becscie Formation, Becscie River mouth, Anticosti Island, designated by Bolton (1960; Laub, 1979). Specimen figured by Lambe (1901, pl. 13, figs. 3, 3a, 3b) is supposedly the holotype but illustration is insufficient to confirm and no GSC number is available to compare to Billings (1862) (Laub, 1979).

Diagnosis. Species of *Petrozium* with non- or minimally carinate septa, parricidal offsets, single column of large dissepiments, complete tabulae which are variably flat to arched upward or depressed axially, periaxial moat between tabularium and dissepimentarium. Increase generally nonparricidal, rarely parricidal.

Description of corallum. Single highly silicified and abraded corallum fragment 200+ mm high plus few isolated corallite fragments. Corallites generally dendroid and parallel except near base. Lateral extensions of the dissepimentarium connecting adjacent corallites occur irregularly.

Description of corallites. Corallites long, straight, cross section generally subcircular (Pl. 25, figs. 5, 7), diameter generally 5.5-7.5 mm. Major septa long, thin in all stages, reaching or nearly reaching axis; number of major septa relative to corallite diameter shown in Text-figure 43. Little or no axial structure in all corallites (Pl. 25, fig. 7). Minor septa long, up to 50 percent of corallite radius. Narrow dissepimentarium of single column of steeply inclined convex upward dissepiments, in transverse section appearing



Text-fig. 43. Biometric data for *Petrozium pelagicum* from Anticosti Island. Corallite diameter vs. number of major septa (22 points, 22 corallites).

to form an inner wall. Dissepimentarium in connecting processes formed of two columns of dissepiments. Tabulae complete, strongly arched upwards axially with periaxial moat of concave abaxial ends of tabulae (Pl. 25, fig. 6).

Astogeny and increase. Corallum base missing, so astogeny cannot be described. Increase lateral, nonparricidal.

Discussion. Petrozium pelagicum was initially described from Anticosti Island (Billings, 1862), and illustrations of specimens from the Becscie (and possibly the Merrimack) Formation by Bolton (1981a, pl. 5, figs. 4, 5, pl. 6, figs. 1-8, 11) show considerable development of lonsdaleoid dissepiments (Bolton, 1981a, pl. 6, fig. 3), a feature that was not clearly seen in a specimen collected during the present study and figured herein (SR16+1720). The generally straight-sided corallites, single column of dissepiments (giving the illusion of an "inner wall"), strongly arched tabulae, and long major septa seen in specimen SR16+1720 match some of the illustrations of Bolton (1981a, including the lectotype, pl. 5, figs. 4, 5) and the description and illustrations of the type and other specimens in Laub (1979, also including the lectotype, pl. 25, figs. 2, 4). Specimen SR16+1720 (and additional fragmentary corallites) from this study and the specimens illustrated in Bolton (1981a, *non* pl. 6, figs. 9, 10 [see below]) do not appear to have carinate major septa or to reproduce parricidally, and cannot be clearly distinguished from each other. The specimens from this study are, therefore, considered conspecific with *Petrozium pelagicum* as previously reported from Anticosti Island (Billings, 1862;

Lambe, 1901; Bolton, 1981a, *non* pl. 6, figs. 9, 10). One of the illustrated specimens in Bolton (1981a) does not belong to *P. pelagicum*, and probably not to *Petrozium*; GSC 66855 (Bolton, 1981a, pl. 6, figs. 9, 10) clearly shows multiple columns of dissepiments and may be *Strombodes socialis* (see discussion of *S. socialis*, above).

Laub (1979) discussed *Petrozium pelagicum* in great detail based on specimens from Anticosti Island, Ohio and Estonia. These specimens all had comparable corallite size, number of major septa, lack of axial structure and similar dissepimentaria. The specimens from Estonia described as *Petrozium losseni* (Dybowski, 1874) (see Kaljo, 1958, pp. 114, 115, pl. 4, figs. 11-17) are similar to the types of *P. pelagicum* from Anticosti Island except that weak carination of the major septa is apparent. Laub (1979) assigned the Estonian specimens to *P. pelagicum*. Laub (1979, pp. 203, 204, pl. 25, figs. 2, 4) reillustrated and redescribed the type specimen of *P. pelagicum* and differentiated between the type and specimens from Ohio on the basis of the occurrence of parricidal increase in the latter material. The illustrations of Ohio material in Laub (1979, pl. 22, figs. 11-14) do not show evidence of parricidal offsetting, nor do those from Anticosti in Bolton (1981a) or the poorer quality illustrated specimens from Estonia in Kaljo (1958), although Laub (1979) stated that offsetting in his material of *P. pelagicum* is "clearly parricidal." Lambe (1901) illustrated and described as *Diphyphyllum caespitosum* (Lambe, 1901, pl. 13, figs. 3, 3a, 3b) the specimen from Anticosti Island later designated as the lectotype of *Petrozium pelagicum* by Bolton (1960; Laub, 1979).

The poor preservation (silicification) of the specimens from this study could account for the apparent lack of carination of the major septa. Despite the preservation, the specimens from this study match in general with the morphology of *Petrozium pelagicum* in Laub (1979). The difference in mode of reproduction between the specimens from Ohio described by Laub (1979) and specimens from Anticosti and Estonia (Kaljo, 1958; Bolton, 1981a) may represent an intraspecific variation between regions and apart from that feature, the material from this study is sufficiently similar to be considered conspecific with *P. pelagicum* from Estonia and Ohio.

Petrozium dewari Smith, 1930 from the late Llandovery (Telychian) *Pentamerus* Beds of Shropshire, England, is the type species and differs from *P. pelagicum* in having strong development of carinae and a broader dissepimentarium (Jell and Sutherland, 1990, pp. 807-809, pl. 9, figs. a-m). *Petrozium mcallisteri* Merriam, 1973 from the Middle Silurian Hidden Valley Dolomite of California has incomplete tabulae and a relatively broad dissepimentarium of three columns of dissepiments (Merriam, 1973, pp. 47, 48, pl. 9, figs. 6-10), whereas *P. pelagicum* has complete tabulae and only a single row of dissepiments.

Occurrence. Chabot Member, Becscie Formation (to Merrimack Formation?) (Rhuddanian), Anticosti Island, Québec; Tamasalu Stage (mid-Llandovery), Dago (Hiiumaa?; Kaljo, 1958) Island, Estonia; Brassfield Formation (mid-Llandovery), Ohio.

Material. Three specimens: BB2-V-10 (Elias Collection); SR16+447-1; SR16+1720 (Summer 1994).

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PLATE CAPTIONS

All specimens are from Anticosti Island, Québec; see Appendices A and B for detailed locality data. Unless otherwise specified, transverse and oblique sections are illustrated looking toward the base of the corallum. Longitudinal sections are illustrated with the calice up. All internal sections are direct (negative) prints of acetate peels or thin sections and have the cardinal side down unless otherwise specified.

PLATE 1

Figs. 1-16. *Streptelasma affine* (Billings, 1865).

All specimens from the Ellis Bay Formation.

1-3. Laf-EB7-LI-1, loc. 6, Laframboise Member. Alar side, cardinal side unknown; longitudinal sections, cardinal side unknown, same orientation as 1; x1.

4-6. 83AP14-1-18F, loc. 6, Laframboise Member. Transverse sections, x2.

7, 8. CVP-EB2-85-2, loc. 5, Velleda Member. Transverse sections, x2.

9. CVP-EB1S-m17-14, loc. 5, Velleda Member. Transverse section, x2.

10, 11. 83AP17-1-bh-37A, loc. 6, Laframboise Member. Longitudinal section, cardinal side left; transverse section, position marked on 10; x2.

12-14. CVP-EB2-145, loc. 5, Velleda Member. Alar side, cardinal side right, x1.5; transverse sections, positions marked on 12, x2.

15. A436-9b, loc. 6, Laframboise Member. Longitudinal section, cardinal side unknown, x2.

16. CVP-EB2-140-2, loc. 5, Velleda Member. Transverse section, x2.

PLATE 2

Figs. 1-8. *Streptelasma affine* (Billings, 1865).

All specimens from the Laframboise Member, Ellis Bay Formation.

1, 2. 83AP14-1-24F, loc. 6. Transverse sections, x2.

3, 4. A436-9, loc. 6. Longitudinal section, cardinal side left; transverse section, position marked on 3; x2.

5. A436-9a, loc. 6. Transverse section, x2.

6-8. 83AP17-1-bh-43, loc. 6. Transverse sections, 7 ca. 25 mm above 6, 8 ca. 12 mm above 7, cardinal side unknown, x2.

PLATE 3

Figs. 1-10. *Streptelasma* n. sp. 1.

All specimens from the Laframboise Member, Ellis Bay Formation.

1-3. POR-OPB-6 (holotype), loc. 33. Transverse section; oblique section; transverse section; x2.

4. FP-Laf-bh-1h-3, loc. 44. Transverse section, cardinal side unknown, x2.

5, 6. A894-1, loc. 37. Transverse section, x2; transverse photomicrograph, from inner stereozone, lower middle of 5 (rotated 90 degrees counterclockwise); x10.

7. POR-OPB-10, loc. 33. Transverse section, x2.

8. FP-Laf-bh-1h-5, loc. 44. Transverse section, cardinal side unknown, x2.

9, 10. A41-2 (paratype), loc. 8. Longitudinal section, cardinal side left; transverse section, position marked on 9; x2.

Figs. 11-13. *Streptelasma* n. sp. 2.

All specimens from the Chabot Member, Becscie Formation.

11-13. BB2-V-13 (holotype), loc. 14. Longitudinal photomicrograph, cardinal side right; transverse sections, positions marked on 11; x2.

PLATE 4

Figs. 1-9. *Streptelasma* n. sp. 2.

All specimens from the Chabot Member, Becscie Formation.
1-3. BB2-aV-8 (paratype), loc. 14. Transverse sections, from lowest to highest, x2.
4, 5. BB2-aV-7, loc. 14. Transverse sections, x3.
6, 7. BB2-V-12, loc. 14. Transverse sections, x3.
8. BB2-V-6, loc. 14. Transverse section, x2.
9. BB2-V-9, loc. 14. Transverse section, x2.

Figs. 10-14. *Streptelasma* sp.
10-14. A468a-3, loc. 42, Grindstone (Velleda?) Member, Ellis Bay Formation. Cardinal side, x2; longitudinal section, cardinal side left, x3; transverse sections, positions marked on 10, 11; x3.

PLATE 5

Figs. 1-17. *Bighornia patella* (Wilson, 1926).
1-6. WCR-V-cb+57-1, loc. 13, Lavache Member, Vauréal Formation. Alar (cardinal side left), counter, cardinal sides, x2; transverse sections, positions marked on 1; x4.
7. WCR-V-cb+37-9, loc. 13, Lavache Member, Vauréal Formation. Longitudinal section, cardinal side right, x4.
8. WCR-V-9, loc. 13, Lavache Member, Vauréal Formation. Transverse section, x4.
9. WCR-V-1, loc. 13, Lavache Member, Vauréal Formation. Transverse section, x4.
10, 11. CA-V-340-22, loc. 3, Homard Member, Vauréal Formation. Counter side, x2; transverse section, position marked on 10; x4.
12. WCR-V-13, loc. 13, Lavache Member, Vauréal Formation. Transverse section, x4.
13. A595-9, loc. 43, Lousy Cove Member, Ellis Bay Formation. Transverse section, x4.
14. WCR-V-14, loc. 13, Lavache Member, Vauréal Formation. Transverse section, x4.
15. CA-V-340-20, loc. 3, Homard Member, Vauréal Formation. Transverse section, x4.
16, 17. WCR-V-12, loc. 13, Lavache Member, Vauréal Formation. Transverse sections, x4.

PLATE 6

Figs. 1-7. *Bighornia patella* (Wilson, 1926).
1-5. WCR-V-cb+57-3a, loc. 13, Lavache Member, Vauréal Formation. Alar side, cardinal side right, x2; 7-10, transverse sections, positions marked on 1; x4.
6. WCR-V-4, loc. 13, Lavache Member, Vauréal Formation. Transverse section, x4.
7. A595-1, loc. 43, Lousy Cove Member, Ellis Bay Formation. Longitudinal section, cardinal side right, x4.

Figs. 8-13. *Salvadorea selecta* (Billings, 1865).
8. A468a-5, loc. 42, Grindstone (Velleda?) Member, Ellis Bay Formation. Transverse peel, with encrusting *Propora*, x1.5.
9. SPO-V+95-7, loc. 1a, Joseph Point Member, Vauréal Formation. Transverse peel, x1.5.
10, 11. Carl-V-FB-1, loc. 28, Lavache Member, Vauréal Formation. Alar side, cardinal side left; longitudinal peel, cardinal side left; x1.5.
12. VRO-1, loc. 30, Velleda?-Prinsta Member, Ellis Bay Formation. Lateral side, cardinal side unknown, x1.5.

PLATE 7

Figs. 1-16. *Salvadorea selecta* (Billings, 1865).
1-6. MB-SC+40-1, loc. 39, Schmitt Creek Member, Vauréal Formation. Longitudinal section, cardinal side right, x1.5; alar side, cardinal side left, x1; transverse peels, positions marked on 2; x1.5.
7. MB-SC+215-1, loc. 39, Schmitt Creek Member, Vauréal Formation. Transverse peel, x1.5.
8. MB-SC+80-1, loc. 39, Schmitt Creek Member, Vauréal Formation. Transverse peel, x1.5.
9. MB-SC+220, loc. 39, Schmitt Creek Member, Vauréal Formation. Transverse peel, x1.5.

10, 11. MB-SC+45, loc. 39, Schmitt Creek Member, Vauréal Formation. Transverse peels, x1.5.
12, 13. A466c-1, loc. 43, Prinsta Member, Ellis Bay Formation. Transverse peels, x1.5.
14-16. SPO-V-b4-5, loc. 1a, Joseph Point Member, Ellis Bay Formation. Transverse sections, x1.5.

Figs. 17-19. *Lobocorallium trilobatum vaurealense* (Twenhofel, 1928).
All specimens from the Vauréal Formation.
17, 18. SPO-V-b4-1b, loc. 1a, Joseph Point Member. Transverse sections, x2.
19. CAS-lcb-2, loc. 3a, Homard Member. Transverse section, x2.

PLATE 8

Figs. 1-9. *Lobocorallium trilobatum vaurealense* (Twenhofel, 1928).
All specimens from the Vauréal Formation.
1-5. SPO-V-PB+85, loc. 1a, Joseph Point Member. Alar side, cardinal side left, x1; longitudinal section, cardinal side left, x2; transverse sections, positions marked on 1, 2; x2.
6. RH-V+125-1, loc 2, Homard Member. Transverse peel, x2.
7, 8. SPO-V-b4-4, loc. 1a, Joseph Point Member. Transverse sections, x2.
9. Carl-V+3.0-1, loc. 28, Lavache Member. Transverse peel, x2.

Figs. 10-14. *Deiracorallium angulatum angulatum* (Billings, 1862).
All specimens from the Vauréal Formation.
10-12. OC-V-610-2, loc. 29, Joseph Point Member. Transverse sections, x4.
13, 14. RH-V-1, loc. 2, Homard Member. Transverse sections, x3.

PLATE 9

Figs. 1-9. *Deiracorallium angulatum angulatum* (Billings, 1862).
All specimens from the Vauréal Formation.
1, 2. BMac-V-lsh-2, loc. 27, Tower? Member. Alar side, cardinal side left; cardinal side; x1.5.
3. PO-V-1, loc. 1, Joseph Point Member. Transverse section, x3.
4. CAS-V-lcb-4, loc. 3a, Homard Member. Transverse section, x3.
5. OC-V-610-5, loc. 29, Joseph Point Member. Transverse section, x3.
6. OC-V-610-4b, loc. 29, Joseph Point Member. Transverse section, x4.
7, 8. OC-V-610-3, loc. 29, Joseph Point Member. Transverse sections, x3.
9. BMac-V-lsh-1, loc. 27, Tower? Member. Longitudinal section, cardinal side right, x1.5.

Figs. 10-25. *Eurogrewingkia pulchella* (Billings, 1862).
10, 11. SGC-V-10, loc. 9, Grindstone Member, Ellis Bay Formation. Transverse sections, x4.
12. 83AP19-1-120-1, loc. 6, Fox Point Member, Becscie Formation. Alar side, cardinal side left, x2.
13. SGC-V-15, loc. 9, Grindstone Member, Ellis Bay Formation. Transverse section, x4.
14. SGC-V-14, loc. 9, Grindstone Member, Ellis Bay Formation. Transverse section, x4.
15. 83AP17-1-bh-27f, loc. 6, Laframboise Member, Ellis Bay Formation. Longitudinal section, cardinal side right, x3.
16, 17. CVP-EB1Sm-17-5, loc. 5a, Velleda Member, Ellis Bay Formation. Cardinal side, x3; transverse section, position marked on 16; x4.
18-20. CVP-EB2-80-2, loc. 5a, Velleda Member, Ellis Bay Formation. Alar side, cardinal side right, x3; transverse sections, positions marked on 18; x4.
21-23. CVP-EB2-85-11, loc. 5a, Velleda Member, Ellis Bay Formation. Cardinal side, x3; alar side, cardinal side right, x3; transverse section, position marked on 22; x4.
24, 25. CF-EB2-l-1, loc. 5b, Velleda Member, Ellis Bay Formation. Transverse sections, x4.

PLATE 10

Figs. 1-20. *Eurogrewingkia pulchella* (Billings, 1862).

All specimens from the Ellis Bay Formation.

1-3. CVP-EB2-195-1, loc. 5a, Velleda Member. Alar side, cardinal side right, x3; transverse sections, positions marked on 1; x4.

4-7. WC-EB3-0-80-2, loc. 5b, Velleda Member. Cardinal side, x3; transverse sections, positions marked on 4; x4.

8-10. WC-EB3-0-80-3, loc. 5b, Velleda Member. Transverse sections, x4.

11-13. PL-EB5-m478, loc. 6, Lousy Cove Member. Transverse sections, x4.

14, 15. PL-EB7-IR-L3-3, loc. 6, Laframboise Member. Transverse sections, x4.

16. PL-EB7-SR-3-4, loc. 6, Laframboise Member. Transverse section, x4.

17-20. PL-EB7-RF-U2-1, loc. 6, Laframboise Member. Alar side, cardinal side left, x3; transverse sections, positions marked on 17; x4.

PLATE 11

Figs. 1-7. *Eurogrewingkia pulchella* (Billings, 1862).

1-3. 83AP17-1-bh-41, loc. 6, Laframboise Member, Ellis Bay Formation. Transverse sections, x4.

4-7. 83AP17-1-1b-2a, loc. 6, Fox Point Member, Becscie Formation. Transverse sections, x4.

Figs. 8-19. *Bodophyllum englishheadense* Elias, 1982.

All specimens from the Vauréal Formation.

8. MB-OB-20, loc. 39, Mill Bay Member. Longitudinal peel, cardinal side unknown, x2.

9. MB-OB-8, loc. 39, Mill Bay Member. Transverse peel, x2.

10-12. CA-V-410-11, loc. 3, Homard Member. Alar side, cardinal side right, x2; transverse sections, positions marked on 10; x3.

13, 14. CA-V-410-22, loc. 3, Homard Member. Transverse sections, x3.

15. CA-V-380-22, loc. 3, Homard Member. Transverse section, x3.

16. CA-V-145-5, loc. 3, Homard Member. Transverse section, cardinal side approximately down for both coralla, x3.

17. MB-IB-6, loc. 39, Mill Bay Member. Lateral side, cardinal side unknown, x2.

18. CA-V-410-5, loc. 3, Homard Member. Transverse section, x3.

PLATE 12

Figs. 1-6. *Bodophyllum englishheadense* Elias, 1982.

All specimens from the Vauréal Formation.

1, 2. CA-V-380-16, loc. 3, Homard Member. Transverse sections, x3.

3. CA-V-225-9, loc. 3, Homard Member. Transverse section, x3.

4. RSM-V-4, loc. 17, Mill Bay Member. Transverse section, x3.

5. CA-V-410-25, loc. 3, Homard Member. Transverse section, cardinal side of smaller corallum down, x3.

6. CA-V-410-9, loc. 3, Homard Member. Transverse section, with associated bryozoan, x3.

Figs. 7-26. *Bodophyllum* n. sp.

All specimens from the Laframboise Member, Ellis Bay Formation.

7-10. 83AP17-1-bh-10 (holotype), loc. 6. Transverse sections, x2.

11-13. SR-BH-ts-1, loc. 38. Calice view, cardinal side down, x3; transverse sections, x3.

14. PL-EB7-RC-U1-12, loc. 6. Transverse photomicrograph, note distortion of wall associated with vermiform grooves (intersection of vg lines; groove with possible tube at intersection of vgt? lines), x15.

15-18. 83AP17-1-bh-38b (paratype), loc. 6. Longitudinal sections, cardinal side left; transverse sections, positions marked on 15; x2.

19. PL-EB7-SR-U1-4, loc. 6. Transverse section, x3.

20-22. 83AP16-1-bh-5 (paratype), loc.6. Longitudinal section, cardinal side left; transverse sections, position of 22 marked on 20; x3.

23-25. PL-EB7-RC-L2-3, loc. 6. Transverse sections, bryozoan attached to 23, x3.

26. PL-EB7-FR-U-4, loc. 6. Transverse section, attached to halysitid, x3.

PLATE 13

Figs. 1-5. *Bodophyllum* n. sp.

All specimens from the Laframboise Member, Ellis Bay Formation.

1, 2. PL-EB7-RF-U1-2, loc. 6. Transverse sections, cornulitid attached to right side of 1, x3.
3. PL-EB7-RC-M3-3, loc. 6. Transverse section, x3.
4. PL-EB7-RC-U1-13, loc. 6. Transverse section, x3.
5. PL-EB7-SR-3-28, loc. 6. Transverse section, x3.

Figs. 6-23, 25, 26. *Dinophyllum hannah* (Twenhofel, 1928).

6-8. YPM 10406 (holotype), Zone 3, Gun River, Gun River Formation. Transverse sections, x2.
9. CO-A2-TS-2, loc. 12, Chabot Member, Becscie Formation. Longitudinal section, cardinal side right, x2.
10. BB2-V-32, loc. 14, Chabot Member, Becscie Formation. Transverse section, x2.
11, 12. CO-A2-TS-1, loc. 12, Chabot Member, Becscie Formation. Cardinal side, x1.5; transverse section, position marked on 11; x2.
13, 14. BB2-V-3, loc. 14, Chabot Member, Becscie Formation. Transverse sections, x2.
15, 16. SR+45-1, loc. 38, Fox Point Member, Becscie Formation. Transverse sections, x1.5.
17. BB2-V-4, loc. 14, Chabot Member, Becscie Formation. Transverse section, x2.
18. BB2-V-11, loc. 14, Chabot Member, Becscie Formation. Transverse section, x2.
19. SR-ENC+30, loc. 38, Fox Point Member, Becscie Formation. Transverse peel, x2.
20, 21. BB2-V-20, loc. 14, Chabot Member, Becscie Formation. Transverse sections, x2.
22, 23. BB2-V-16, loc. 14, Chabot Member, Becscie Formation. Transverse sections, x2.
25. SR+45-4, loc. 38, Fox Point Member, Becscie Formation. Transverse peel, x2.
26. SR+390-3, loc. 38, Fox Point Member, Becscie Formation. Longitudinal peel, cardinal side right, x2.

Fig. 24. *Zaphrentis anticostiensis* Twenhofel, 1928.

24. YPM 10387 (holotype), Zone 4, Gun River, Gun River Formation. Transverse section, x2.

PLATE 14

Figs. 1-17. *Rhegmaphyllum* n. sp.

All specimens from the Becscie Formation.

1-3. 83AP29-1-34-1a (paratype), loc. 8, Fox Point Member. Transverse sections, x3.
4. SR+460-5, loc. 38, Fox Point Member. Oblique section through calice, x6.
5-7. 83AP17-1-1B-10 (holotype), loc. 6, Fox Point Member. Transverse sections, x4.
8, 9. 83AP16-1B-1c, loc. 6, Fox Point Member. Transverse sections, x6.
10. SR16+1375-4, loc. 35, Chabot Member. Transverse section, x6.
11-14. SR+460-7 (paratype), loc. 38, Fox Point Member. Longitudinal sections, cardinal side right, x4; transverse section, position marked on 11, x4; transverse photomicrograph, close up of lower left of 13, x20.
15. SR+350-2, loc. 38, Fox Point Member. Transverse section, x6.
16. SR16+165-5, loc. 35, Chabot Member. Transverse section, x9.
17. SR16+250-3, loc. 35, Chabot Member. Transverse section, x6.

Figs. 18, 19. *Amplexoides* sp. Bolton, 1981a.

18, 19. GSC 66864, GSC loc. 66762, Jupiter River, first section upriver from 24 mile lodge, uppermost Chabot Member, Becscie Formation or lowermost Merrimack Formation. Transverse sections, x1.5.

PLATE 15

Figs. 1-8. *Palaeophyllum lyterion* (Bolton, 1979).

All specimens from the Laframboise Member, Ellis Bay Formation.

1-3. GSC 61625 (holotype), GSC loc. 92401, east bank, Vauréal River. Longitudinal photomicrograph, x5; transverse section, x1.9; transverse photomicrograph, from centre right of 2; x13.

4. PORc-5, loc. 33. Photomicrograph of transverse peel, "calcareous vermiform epibiont," x10.

5-7. GSC 61646 (holotype of *Palaeophyllum clion* Bolton, 1979), GSC loc. 92404, north bank, Salmon River. Longitudinal photomicrograph, note lateral increase at bottom centre, x10; transverse section, x1.9; transverse photomicrograph, from lower middle of 6; x13.

8. GSC 61629 (paratype), GSC loc. 33642, south bank, Salmon River. Longitudinal section through base of corallum, x8.

PLATE 16

Figs. 1-9. *Palaeophyllum lyterion* (Bolton, 1979).

All specimens from the Laframboise Member, Ellis Bay Formation.

1-4. PORc-13, loc. 33. Photomicrograph of transverse peel of central corallites, from lower right of 2, bifurcating fracture as reference point, x4; transverse peel, x1.9; photomicrograph of transverse peel of central corallites from lower middle of 4, section 10 mm above 1, 2, x4; transverse peel, x1.9.

5-7. SRc-8, loc. 38. Scanned image of longitudinal peel, x0.4; transverse peels, note "calcareous vermiform epibiont" left of centre of 6 (intersection of "cve" lines), x1.9.

8. A737, loc. 33. Transverse peel, x1.9.

9. A892b, loc. 36. Longitudinal peel, x1.9.

PLATE 17

Figs. 1-5. *Palaeophyllum lyterion* (Bolton, 1979).

All specimens from the Laframboise Member, Ellis Bay Formation.

1-3. PORc-3, loc. 33. Transverse peels, 15, 25, 55 mm above corallum base, same orientation, arrows indicate reference point (position on each section in vertical line); note "calcareous vermiform epibionts" in 3 (intersection of "cve" lines); x1.9.

4. RPJc-3, loc. 31. Photomicrograph of transverse peel, note three "calcareous vermiform epibionts," x10.

5. SRc-4, loc. 38. Mosaic of vertical peels, part transverse, part longitudinal, x1.9.

PLATE 18

Figs. 1-4. *Palaeophyllum lyterion* (Bolton, 1979).

All specimens from the Laframboise Member, Ellis Bay Formation.

1-3. A892c-1, loc. 36. Mosaic of transverse peels, x1.7; photomicrographs of transverse peel in 1, from top right (rotated 90 degrees clockwise, right side of 2 trimmed off in 1), centre (same orientation), x10.

4. SRc-3, loc. 38. Photomicrograph of longitudinal peel, x7.

Figs. 5-7. *Palaeophyllum vaurealense* (Twenhofel, 1928).

5-7. LSMc-2, loc. 17, Mill Bay Member, Vauréal Formation. Transverse peel, x1.9; photomicrograph of transverse peel, x8; longitudinal peel, x1.5.

PLATE 19

Figs. 1-8. *Palaeophyllum vaurealense* (Twenhofel, 1928).

1-8. RHc-1, loc. 2, Homard Member, Vauréal Formation. Corallum side view, x0.66; corallites from underside of corallum, x4; transverse peel, lower corallum axis, x1.9; transverse peel, upper corallum axis, x1.9; oblique peel, x1; transverse peel, peripheral, x1.9;

photomicrograph of transverse peel, from centre right of 3, x8; photomicrograph of transverse peel, from left of centre of 6 (rotated ca. 90 degrees counterclockwise), x8.

PLATE 20

Figs. 1-9. *Palaeophyllum vaurealense* (Twenhofel, 1928).

1, 2.	RHc-1, loc. 2, Homard Member, Vauréal Formation. Transverse peel (oblique section), x1.9; photomicrograph of longitudinal peel, x8.
3.	A466b-2, loc. 43, Prinsta Member, Ellis Bay Formation. Transverse peel, x4.
4.	MHc-2, loc. 22, Mill Bay Member, Vauréal Formation. Transverse peel, x1.9.
5, 6.	MBtop, loc. 39, Mill Bay Member, Vauréal Formation. Transverse peel, x1.9; photomicrograph of transverse peel, x8.
7-9.	MBSC-15, loc. 39, Mill Bay Member, Vauréal Formation. Transverse peels, same level in corallum, x1.9; photomicrograph of transverse peel, from middle of 8, x7.

PLATE 21

Figs. 1-7. *Palaeophyllum* n. sp.

All specimens from the Laframboise Member, Ellis Bay Formation.

1-3.	Laf-TM-4 (holotype), loc. 6. Transverse section, x4; vertical sections, different corallites, cardinal side unknown, x4
4.	83AP16-F-1 (paratype), loc. 6. Transverse section, x4.
5.	PL-EB7-SR-U1-23, loc. 6. Transverse section, cardinal side unknown, x4.
6.	83AP18-1-R7-4e, loc. 6. Transverse section, cardinal side unknown, x4.
7.	PL-EB7-SR-2-10, loc. 6. Transverse section, cardinal side unknown, x4.

Fig. 8. *Palaeophyllum* sp. Bolton, 1981a.

8.	JR24SE-355c, loc. 23, Chabot Member, Becscie Formation. Corallum top view, x0.65.

PLATE 22

Figs. 1-3. *Palaeophyllum* sp. Bolton, 1981a.

All specimens from the Chabot Member, Becscie Formation.

1.	JR24SE-355-2, loc. 23. Longitudinal peel, fragment possibly from same corallum as 2 and 3, note enveloping bryozoan, x3.
2, 3.	JR24SE-355c, loc. 23. Transverse peel from centre of corallum (see Pl. 21, fig. 8), x2; transverse section, fragment of corallum in Pl. 21, fig. 8, note sponge encrusting corallum in 2 and 3, x3.

Figs. 4-12. *Cyathactis euryone* (Billings, 1862).

All specimens from the Chabot Member, Becscie Formation.

4.	BB2-aV-18, loc. 14. Transverse section, with enveloping stromatoporoid, cardinal side unknown, x2.
5, 6.	BB2-aV-11, loc. 14. Transverse sections, cardinal side unknown, x2.
7.	JR24-F-2, loc. 23. Transverse peel, with enveloping stromatoporoid, cardinal side unknown, x2.
8-12.	BB2-aV-4, loc. 14. Alar side, cardinal side left, x2; transverse sections, positions marked on 8, x2; longitudinal section, from immediately below 11, x2.

PLATE 23

Figs. 1, 2. *Cyathactis euryone* (Billings, 1862).

1, 2.	BB2-aV-1, loc. 14, Chabot Member, Becscie Formation. Transverse sections, with enveloping stromatoporoid and associated favositid, cardinal side down, x2.

Figs. 3-15. *Paliphyllum ellisense* (Twenhofel, 1928).

All specimens from the Laframboise Member, Ellis Bay Formation.

3, 4. 83AP17-1-bh-39, loc. 6. Transverse sections, cardinal side down (?), x2.
5. A737-7, loc. 33. Longitudinal peel, x1.
6, 7. 83AP17-1-bh-22b, loc. 6. Transverse sections, x2.
8. PL-EB7-2, loc. 6. Transverse section, x2.
9. 83AP14-1-17F-1, loc. 6. Transverse (and longitudinal) section, with encrusting bryozoan, x2.
10-14. PL-EB7-3b, loc. 6. Lateral side of corallite and offset, x0.8; transverse sections, cardinal side up or down, x2.
15. Laf-TMX, loc. 6. Longitudinal peel, cardinal side unknown, x2.

PLATE 24

Figs. 1-5. *Paliphyllum ellisense* (Twenhofel, 1928).

1-3. 83AP17-1-bh-36a, loc. 6. Transverse sections, cardinal side at ca. 45 degrees counterclockwise from bottom centre of left hand corallite and at ca. 45 degrees clockwise from bottom centre of right hand corallite, x2.
4, 5. A737-6, loc. 33. Corallum lateral side, x0.50; transverse peel, x1.

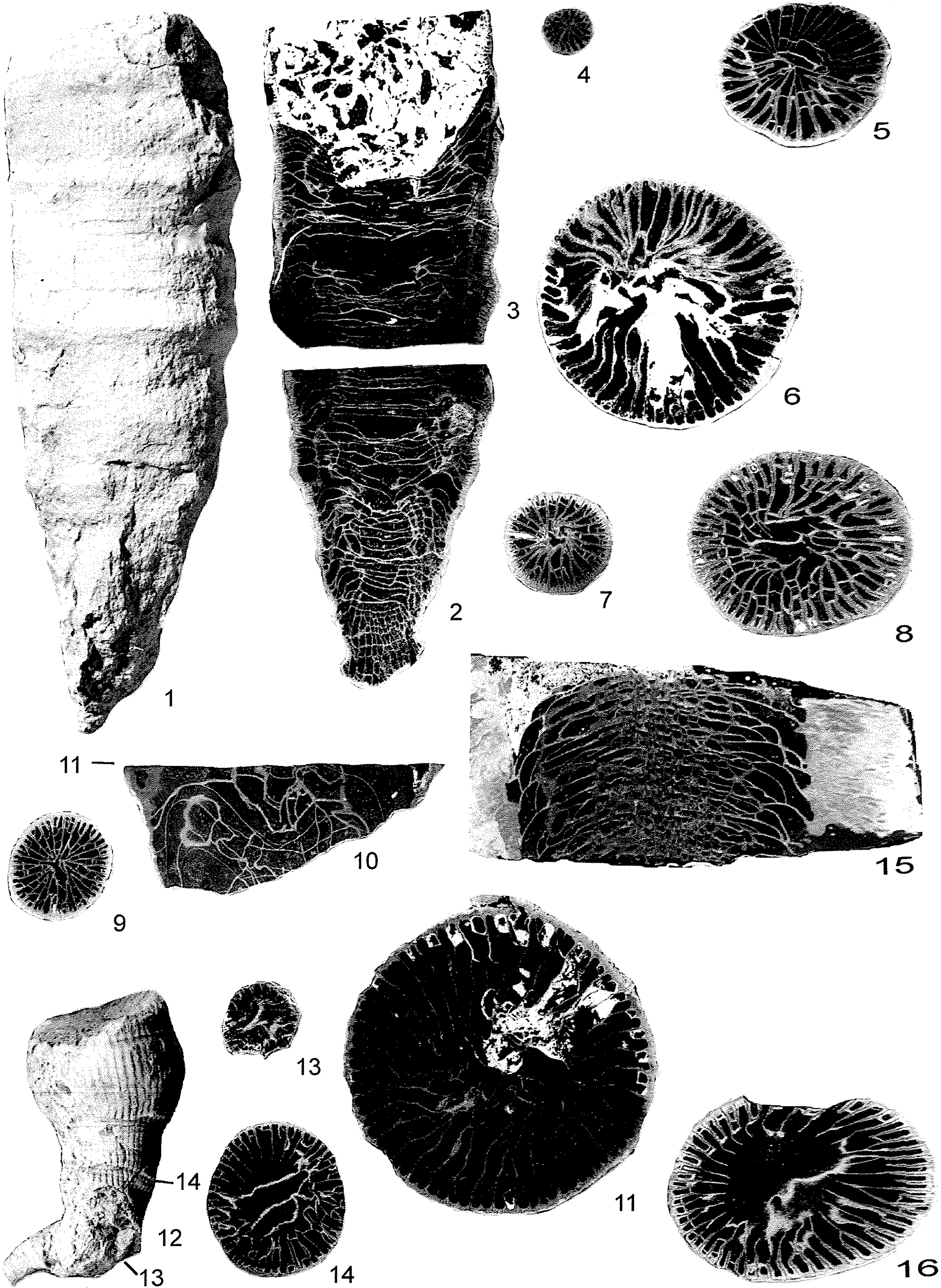
PLATE 25

Figs. 1-4. *Strombodes socialis* (Soshkina, 1955).

1-3. JR24c, loc. 23. Longitudinal section, x2; transverse sections, same orientation, 3 from 10 mm above 2, x2.
4. A504-1, loc. 23. Lateral view of corallum fragment, x2.

Figs. 5-7. *Petrozium pelagicum* (Billings, 1862).

5-7. SR16+1720, loc. 35. Transverse peel, x1.5; longitudinal section, x2; transverse photomicrograph, x4.



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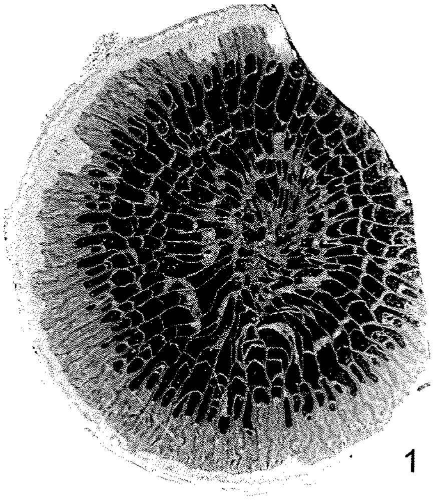
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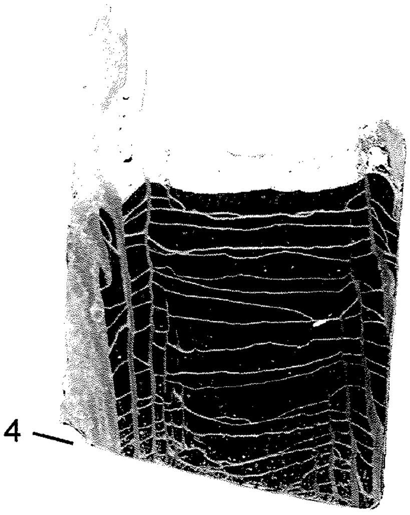

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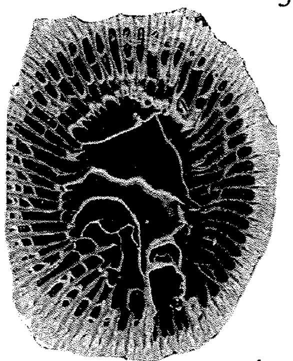
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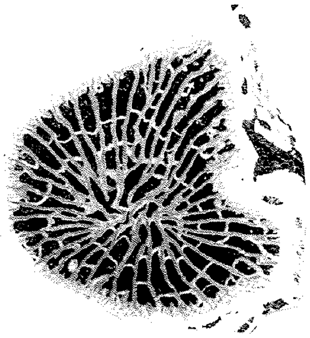
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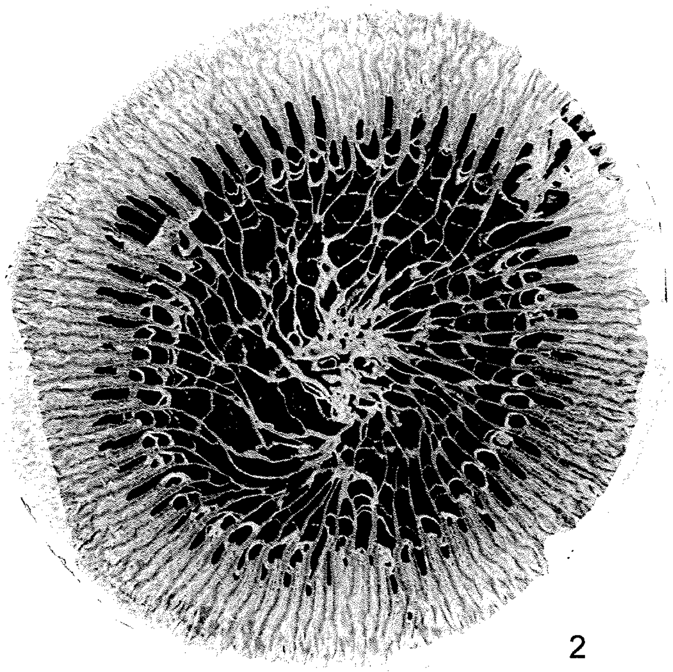
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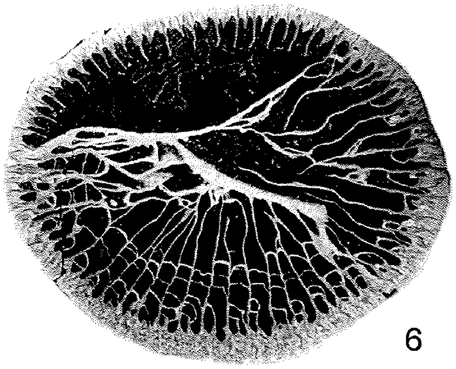
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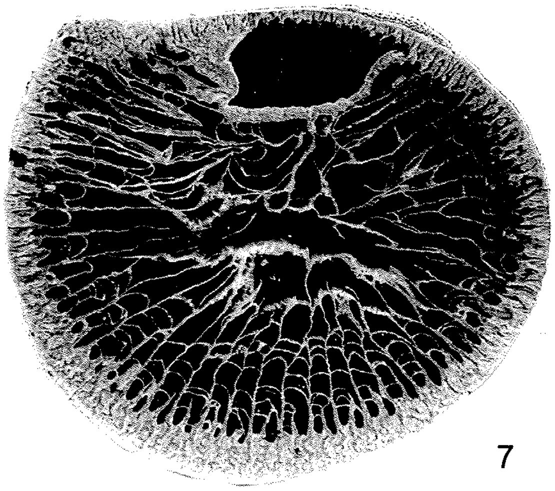
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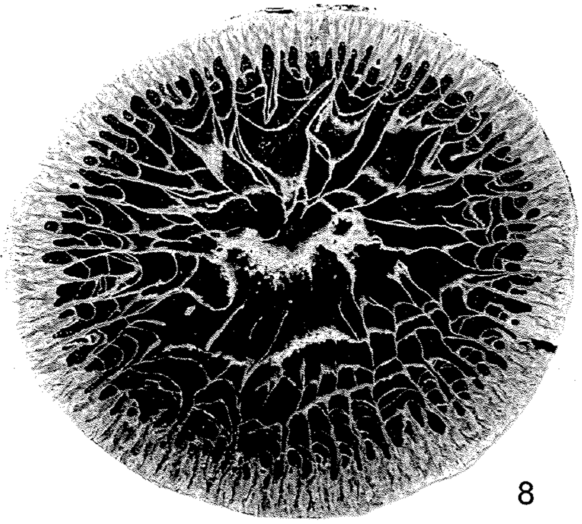
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Plate 2

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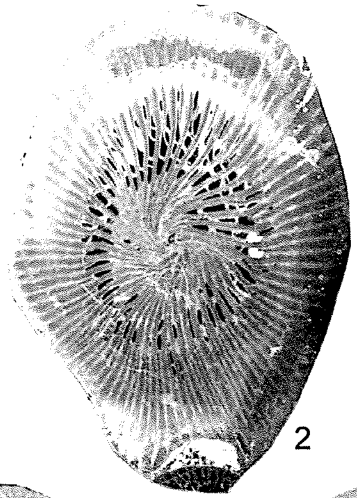

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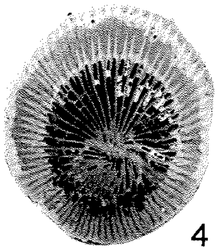

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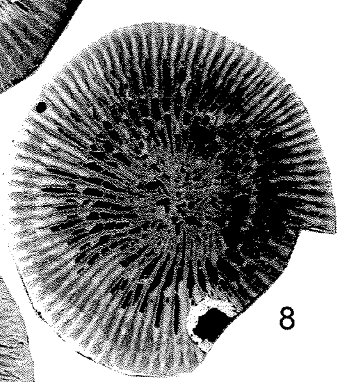

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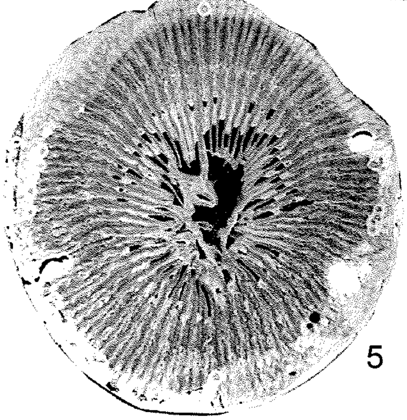

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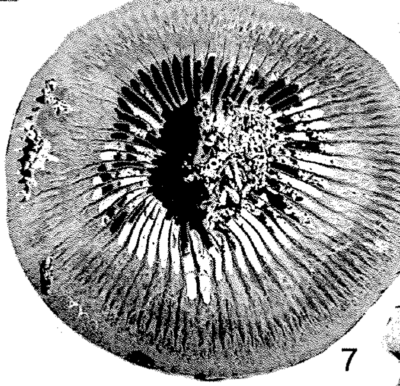

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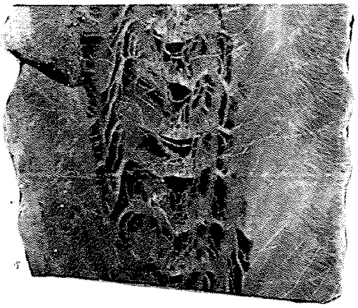

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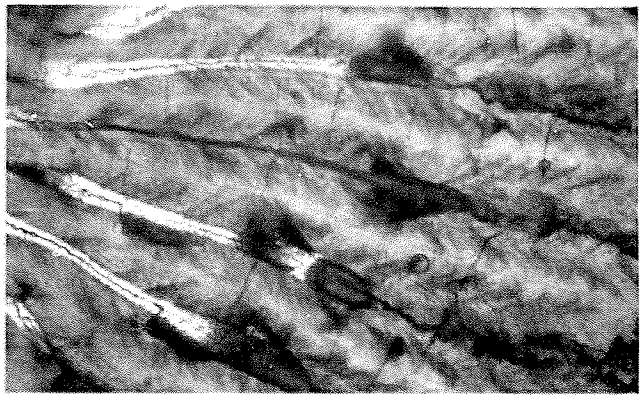

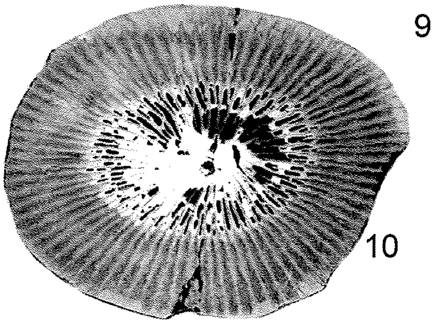

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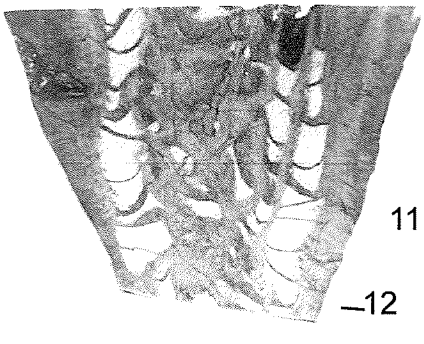

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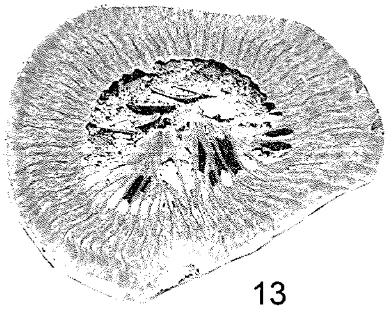

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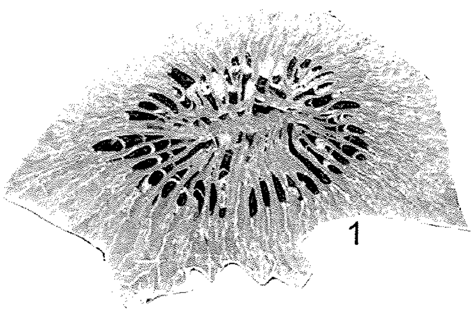
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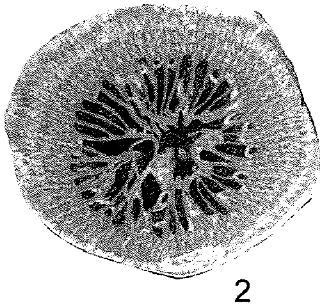
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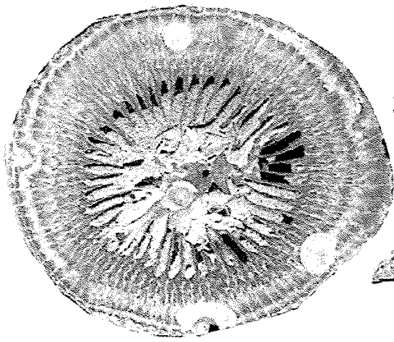
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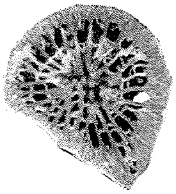
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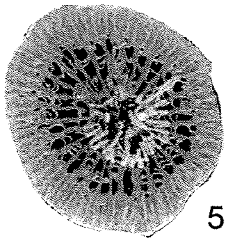
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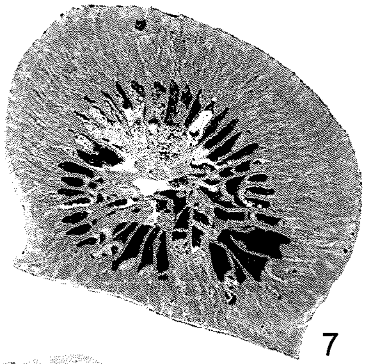
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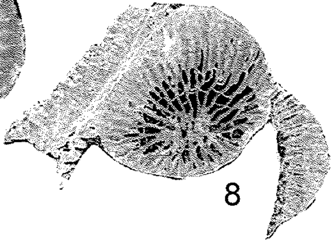
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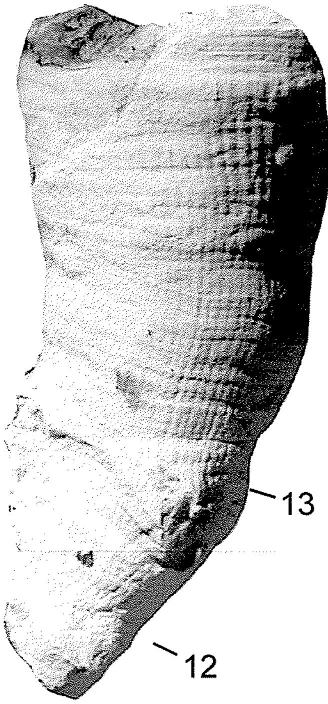

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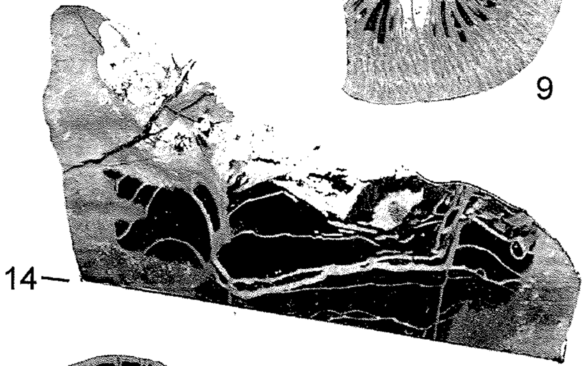

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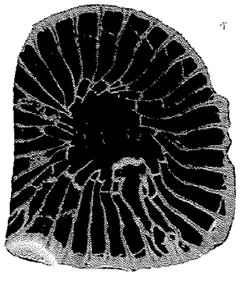
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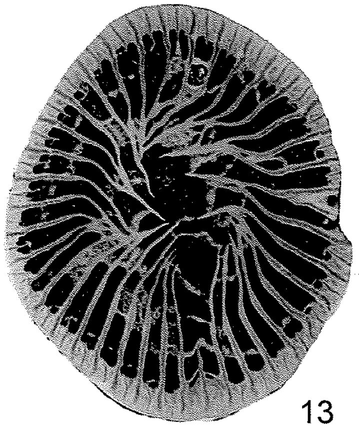
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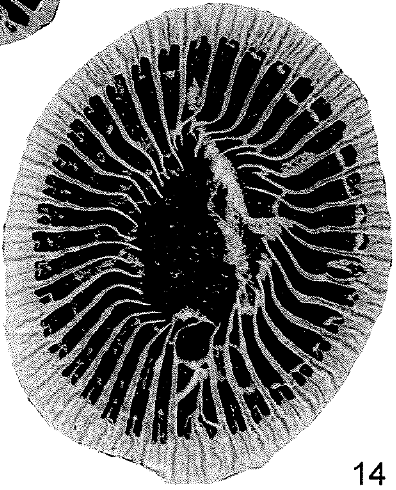
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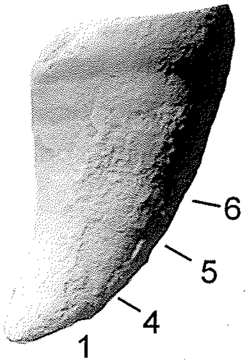

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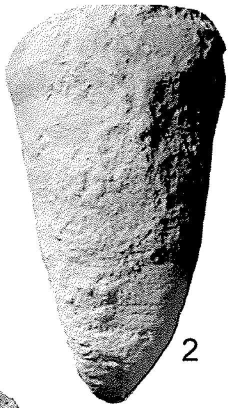

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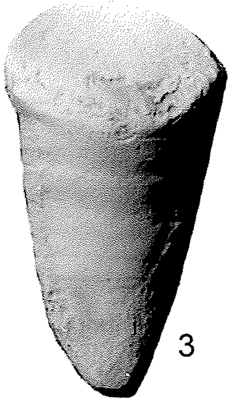

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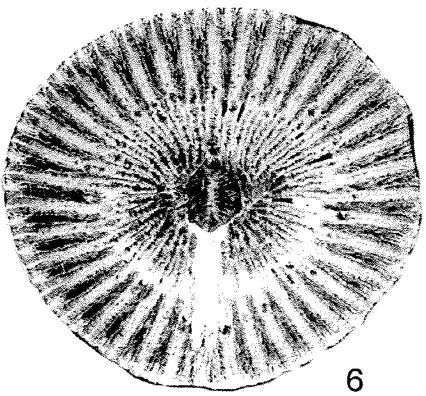

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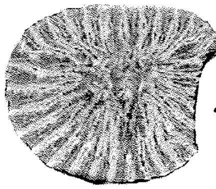

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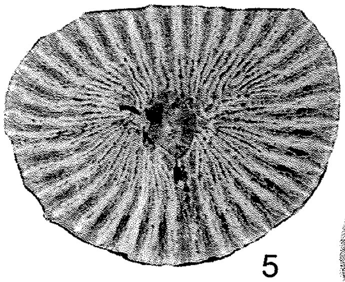

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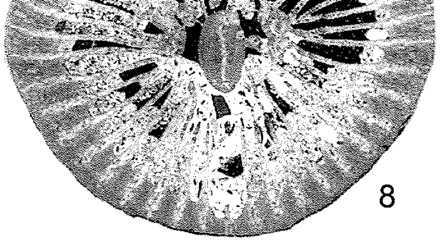

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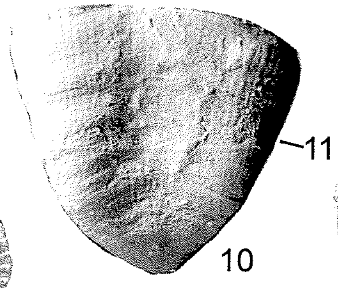

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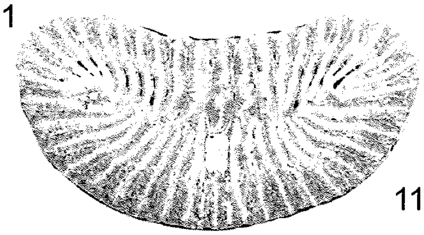

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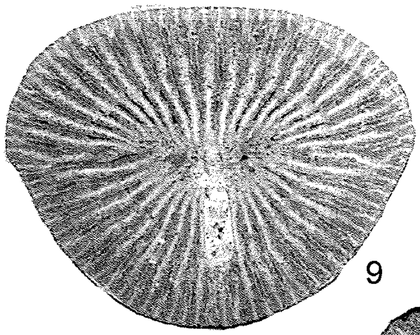

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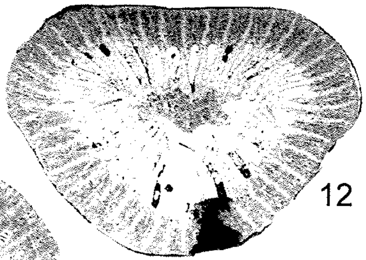

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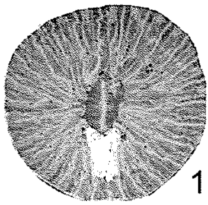

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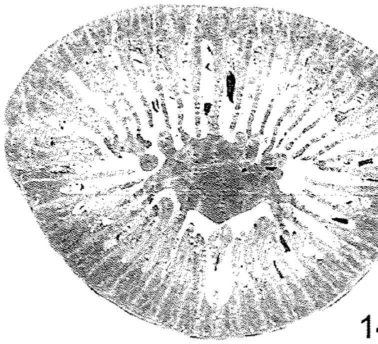

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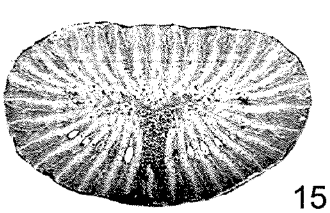

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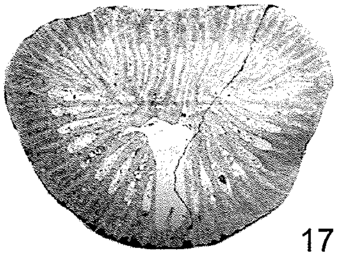

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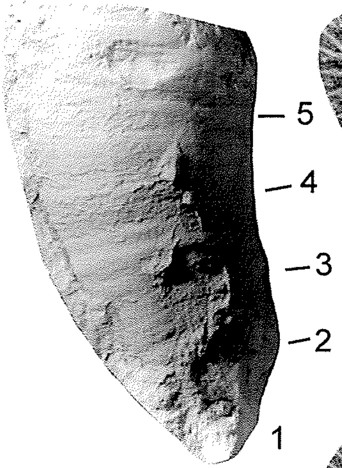
Plate 5



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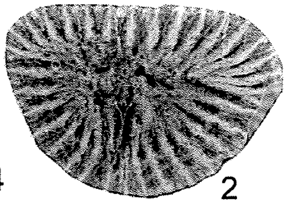

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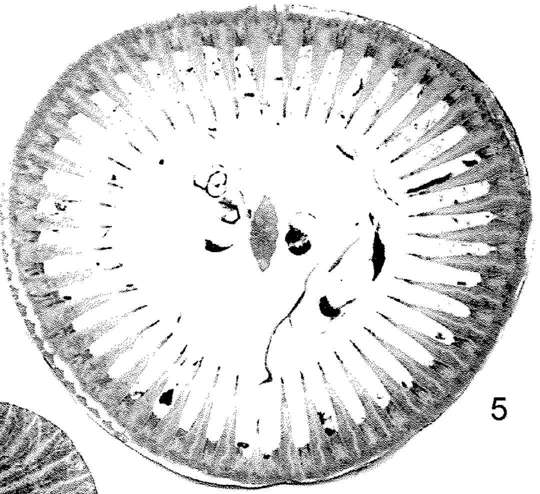

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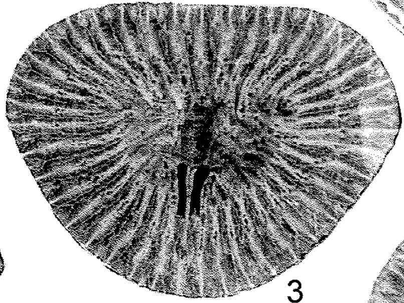

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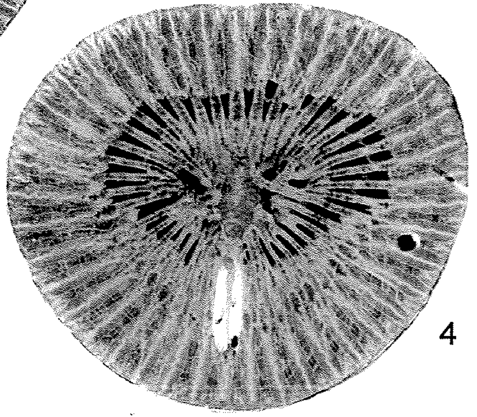

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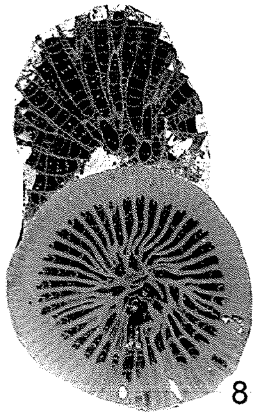

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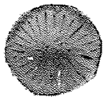

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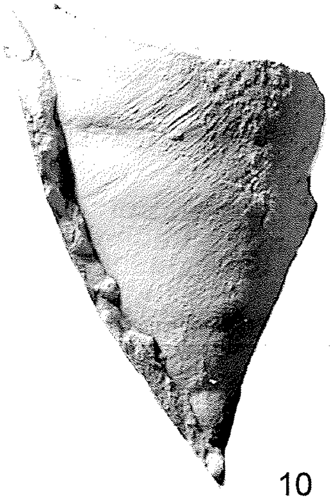

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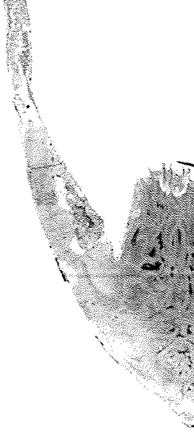

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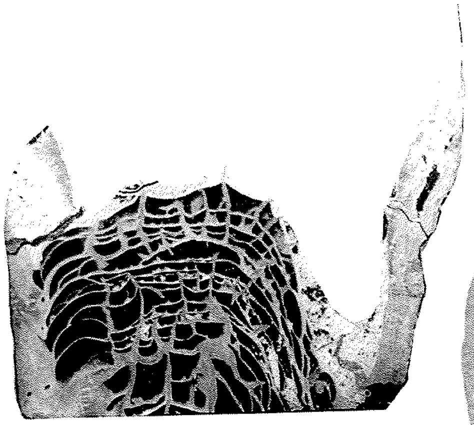
Plate 6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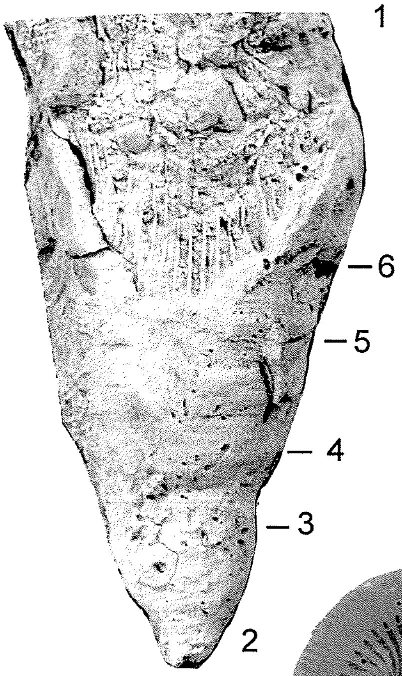

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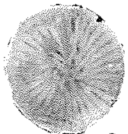
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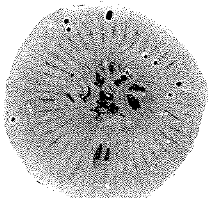
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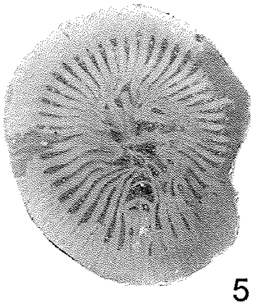
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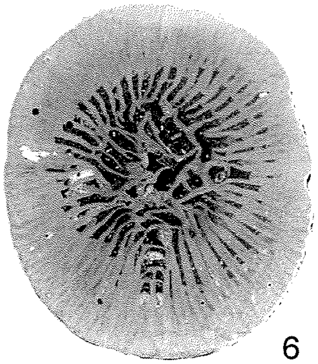
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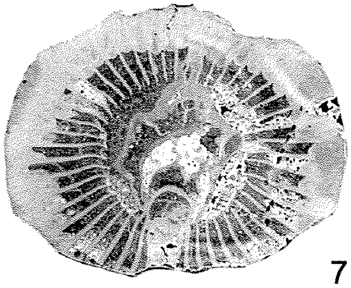
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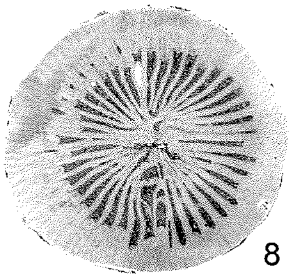
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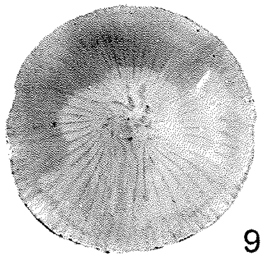
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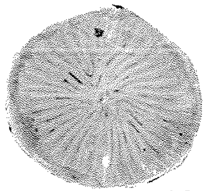
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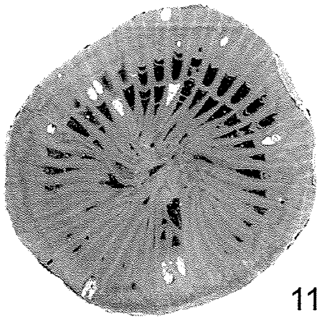
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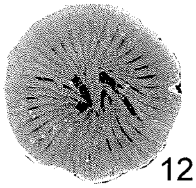
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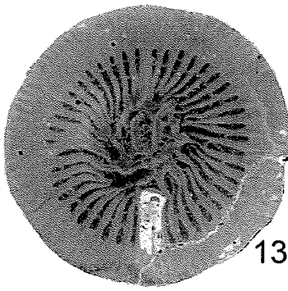
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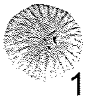
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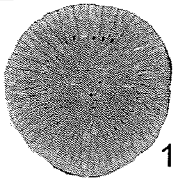
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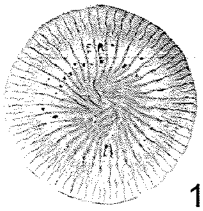
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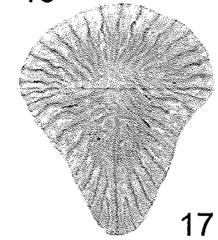
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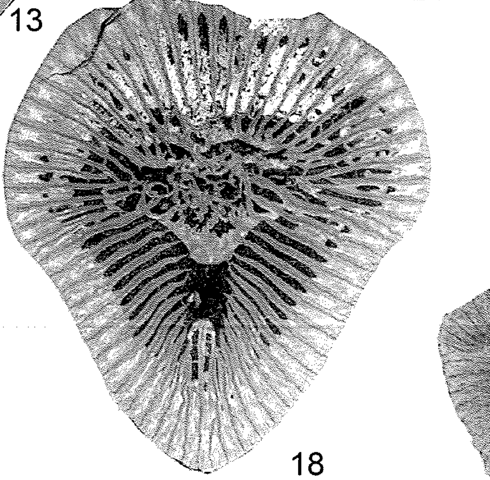
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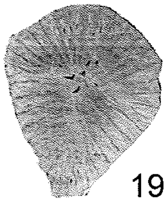
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Plate 7

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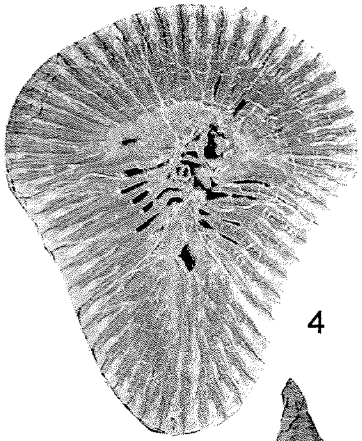
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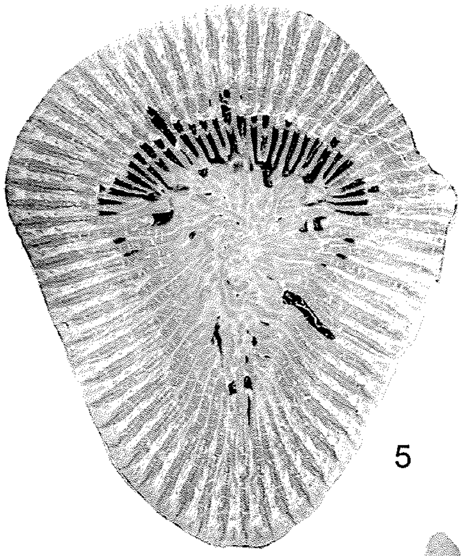
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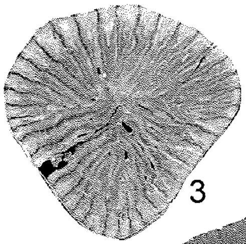
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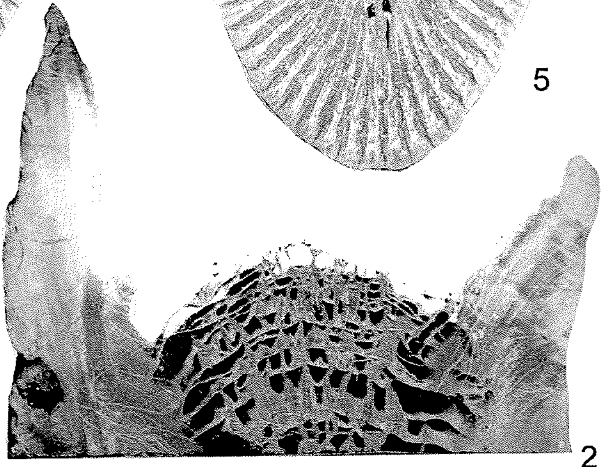

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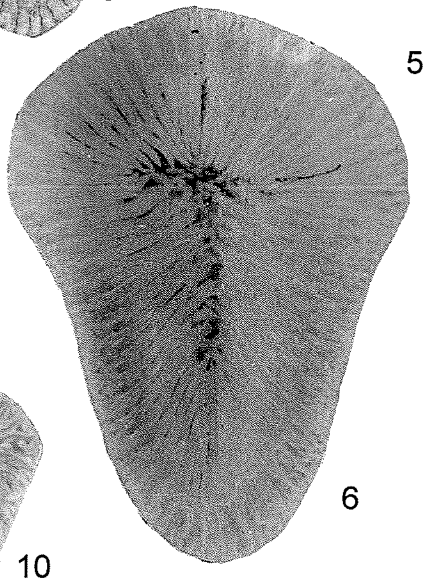
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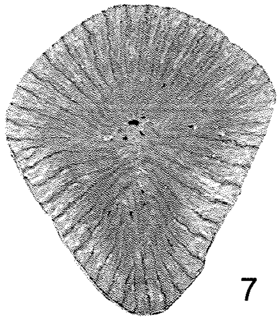
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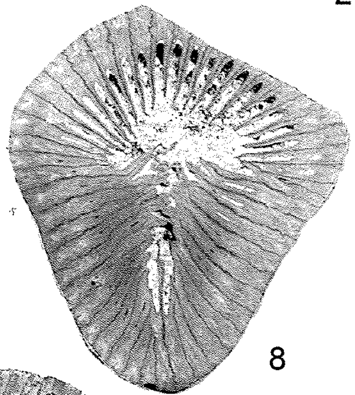
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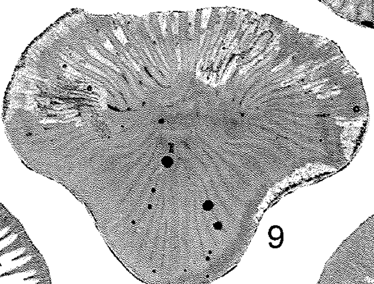
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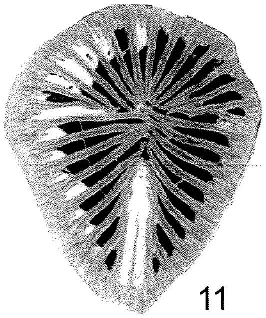
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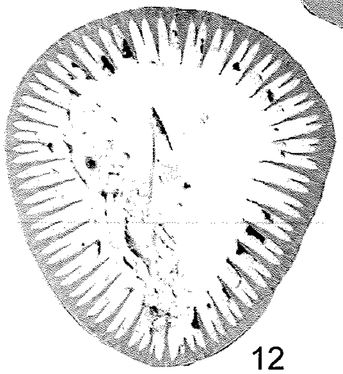
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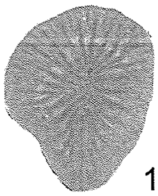
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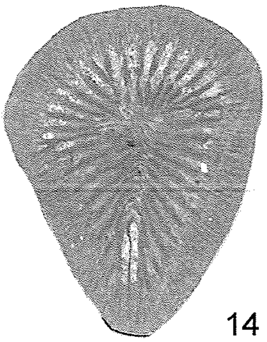
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Plate 8


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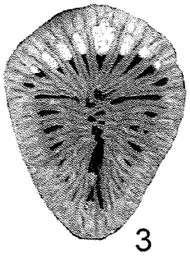
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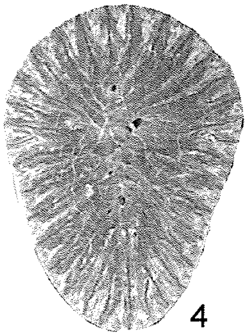
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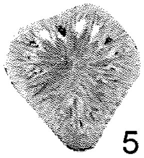
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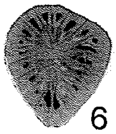
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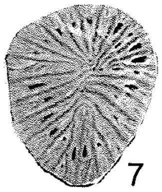
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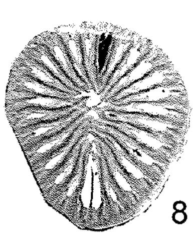
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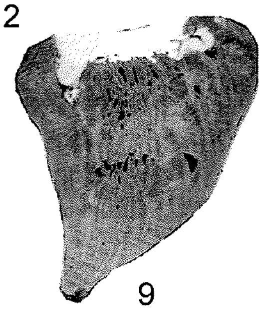
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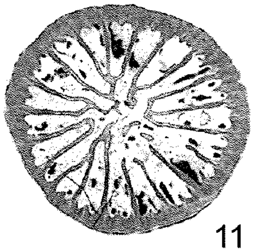
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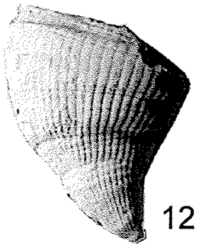
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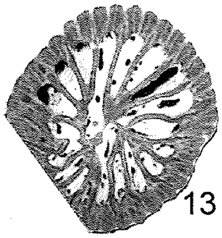
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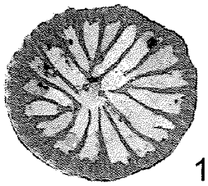
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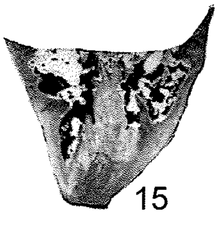
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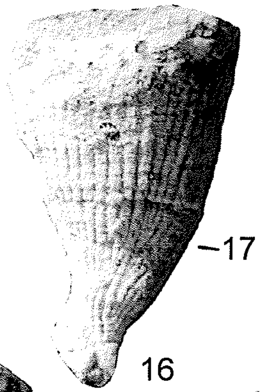

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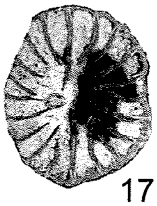
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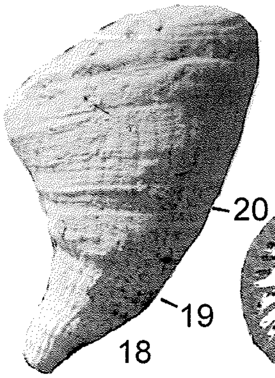

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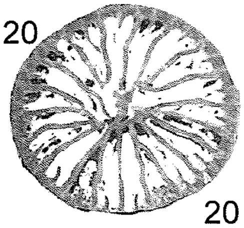
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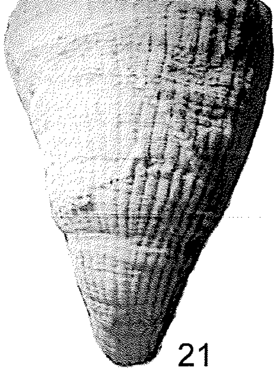
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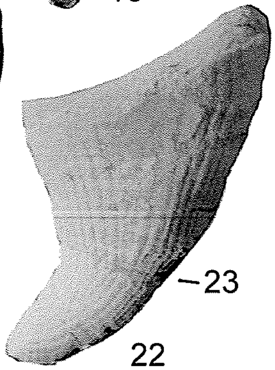

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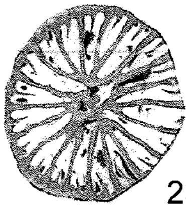
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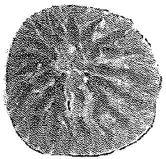
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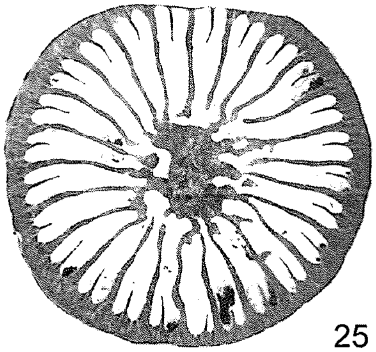
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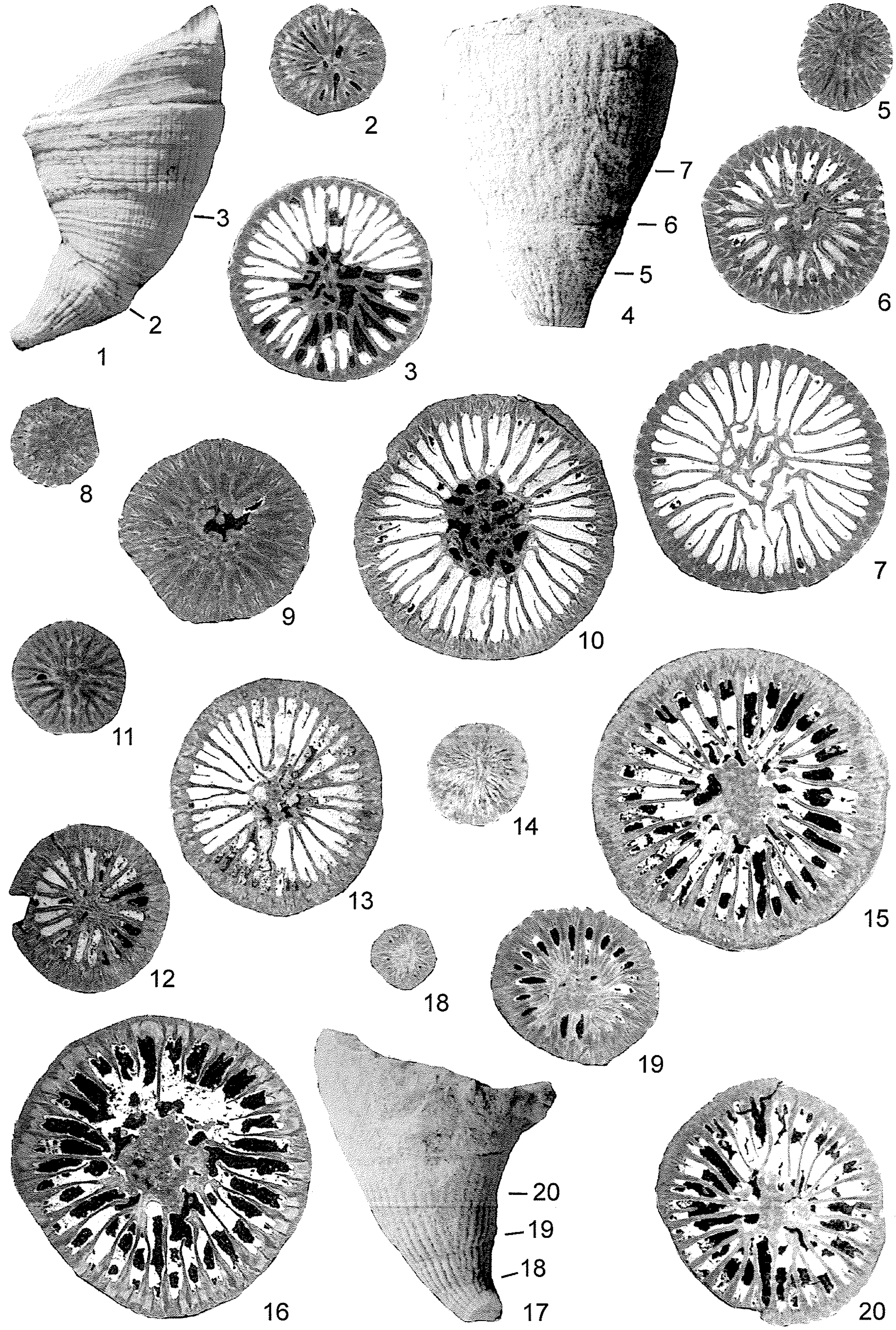
Plate 9



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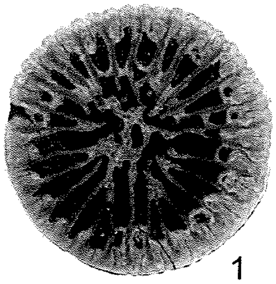
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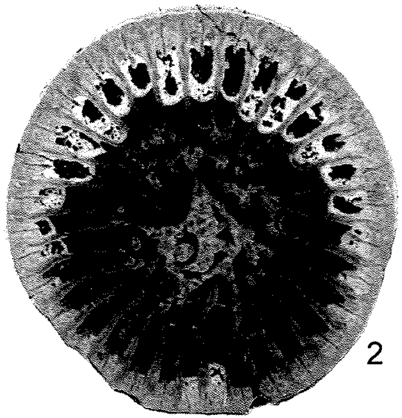
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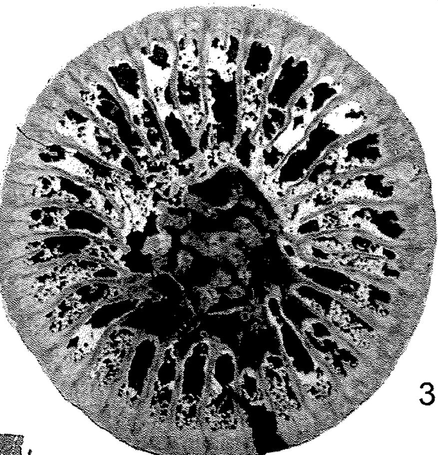
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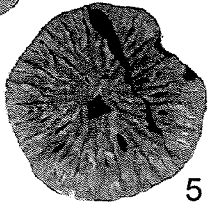
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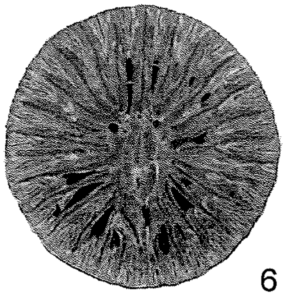
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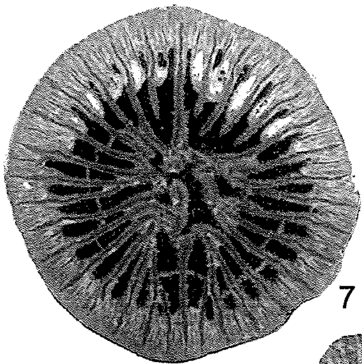
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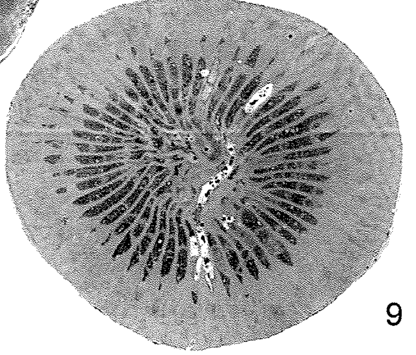
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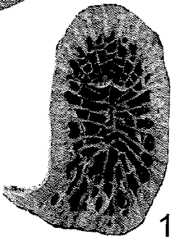
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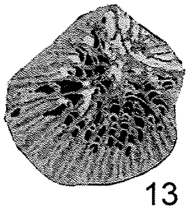
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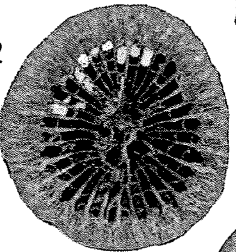
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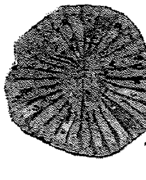
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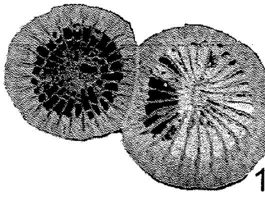
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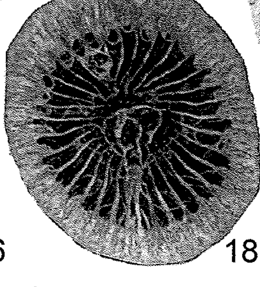
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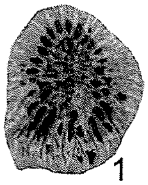
Plate 11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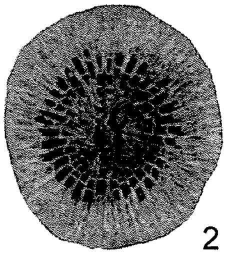
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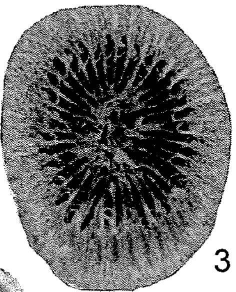
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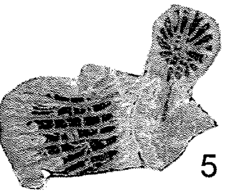
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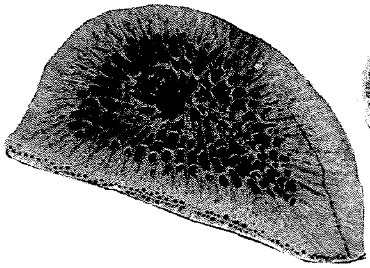
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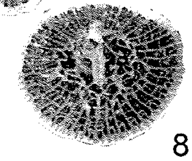
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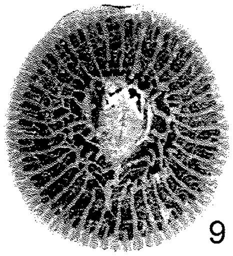
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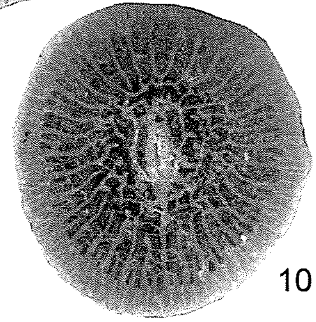
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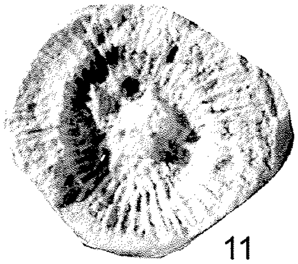
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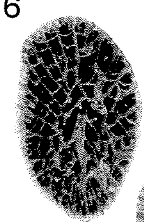
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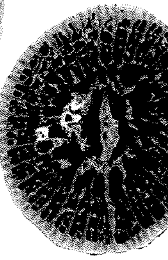
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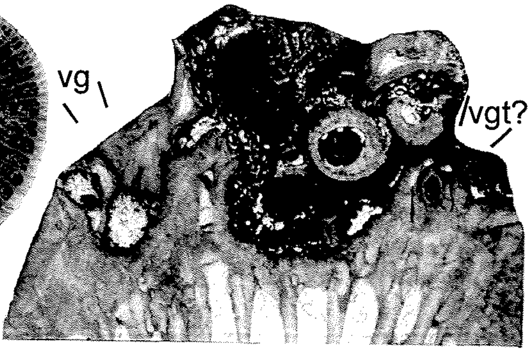

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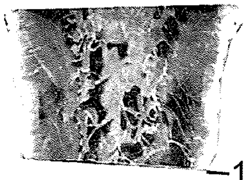

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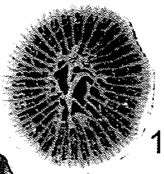
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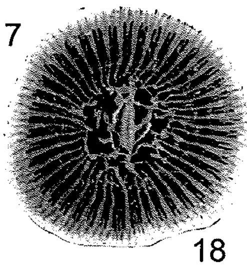
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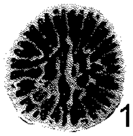
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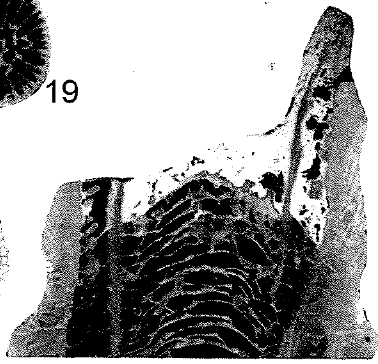

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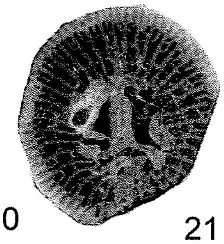
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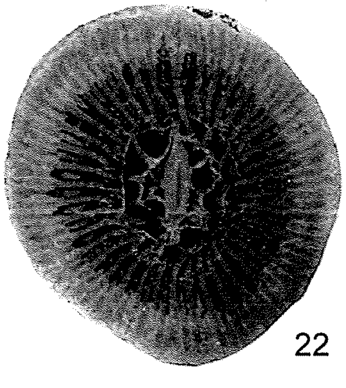
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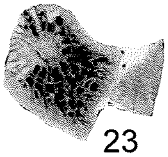
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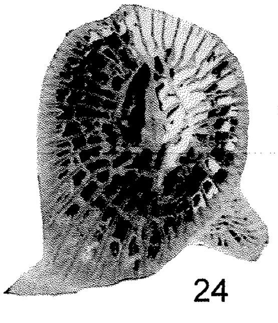
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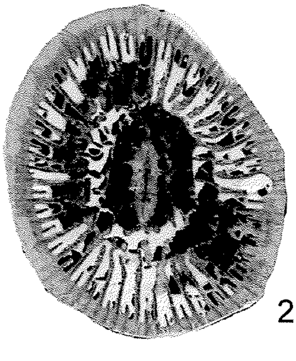
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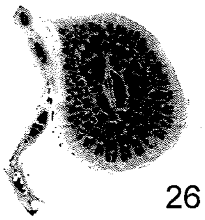
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Plate 12

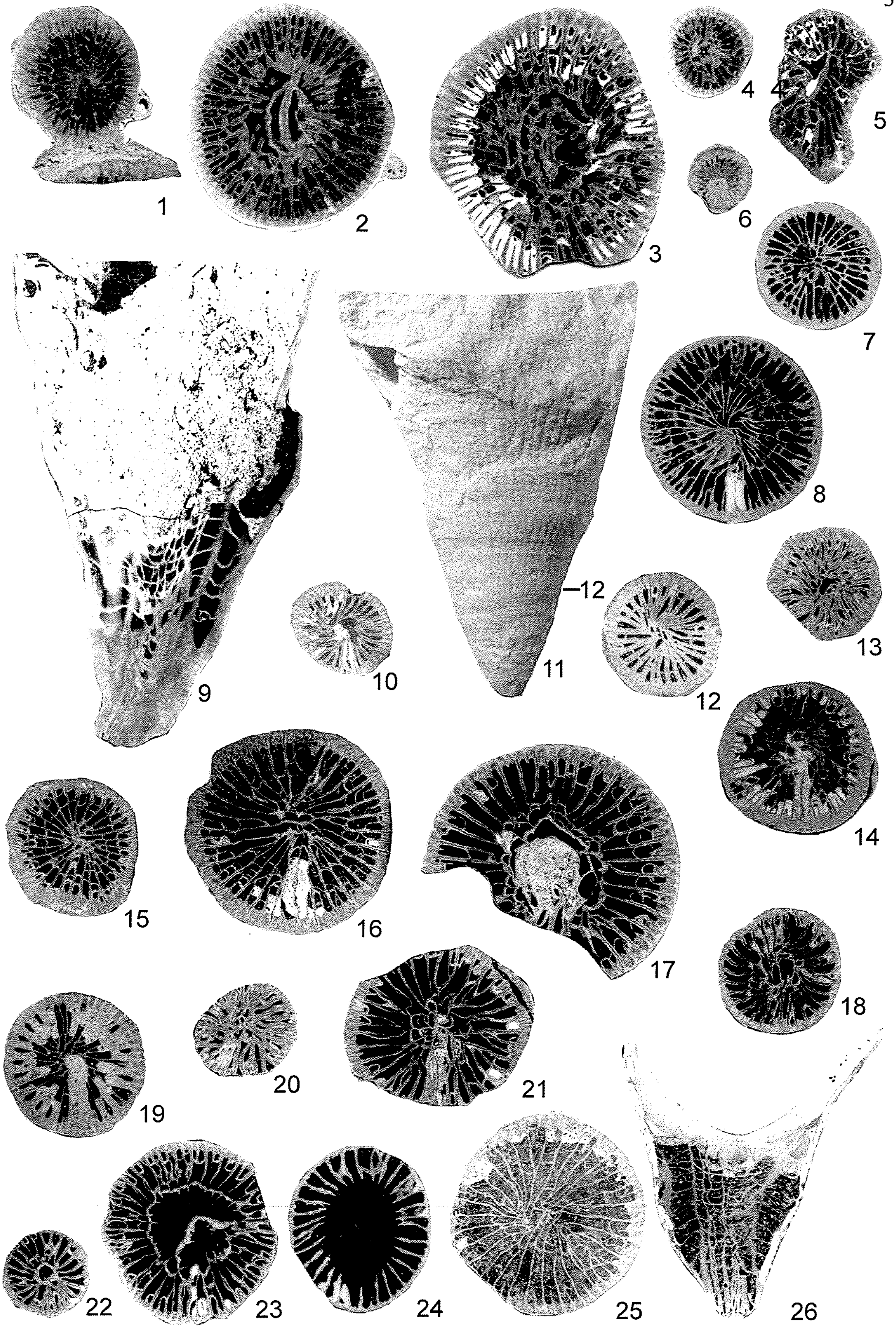
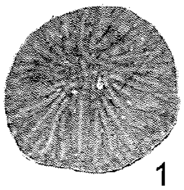


Plate 13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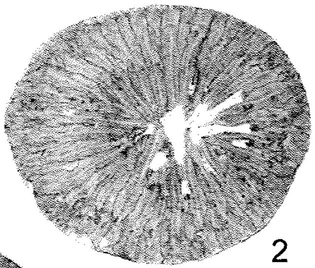
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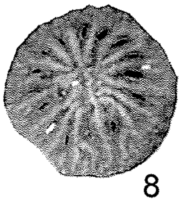
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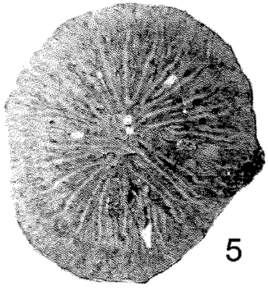
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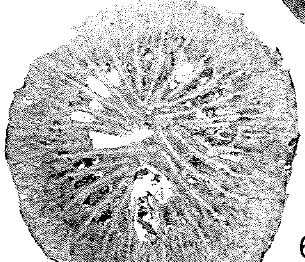
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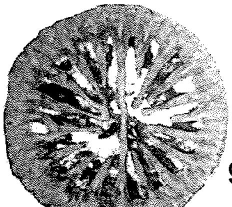
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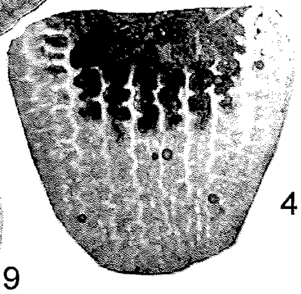
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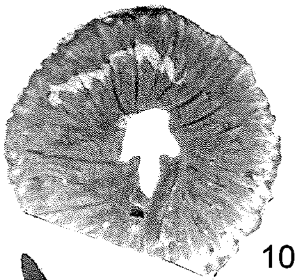
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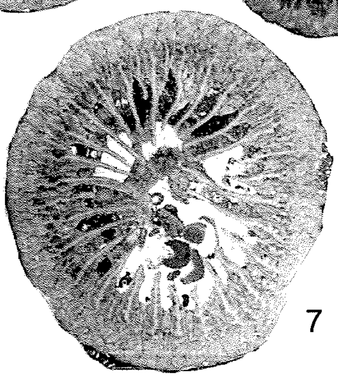
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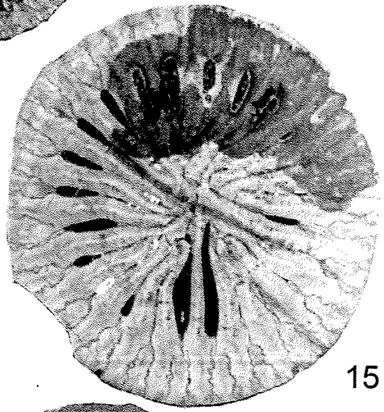
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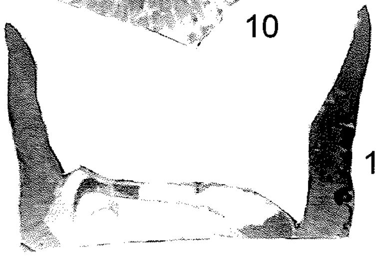
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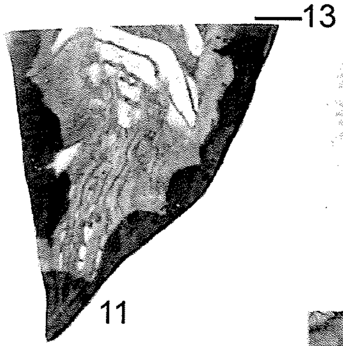

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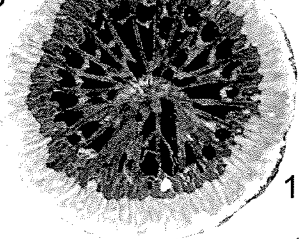
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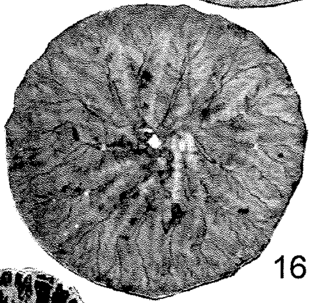
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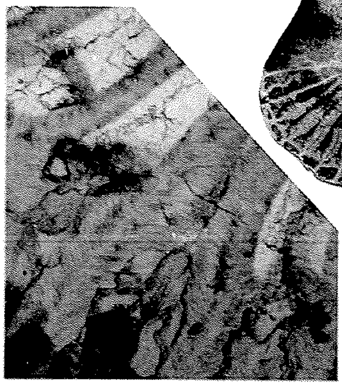
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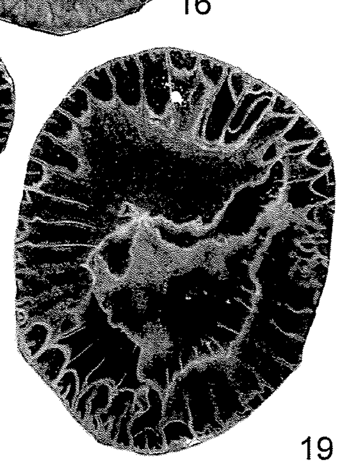
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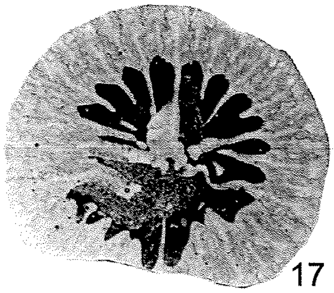
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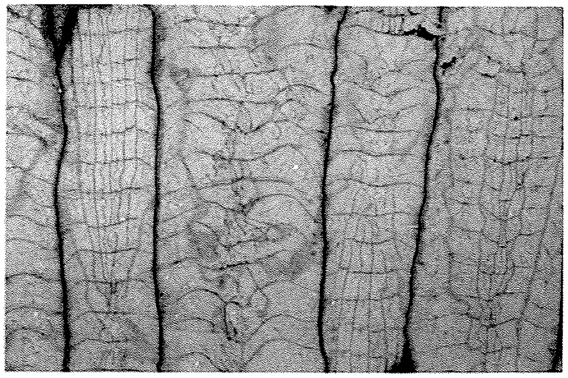
Plate 14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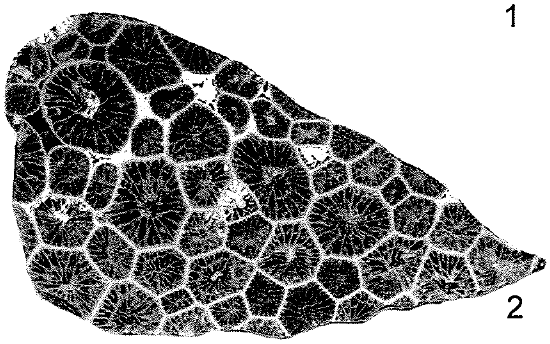
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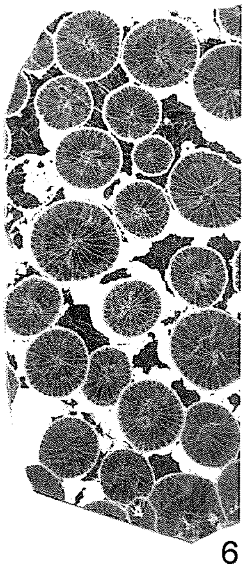
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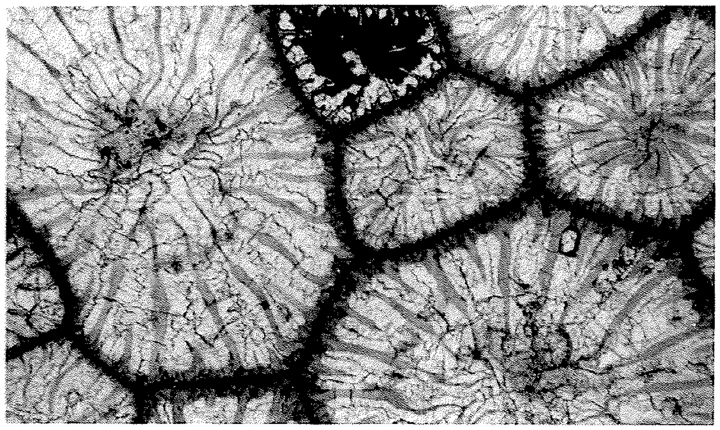
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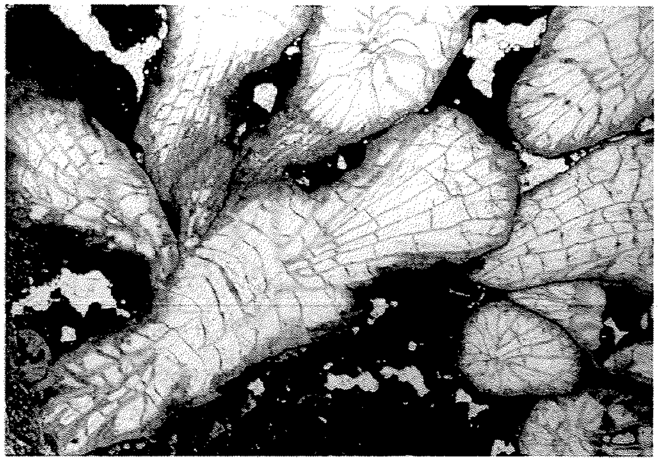
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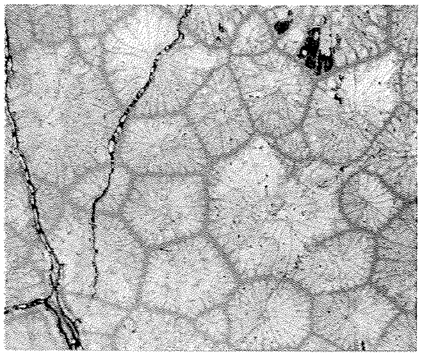
Plate 15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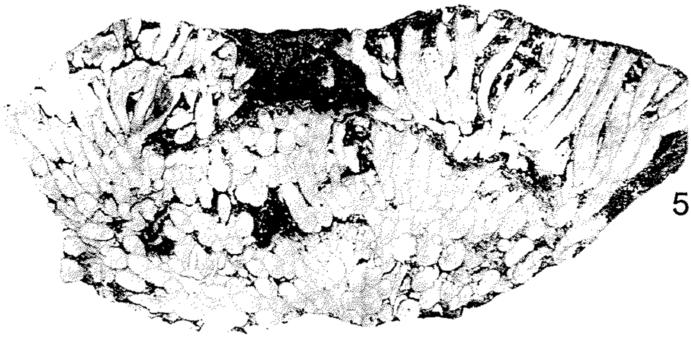
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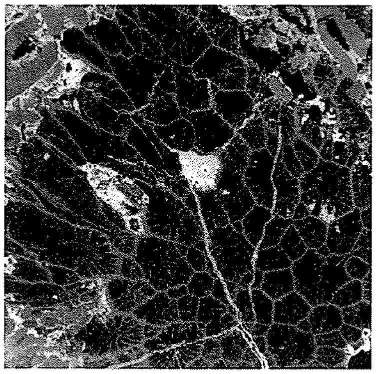
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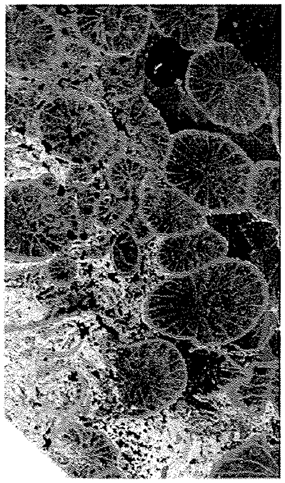

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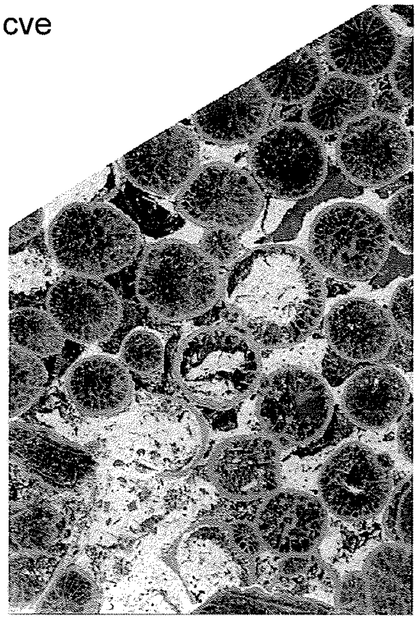
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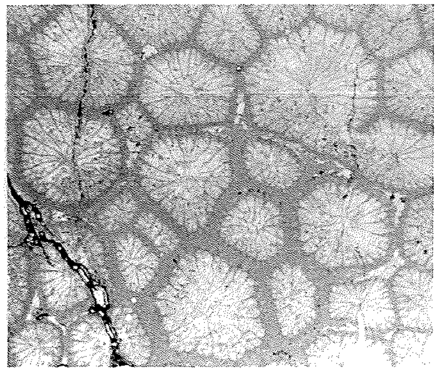
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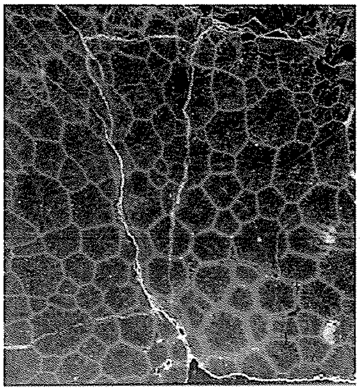
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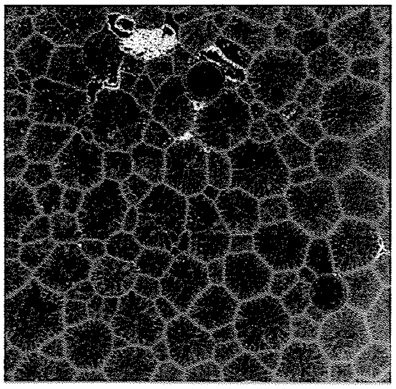
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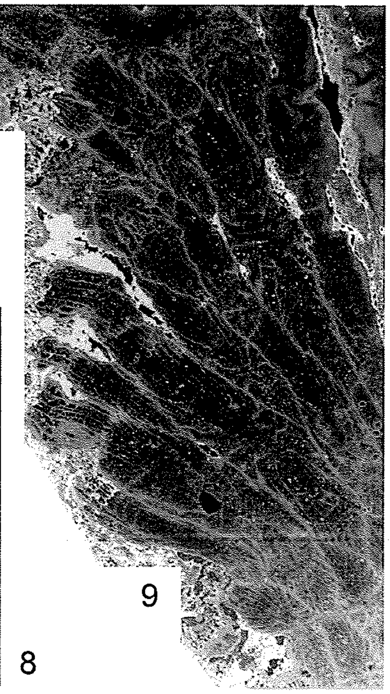
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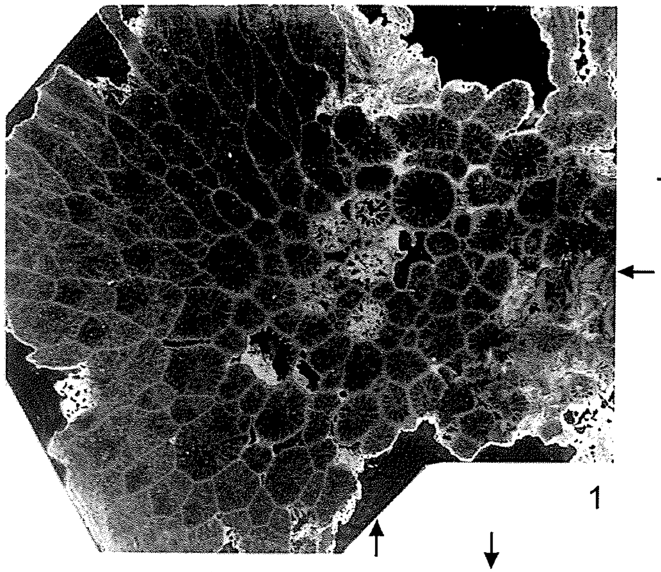
Plate 16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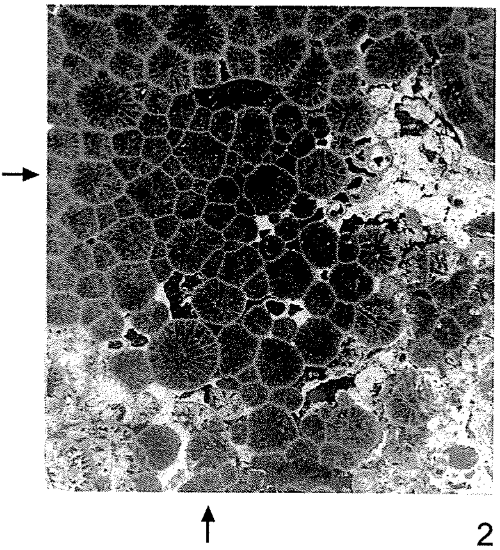
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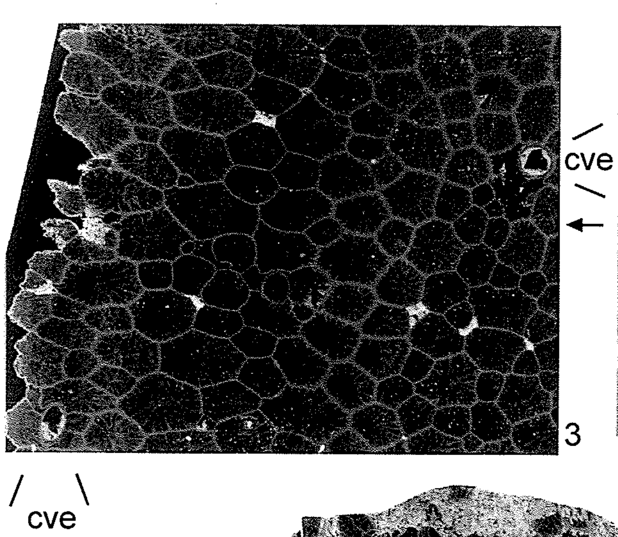

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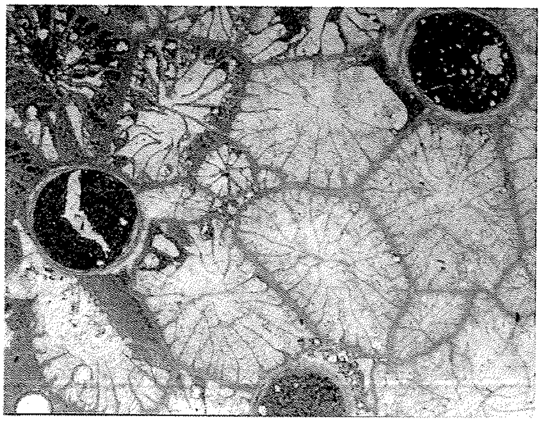
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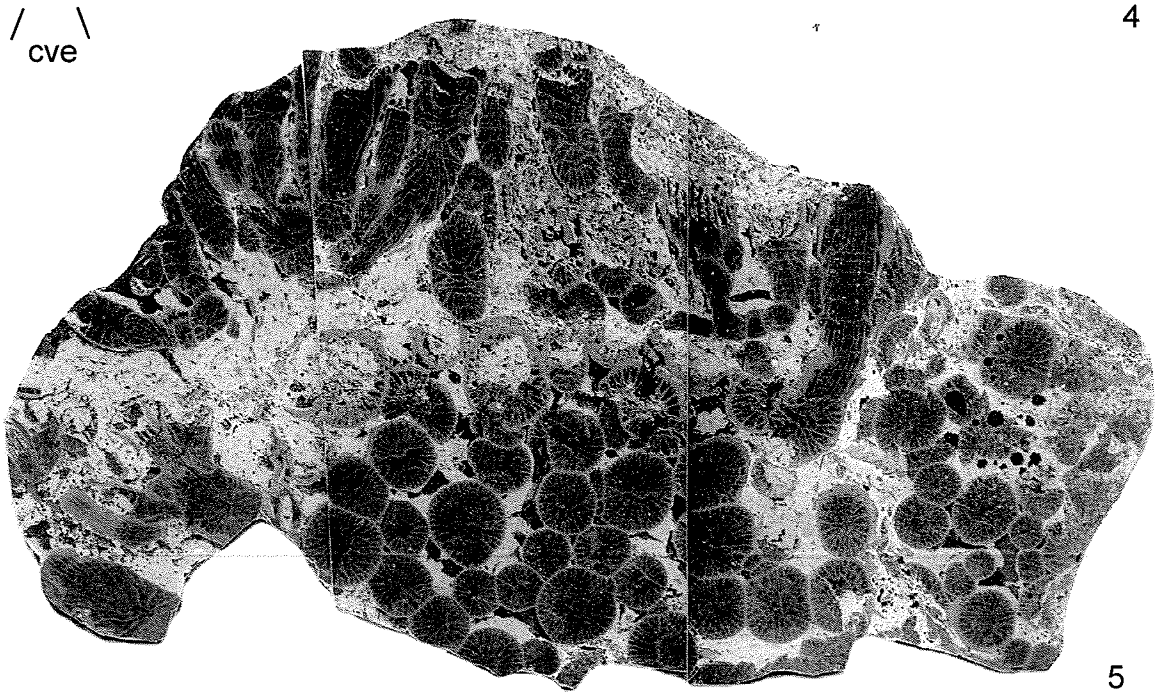
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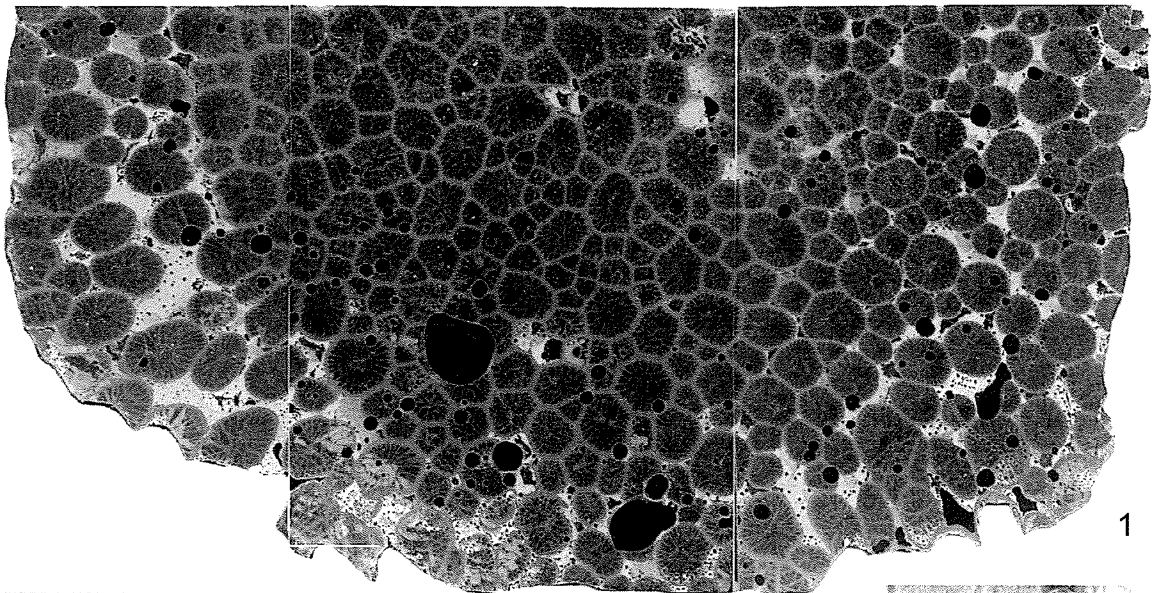
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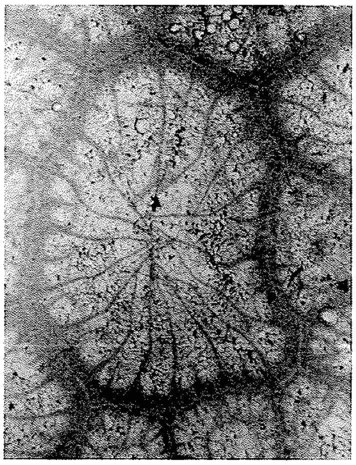
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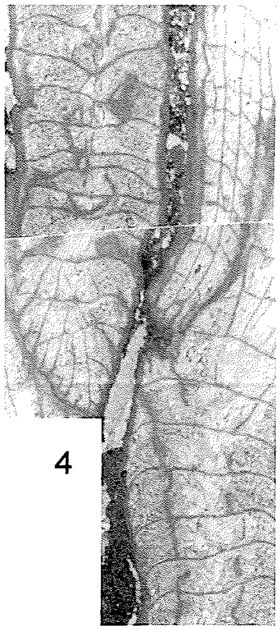
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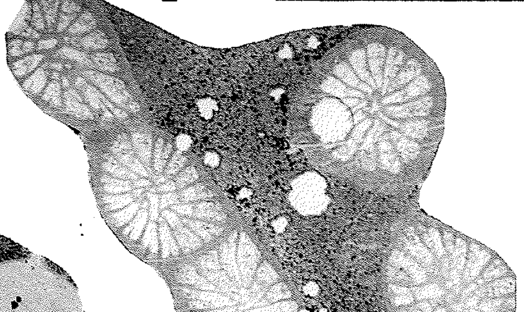
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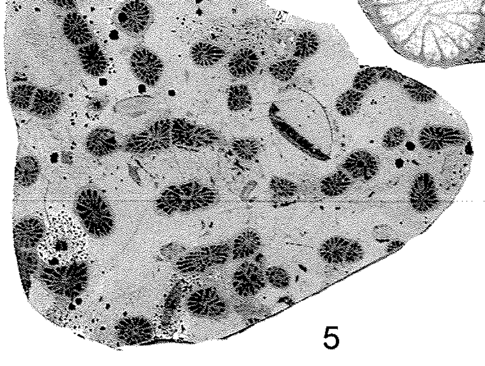
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Plate 18


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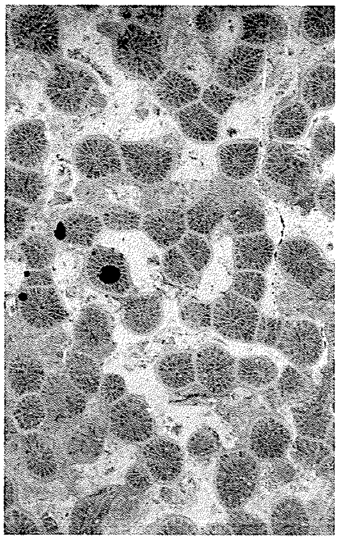
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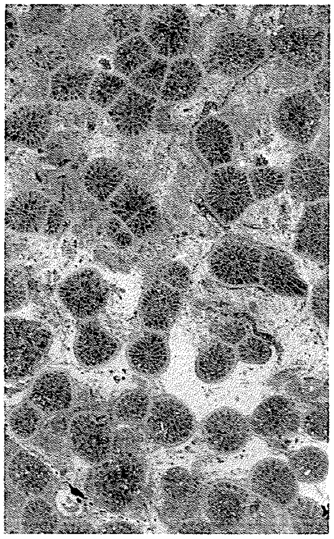
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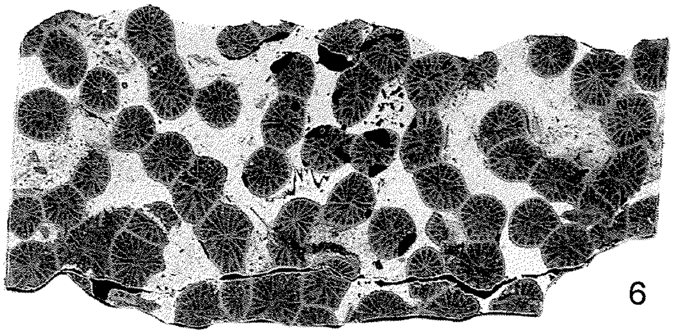
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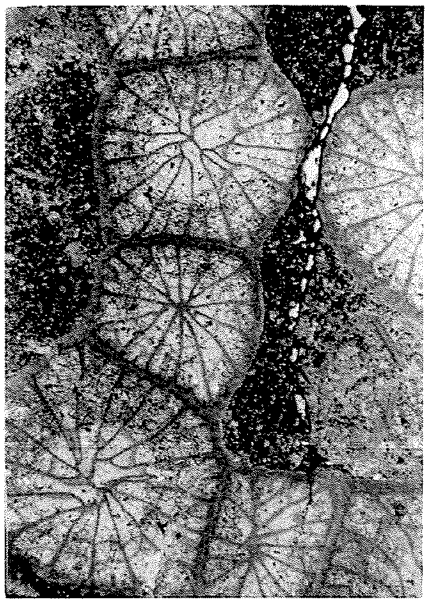
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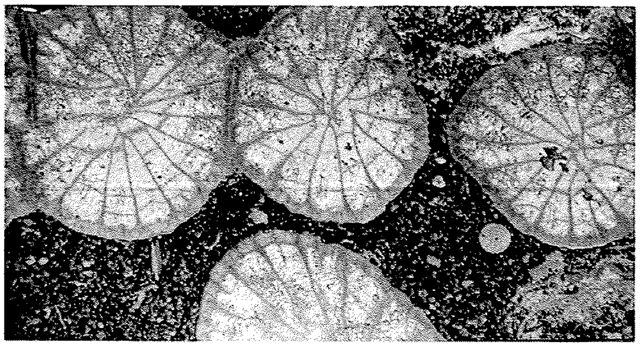

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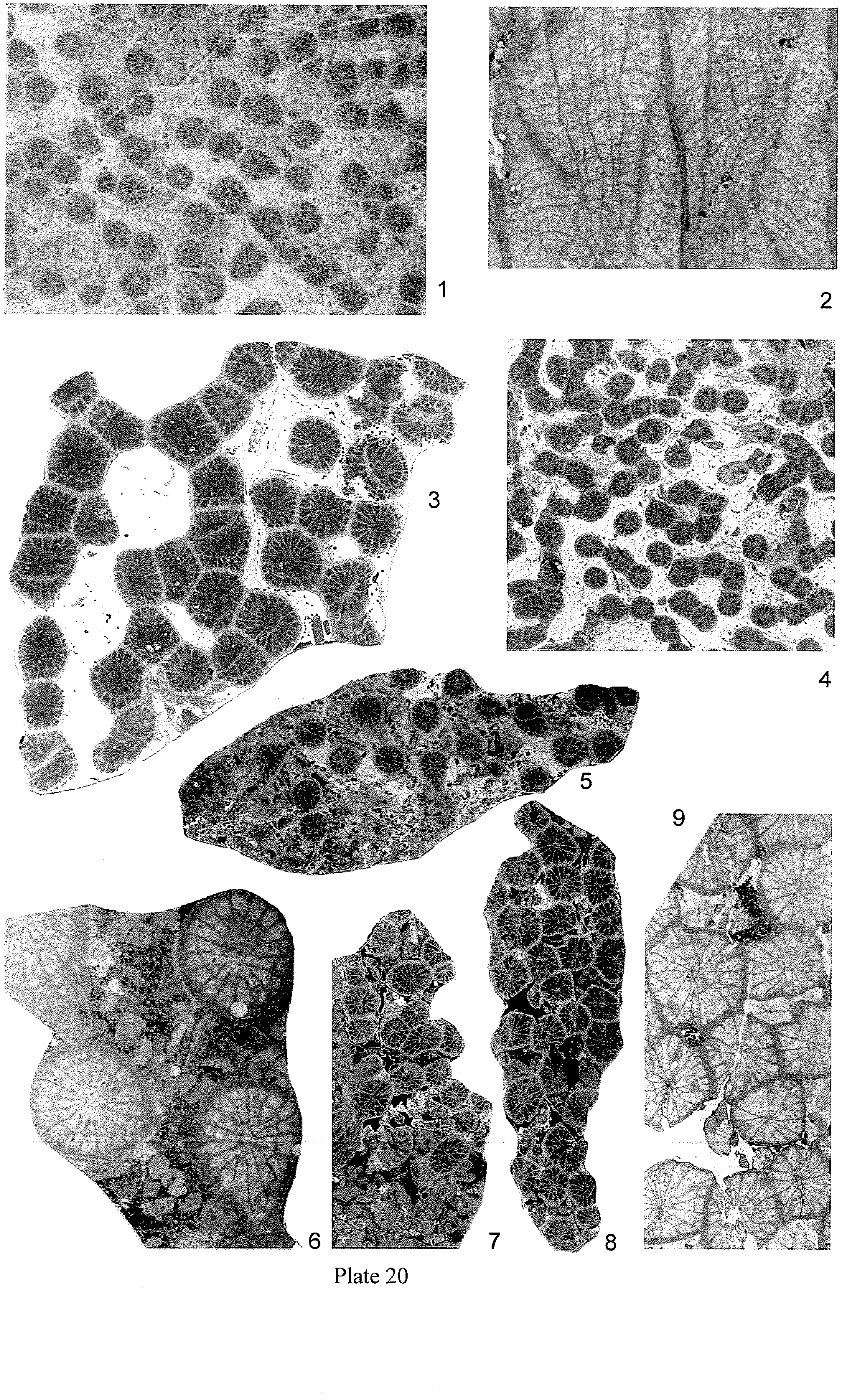

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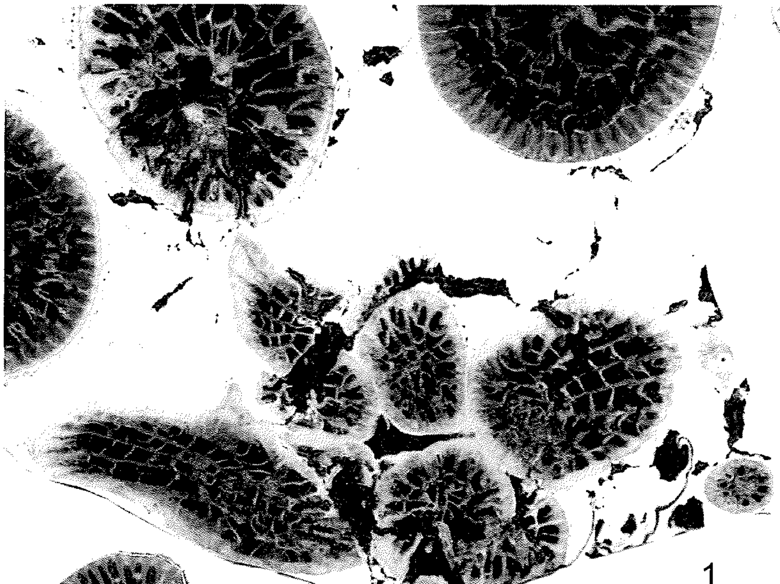

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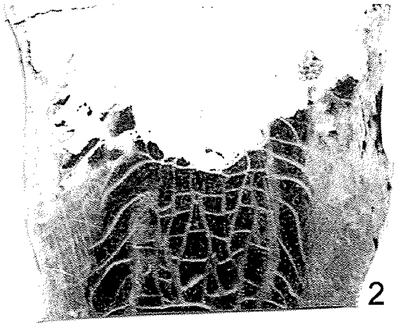

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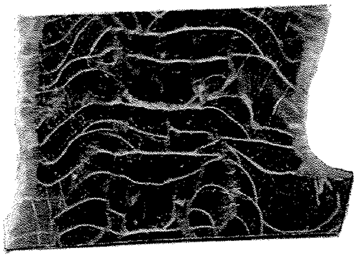

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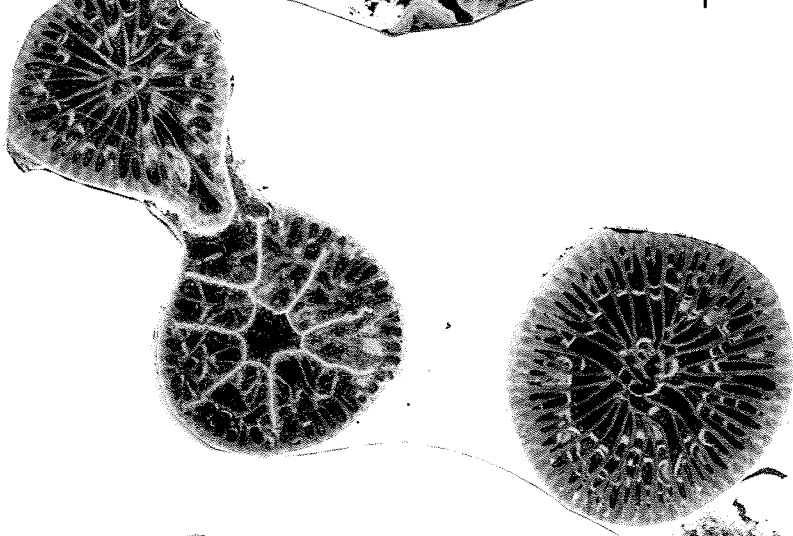

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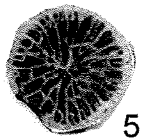

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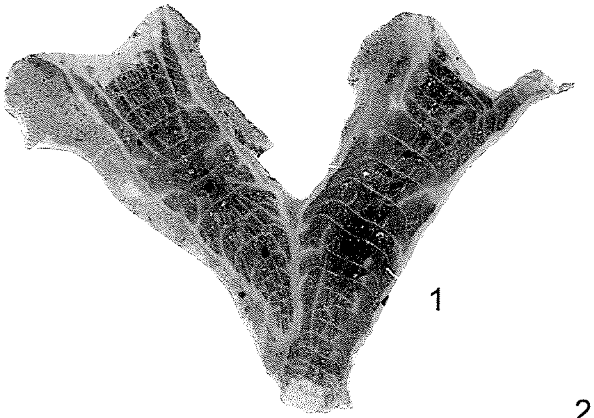
Plate 21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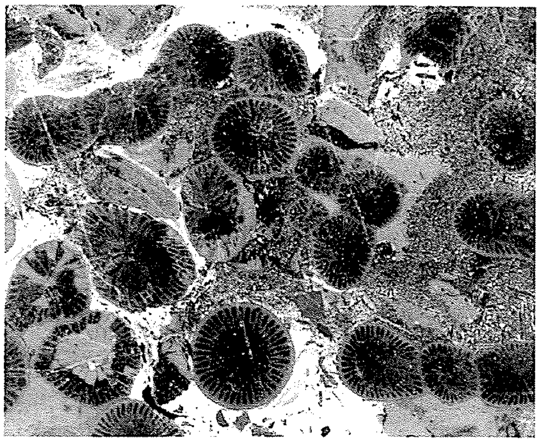
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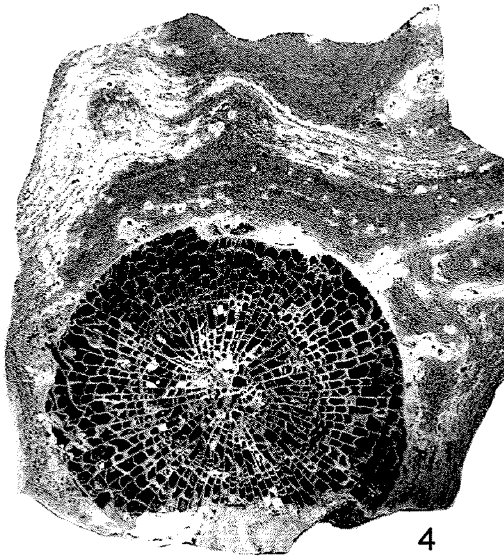
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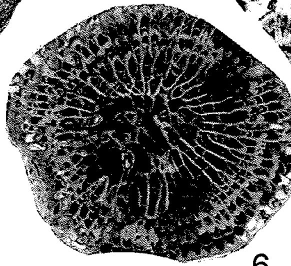
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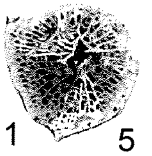
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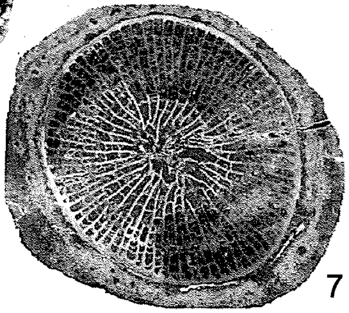
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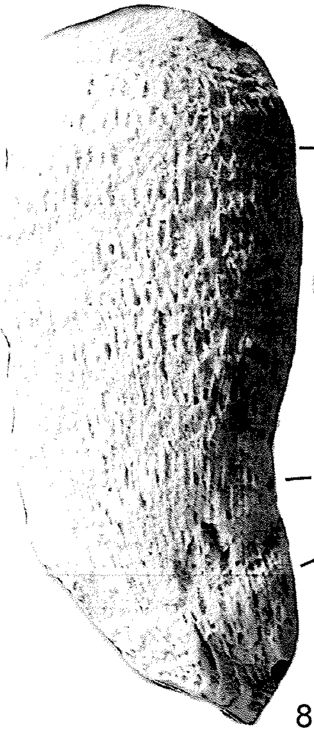
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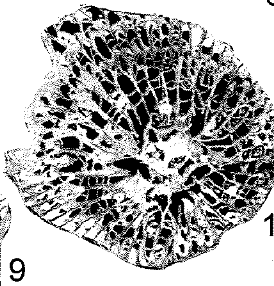
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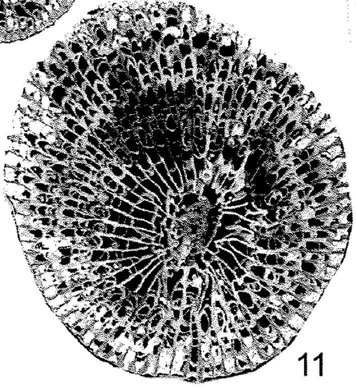
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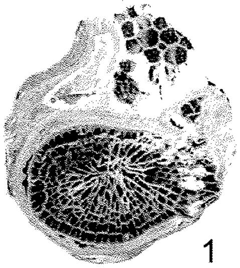
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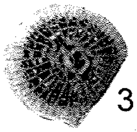
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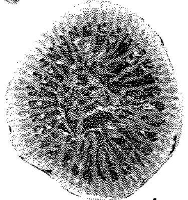
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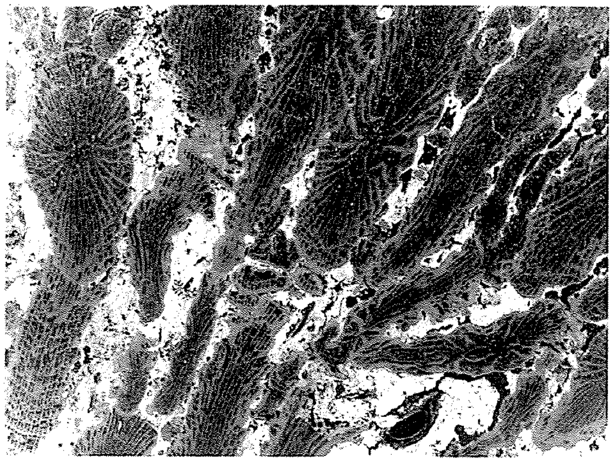
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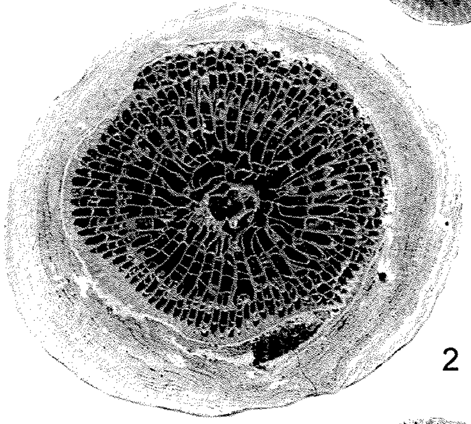
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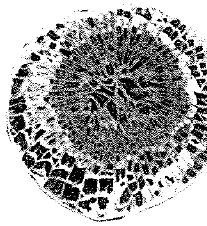
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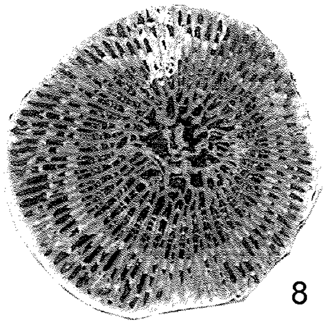
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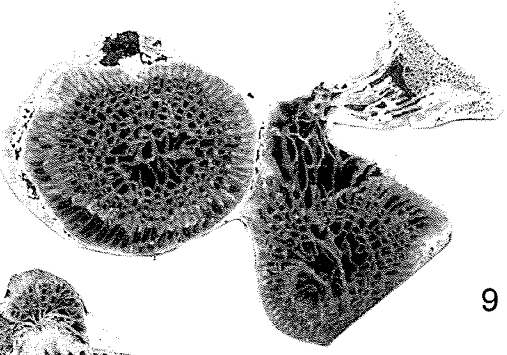
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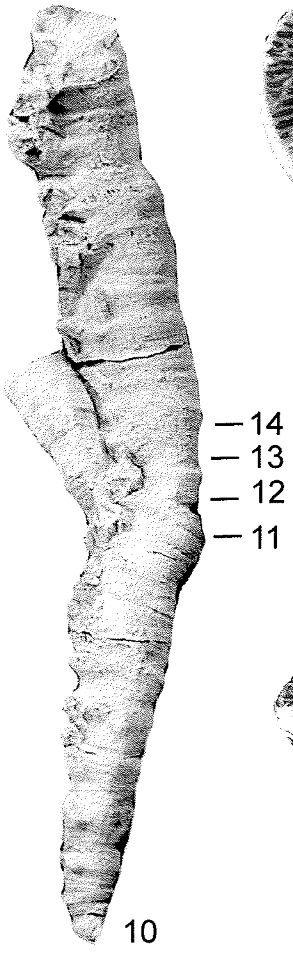

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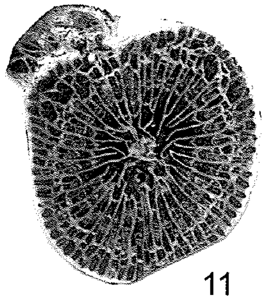
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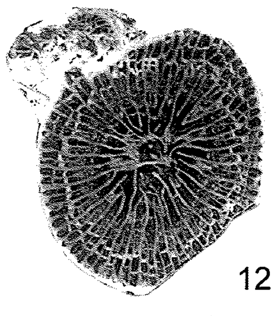
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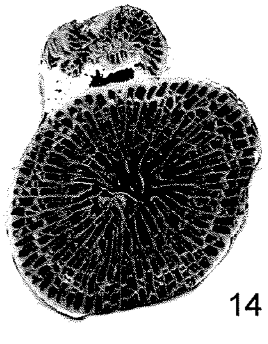
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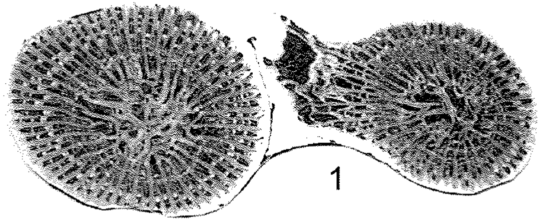

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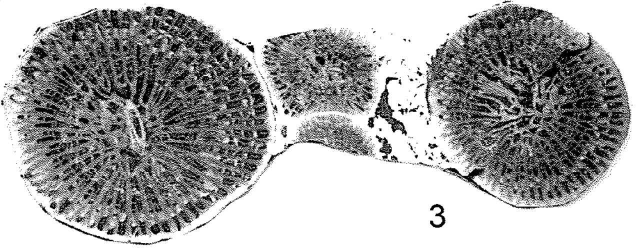

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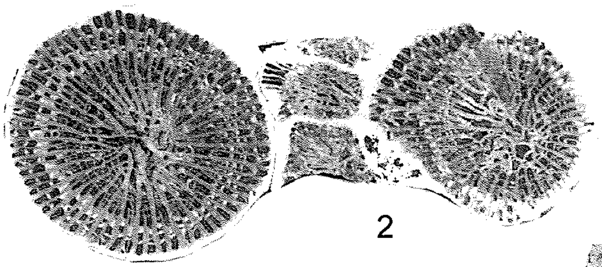

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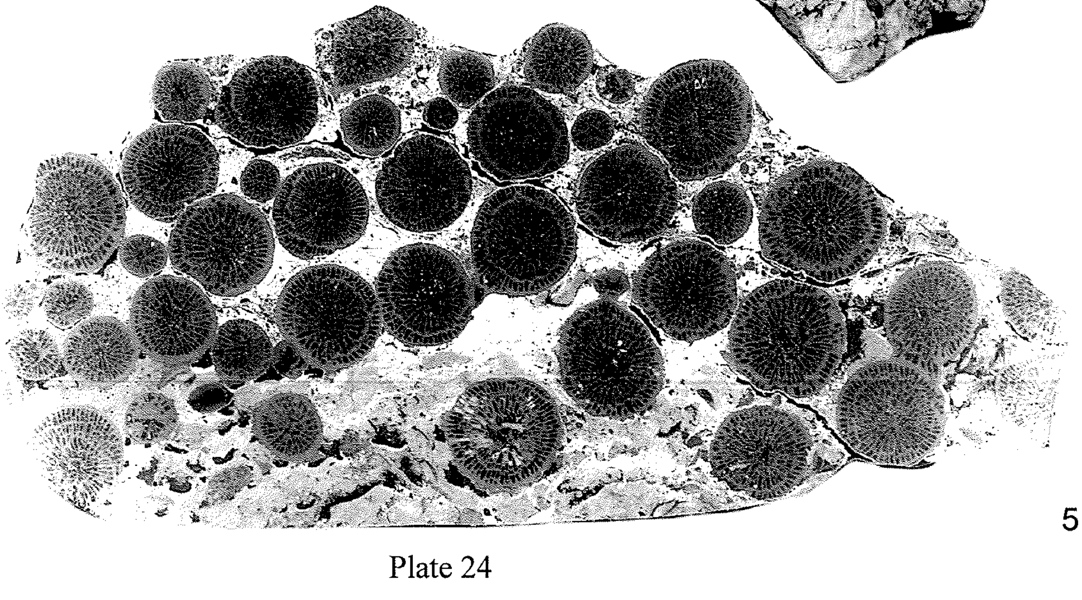

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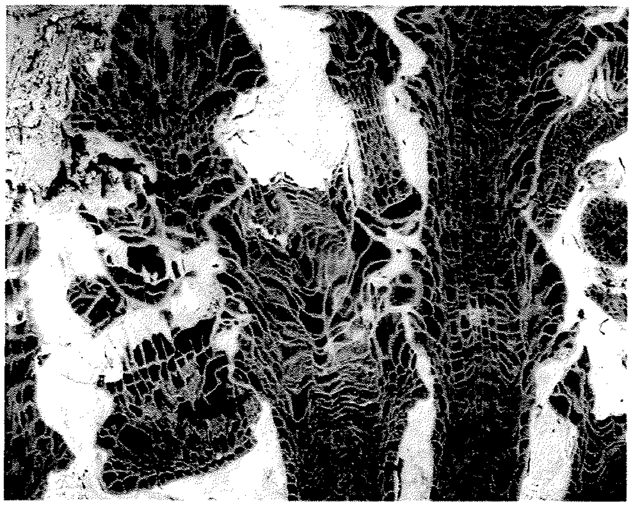

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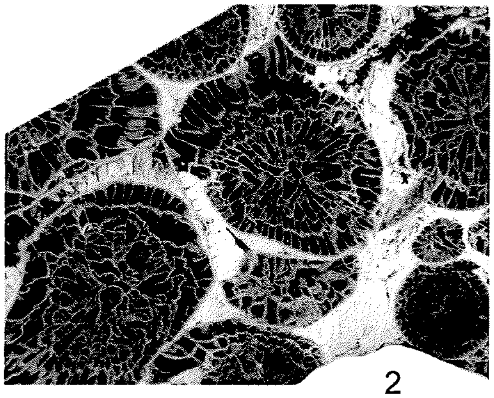

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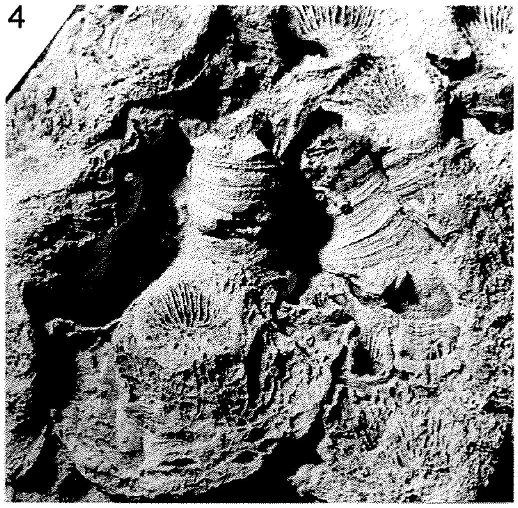

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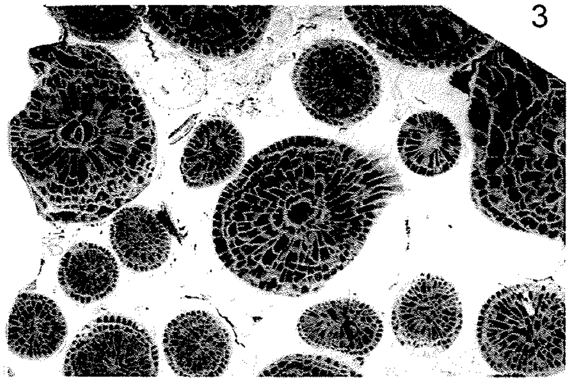

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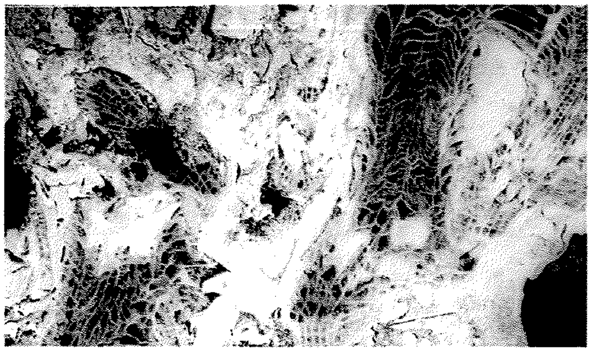

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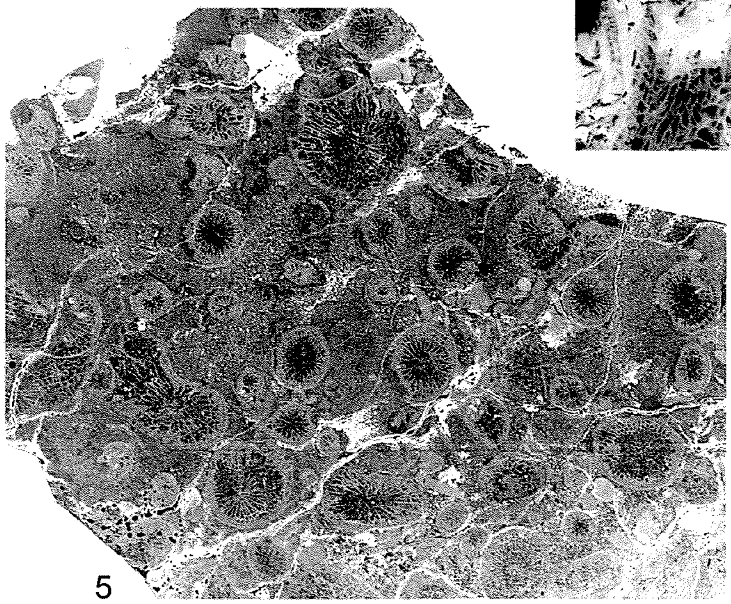

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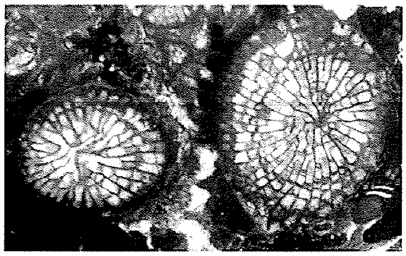

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Plate 25

APPENDIX A - FOSSIL LOCALITIES

All localities are on Anticosti Island, Québec. Information in parentheses after location description is the NTS 1:50000 map sheet number followed by the UTM coordinates (E:N). Locality number in brackets is shown in Text-figure 1. "=" denotes equivalence to another locality, "≈" denotes approximate equivalence. Member nomenclature generally follows Long and Copper (1987a); if Petryk (1981) nomenclature is used, then Long and Copper equivalent is in parentheses.

I. Collections by Dr. Allen Petryk (Québec EMR) (OPB = oncolite platform bed) see Appendix B for detail maps and stratigraphic columns.

Coll.	Location [+ Locality no.]	Stratigraphic Position
83AP11-2-8F	Pointe Laframboise (22H/16 ca. 97680:17550) [Loc. 6]	Upper 30 cm mbr. 6 (Lousy Cove), Ellis Bay Fm.
83AP11-2-12,13	see above	Basal m mbr. 1 (Fox Point), Becscie Fm.
83AP14-1F	see above	Upper 8 cm OPB, mbr. 7 (Laframboise), Ellis Bay Fm.
83AP14-1-11+	see above	Bioherm, ca. upper 50 cm, 380-430 cm above OPB, mbr. 7 (Laframboise), Ellis Bay Fm.
83AP16-1-bh	see above	Bioherm, 250-380 cm above OPB, mbr. 7 (Laframboise), Ellis Bay Fm.
83AP16-1-1B	see above	Basal m mbr. 1 (Fox Point), Becscie Fm.
83AP16-1-32'+1	see above	160 cm above base, mbr. 1 (Fox Point), Becscie Fm.
83AP17-1-bh	see above	Bioherm, 20-380 cm above OPB, mbr. 7 (Laframboise), Ellis Bay Fm.
83AP17-1-1B	see above	Basal m mbr. 1 (Fox

		Point), Becscie Fm.
83AP18-1-R3	see above	1 m above base mbr. 6 (Lousy Cove), Ellis Bay Fm.
83AP18-1-R5	see above	9 cm above OPB, mbr. 7 (Laframboise), Ellis Bay Fm.
83AP18-1-R6	see above	Basal m mbr. 1 (Fox Point), Becscie Fm.
83AP18-1-R7 and 83AP11-2	see above	Bioherm, 10-30 cm above OPB, mbr. 7 (Laframboise), Ellis Bay Fm.
83AP19-1	see above	317-564 cm above base, mbr. 1 (Fox Point), Becscie Fm.
83AP20-2'-102	see above	475 cm above base, mbr. 1 (Fox Point), Becscie Fm.
83AP20-3	see above	612-681cm above base, mbr. 1 (Fox Point), Becscie Fm.
83AP22-1-15	Cap Henri (22H/16 00500-00600: 16500-7150) [Loc. 8]	OPB, lower 16 cm, mbr. 7 (Laframboise), Ellis Bay Fm.
83AP23-1	see above	Bioherm, 130-219 cm above base of mbr. 7 (Laframboise), Ellis Bay Fm.
83AP24-2	see above	246-355 cm above base, mbr. 1 (Fox Point), Becscie Fm.
83AP29-1	see above	550-603 cm above base, mbr. 1 (Fox Point), Becscie Fm.
83AP33-1	see above	711-780 cm above base, mbr. 1 (Fox Point), Becscie Fm.
84AP19-1	see above	904-962 cm above base, mbr. 1 (Fox Point), Becscie Fm.

1.9.75-3	O/S boundary section NE coast (12F/5 ca. 83080:63440) [Loc. 44] ≈ FP-B, A313	Fox Point Mbr., Becscie Fm.

II. Collections by Dr. Paul Copper (Laurentian University) (BH = biohermal)

Coll.	Location [+ Locality no.]	Stratigraphic Position
A4	LaLoutre road, roadside outcrop, 4.2 km S of main road (12E/13 54350:12850) [Loc. 19a]	Prinsta Mbr., Ellis Bay Fm.
A5	Beaver Cove road, 3.2 km NE of main road (12E/14 73740-70:11950-12000) [Loc. 24]	Mill Bay Mbr. (BH), Vauréal Fm.
A14	Main road, 1.1 km S of Beaver Cove road (12E/14 73400:10850) [Loc. 24a]	Mill Bay Mbr. (BH), Vauréal Fm.
A35	Havre du Brick road, roadside outcrop (12E/8 46100:75450) [Loc. 20]	Homard Mbr. (?),Vauréal Fm.
A36	Ste. Marie River road, roadside outcrop (12E/13 37150:17600) [Loc. 17a]	Prinsta Mbr., Ellis Bay Fm.
A41	W side, Ellis Bay, coastal outcrop (22H/16 00550:16500) ≈ 83AP23-1 [Loc. 8]	Laframboise Mbr. (BH), Ellis Bay Fm.
A42	Jupiter River road, 3.2 km S of main road (12E/11 73750:02600) [Loc. 21]	Prinsta Mbr. (near base), Ellis Bay Fm.
A72	Gravel road E of Jupiter River road (12E/11 74560:04780) [Loc. 25]	Lousy Cove Mbr. (?), Ellis Bay Fm.
A74	Junction Cliff section, limestones in upper part of cliff (22H/16 96160-80:19840-20020) = C718, ≈ CVP-EB2 [Loc. 5a]	Velleda or basal Prinsta Mbr., Ellis Bay Fm.
A80	Tote road, roadside outcrop, 1.3 km S of main road (12E/12 84280:04780) [Loc. 26]	Mill Bay Mbr. (BH), Vauréal Fm.
A85	*Parastrophinella* bluff E of Junction Cliff shaly units near top (22H/16 96870:18950)	Middle Prinsta Mbr., Ellis Bay Fm.

	[Loc. 5a]	
A86	Pointe Laframboise, type section (22H/16 97850:17300) (see Appendix B for equivalents) [Loc. 6]	Laframboise Mbr. (BH), Ellis Bay Fm.
A96	Tidal flats, E side Becscie River mouth (22H/9 24380-540:06670-700) [Loc. 15]	Chabot Mbr., Becscie Fm. (*Virgiana* community type locality)
A97	Bluffs, E side Becscie River mouth bay (22H/9 24780:06550) [Loc. 15]	ca. 2 m above A96
A135	Bluffs, S side Prinsta River mouth (12F/5 74480:66450) [Loc. 41]	Basal Prinsta Mbr., Ellis Bay Fm.
A140	N side Fox Bay, coastal outcrops (12F/5 85060:60370) [Loc. 44]	Basal Chabot Mbr., Becscie Fm.
A142	First cove S of Fox Point, coastal bluff (12F/5 84750:62130) [Loc. 44]	Fox Point Mbr., Becscie Fm.
A144	First cove N of Fox Point, coastal bluff (12F/5 84170-280:62830-910) [Loc. 44] ≈ FP-B	Fox Point Mbr., Becscie Fm. (ca. 5 m above O/S boundary)
A146	Ruisseau aux Algues area N of Fox Point (12F/5 82940:63560) ≈ FP-EB7 [Loc. 44]	Laframboise Mbr. (BH), Ellis Bay Fm.
A149	Reef Point S side Fox Bay outcrop on headland (12F/5 87080:58180) [Loc. 45]	Upper few m Chabot Mbr., Becscie Fm.
A219	NW side Lousy Cove (12F/5 80850-70: 64880-950) [Loc. 43] ≈ LC-PM	1.05-2.90 m above base, Prinsta Mbr., Ellis Bay Fm.
A292	Tidal flats W of Petite Riviere (22H/9 13440:09970) [Loc. 14]	Chabot Mbr., Becscie Fm.
A313	O/S boundary section NE coast (12F/5 83080:63440) [Loc. 44] ≈ FP-B	Basal 2 m, Fox Point Mbr., Becscie Fm., directly above oncolite bed
A357(1)	Coastal section S of Table Head lighthouse	Nodular shale, 2-5 m above

	(12F/5 80850:65000) [Loc. 42]	base, Prinsta Mbr., Ellis Bay Fm.
A359	Prinsta Point section, NE of Prinsta River mouth (12F/5 74280:67620) [Loc. 41]	Basal 1.65 m, Prinsta Mbr., Ellis Bay Fm.
A362	= A135 [Loc. 41]	
A364(1)	First outcrop W of Schmitt Creek (12E/8 64700-65800:69600-70200) ≈ MB-SC (Loc. 39)	Basal Schmitt Creek Mbr., Vauréal Fm.
A423	Riviere Trois Milles, S of Menier airport, south bank (22H/15 07700:20160) [Loc. 9c]	Grindstone Mbr., Ellis Bay Fm.
A430	Anse aux Fraises, tidal flat outcrops (22H/16 95540:21130) [Loc. 4]	~3.35 m above base, Grindstone Mbr., Ellis Bay Fm.
A435	Junction Cliff (22H/16 96150:19750) ≈ CVP [Loc. 5]	Basal 1-2 m, Velleda Mbr., Ellis Bay Fm.
A436	Pointe Laframboise (22H/16 97680-720: 17550-650) (see Appendix B for equivalents) [Loc. 6]	Laframboise Mbr. (BH), Ellis Bay Fm.
A438	*Parastrophinella* bluff SE of Junction Cliff (22H/16 96650:19540) [Loc. 5]	Lower Prinsta Mbr., Ellis Bay Fm.
A439	Junction Cliff section resistant limestones (22H/16 96100:19750) ≈ CVP [Loc. 5]	Basal 1.0-1.2 m, Velleda Mbr., Ellis Bay Fm.
A442	Tidal flats, Pointe Laframboise (22H/16 ca. 97700:17600) (see Appendix B for equivalents) [Loc. 6]	Laframboise Mbr. (BH), Ellis Bay Fm.
A466	Lousy Cove, N side (12F/5 80900:64850) ≈ LC-PM [Loc. 43]	Lower Prinsta Mbr., Ellis Bay Fm.
A468a	Cliffs S of Table Head lighthouse (12F/5 80450:66180) [Loc. 42]	Lowest Velleda or uppermost Grindstone Mbr., Ellis Bay Fm.

A504	Roadside outcrop, NW of 24 mile bridge Jupiter River road (12E/11 68100:99100) [Loc. 23]	Upper Chabot Mbr., Becscie Fm.
A590	Schmitt Creek, W bank (12E/8 66520: 68160) [Loc. 40]	Basal Fox Point Mbr., Becscie Fm.
A595	NW side Lousy Cove (12F/5 80920: 64800) ≈ LC-PM [Loc. 43]	Basal 1-2.5 m, Prinsta Mbr., Ellis Bay Fm.
A737	Naciscotek road, clearing 6.9 km E of main road (12E/10 32400:84300) =? POR-BH [Loc. 33]	Laframboise Mbr. (BH), Ellis Bay Fm.
A738	Pointe Laframboise, type locality of mbr. (22H/15 97700:17400) (see Appendix B for equivalents) [Loc. 6]	Laframboise Mbr. (BH), Ellis Bay Fm.
A743	N bank Salmon River (12E/8 44410: 71910) [Loc. 38]	Laframboise Mbr. (BH), Ellis Bay Fm.
A843	Salmon Road, 1.7 km E of river intersection (12E/7 26270:75500) [Loc. 32]	Chabot Mbr., Becscie Fm.
A892	Homard Road, 10.2 km E of Lac Poulin road junction (12E/8 46100:75450) [Loc. 36]	Laframboise Mbr., Ellis Bay Fm.
A894	Homard Road (12E/8 46750:75560) [Loc. 37]	1-2 m above oncolite bed, Laframboise Mbr., Ellis Bay Fm.
A902	Homard Road (12E/8 39540:76450) [Loc. 34]	Basal Fox Point Mbr., Becscie Fm.

III. Elias and Summer 1994 Collections

Coll.	Location [+ Locality no.]	Stratigraphic Position
B-B2	Tidal flat and cliffs, W side Becscie River mouth (22H/9 21250-600:06950-07100) [Loc. 15]	Mbr. 2 (Chabot), Becscie Fm.

BMac-V	Cliff and tidal flat W of Baie MacDonald at Nid des Corbeaux (12E/14 94450-750: 12050-12200) [Loc. 27]	Tower? Mbr., Vauréal Fm.
CA-B1	Cliff section at Cap à l'Aigle (22H/16 04750:15100) [Loc. 11]	Lower mbr. 1 (Fox Point), Becscie Fm.
Carl-V	Coastal outcrop W of Pointe Carleton (12E/10 03800:08750) [Loc. 28]	Lavache Mbr., Vauréal Fm.
CA-V	Cliffs at Cap Anglais, 200-400 m N of lime kiln (22H/16:93100:28750-92800:28600) [Loc. 3]	Homard Mbr., Vauréal Fm., ca. 8 m of section
CAS-V	Coastal outcrop S of Cap Anglais below campground (22H/16 92700: 28450-92700:28150) = SCA-V [Loc. 3a]	Homard Mbr., Vauréal Fm., same level as CA-V
CB(EB3)	Cliff section E of Cap Blanc (22H/16 03400-600:18200-50) [Loc. 9a]	Mbr. 3 (Prinsta), Ellis Bay Fm.
CB(EB4)	Tidal flat and cliffs at S end of Baie des Navots (22H/16 04300:17200-450) [Loc. 9b]	Mbr. 4 (Prinsta), Ellis Bay Fm.
CC-V	Coastal outcrop W of Cap Caron (12E/13 28800:29850) [Loc. 16]	Lavache Mbr., Vauréal Fm.
CO-B2	Outcrop at Pointe de l'Ours (22H/16: 07800:12650-700) [Loc. 12]	Mbr. 2 (Chabot), Becscie Fm.
CO-BB	Outcrop between Cap a l'Aigle and Pointe de l'Ours (22H/16 06550:13800) [Loc. 12a]	Basal mbr. 2 (Chabot), Becscie Fm.
CSG-V	Canal de St. Georges, above bridge (22H/16 02600:18200) = SGC-V [Loc. 9]	Grindstone Mbr., Ellis Bay Fm.
CVP	Cliff section at Cap de la Vache qui Pisse (22H/16 96160-80:19840-20020) ≈A74, A435, A439 [Loc. 5]	Mbrs. 1-2 (Grindstone-Velleda), Ellis Bay Fm.

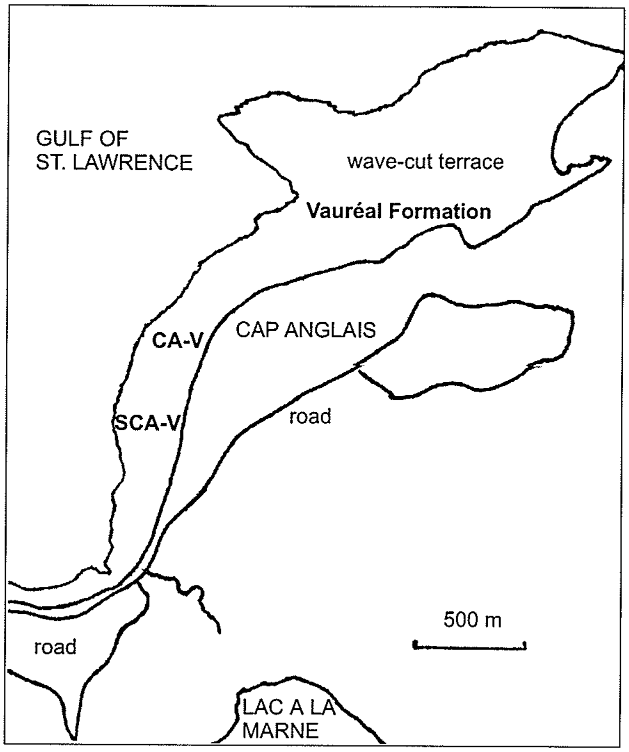
FC	Fossil Cliff section (22H/16 97000-18850) = CF [Loc. 5a]	Mid mbr. 2 (Velleda), Ellis Bay Fm.
FP	Cliff outcrop around Fox Point (12F/5 83100-84800:62150-63450) ≈ A142, A144, A146, A313 [Loc. 44]	Uppermost Ellis Bay Fm. and basal Becscie Fm.
GR-V	Coastal outcrop W of Grand Ruisseau [Loc. 7]	Tower? Mbr., Vauréal Fm.
JR24	Jupiter River 24 mile bridge, N side, 200 m upstream from bridge (12E/11 68300:96200) [Loc. 23]	Upper Chabot Mbr., Becscie Fm.
JR24SE	Copper and Long (1989) Merrimack reference section S of 24 mile bridge on Jupiter River (12E/11 68000-50:95500-50) [Loc. 23]	Uppermost Chabot Mbr., Becscie Fm.
LC	Lousy Cove cliff outcrops (12F/5 81700-82300:63750-64400) ≈ A219, A466b, c, A595 [Loc. 43]	Prinsta Mbr., Ellis Bay Fm.
LLR 5.9	LaLoutre road, 5.9 km S of highway (12E/13 54100:11450) [Loc. 19]	Mbr. 5?, Ellis Bay Fm.
LLR 11.2	LaLoutre road, 11.2 km S of highway (12E/12 53200:07300) [Loc. 18]	Mbr. 2 (Chabot), Becscie Fm.
LLR 16.1	LaLoutre road, 16.1 km S of highway (12E/12 52450:03550) [Loc. 18a]	Mbr. 2 (Chabot), Becscie Fm.
LSM-V	Outcrop at culvert on main highway crossing Riviere Ste. Marie (12E/13 36900:18950) = LSM-V [Loc. 17]	Mill Bay Mbr., Vauréal Fm.
MB	Tidal flat and cliffs W of Mill Bay (12E/8 65350-950:69600-900)≈ A364(1) [Loc. 39]	Mill Bay and Schmitt Creek mbrs., Ellis Bay Fm.
MH-V	Roadside outcrop on main highway ca. 2 km E of Jupiter road (12E/14 72410:11230) [Loc. 22]	Mill Bay Mbr., Vauréal Fm.

NAF-V	Cliff NE of Anse aux Fraises (22H/16 95800:21150) [Loc. 4]	Schmitt Creek Mbr., Vauréal Fm.
OC-V	Outcrop between culvert and falls at Observation Canyon (12E/10 09350: 95650) [Loc. 29]	Joseph Point Mbr., Vauréal Fm.
PI	Cliff section at Pointe aux Ivrognes (22H/16 00550-600:16500-17150) (See Appendix B for equivalents) [Loc. 8]	Mbr. 7, Ellis Bay Fm. and basal 13 m, Becscie Fm.
PL, LaF	Cliff section at Pointe Laframboise (22H/16 97700-800:17250-600) (See Appendix B for equivalents) [Loc. 6]	Mbrs. 5-7 (Lousy Cove-Laframboise), Ellis Bay Fm. and basal 9 m Becscie Fm.
PO-V	Coastal outcrop near lighthouse at Pointe de l'Ouest (22H/15 90400:24400) [Loc. 1]	Joseph Point Mbr., Vauréal Fm.
POR	Roadside outcrop ca. 6.9 km E of highway on Naciscotek road (12E/10 32650-700: 83200) =? A737 [Loc. 33]	Laframboise Mbr., Ellis Bay Fm.
RH-V	Tidal flats near mouth of Ruis Harvey and outcrop near falls (22H/16 91250: 26750) [Loc. 2]	Upper Homard Mbr., Vauréal Fm.
ROS	Tidal flat and cliffs at Les Roselets (22H/16 04350:16250-600) [Loc. 10]	Mbr. 5 (Lousy Cove), Ellis Bay Fm.
RPJ	Roadside outcrop ca. 300 m E of Riviere des Petits Jardins (12E/10 24550:86550) [Loc. 31]	Laframboise Mbr., Ellis Bay Fm.
RSM-V	= LSM-V [Loc. 17]	Mill Bay Mbr., Vauréal Fm.
SCA-B1	Coastal outcrop S of Cap a l'Aigle (22H/16 06130:014350) [Loc. 11a]	Fox Point Mbr, Becscie Fm.

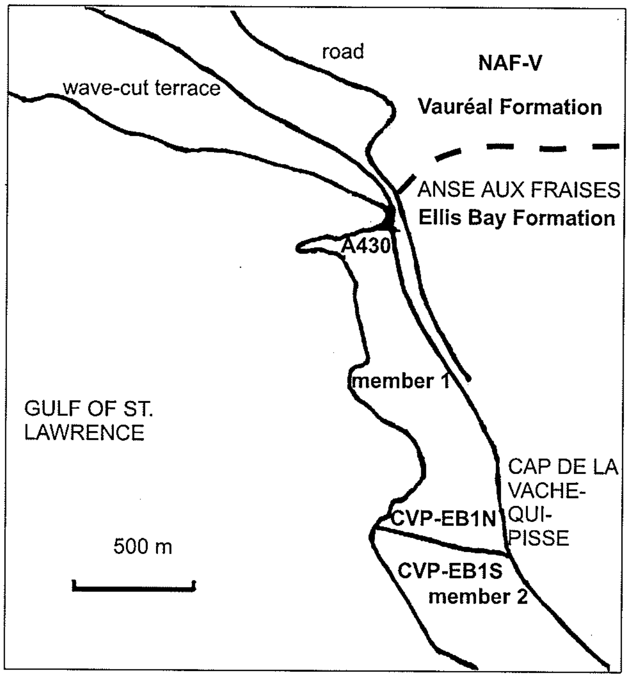
SCA-V	= CAS-V [Loc. 3a]	Homard Mbr., Vauréal Fm. Same level as CA-V
SGC-V	= CSG-V [Loc. 9]	Grindstone Mbr., Ellis Bay Fm.
SPO-V	Small cliff SE of lighthouse at Pointe de l'Ouest (22H/15 90500-700:24250-050) [Loc. 1a]	Joseph Point Mbr., Vauréal Fm., 2-3 m above PO-V.
SR-BH/B1	Salmon River 8 mile pool, outcrop on SE side of river (12E/8 43500-44200:71300-650) [Loc. 38]	Laframboise Mbr., Ellis Bay Fm. and basal Fox Point Mbr., Becscie Fm.
SR-16	River bank outcrop, E side Salmon River, Sixteen Mile pool (12E/8 40100-42200: 71250-350) [Loc. 35]	Chabot Mbr., Becscie Fm.
VR	Riverbank, W side Vauréal River, 0-ca. 600 m downstream from bridge (12E/10 22250:89500) [Locs. 30, 30a]	Velleda?-Prinsta Mbr., Ellis Bay Fm.
WC	Cliff section on W coast between FC and Pointe Laframboise (22H/16 97350-500:18100-400) [Loc. 5b]	Mbrs. 3-4 (Velleda-Prinsta), Ellis Bay Fm.
WCR-V	Coastal outcrop between rivers W of Cap de Rabast (22H/16 14200-15300) [Loc. 13]	LaVache Mbr., Vauréal Fm., ~2 m of section

APPENDIX B - DETAIL MAPS AND STRATIGRAPHIC COLUMNS

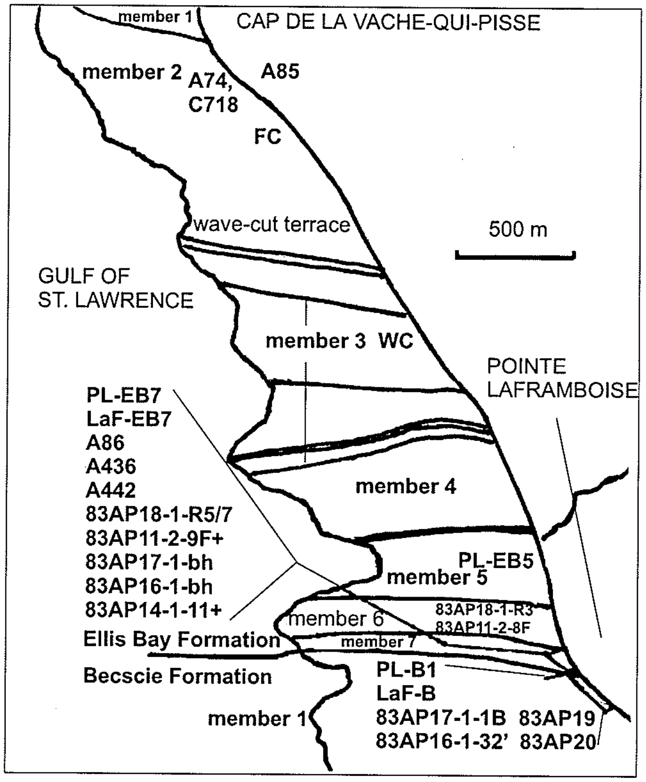
Maps are based on Petryk (1981a), Long and Copper (1987a, 1997), Copper and Long (1989) and Jin and Copper (1997). On maps, collections are identified in bold capitals, stratigraphic units are in bold, geographic names are in plain capitals and geographic features are in plain lower case.



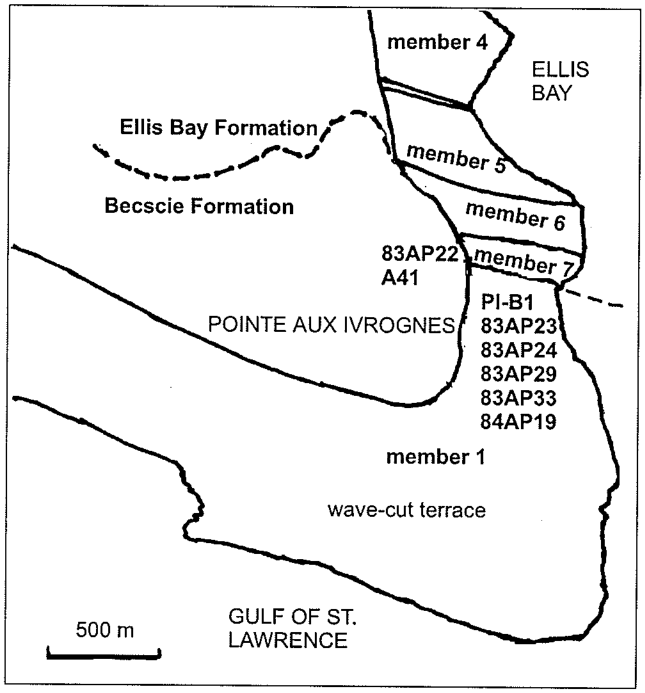
Map 1. Collection localities near Cap Anglais (locs. 3, 3a).



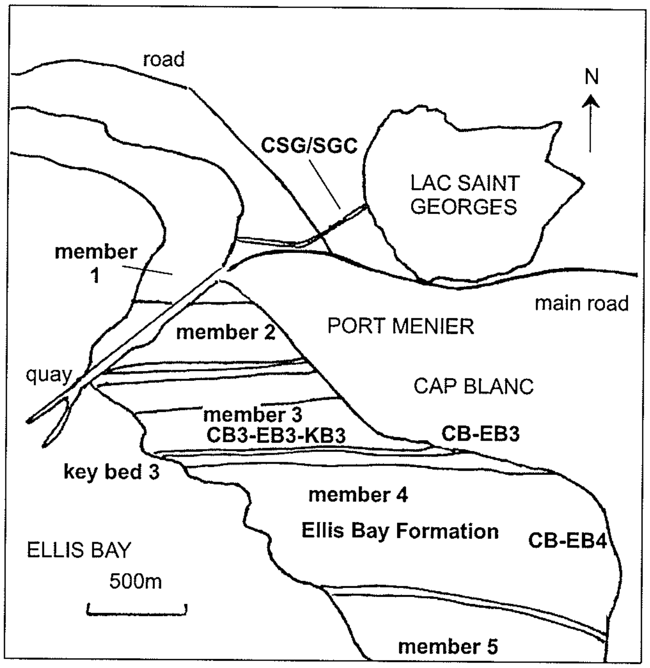
Map 2. Member boundaries (sensu Petryk, 1981) and collecting localities near Anse aux Fraises (loc. 4) and Cap de la Vache-qui-Pisse (loc. 5). Formational boundary is *sensu* Jin and Copper (1997). Compare with member terminology of Jin and Copper (1997, fig. 1).



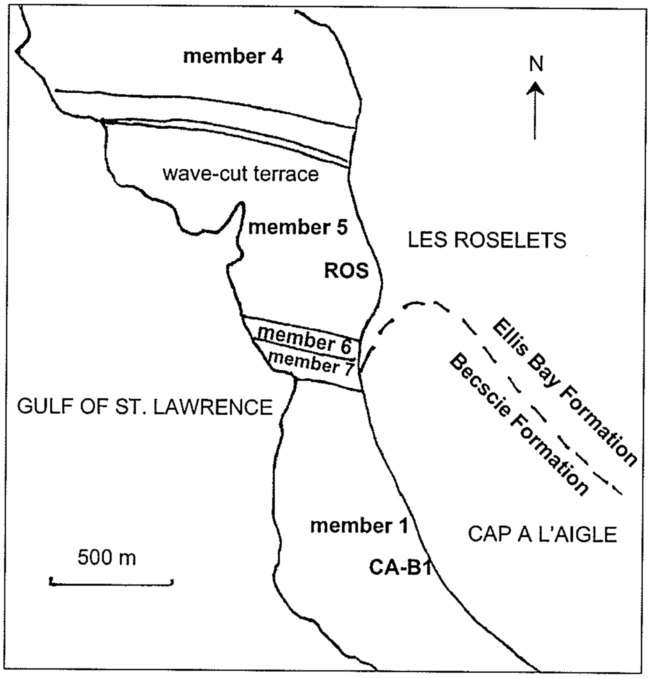
Map 3. Member boundaries (sensu Petryk, 1981) and collecting localities between Cap de la Vache-Qui-Pisse (loc. 5) and Pointe Laframboise (loc. 6). Collections PL-EB7 to 83AP14-1-11+ are in member 7 of the Ellis Bay Formation and collections PL-B1 to 83AP20 are in the basal Becscie Formation. Compare with member terminology of Jin and Copper (1997, fig. 1).



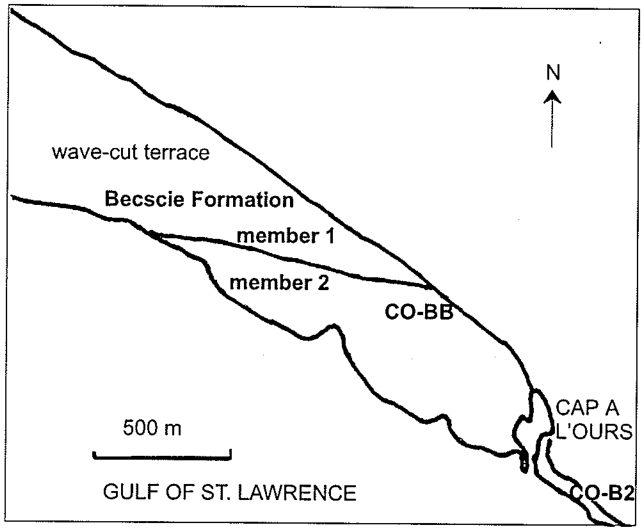
Map 4. Member boundaries (sensu Petryk, 1981) and collecting localities near Pointe aux Ivrognes (Cap Henri; loc. 8). Compare with member terminology of Jin and Copper (1997, fig. 1).



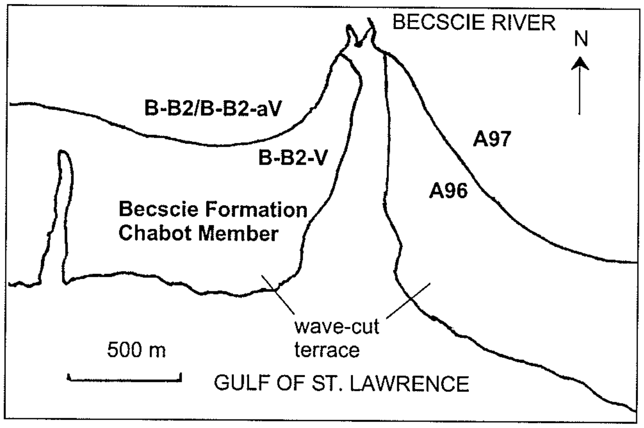
Map 5. Member boundaries (*sensu* Petryk, 1981) and collecting localities near Port Menier (loc. 9)/Cap Blanc (locs. 9a, b). Placement of loc. 9 within the Ellis Bay Formation is *sensu* Jin and Copper (1997). Compare with member terminology of Jin and Copper (1997, fig. 1).



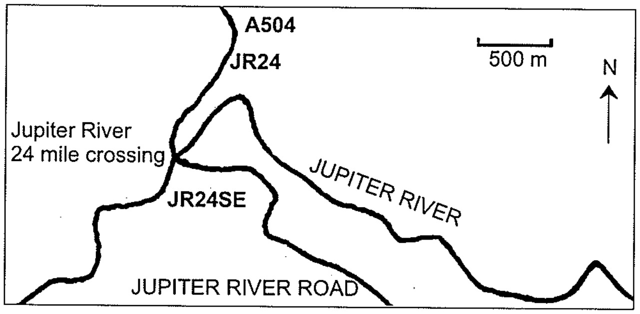
Map 6. Member boundaries (*sensu* Petryk, 1981) and collecting localities between Les Roselets (loc. 10) and Cap à l'Aigle (loc. 11). Compare with member terminology of Jin and Copper (1997, fig. 1).



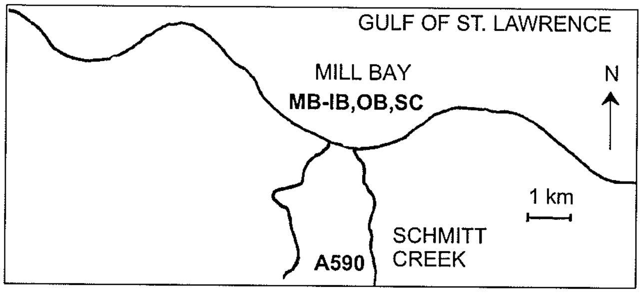
Map 7. Member boundaries in the Becscie Formation (sensu Petryk, 1981) and collecting localities near Cap à l'Ours (locs. 12, 12a).



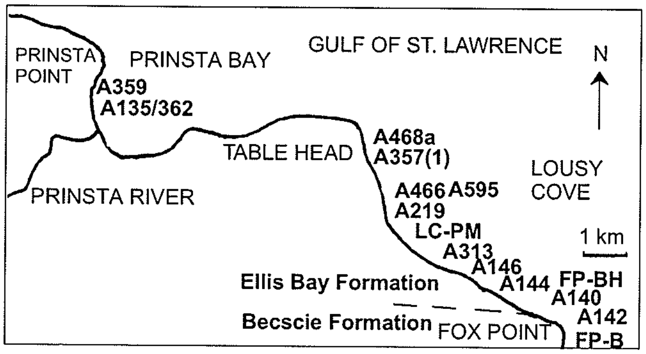
Map 8. Collecting localities near Becscie River mouth (loc. 15).



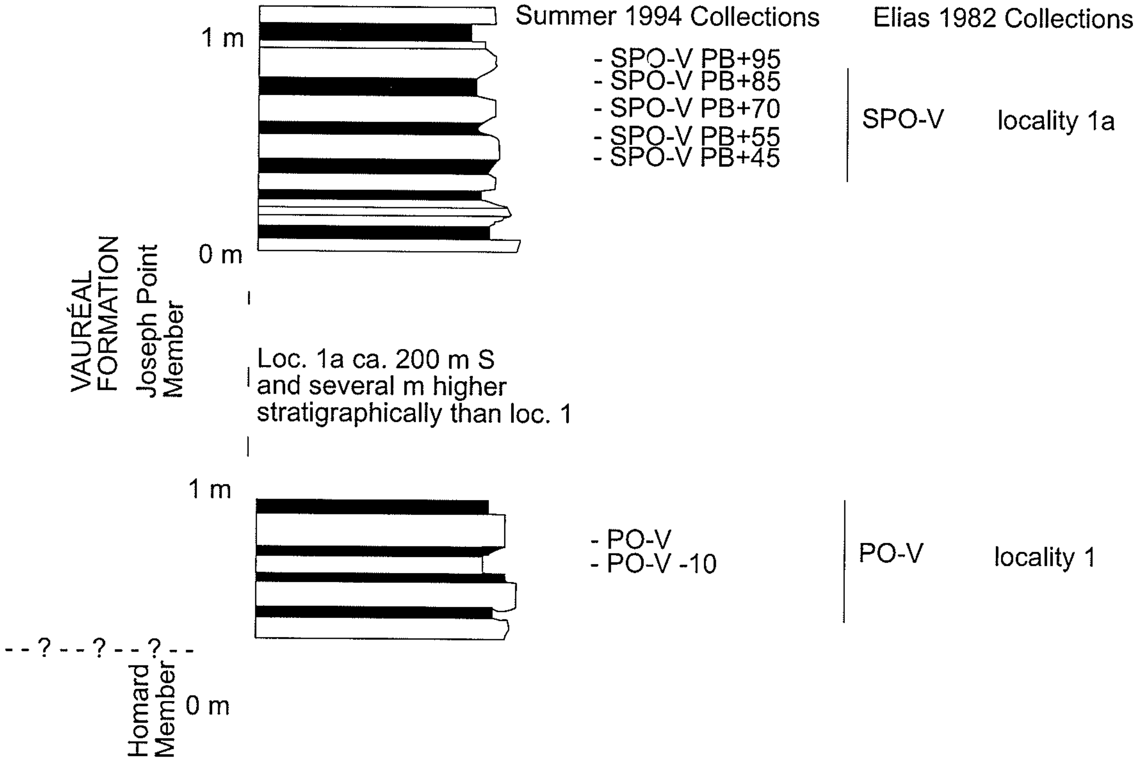
Map 9. Collecting localities near the Jupiter River 24 mile crossing (loc. 23).



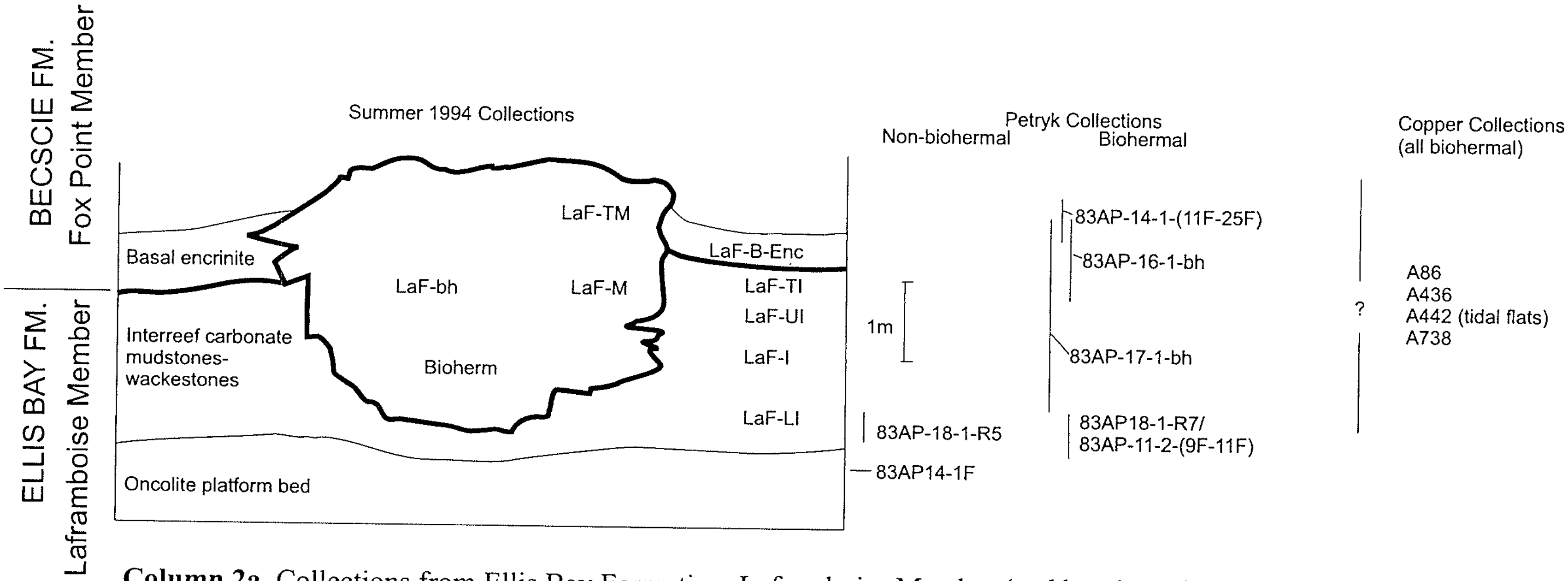
Map 10. Collecting localities around Mill Bay (loc. 39) and Schmitt Creek (loc. 40).



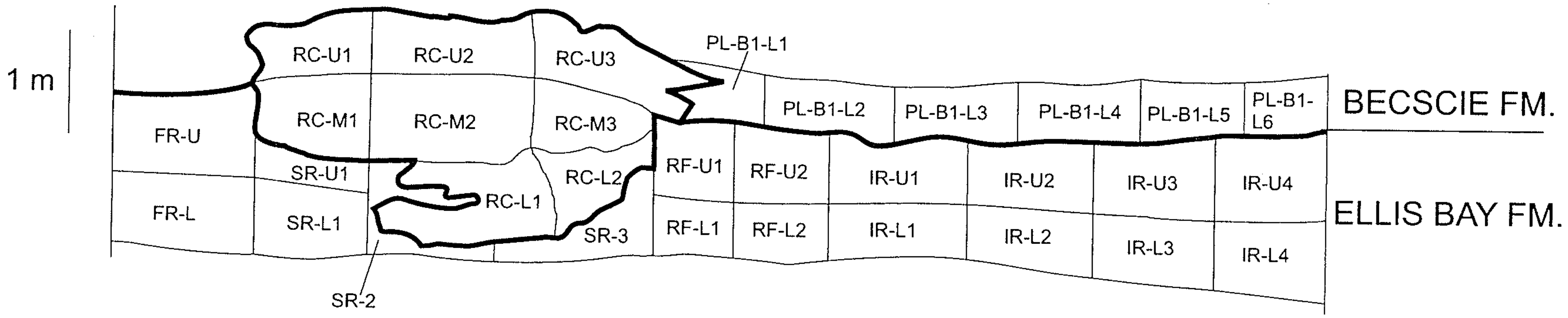
Map 11. Formation boundary and collection localities on the north coast: Prinsta Point (loc. 41), Table Head (loc. 42), Lousy Cove (loc. 43), and Fox Point (loc. 44).



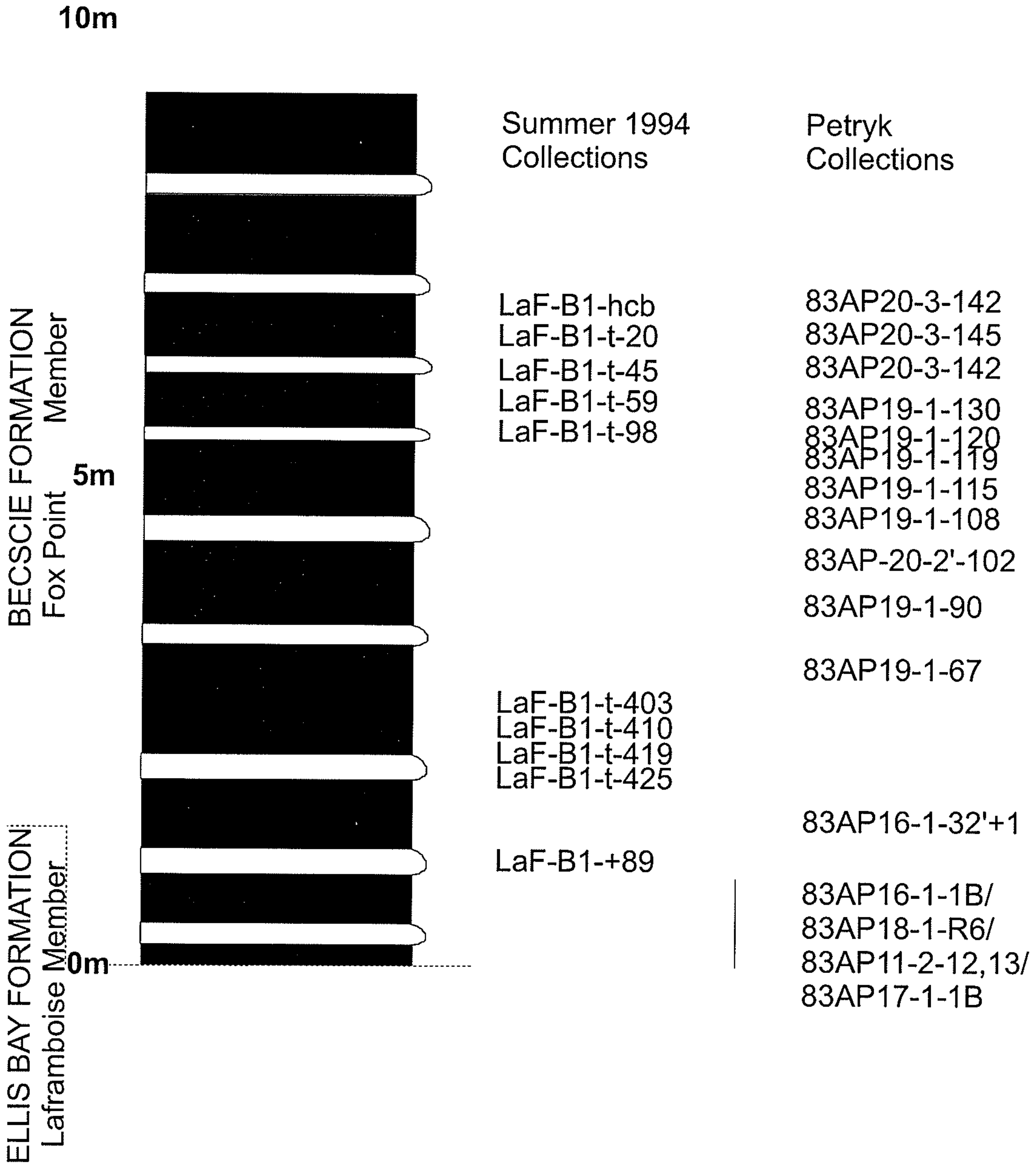
Column 1. Collections from locs. 1, 1a at Pointe de l'Ouest, and south of Pointe de l'Ouest. Vertical lines beside Elias collection numbers indicate approximate position. Black units = carbonate mudstones, white units = flat bedded to nodular wackestones.



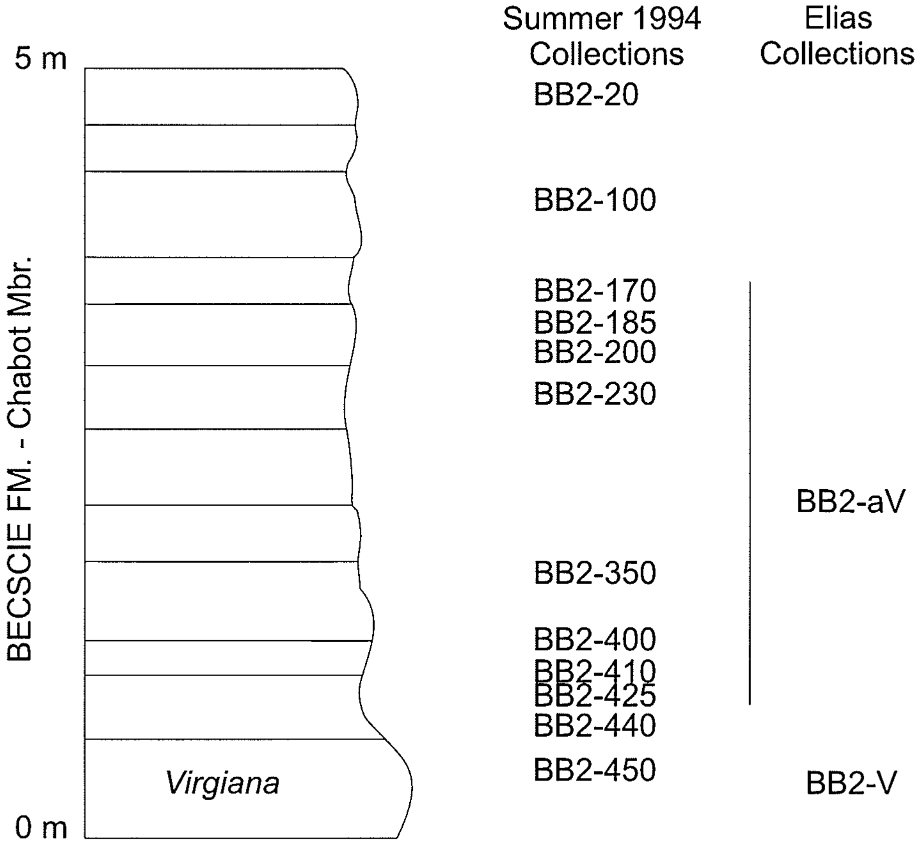
Column 2a. Collections from Ellis Bay Formation, Laframboise Member (and basal encrinite of Becscie Fm.) at Pointe Laframboise, loc. 6. Outline of bioherm is a general schematic diagram; there are several bioherms at loc. 6 and not all collections are from the same bioherm. No vertical exaggeration.



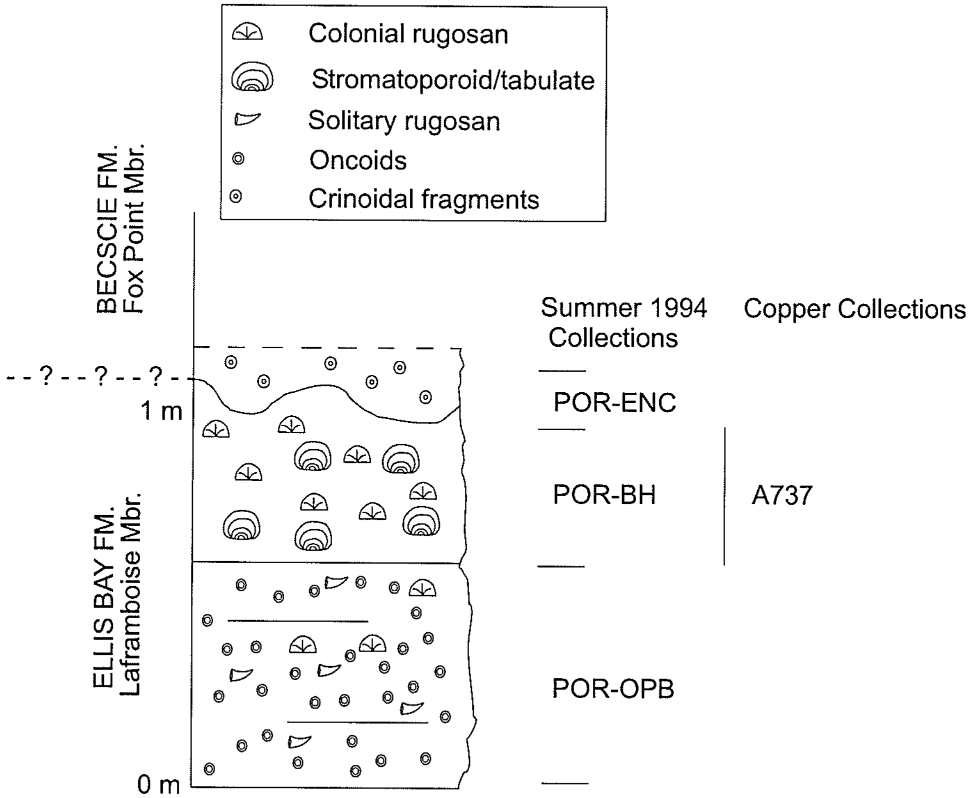
Column 2b. Collections from intensively sampled bioherm (Elias Collections) in Laframboise Member, Ellis Bay Formation at loc. 6.



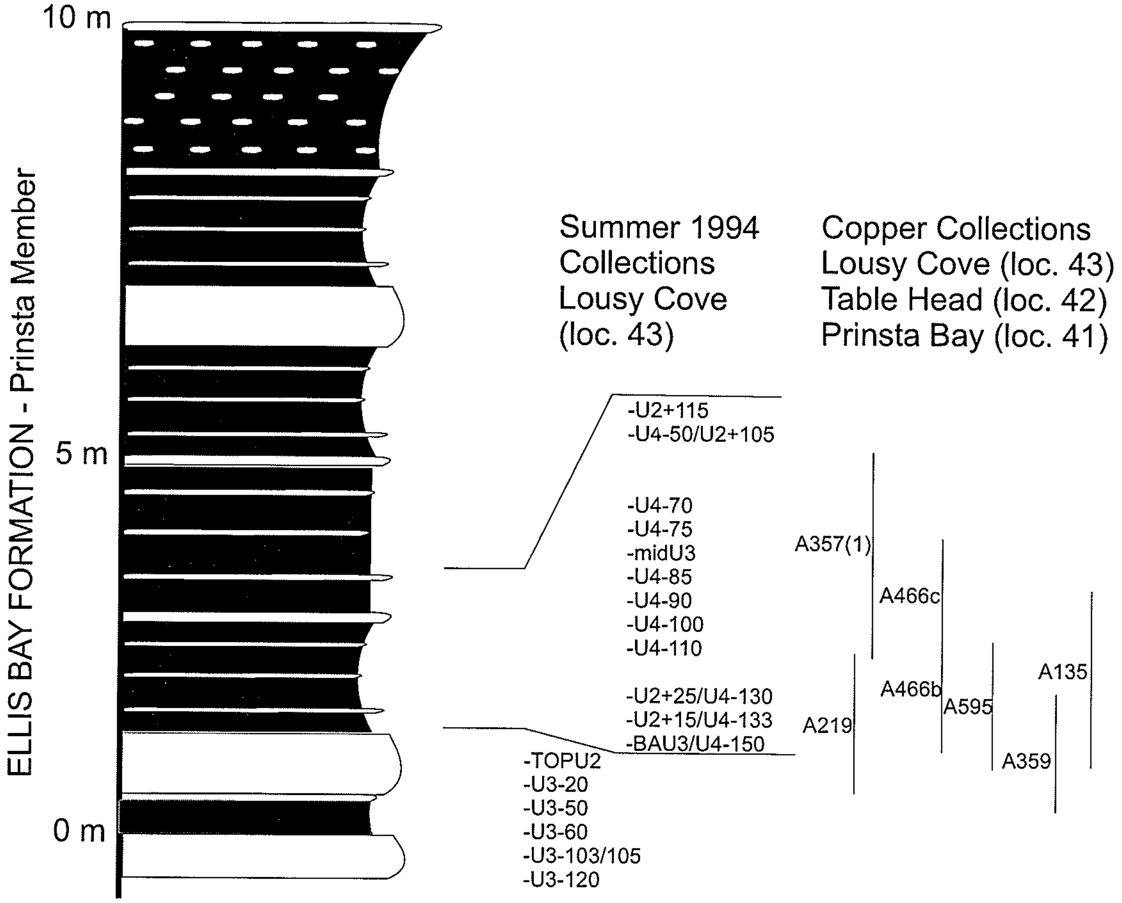
Column 3. Collections from the basal Becscie Fm. from loc. 6, Pointe Laframboise. Lowest four Petryk collections are in "basal metre". Black units = carbonate mudstones with minor shales, white units = flat to nodular wackestones. N.B., two Petryk collections have the same prefix (83AP20-3-142).



Column 4. Collections from packstones-grainstones (varying thicknesses; a few minor mudstone-wackestone beds present) of the Chabot Member, Becscie Formation, at the Becscie River mouth (loc. 15). Vertical line beside Elias collections indicates approximate position.



Column 5. Collections from loc. 33 (Naciscotek road). Thickness of biohermal interval and positions of boundaries approximated. POR-ENC are specimens that projected up into the encrinite from the top of the Ellis Bay Formation (some apparently in growth position, some overturned or transported).



Column 6. Collections from the Prinsta Member on the northeast coast. Most Summer 1994 collections from interval between ca. 1.5 and 3.5 m above the base of the section (magnified). All summer 1994 collection numbers have the prefix LC-PM-. Recessive units are thin-bedded carbonate mudstones (black), resistant units are sandy grainstones (white), topmost unit is nodular lime mudstone.

APPENDIX C - BIOMETRIC AND OTHER DATA

The abbreviations and terminology used in this appendix are listed below. Note that the colonial taxa are described using slightly different terminology than solitary taxa and that for *Palaeophyllum vaurealense* and *Palaeophyllum lyterion*, multiple measurements from each section were taken (usually 20 corallites per section).

Terminology and abbreviations for *Palaeophyllum* (see Biometric Methods under Systematic Paleontology for detailed discussion and explanation); all measurements in mm:

DIAMETER (d)

NUMBER OF MAJOR SEPTA (n)

NUMBER OF NEIGHBOURS (nn)

MAJOR SEPTUM LENGTH (Msl)

MINOR SEPTUM LENGTH (msl)

WALL THICKNESS (wt)

TABULAR SPACING (ts = tab/5mm)

Note: For *Palaeophyllum vaurealense*, supplementary data are data collected for histogram generation (see Systematic Paleontology).

The following general terminology applies to all solitary taxa and *Paliphyllum ellisense*:

LABEL: Locality code (see Appendix A)

LEVEL: Stratigraphic position
    A1 (e.g.): Level A1 (arbitrary)
    BA: Basal
    BA # cm: Basal # cm
    BA + # cm: # cm above base
    BEACH L: Beach level
    BH: Bioherm
    BH-M: Bioherm margin
    BH-TM: Bioherm top margin
    CB: Coral bed
    ENC: Encrinite

FB: Float block
FL: Float
I: Interbiohermal
IB: In bed
IS: In situ
KB3: Key bed 3
L: Lower
LABELX +/- # cm: # cm above or below coll. X
LI: Lower interbiohermal
LOW SH: Lower shale
M: Middle
MID: Approximately middle
OB: On bed
OPB: Oncolite platform bed
PB: Prominent bed
TI: Top interbiohermal
U: Upper
UM/LM: Uppermost/lowermost
U/M (e.g.): Upper middle
U1-U4: Unit 1-Unit 4 Prinsta Member
UI: Upper interbiohermal
+: # m (or cm) above base
+ # BH: # cm above base of BH
- # BH: # cm below top of BH
- #H BH: # hammer lengths (ca. 27 cm) below top of BH

NUM: Specimen number

SIZE: Unless otherwise specified, size is length of corallum in mm. (#, #) = (length in mm, maximum diameter in mm), Dmax = maximum diameter.

SHAPE (SHA)
CE: ceratoid
CY: cylindrical
FRAG: fragmentary (indicates that corallum exterior exposed but incomplete)
TR: trochoid
TU: turbinate

CURVATURE (CURV)
BE: bent
CU: curved
DI: distorted

IRR: irregular
SL: slightly curved
ST: straight

ABRASION (ABRAD) includes factors that would obscure the degree of abrasion
AB: abraded
AB/C(K,A): abraded on cardinal (counter, alar) side, nonabraded elsewhere
CO: covered
LO: localised abrasion
MI: mildly abraded
NO: nonabraded
SID/SI: silicified
WE: weathered

GROOVES AND RIDGES/GROWTH LINES (GR/GL)
Y/Y: yes/yes (e.g.)
/S: some gl

RUGAE
Y,N: yes, no
Y(#): yes (# rugae)
$\#_1$, $\#_2$, $\#_3$...: rugae separated by # mm

EPI-/ENDOBIONTS (EPIS)
N: none
ALC: algal coat
AUL: auloporid
BOR: unidentified borings
BRAN: branching epizoan
BRY (or BR if space limited): bryozoan
CATEN: cateniform tabulate
COL: colonial rugosan
COR(U): cornulitid (upside down)
CYCLO: cyclostome bryozoan
ENC: miscellaneous encruster
FAV: favositid
HEL: heliolitid
MBO: microboring
RUG: rugosan
SERP: serpuloid worm tubes
SOLI: solitary rugosan
SPI: *Spirorbis*
STR: stromatoporoid

TAB: tabulate coral
TRY: *Trypanites*
TUBE: tube
WE: *Wetheredella*
/K,A,C: epibiont on counter, alar, cardinal side
* : unique occurrence
L./V.L.: large or very large epizoan
?: questionable occurrence

OTHER (OTH)

ATT: attachment structures/attached
ATT->: attached to...
BAND: colour banding
BUD: budding (1 or more)
CALBUD: calicular budding
CAR: carinae
CON: constricted
DIST: exterior of corallum distorted
DP CAL: deep calice
ELLIP: ellipsoidal cross section
EMBFRAG: embedded fragment
EPIDIST: epitheca distorted
HINJ: healed injury
IND: indentation
INTDIST: corallum interior distorted
LP: life orientation
OST: ostracode embedded in septum
PERPFIB: fibres perpendicular to septal axis
REJUV: rejuvenescence
SEPDIST: septum(a) distorted
STRDIST: distortion associated w/ stromatoporoid
TRILOB: trilobate cross section
TRYPDIST: distortion associated with *Trypanites*
TALONS/TAL: talons
SPECS: # specimens included together

NUMBER OF MAJOR SEPTA (MAJ, n in colonial taxa)

DIAMETER (DIAM, d for colonial taxa)
diameter in millimetres

CC
cardinal-counter dimension in mm

AA
alar-alar dimension in mm

STEREOZONE (STEREO)
#%: stereozone #% of corallum radius
#: stereozone # mm wide
TN: thin
TH: thick

AXIAL STRUCTURE (AS)
L: large
LO: loose
LSSO: large, semi solid
MI: minimal
N: none
S: small
SO: solid
S/SO: small/solid
Y: present

AXIAL STRUCTURE DESCRIPTION (ASD)
CCW: counterclockwise axial whorl
COMP: completely dilated
HOLE: axial hole
L: septal lobes
LA: septal lamellae
MLA: median lamella
PALLI or PAL: septal palli
S->A: septa extend to axis
S%->A: septa extend #% of radius
#: axial region diameter in mm

AXIAL REGION DIAMETER (ARW)
For *Eurogrewingkia pulchella* only, in addition to ASD

MINOR SEPTA (MIN)
VS: very short
S: short
L: long
VL: very long

#%: minor septa #% of corallum radius

TABULARIUM/DISSEPIMENTARIUM

CO: tabulae complete
IC: tabulae incomplete
N: none
/UA: tabulae upward arched
/IRREG: irregular tabular spacing
/AXD: tabulae axially depressed
#DIS: # columns of dissepiments

C/K (Cardinal-counter plane features)

CF: cardinal fossula, # = width across fossula at widest point (mm)
CS S KS: cardinal/counter axis recognizable by septal connection
CS: cardinal septum distinct
CSS: cardinal septum short
NCF: no cardinal fossula (only in species where CF is common)

CFCSL (Cardinal fossula/ cardinal septum long; *Salvadorea selecta* only)

Y/Y, N/N (e.g.)

Streptelasma affine

LABEL	LEVEL	NUM	SIZE	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTH	MAJ	DIAM	STEREO	MIN
83AP14-1	BH380-430	12	90,55	TR	SL	MI	Y/N	Y	WE/BR/COR		32	11	0.4	0.6
											36	15	0.9	1
											45	31	1.6	2.5
83AP14-1	BH380-430	13				NO	Y/Y	N	BRAN					
83AP14-1	BH380-430	14				NO	Y/Y	13,13,13,9,10,7,7	BR/BRAN/RUG					
83AP14-1	BH380-430	15				MI	Y/N	N	ALC/WE		37	24	0.3	1
83AP14-1	BH380-430	18	70		CU	NO	Y/Y	Y	N	CON	34	13	0.6	0.5
											40	23	0.5	1.3
											18	4.5	0.3	
83AP14-1	BH380-430	19				MI	Y/N	Y	BR/WE		49	34	2.3	5.5
83AP14-1	BH380-430	24		TR	SL	MI	Y/N	Y	WE/CATEN		42	19	1.2	1.3
											59	46	6	10
83AP14-1	BH380-430	25	160,65	CE/CY	SL	MI	Y/N	N	WE/STR/HEL/BOR		52	37	2.6	6
83AP17-BH	BH20-380	2C		CE	BE	MI	Y/N	N			40	14	0.7	1.3
											49	19.5	1.2	2
83AP17-BH	BH20-380	8B				MI	Y/N	N	WE		38	13.5	1	1.2
83AP17-BH	BH20-380	9									27	7	0.7	1
											23	5	0.5	?
83AP17-BH	BH20-380	14A				NO	Y/Y				49	19.5	1	1
83AP17-BH	BH20-380	15A				MI	Y/N	N	WE/COR		42	17	0.8	1.5
83AP17-BH	BH20-380	15Ba			SL	MI	Y/N	N	WE		18	5.5	0.2	
											22	8.5	0.3	
83AP17-BH	BH20-380	15Bb			SL	MI	Y/N	N	WE		13	2.5	0.2	
											23	7.5	0.2	
83AP17-BH	BH20-380	23				MI	Y/N		ALC		30	11.5	0.4	0.4
											?	17.5	0.3	1
83AP17-BH	BH20-380	25B				MI	Y/N	N	ALC		21	8		
											22	12.5		
83AP17-BH	BH20-380	26B				MI	Y/N	N	ENC/??		20	8.5	0.3	0.5
83AP17-BH	BH20-380	27A				MI	Y/N	N	BRY		21	5	0.4	

83AP17-BH	BH20-380	27D		CE		NO	Y/Y	N	COR/WE		19	4.5	0.2	0.3
											25	10	0.3	0.7
83AP17-BH	BH20-380	31		CY		MI			COR/BR*/WE		55	39	2.5	4
83AP17-BH	BH20-380	32A		CE	BE	MI	Y/N	N	ENC		18	5		
											28	9.5	0.3	0.6
											17	4		
83AP17-BH	BH20-380	35C		CE	BE	NO	Y/Y	Y	N	CON				
83AP17-BH	BH20-380	37A			SL	MI	Y/N	N	ALC		39	29	0.7	1.6
83AP17-BH	BH20-380	38C		CE	ST	MI	Y/N	N	N		24	7	0.3	
											32	16	0.3	0.8
83AP17-BH	BH20-380	42			BE	MI	Y/N	N	WE	CON	40	29	0.4	0.8
											36	21	0.4	1
83AP17-BH	BH20-380	43	ca.90	TR/CY	ST	NO	Y/Y	N	WE/BR		44	19	0.8	1.6
											50	37	2.5	4
											48	28	1	3.3
83AP17-BH	BH20-380	44A			SL				BRAN					
83AP17-BH	BH20-380	45				MI	Y/N	N	WE					
83AP18-1-R7	BH<30	2				NO			WE		45		3.5	7.5
83AP18-1-R7	BH<30	4C				NO	Y/N				24	6	0.6	0.6
											29	9	0.8	0.8
83AP23-1	BH130-219	3	110,54	CY	SL	MI			WE/STR/TRY	ATT?				
83AP23-1	BH130-219	4	95,45		SL	MI	Y/N	8,6,10,7,9	WE/BR/COR		36	17.5	1.3	1.5
											42	24	1.7	3
											47	36.5	3	5
											46	32	2.2	4.8
A41	BH	4												
A41	BH	10		CY	ST	CO		Y	WE/BR		46	13.4	0.8	1.7
A41	BH	19		CY	ST	LO	Y/Y	Y	ALC/MBO		30	10	0.7	1.1
A41	BH	21		CY		AB	N/N	N	ALC	DIST	33	11.2	1.2	1.4
A41	BH	25		CY	ST	AB	N/S	N	ALC/MBO		31	9.4		
A86		1	>60	TR	ST	MI	Y/N	N	BRYOC		41	18.9	0.5	1.1
A97		1												

A135	BA 2.89m	3		TR	ST	AB	Y/N	N	N		33	16.2	1.2	2.5
A435	BA1-2	1		TR	SL	WE/CO			N		30	13.4	0.6	1.6
A435	BA1-2	5		TR	ST	WE			N		32	13.3	0.7	1.6
A435	BA1-2	6		TR	ST	WE			N		28	13.5	0.5	1.4
A435	BA1-2	7		TR	CU	AB/C	Y/N	N	N					
A436	BH	6		TR			Y/N	N	TUBE?					
A438C	BA-M	1		TR	CU	MI	Y/Y	N	MBO/TRY					
A438C	BA-M	2		TR	SL	AB/AL	Y/N	N	N		32	16.6		3.8
A438C	BA-M	4		TR	ST	NO	Y/N	?	N	DIST	24	10.2	0.8	
A438C	BA-M	5		TR	ST	MI	Y/N	N	N		23	8		
A468a		11		TR	ST	AB	N/Y	N	N		37	14.1	1.1	1.5
A894	BH	1				CO					41	20		
CF-EB2	L.CLIFF	2		CE		NO	Y/Y	N	BOR?A,KL	DISTS	33	9		
											44	15		
CF-EB2	L.CLIFF	3									32	15	0.7	2.7
											24	7.5		
CF-EB2	L.CLIFF	5	13			MI	Y/N	N	N	ATT/CON	25	6		
CVP-EB1S	T-17	11				AB			N	DIST	26	7.8	0.6	0.8
CVP-EB1S	T-17	14				AB	Y/N		N		27	9.5	0.5	1.2
CVP-EB2	B+85	2			SL	MI	Y/N	N	N		27	15.5	0.8	1.5
											25	9.5	0.5	1
CVP-EB2	B+85	3												
CVP-EB2	B+120	1				AB			N		28	11.5	0.5	1
CVP-EB2	B+125	3				AB			N		33	7.9	0.3	0.4
CVP-EB2	B+135	1a				MI			N		22	9	0.3	0.9
CVP-EB2	B+135	1b	30		SL	AB			N		26	13.3	0.5	1.9
CVP-EB2	B+135	1c	30		BE	AB			N					
CVP-EB2	B+135	2				AB			N					
CVP-EB2	B+135	3				MI	Y/Y	N	N					
CVP-EB2	B+140	1				MI	Y/Y	N	N					
CVP-EB2	B+140	2				MI	Y/N	N	N		30	17.5	0.6	2.3
CVP-EB2	B+140	3									26	13	0.4	2.5
CVP-EB2	B+145	1	35		BE	MI	N/Y	N	N					
CVP-EB2	B+150	4	40			AB	N/N	N	N		30	17	0.4	2.4

CVP-EB2	B+200	1				MI			N		27	12	0.5	1.1
CVP-EB2	B+210	1				NO	Y/Y	N	N	DIST	24	8	0.5	0.8
											30	14.5	0.5	2.9
CVP-EB2	B+230	2				MI	Y/Y	N	N	INTDIST				
CVP-EB2	B+235	1		CE		NO	Y/Y	N	?		38	12	0.7	1.1
CVP-EB2	B+235	3							N	DIST	38	13.3	1	1.3
CVP-EB2	B+235	4				MI	N/Y	N	N	CAR*			TN	
CVP-EB2	B+235	5				MI	Y/N	N	N		27	13	0.6	2.2
CVP-EB2	B+235	6				AB			BRY?		29	11.5	0.5	1.4
CVP-EB2	B+235	7				MI	Y/N	N	N		27	12	0.5	1.8
CVP-EB2	B+235	9				MI	Y/N		N		21	8	0.4	1.4
CVP-EB2	B+239	1				NO	Y/Y	N	TUB?		24	7.5	0.5	1.7
CVP-EB2	B+239	2				MI	Y/Y	N	N		25	9.5		
CVP-EB2	B+239	4				MI	Y/Y	N	N					
CVP-EB2	B+250	1				MI	Y/Y	N	ALC?A		29	14.5	0.8	3
CVP-EB2	B+250	2				MI	Y/Y	N	N					
FP	-1.5H BH	1		TR	ST	CO			ALC/BOR?	DIST	51	23.7	1.1	2.8
FP	-1H BH	1		TR		CO			ALC					
FP	-1H BH	2		CE	ST	MI	N/N	N	N			31.4	2.9	5.7
FP	-1H BH	16		TR	ST	MI	N/N	N	N					
FP	-1H BH	18		CE	ST	MI	N/N	Y	BOR?ALC		60	40.1	3.5	5.7
FP	-2H BH	5				MI	Y/N		BRY*		41	12.3		
											28	7		
FP	-2H BH	6		CE	ST	MI	N/Y	N	BR/WE		53	27.3	1.6	3.9
FP	BH?	1		FRAG		AB			BR/ALC				3.9	5.5
FP	BH?	13												
FP	BH?	16		FRAG									4	8.5
FP	BH?	17		FRAG										
LAF	LI	1	>135	CE	ST	MI	Y/N	Y	N					
LAF	TI	5		TR		MI	Y/N	N	N		22	7.3		
PL-B1	L5	1				MI			N		34	15.5	0.7	1.6
PL-EB5	T-260	1				AB			N					
PL-EB5	T-90	1				AB			MBO		41	11.9	0.7	
											42	13	0.8	

PL-EB7	BH	1		CY	ST	MI	Y/Y	N	WE/BR		48	24.4	1.3	2.2
											56	41	3.9	5.7
PL-EB7	BH	4				MI	N/Y		WE/BR		35	12.1	0.8	1.4
PL-EB7	SR-L1	1				MI	Y/N		N	DIST		23	0.7	0.9
PL-EB7	SR-L1	2	65			MI	Y/N	N	ALC	DIST/ATT?	28	9.1	0.5	
											38	18.5	0.7	0.9
PL-EB7	SR-3	3				MI	Y/N	N	ALC					
PL-EB7	SR-3	15							ALC					
PL-EB7	RC-L2	7							ENC		26	6.9		
PL-EB7	RC-L2	11				MI	Y/N		?					
PL-EB7	RC-L2	16				MI	Y/N		WE		19	4.9		
PL-EB7	RC-L3	2							WE/BR*					
PL-EB7	RC-L3	4							BR/WE*					
PL-EB7	RC-L3	9	15			NO	Y/Y	N	N	ATT/TIP	24	7.9	0.3	0.8
PL-EB7	RC-U1	10				MI	Y/N		ALC/COR(U)		29	8.3		
PL-EB7	RF-L1	3				MI	Y/N		ALC/WE		21	6		
											29	8.6		
PL-EB7	RF-L1	5				AB			WE/HEL		45	42.8	2.4	6.4
PL-EB7	RF-L1	6				MI	Y/N		BR/ALC		35	12.5		
PL-EB7	RF-U1	3				MI	Y/N		N					
PL-EB7	RF-U1	14				MI	Y/N	N	ALC		31	9.8		
PL-EB7	RF-U2	8				MI	Y/N		WE		24	8.3		
											35	18.3	0.5	1.5
											32	14.1	0.8	1.5
PL-EB7	IR-L2	8				MI	Y/N		ALC		15	2.5		
PL-EB7	IR-L2	9	40		ST/BE	MI	Y/N		ALC	DIST	37	12.2	0.8	1.5
PL-EB7	IR-L3	2				MI	Y/Y	N	WE					
PL-EB7	IR-L3	5				MI	Y/N	N	N		26	8.5	0.5	
PL-EB7	IR-L3	8				AB	Y/N	N	ALC		31	13.2	0.7	1.2
											35	22.4	0.8	1.5
PL-EB7	IR-U2	3				MI	Y/N		ALC	DIST?	37	15.3	0.8	1.4
PL-EB7	IR-U2	10				MI	Y/N		ALC/WE		20	5.8	0.2	
PL-EB7	IR-U3	5				MI	Y/N	N	ALC		21	6.3		
POR	BH	4		TR		CO			N	BUD?/DIST	37	15.3	1.3	2.6

POR	BH	5		TR	ST	AB/WE	N/N	6,6,4,4	TRY?		52	32.3	3.4	5.9
POR	OPB	4	>80X65	TR	ST		Y/Y	Y	N					
POR	OPB	5	>70	TR	SL	AB/WE	Y/Y	N	N		56	34.6	2.1	4.4
POR	OPB	23	>65	TR	ST	MI	N/N	Y	TRY?	DIST	47	17.5	1.4	2.2
POR	OPB	24	>100	TR	ST	AB	N/N	N	N					
SR	BBBH	6				CO			?		26	8.4		
SR	-60	1		TR	ST	CO			WE		44	30.2		
SR	BH	5	>75	TR	ST	WE			WE		52	36.2		
SR	BH	6		TR	SL	WE			N		42	13.4		
SR	BH	A							CATEN/WE	ATT	43	15.1	1.6	1.7
SR	BH	C							ALC/WE			43.4	7.6	8.3
SR	BH	D							WE/SOLI		51	37.5	5.6	8.1
											52	45.6	7.4	8.8
SR	SR+45	2		TR	ST	MI/WE	N/N	Y	N					
WC-EB3	T-125	1		TR		NO	Y/Y	Y	N		27	9	0.5	0.9
											22	5.5	0.4	0.5
WC-EB4	U1	1				MI	Y/N	N	ALC?		18	4.8	0.2	

Streptelasma n. sp. 1

LABEL	LEVEL	NUM	SHA	CUR	ABRAD	GRGL	RUG	EPIS	OTH	MAJ	DIAM	STEREO
A41	BH	2	CY	ST	MI	N/N	Y	ALC		37	21.4	11.7
										42	20.4	10.8
A894	BH	2			CO			ALC/TRY		57	24.7	13.9
FP	-1.5H BH	4			CO			BRY*		49	23.8	8.3
FP	-1H BH	3			AB	N/N	N	ALC		39	13.6	4.9
FP	-1H BH	5										
FP	-2H BH	3			CO			ALC		41	11.9	2.6
FP	BH?	2	CE	CU	CO	N/N	Y	BRY+ALC		35	18	4.5
PL-EB7	IR-U4	3			MI	Y/N		ALC		27	7.1	1.7
POR	ENC	1	TR	ST	AB/WE	Y/N	N	TUB		42	16.4	6.1
POR	OPB	6	TR		AB/CO	N/N	N	TRY/TAB?	2SPECS	48	21.8	10.5
										33	10.1	4.9
										48	23.3	7.9
POR	OPB	10	CY	BE	WE/AB	N/N	N	ALC?		56	25.3	11.6
SR	BH -180	1			CO			ALC		42	16.3	6.9
SR	BH?	7								29	8.4	2.1

Streptelasma n. sp. 2

LABEL	LEVEL	NUM	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTH	MAJ	DIAM	STEREO	AS	ASD	CK
A96		1	TU	ST	WE/SID					54	17.9	VTH	N		CF
A843		1	TU	ST	AB	N/N	N	BRY/ALC	ELLIP	44	18	50%	SO	N	CS(TH?)
										44	24.1				
BB2	-170	4	CY					STR?	CALDIST	28	8.2	3.1	Y	L	
BB2	-230	4						STR	CALBUD?						
BB2	-230	5	CY		MI	Y/N	Y	BRY	REJUV?	28	8.8		N	S<>A	
BB2	-230	11	TR		MI			ENC+CAT	DIST			THK	N	MLA?	
BB2	L-C350	3	TR	ST	AB			BLOB?		30	9.6	3.6	Y	DIL SEP	
BB2	-410	3	TR	ST	AB			BRY/ALC?		43	16.5	7.5			
BB2	-410	4													
BB2	-410	6			AB			N	DIST	28	10.6	3.2	N		
BB2	-425	1	TR	CU	AB			BOR?		36	11.5	4.1	SM	CCW	
BB2	-425	5A													
BB2	-425	5B													
BB2	AV	7			AB			ALC+?	REJUV?	31	9.9	3.5			
										26	7.8	1.8			
BB2	AV	8			AB			MBO	OST/DIST*	40	16.3	6.5	Y	MLA	
										42	15.4	5.8			
										43	20.1	8.2			
BB2	V	5										50%<			
BB2	V	6			MI	Y/N		N	DIST	27	7.8	2.9	LO	L+LA	
BB2	V	9			MI	Y/N		ALC/STRO*	ELLIP	44	17.8	8.3	LO	LA	CF?
BB2	V	12			MI			N	DIST*	37	13.3	3.4	Y	MLA/L+LA	
										33	7.4				
BB2	V	13			MI			ALC/STR*		45	18	9.5	Y	TN MLA	
										33	7.4				
BB2	V	21			MI			N				TH	N		
BB2	V	30			AB			N				0.5	LSSO	COMP	
FP	+100	3			MI/WE	N/N	N	N				VTH			
JR24	F	3	TR	ST	MI			ENC?		47	16	5.5	LSO	7.2	
JR24SE	M-140	1	TR		MI	Y/Y	N	N	DIST	27	9.5	2.6		S->A	

JR24SE	M-390	1B	TR		AB			N		46	18.9	6.8	LO	S~>A
SR16	+145	5						N		26	9	3.4		S<>A
SR16	+145	6	TR	CU	MI	Y/Y	N	N		23	9.6	4	?	
SR16	+520	1A			WE			N	DIST		20.1	10.5	CCW	S<>A
SR16	+910	1												
SR16	+1375	2												

Bighornia patella

LABEL	LEVEL	NUM	SIZE	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTH	MAJ	CC	AA	CK
A595	U2	1		CE	SL	AB	N/N	N	?	REJUV	44	16.4	16.8	
A595	U2	5					N/N		TRY/C		39	12.6	12	
A595	U2	9					N/N				27	6.8	7.2	
CA-V	E+225	2		TR		AB			TRY/A		39		13.1	
CA-V	E+340	6							N					
CA-V	E+340	17				AB			N					
CA-V	E+340	20		CE	SL	AB			ENC?/K?		34	6.5	10.7	0.8
CA-V	E+340	22	18		SL	MI			N	ATT?/K				
CA-V	E+340	25				AB			N		36	7.8	11.9	0.9
CA-V	E+340	26				AB				ATT				
CA-V	E+410	18				AB			N	IND/K				
CC-V	A1	1			CU	NO	Y/Y	N	N					
CC-V	A1	2				CO/MI	Y/N	Y	BOR?		41	8	12.7	0.9
CC-V	A2	1				MI	Y/Y	N	N		38	11		0.9
CC-V	A3	1												
CC-V	E+165	1				MI	Y/N	N	N					
CC-V	E+190	1							N		42	9.7	13.5	
CC-V	E+60	1							N		40	9.8	10.4	1.2
WCR-V	CB	1				WE			N				16.5	0.9
WCR-V	CB	2				CO			N					
WCR-V	CB	3				MI/CO			N		39		12	
WCR-V	CB	4			SL	WE/MI	N/Y	N	N		34	8.8	11.7	1.2
WCR-V	CB	5		TR	SL	MI	N/Y	N	N		35	5.9	9	0
WCR-V	CB	6		TR		MI	Y/Y	N	N					
WCR-V	CB	7				MI/CO			N		30	5.5	8.6	0
WCR-V	CB	8									35		10	0.7
WCR-V	CB	9				CO/MI			N					
WCR-V	CB	10				CO			N		34	8.3	11.3	0.9
WCR-V	CB	11				WE	Y/Y	N	N					
WCR-V	CB	12				WE	N/N	N	N		29		9.2	0.7
WCR-V	CB	13				MI	N/Y	N	BOR?		27	4.9	7.5	1

WCR-V	CB	14			MI	Y/Y	N	N	35	7.2	10.5	0.8
WCR-V	CB	15							33		8.9	1
WCR-V	CB	16		SL	AB	N/N	N	N				
WCR-V	CB	17		SL	WE	N/N	N	N	33	6.4	8.7	0.8
WCR-V	CB	18			AB/CO			N	32	6.2	9.9	1
WCR-V	CB	19			MI	Y/Y	N	N				
WCR-V	CB	20	TR		WE/AB	N/N	N	N	32	8.3	10.7	0.7
WCR-V	CB	21	TR		MI	Y/Y	N	N				
WCR-V	CB	22										
WCR-V	CB	23	TR		WE/AB	Y/N	N	N				
WCR-V	CB+37	1						N				
WCR-V	CB+37	2										
WCR-V	CB+37	3			CO				42	11.7	14.9	
WCR-V	CB+37	4			CO			N	30	6	7.5	0
									43		14.4	
WCR-V	CB+37	5			CO			N	34	8.5	11.4	1.1
WCR-V	CB+37	6			CO			N	40	9.8	12.9	0.9
WCR-V	CB+37	7			CO			N	42	9.8	14.5	1.1
WCR-V	CB+37	8			CO			N	32	6.7		0.7
WCR-V	CB+37	9			CO			N	40	9	12.8	0.9
WCR-V	CB+37	10			CO			N	37	7.4	8.6	
WCR-V	CB+48	1			MI/CO			N	41	8.9	11.4	1
WCR-V	CB+48	2	TR		WE/CO		Y	N	43	12.1	14.7	
WCR-V	CB+48	3			WE/CO			N				
WCR-V	CB+48	4	TR	CU	MI	N/Y?	Y?	?	38	9.1	13.5	0.8
WCR-V	CB+48	5	TR	SL	MI	N/N	Y	N	33	6.6	8.5	0.8
WCR-V	CB+48	6		CU	WE	Y/Y	N	N	34		10.1	1
WCR-V	CB+48	7	TR	SL	WE	N/N	N	N				
WCR-V	CB+54	1			CO			N	31	6.8	10.1	0.8
WCR-V	CB+54	2	TR		WE			N	38	7.3	9	1
WCR-V	CB+54	3			WE/MI	N/N	N	N				
WCR-V	CB+54	4	TR	CU	MI	N/Y	N	N	35	8.9		1
WCR-V	CB+54	5	TR		WE/MI	N/N	N	N	34	6.2	10	1.1
WCR-V	CB+54	6	TR	CU	WE			N	31	7	10.2	0.9

WCR-V	CB+54	7		TR	CU	MI	N/Y	N	N		38	7.6	10.8	0.9
WCR-V	CB+54	8								2SPECS				
WCR-V	CB+54	9		TR		WE	Y/N	N	N		41	13.6	15.2	
WCR-V	CB+54	10			CU	MI	Y/Y	N	N					
WCR-V	CB+54	11				CO	Y/							
WCR-V	CB+54	12				WE/AB	N/Y	N	N		31		9	
WCR-V	CB+54	13			CU	WE			N		36		11.4	1
WCR-V	CB+54	14			CU	MI	N/N	N	N		39	8.9	12.1	1.1
WCR-V	CB+54	15				CO/MI			N		31	6.2	7.7	0.8
WCR-V	CB+54	16				WE	Y/N	N	N		34	8	11	1.1
WCR-V	CB+54	17				CO			N					
WCR-V	CB+54	18			CU	WE			N		31	5.6	8.2	1
WCR-V	CB+54	19				WE/CO			N					
WCR-V	CB+54	20				WE/CO			N		42	9.6	13.3	0.8
WCR-V	CB+54	21		TR		WE/CO			N					
WCR-V	CB+57	1	29,18		CU	WE/MI	N/N	N	N	BAND	39	13.3	14.6	
											30	6.3	7.7	
											37	9.8	11.8	
WCR-V	CB+57	2	14		CU	WE			N		34	8.5	10.4	1
WCR-V	CB+57	3a	40	TR	CU	MI	N/Y	Y	N		43	17.9	18.5	
											32	6.9	9.9	
											43	13.9	16.2	
											40	10.4	13.5	
WCR-V	CB+57	3b				CO					30	5.9	7.8	0
WCR-V	CB+57	3c				CO	Y/Y	N	N		28	6.5	8.7	0.8
WCR-V	CB+57	3d				CO					33	7.3	8.6	0.8
WCR-V	CB+57	4a				CO			N		21	4.3	4.3	1
WCR-V	CB+57	4b		TR		WE/CO	N/Y	N	N		40	9.3	12.6	1.1
WCR-V	CB+57	4c		TR	SL	WE	N/Y?	Y?	N		35	9		1.1
WCR-V	CB+57	4d				WE			N		35		10.2	
WCR-V	CB+57	4e				CO			N		37		10.3	1
WCR-V	CB+57	4f				CO								
WCR-V	CB+57	4g				CO								
WCR-V	CB+57	4h				CO	Y/N		N		42	8.9	12.7	1.1

WCR-V	CB+57	4i		TR	WE/CO			N		30	6.3		0.8
WCR-V		1						N		39	11.2	14.1	1
WCR-V		2	18		MI	N/Y	N	N	ATT	33	8.6	11.5	1
WCR-V		3a	11		MI	N/N	N	N	ATT?/K	33	8.1	10.2	0.9
WCR-V		3b	18	TR	NO	Y/Y	N	N		38	9	12.9	1.3
WCR-V		4	16	TR	MI	N/Y	N	N		36	8	11.7	1
WCR-V		5	18	TR	MI	N/Y	N	N	ATT?/K	33		10	
										39	9.6	12.9	0.9
WCR-V		6			MI	N/Y	N	N		36	10	13	1
WCR-V		7	20		AB	N/N	N	N		31		9.3	
										39	9.8	13.4	0.9
										40	11.5	14.5	1.1
WCR-V		8a	16		NO	Y/Y	N	N		40	9	12.2	1.2
WCR-V		8b	11		AB					29	6.3	7.4	
WCR-V		9	18		AB					40	12	14.8	1.2
WCR-V		10								36	9.3	11.8	1.2
WCR-V		11								37	7.9	9.6	0.8
WCR-V		12	15		MI			N		37	8.6	11.4	1
WCR-V		13			MI	N/Y	N			38	9.1	11.8	1.4
WCR-V		14								42	11.6	14.5	0.9
WCR-V		15								31	6.2	9	1
WCR-V		16	16		NO	Y/Y	N	N	ATT?CTIP	37	9.2	12.6	1.1
WCR-V		17								38	8.3	10.9	1
WCR-V		18	10							26	4.8	6.8	0.6
WCR-V		19			MI	N/Y	N						
WCR-V		20			MI	N/Y	N						
WCR-V		21	18		AB	N/N	N	N					

Salvadorea selecta

LABEL	LEVEL	NUM	SIZE	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTH	MAJ	DIAM	CFCSL
A219	BA+2m	1		TR	ST	AB	N/N	N	TRY		32	11.5	N/N
											40	19.6	N/N
A357(1)	BA+2-5m	1	35	TR	SL	MI	N/N	N	BRY/KL		30	11.8	N/N
											38	19.1	Y/N
A359	U2	12		TR	ST	WE?	Y/N	N	N		26	7.7	
A364(1)		1		TR	CU	AB	N/N	N	N		42	21.8	N/N
											34	11	Y/N
A364(1)		2		TR	SL	AB	N/N	N	TRY/K		44	19	Y/Y
A364(1)		3		TR	CU	CO/AB	N/N	N	BOR?		48	20.8	Y/Y
A364(1)		4		TR	ST	AB			N		40	15.9	Y/Y
A466b(1)	BA .7-2	1		TR	SL	MI	N/N	N	TRY/BOR		36	15.1	Y/Y
A466b(1)	BA .7-2	5		TR	CU	AB	N/N	N	TRY?		35	15.7	Y/Y
A466b(1)	BA .7-2	8		CE	CU	AB	N/N	N	TRY	OST*	34	12	
A466c	BA 2-4.05	1	64	TR	CU	MI	Y/N	N	BRY/C		37	16	N/N
											43	25.2	Y/N
A466c	BA 2-4.05	2	61	TR	CU	AB	N/N	N	BRY/A		36	14.5	N/N
											42	22.2	Y/N
A466c	BA 2-4.05	3		TR	CU	NO	Y/Y	N	N	DIST/C			
A466c	BA 2-4.05	4		TR	CU	CO			N	DIST/C			
A466c	BA 2-4.05	5		TR	CU	NO	Y/Y	Y	N				
A468a		1	60+	TR	ST	AB	N/N	N	TRY/CAK		45	27.2	Y/Y
											30	15.1	N/N
A468a		2		TR	ST	AB	N/N	N	TRY/ BRYABS		33	16	N/N
											40	25.6	Y/Y
A468a		4		TR	SL	AB	Y/N	N	ENC		41	20.6	Y/Y
A468a		5		TR	SL	CO	N/N	N	TAB/TRY	DIST	35	14.7	Y/Y
											40	21.9	Y/Y
A468a		7		TR	CU	AB	N/N	N	TRY		35	14.1	N/N
A468a		16		TR	ST	LO	Y/N	N	N		35	13.4	N/N
A468a		23		TR	ST	CO	N/N	N	N		30	11	N/N
A468a		24		TR	SL	MI	N/N	Y	N		31	10.6	

A595	U2	2		TR	ST	MI	Y/N	N	BRY?		35	18.1	Y/N
A595	U2	3		TR	ST	MI	Y/Y	Y	BRY/K		29	10.8	Y/Y
A595	U2	4		TR	ST	AB	N/N	N	N				
A595	U2	6		CE	ST	AB	N/N	N	ALC/TRY				
A595	U2	8		CE	ST	MI	Y/Y	N	N		27	8.3	
CARL-V	FB	1	41	TR	CO	MI	N/N	N	N				
CARL-V	FB	2	32	TR	CU	MI	Y/N	Y	N		43	13.3	
CAS-V	LCB+245	1		TR	ST	MI	Y/N	Y			33	15	N/N
											29	10	Y/Y
CA-V	E+110	1		TR		AB			TRY/K		39	15.8	Y/Y
CA-V	E+110	2				AB			BRY		37	19.1	Y/Y
CA-V	E+145	4							N		22	5.9	N/N
											30	9.6	Y/Y
CA-V	E+185	1	23	TR		AB	N/N	N	N		28	9	Y/Y
											20	5.8	
CA-V	E+340	19		TR		AB	Y/N		N		39	14.1	N/N
CA-V	E+340	21		TR	ST	AB			N		34	9.5	N/N
											36	15.7	Y/Y
CA-V	E+340	24		TR		AB			N		32	10.2	N/N
											26	9.6	Y/Y
CA-V	E+380	32				AB			N	ATT	26	6.9	
CA-V	E+410	12				AB			N		38	14.6	N/N
CA-V	E+410	23											
CA-V	E+410	37											
GR-V		1							N				Y/Y
GR-V		3		TR		MI	Y/N	N					Y/N
LC	MIDU3	1				CO/MI	Y/N	N	N		33	15	N/N
LC	TOPU2	1		TR	ST	AB	N/N	N	N				Y/Y
LC	TOPU2	2		TR	ST	AB	Y/N	N	N		34	13.2	Y/Y
LC	U2+15	2		TR	ST	MI	N/N	N	TRY		36	24.1	N/N
LC	U2+15	3		TR		CO			N	OST*	40	16.5	Y/Y
LC	U2+15	4				CO/MI	N/N	N	BOR		40	18	Y/Y
LC	U2+15	5		TR	ST	MI	N/N	N	TRY/BRY/K		38	19.5	Y/N
LC	U2+15	6		TR	ST	MI	N/N	N	N		35	16.6	Y/Y

LC	U2+15	7		TR	ST	MI	N/N	N	TRY		42	22	Y/Y
LC	U2+15	8		TR	ST	MI	N/N	N	TRY		38	17.2	Y/N
LC	U2+25	1		TR		WE	N/N	N	N				N/N
LC	U3+120	1	62,49					Y	BRY		50	26	
LC	U3-103	1		TR	ST	MI	N/N	N	BRY	ATT	37	16.2	Y/Y
LC	U3-105	1	52	TR	ST	WE/MI	N/N	N	ALC+TAB		39	14.2	N/N
											44	25.1	Y/N
LC	U3-105	2		TR	SL	NO	Y/Y	N	BOR/C		35	15.6	Y/Y
LC	U3-105	4		TR	CU	AB	N/N	N	BOR/TRY/C		39	14.8	Y/Y
LC	U3-105	5		TR	SL	MI	Y/N	N	N		39	16.3	Y/N
LC	U3-120	1		TR	ST	MI	N/N	N	TRY		42	20.6	Y/N
LC	U3-120	2		TR	ST	AB	N/N	N	TRY		40	20.8	N/N
LC	U3-120	4		TR	SL	CO	Y/		N		39	19.9	Y/N
LC	U3-20	1				CO/MI	N/N	N	N		44	20.1	Y/N
LC	U3-210	1		TR	ST	MI	N/N	N	ENC		35	18.6	N/N
LC	U3-50	1		TR		CO/MI	N/N	N	N		34	12	N/N
LC	U3-60	1		TR	ST	MI	N/N	N	ENC/C?		40	19.1	N/N
LC	U4-100	2		TR	CU	AB	N/N	N	N		35	15	N/N
LC	U4-75	2		TR	CU	AB	N/N	N	N		30	9.6	
LC	U4-75	3		FRAG									
LSM-V	BH	1a	38	TR	SL	AB	N/N	N	N		36	12.8	N/N
MB	+5	1		TR		WE/CO			TRY		50	22.9	Y/N
MB	+15	1		FRAG									Y/N
MB	+40	1	>93	TR	CU	WE/CO			BOR/K		41	18.6	N/N
											48	28	Y/N
MB	+80	1		TR	ST	WE/AB	N/N	Y	ALC/TAB		41	23.2	Y/Y
MB	+150	1	>47	TR	CU	LO	N/Y	Y	N				
MB	+215	1		TR		MI	N/N	N	TRY		49	30	Y/N
MB	+220	1		TR	SL	MI	N/N	N	TRY		45	21.5	N/N
MB	+250	1		TR	CU	AB			N				
MB	+260	1		TR	CU	CO			N		39	18	N/N
MB	+260	3		FRAG		MI	N/Y		N				
MB	+310	1		TR	CU	AB	N/N	N	BOR/K		35	11.3	N/N
RSM-V	BH	2		TR	ST	MI	Y/N	N	N		31	11.9	

RSM-V	BH	3		TR		WE	N/Y	N	N		31	14.1	
SPO-V	+55	1		TR	ST	WE/MI	N/N	N	N		34	11.1	N/N
SPO-V	+95	4				CO/MI	N/N	N	N		31	14.7	N/N
SPO-V	U2+120	7		TR		CO/AB	N/Y	Y	N		26	7.3	N/N
SPO-V	+95	11				CO/MI	N/N	N	N		30	13.5	N/N
SPO-V	+95	13		CY		AB/CO	N/N	N	N		35	12.5	
SPO-V	B1	5							N		27	8.8	N/N
											28	11.7	Y/Y
SPO-V	B4	3							N		30	13	Y/Y
SPO-V	B4	5		TR		AB	Y/N		N		25	6.9	N/N
											35	15	N/N
											36	16	Y/Y
SPO-V	B5	1		TR		AB			ALC?RUG?		34	16.2	N/N
VR		1		TR	SL	AB	N/N	N	ENC?	REJUV?	49	18.5	N/N
VR		2	>63	TR	SL	AB/CO	N/N	N	BOR?		40	16.1	N/N
VR		3		TR	CU	AB/CO	N/N	N	N		43	13.3	Y/Y
VR		4		TR	SL	AB	N/N	N	TRY/C		46	15.6	Y/N
VR	AU	1	100	TR	SL	WE/AB	N/N	N	TRY/K				
VR	VRO	1		TR	SL	MI	N/N	N	N	BUDS*			

Lobocorallium trilobatum vaurealense

LABEL	LEVEL	NUM	SIZE	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTH	MAJ	CC	AA
CARL-V	+3.0	1		TR	SL	MI	N/N	N	TRY		52	19.6	22.8
CAS-V	LCB	2		TR		AB			N		35	13.1	11.3
SCA-V	+15	1		TR	CU	MI	N/Y	N	BOR?				
CA-V	+220	1		TR		MI	N/Y	N	TRY?				
CA-V	E+340	1				AB			N		63	27.2	22.8
MHVS		1			SL	AB	N/N	Y	BRY		52	19.9	18.5
MHVS		2			CU	WE/AB	N/N	Y	N				
RH-V	+125	1				CO/MI					66	35.5	25.5
SPO-V	+85	1	80								51	26.7	21.6
				TR		MI	N/Y	Y	N		56	33.4	27.2
SPO-V	+95	3		TR	SL	MI	N/Y	Y	BRY				
SPO-V	B4	1a				AB			N		55	27.1	24.1
SPO-V	B4	1b				AB					40	15	12.5
											65	31	27.4
SPO-V	B4	1c											
SPO-V	B4	4				AB			N		50	24.5	21.5
											45	19.9	12.2
SPO-V	B6	1							N		53	22.9	19.7

Deiracorallium angulatum angulatum

LABEL	LEVEL	NUM	SIZE	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTH	MAJ	CC	AA
BMAC-V	+110	1	21	TR	SL	NO	Y/Y	N	N				
BMAC-V	BEACH L	1		FRAG		MI	N/N	N	N		45	18	
BMAC-V	BEACH L	2		FRAG		WE/CO			N				
BMAC-V	BEACH L	3		TR	CU	CO/AB	N/N	N	N				
BMAC-V	BEACH L	4		FRAG		WE	N/Y	Y	N				
BMAC-V	BEACH L	5				CO/AB	N/N	N	BOR?		30	12.4	8.9
BMAC-V	LOW SH	1	21	TR	CU	MI	Y/Y	N	N				
BMAC-V	LOW SH	2	32	TR	CU	NO	Y/Y	Y	N				
BMAC-V	LOW SH	3		TR		WE/AB	N/Y	N	N		38	13.6	11.5
CAS-V	LCB	3				AB	N/Y?		N				
CAS-V	LCB	4		TR		AB	Y?/N		N		33	11.6	8.4
CAS-V	LCB	5							N				
OC-V	-610	1				CO					17	4.2	3.4
OC-V	-610	2		TR	CU	MI	N/N	Y	N		23	7.2	4.2
											37	12.5	11.3
											34	10.7	8.9
OC-V	-610	3				CO					27	6.5	5.2
						CO					30	7.4	6.4
OC-V	-610	4A				CO					21	4.7	4.1
OC-V	-610	4B				CO					24	6.8	6.4
OC-V	-610	5				CO					30	10.7	9.2
						CO					20	5.2	4.7
OC-V	-610	6				CO					37	6.7	5.6
OC-V	+120	1A	17	TR	CU	NO	N/Y	N	N		32	10.9	8.9
OC-V	+120	1B	18										
OC-V	+120	2		TR	CU	NO	Y/Y	N	N		30	9.8	6.9
OC-V	+120	3	29	TR	CU	MI	N/Y	N	N		32	9.6	8
OC-V	+120	4		TR	SL	MI	N/Y	N	N				
OC-V	+120	5A	30			WE	N/N	Y	N		37		8.4
OC-V	+120	5B	16			MI	N/Y	N	N		31		7
OC-V	+120	6		TR	CU	MI	N/Y	N	N		27	8.5	6.2

OC-V	+120	7				CO			N	2SPECS	28	8.9	7.5
OC-V	+120	8		TR	CU	MI	N/Y	N	N				
OC-V	+120	9		TR	CU	MI	N/Y	N	N	3SPECS			
OC-V	+120	10	21	TR	CU	MI	N/Y	Y	N	2SPECS	30	9.5	8.2
OC-V	+120	11		TR	CU	MI	Y/Y	N	N	2SPECS			
OC-V	+120	12		TR	CU	MI	N/Y	N	N	3SPECS			
OC-V	+400	1		TR		CO/WE			N	2SPECS	34	7.7	6.4
OC-V	+400	2		TR	CU	WE/CO			TRY	2SPECS			
OC-V	+400	3				CO/WE			N				
OC-V	LOOSE	1				WE/CO			BOR		32	11.2	
OC-V	LOOSE	2				CO/MI	N/N	N	N		23	3.1	
OC-V	LOOSE	3		FRAG						2SPECS			
OC-V	LOOSE	4											
OC-V	LOOSE	5											
OC-V	LOOSE	6				WE/CO			N		28	6.5	3
PO-V	CB	1		TR		CO/MI	N/N	N	N		32	10.4	7.7
PO-V	CB	2		TR		CO/MI	Y/Y	N	N				
PO-V	CB	3		TR		MI	N/Y	N	N		32	10.8	7.4
PO-V	CB	4				CO/MI	N/N	N	BOR?		23	5.4	4.8
PO-V	CB	5		TR	ST	WE/MI	N/N	N	N		35	11.2	7.7
PO-V	CB	6		TR	SL	MI	N/Y	N	N		26	8.4	6.4
PO-V	CB	7				CO			N	2SPECS	29	8.3	7
PO-V	CB	9		TR		CO/MI	N/N	N	N		33	11.1	
PO-V	CB	11		FRAG									
PO-V	CB	12				CO/MI	N/N	N	N				
PO-V	CB	13		FRAG									
PO-V	CB-10	1		TR		MI	Y/Y	N	N		31	10.1	7.6
PO-V	CB-10	2		TR	CU	WE/CO					33	11	
PO-V	CB-10	3		TR/FRAG		WE/CO							
PO-V		1		TR	CU	MI			N		27	8.2	6.5
RH-V		1				MI	N/Y	N	N				
RH-V	+60	1		TR		WE			N				
RH-V	+60	2				CO							

RH-V	+80	1	CO					
RH-V	+95	1	AB/CO	N/N	N	N	27	9.8
SPO-V	B4	2				N		

Eurogrewingkia pulchella

LABEL	LEVEL	NUM	SIZE	SHA	CUR	ABRAD	GRGL	RUG	EPIS	OTH	MAJ	DIA	A.S.	ARD	ASD
83AP11-2	BH<30	9				MI	Y/N	N	N		27	10			
											31	14			
83AP11-2	BH<30	10				AB	N/N	N	ENC						
83AP11-2	U30CM	8(1A)													
83AP11-2	U30CM	8(1B)													
83AP14-1	OPBU8CM	1			SL	AB?	N/N	N	N						
83AP14-1	OPBU8CM	2				AB	N/N	N	ALC		34	13			
83AP14-1	OPBU8CM	4			SL	AB	N/N	N	N		26	8			
											32	13			
83AP14-1	OPBU8CM	6			SL	MI	Y/N	N	WE+ALC		18	4.5			
											29	11			
83AP14-1	OPBU8CM	7					N/N	N			29	11			
83AP14-1	OPBU8CM	8				AB									
83AP14-1	OPBU8CM	10				AB	N/N	N	N						
83AP14-1	BH380-430	22a		TR	SL	AB					27	10			
83AP16-1-1B	BA 1M	1b									22	7			
						AB					15	3			
83AP16-1-1B	BA 1M	1d				MI	Y/?				25	11			
											21	7			
83AP16-1-1B	BA 1M	1e				MI					14	2			
83AP16-1-1B	BA 1M	2				MI	Y/?				22	7			
											15	4			
83AP16-1-1B	BA 1M	3				MI	Y/N				22	5.5			
83AP16-1-32+1	B+160	1				AB									
83AP16-1-BH	BH250-380	1		TR	SL	MI	Y/N	N	ALC		29	12.5			
83AP16-1-BH	BH250-380	2	27		CU	MI	Y/N	N	BRAN		24	7			
											32	13			
83AP17-1-1B	BA 1M	1b			SL				BRY	ATT	16	4.5			MLA?
83AP17-1-1B	BA 1M	2a	24, 15								28	9.5			
											32	12			
											32	12.5			

				TR	SL	AB	N/N	N		24	7	Y	MLA
83AP17-1-1B	BA 1M	2b			SL					23	7		
83AP17-1-1B	BA 1M	3a				MI	Y/N	N		22	6		
83AP17-1-1B	BA 1M	3b				AB							
83AP17-1-1B	BA 1M	3c				AB				22	5		
83AP17-1-1B	BA 1M	4		CE		AB		Y	BRAN				
83AP17-1-1B	BA 1M	5				AB				23	7		
										18	5		
83AP17-1-1B	BA 1M	8			SL					19	4.5		
										14	2		
83AP17-1-1B	BA 1M	14		TR	SL	AB	N/N	N		25	7.5		
										26	9		
83AP17-1-1B	BA 1M	15				NO	Y/Y	N		18	5		
83AP17-BH	BH20-380	2A		TR	SL	NO	Y/Y	N	N	30	12.5		
83AP17-BH	BH20-380	2B		TR	SL	MI	Y/N	N	ALC/K	29	11		
										20	5		
83AP17-BH	BH20-380	3	37, 21	TR	SL	MI	Y/N	N	WE/K,A	26	9		
										32	15.5		
83AP17-BH	BH20-380	4		TR		MI	Y/N	N	ALC	27	8.5		
83AP17-BH	BH20-380	6B		TR	SL	NO	Y/Y	N	N	32	13.5		
										21	6.5		
83AP17-BH	BH20-380	6C	16, 13	TR	SL	NO	Y/Y	N	N				
83AP17-BH	BH20-380	6D		TR	SL	MI	Y/N	N	ALC	27	11		
83AP17-BH	BH20-380	7B	30	TR	CU	MI	Y/N	N	ALC	18	4		
										27	9		
										26	8		
										31	14		
83AP17-BH	BH20-380	8A				MI	Y/N	N		22	7		
83AP17-BH	BH20-380	8C	25		SL	MI	Y/N	N	ALC	27	8		
83AP17-BH	BH20-380	11A				MI	Y/N	N	N	18	4.5		
										14	3.5		
83AP17-BH	BH20-380	11B		CE	BE	NO	Y/Y	N	N	11	2		
										18	6		
										18	5		

83AP17-BH	BH20-380	12B			SL	MI	Y/N	N	N	OST?	26	7.5
											29	11
83AP17-BH	BH20-380	14B		TR	SL	MI	Y/N	N	ALC		27	10.5
											31	14
83AP17-BH	BH20-380	14C		TR	SL	MI	Y/N	N	ALC/A+K		26	10.5
83AP17-BH	BH20-380	18		TR	SL	AB	N/N	N	N		17	4
											31	11
83AP17-BH	BH20-380	24B		TR	SL	MI	Y/N	N	N			
83AP17-BH	BH20-380	24D		TR	SL	NO	Y/Y	N	N		21	5
83AP17-BH	BH20-380	26A		TR	SL	NO	Y/Y	N	ALC		29	10
83AP17-BH	BH20-380	26C		TR	SL	MI	Y/N	N	ENC/K		21	6.5
											28	11
83AP17-BH	BH20-380	26Da	11, 10	TR	CU	MI	Y/N	N	ENC/K		16	4
											14	3.5
83AP17-BH	BH20-380	26Db	13, 10	TR	SL	MI	Y/N	N	N		19	6
											18	5.5
83AP17-BH	BH20-380	26E		TR	SL	AB	K/K	N	N		14	3
			14								21	6.5
83AP17-BH	BH20-380	27C		CE	SL	MI	Y/N	N	ENC		11	2
											20	5
83AP17-BH	BH20-380	27E		CE		MI	Y/N	N	BRY/A		22	5.5
											23	6.5
											16	3.5
83AP17-BH	BH20-380	27F		TR	SL				ENC			
83AP17-BH	BH20-380	27G		TR	SL	MI	Y/N	N	N	OSTINFOS	18	5
											20	10.5
83AP17-BH	BH20-380	27I	12		SL	MI	Y/N	N	ENC		21	6
83AP17-BH	BH20-380	27J			SL	NO	Y/Y	N	N		13	3
											28	8
											21	5
83AP17-BH	BH20-380	27K		TR	SL	MI	Y/N	N	N		15	3.5
											25	7
83AP17-BH	BH20-380	28		TR	SL	MI	Y/N	N	WE/K		26	9
											30	12

83AP17-BH	BH20-380	30	20	TR	SL	NO	Y/Y	N	N				
83AP17-BH	BH20-380	32C		TR	SL	MI	Y/N	N	N		17	4	Y
											32	13	
											26	8.5	
83AP17-BH	BH20-380	32E		TR	SL/BE	MI	Y/N	N	N		16	3.5	
			33								27	9	
83AP17-BH	BH20-380	36C		TR	CU	AB	Y/N	N	BRAN/K		24	6	
			30								13	3	
											32	13	
											32	14	
83AP17-BH	BH20-380	38A					Y/N	N			29	13.5	
83AP17-BH	BH20-380	41			CU	AB	N/N	N	ALC/MBO?	CON	32	13.5	
											32	15.5	
											27	9.5	
83AP18-1-R5	OPB+13	1A				AB			ALC/MBO?				
83AP18-1-R5	OPB+13	1B				AB			ALC/MBO?				
83AP18-1-R5	OPB+13	2					N/N				24	8	
83AP18-1-R5	OPB+9	3	25	TR	SL	AB			ENC		23	9	
83AP18-1-R5	OPB+14	4				MI	Y/N	N	N		25	10	
83AP18-1-R5	OPB+?	5									18	5	
83AP18-1-R7	BH<30	1				MI	Y/N	N	ALC/A		32	15	Y
83AP18-1-R7	BH<30	3B	20	TR	SL	AB	N/N	N	N		29	10	
83AP18-1-R7	BH<30	3C	18	TR	SL		N/N	N	N		28	10	
83AP18-1-R7	BH<30	3E		CE	SL	AB			ALC/MBO?		18	4	
											25	7	
83AP18-1-R7	BH<30	3F											
83AP18-1-R7	BH<30	3G		TR	SL	AB	N/N	N	N		27	10.5	
83AP18-1-R7	BH<30	4A		TR	SL	MI	Y/N	N	N		30	13	
83AP18-1-R7	BH<30	4B				MI	Y/?	N	ALC		29	10	
											30	11	
											26	8	
83AP18-1-R7	BH<30	4D	28	TR	SL	AB	N/N	N	N		31	12	
83AP18-1-R7	BH<30	4F							ALC*/TRY		27	7	
83AP18-1-R7	BH<30	4G	21	TR	SL	MI	Y/N	N	ALC/K		28	8.5	

83AP18-1-R7	BH<30	4H		CE		MI	Y/N	N	ALC		30	11
											30	13
83AP19-1-67	B+317	1									15	3
			12								18	4
83AP19-1-67	B+317	2				MI	Y/N	N				
83AP19-1-90	B+412	1							BRY/C,A		27	10.5
83AP19-1-108	B+493	1	8	TR	SL	NO	Y/Y	N	CYCLO	CON	21	7
											18	5
83AP19-1-115	B+521	1									21	6.5
				TR	SL	AB					27	10
83AP19-1-119	B+537	1				NO	Y/Y	Y?	N	CON	17	4
											13	2.5
											18	3.5
83AP19-1-119	B+537	2		TR	SL	AB					23	5.5
83AP19-1-119	B+537	3				AB					18	4
											14	3.5
											22	5.5
83AP19-1-120	B+539	1		TR	CU/BE	MI	Y/N	N	N	CON		
83AP19-1-130	B+564	1		TR	SL	MI	Y/N	N	N			
83AP19-1-130	B+564	2		TR		NO	Y/Y	N	UNID		16	3.5
									BRY/KAC		21	6.5
83AP20-2-102	B+475	1	33		SL	AB	N/N	N	N		22	6
											14	2.5
											32	13
											29	11
83AP20-2-102	B+475	2			SL	MI	Y/N	N	CYCLO/ACK		21	7
											26	11
83AP20-2-102	B+475	3							CYCLO/ACK		30	13
											25	9
83AP20-2-102	B+475	4			SL	AB	N/N	N	CYCLO/ACK		24	9
											22	6
83AP20-3-142	B+612	1	30		SL	AB	N/N	N	BRY/K		24	8
											28	15.5
83AP20-3-142	B+612	2	18		SL	MI	Y/N	N	CYCLO/CAK		25	9

										11	2
83AP20-3-142	B+612	3		SL	MI	Y/N	N	N		22	7
										14	3
83AP20-3-142	B+612	4	22	SL	MI	Y/N	N	CYCLO/KAC		20	5
										26	11.5
83AP20-3-142	B+612	5			AB	N/N	N	N		27	10.5
83AP20-3-142	B+612	6	22	SL	MI	Y/N	N	N		18	3.5
										26	9.5
83AP20-3-142	B+612	7	24	SL	MI	Y/N	N	N		25	7
										19	3.5
										30	12.5
83AP20-3-142	B+612	8	16	CU	MI	Y/N	N	BRY/K		17	4
										24	8.5
83AP20-3-142	B+612	9	20	SL	MI	Y/N	N	CYCLO/K		23	8
											4
83AP20-3-142	B+612	10	20	SL	MI	Y/N	N			28	9
83AP20-3-142	B+612	11	25	SL	AB	N/N	N	CYCLO/AK	ATT/AC	16	4
										32	13
										27	8.5
83AP20-3-142	B+612	12	30	SL	AB	N/N	N	N		21	5
										18	4
										29	11
										15	3.5
83AP20-3-142	B+612	13			AB	N/N	N	N		24	6
										21	4.5
										28	11
83AP20-3-142	B+612	14									
83AP20-3-142	B+612	15			AB	N/N	N			22	7.5
										13	3
83AP20-3-142	B+612	16		SL	MI	Y/N	N	N		17	5
83AP20-3-142	B+612	17	14		MI	Y/N	N				
83AP20-3-142	B+612	18		SL	AB	N/N	N	N		16	4
			19							25	8.5
83AP20-3-142	B+612	19									

83AP20-3-145	B+631	1			SL	MI	Y/N	N	N		20	6		
83AP20-3-145	B+631	2			SL	MI	Y/N	N	N		27	8.5		
											13	3		
83AP20-3-145	B+631	3			SL	MI	Y/N	N	N		27	10.5		
											17	4		
83AP20-3-161	B+681	1				NO	Y/Y*	N			22	6		
83AP20-3-161	B+681	2			SL	MI	Y/N	N	BRY/K/TUB/A		26	8		
83AP20-3-161	B+681	3	14		SL	NO	Y/Y	N	N					
83AP22-1-15	OPB0-16	1	10	TR	SL	MI	Y/N	N			19	6.5	Y	MLA
83AP22-1-15	OPB0-16	2				AB	N/N	N	BRY*		23	10		
83AP22-1-15	OPB0-16	3				AB	N/N	N	TRY					
83AP24-2-48	B+325	1	27	TR	BE	MI	Y/N	N	BRY		19	5		
											17	4		
											27	10		
83AP24-2-54	B+343	1	25			NO	Y/Y	N	BRY	DIST				
83AP24-2-57	B+355	1				MI	Y/N	N	BRYKAC		21	5		
											26	10		
											26	11		
											26	9		
83AP29-1-23	B+550	1		TR	SL	AB	N/N	N	BRY/K		28	9		
											33	11.5		
83AP29-1-23	B+550	2		TR	SL	MI	Y/N	N	BRY/AKA					
83AP29-1-30	B+580	1a		TR	SL	MI	Y/N	N	N		24	7.5		
											15	3		
83AP29-1-30	B+580	1b	10			NO	Y/Y	N	BRY/ACK	CON/ATT				
83AP29-1-30	B+580	1c				AB	N/N	N	N		20	4.5		
											27	9		
83AP29-1-30	B+580	1d		TR	SL	AB	N/N	N	BRY/C		30	12		
83AP29-1-30	B+580	1e		TR	SL	MI	Y/N	N	N		27	10		
											32	15		
83AP29-1-30	B+580	1f		TR	SL	AB			BRY/K		28	12		
											19	3.5		
83AP29-1-30	B+580	1g	31		SL	MI	Y/N	N	N	CON	29	10.5		
											18	4		

											29	13
83AP29-1-30	B+580	1h		TR	SL	MI	Y/N	N	N	CON	25	9
											32	13
											32	12.5
											16	3
83AP29-1-30	B+580	2a				AB	N/N	N	N		24	6
											25	10
83AP29-1-30	B+580	2b		TR	SL	MI	Y/N	N	N		24	9
											17	4.5
83AP29-1-34	B+603	1b			SL	NO	Y/Y	N	N		25	8
											14	3.5
83AP33-1-53	B+711	1				NO	Y/Y	N	N		27	11
83AP33-1-57	B+725	1		TR	SL	NO	Y/Y	N	N		19	6
											28	9
											17	4
83AP33-1-57	B+725	2		TR	SL	NO	Y/Y	N	N		18	4.5
											23	8
											15	3
83AP33-1-57	B+725	3		TR	SL	NO	Y/Y	N			18	4.5
											29	11
											30	14
											23	7
83AP33-1-58	B+729	1				AB			TRY		21	7
83AP33-1-58	B+729	2		TR	SL	NO	Y/N	N	N		22	6
											26	11
83AP33-1-59	B+731	1				MI	Y/N	N	N		24	9
83AP33-1-64	B+753	1				MI	Y/N	N	N		20	6
											24	10
83AP33-1-64	B+753	2	16	TR	SL	MI	Y/N	N	?		17	3.5
											27	10
83AP33-1-64	B+753	3				AB	N/N	N			26	9.5
83AP33-1-64	B+753	4				MI	Y/N	N			27	11
83AP33-1-72	B+780	1	17		CU	NO	Y/Y	N	BRY/CA		22	5.5
											16	3.5

84AP9-1-100	B+904	1		TR	SL	MI	Y/N	N	N		21	5			
											25	9			
84AP9-1-113	B+962	1				NO	Y/Y	N	N	KEEL?	25	9			
84AP9-1-115	B+962	1									28	11			
											22	6			
84AP9-1-115	B+962	2				MI	Y/N	N			14	3			
											17	4			
84AP9-1-115	B+962	3				MI	Y/N	N	N		18	4			
A4		1		TR	ST	AB	N/N	N	BRY						
A4		2		TR	CU	NO	Y/Y	Y	BRY						
A4		3		TR	CU	NO	Y/Y	N	N						
A36		1		TR	CU	LO	Y/Y	N	N		22	8.7		1.9	
A36		2	12	TR	SL	NO	Y/Y	N	N		17	5.4			
A36		3		TR	CU	NO	Y/Y	N	N		17	6.4			
A36		4		TR	CU	NO	Y/Y	N	N						
A72		1A									18	5.1			
A72		1B									19	5.4			
A72		2	18	CE		NO	Y/Y	N	N						
A72		3		CE		MI	Y/Y	N	N		18	5.6			
A72		4		TR	SL	AB	N/N	N	N		24	8			
A72		5		CE	ST	LO	Y/Y	N	N		20	6.5		0.9	
A74	U/L	1		TR	BE	LO	Y/Y	Y	N						
A74	U/L	2	23	CE	BE	MI	Y/Y	Y	N						
A85	M	1		TR	ST	MI	N/Y	N	ALC?		26	13.8	LG		L+LA/MLA
A135	BA 2.89m	1		TR	SL	AB	Y/N	N	N		23	8.9		2.5	
A135	BA 2.89m	2		CE	ST	AB	N/N	N	TRY				LG/SO		
A135	BA 2.89m	4	24	TR	CU	AB	Y/N	N	N		29	10.8	LO	2.5	L
A135	BA 2.89m	5		TR	ST	AB/C	Y/N	Y(1)	N		24	9.2	SO		L
A135	BA 2.89m	6	17	TR	ST	AB	N/N	N	N				LG/SO		
A135	BA 2.89m	7		TR	SL	AB/K	Y/N	N	BOR/K		25	10	LG/SO	4.8	
A135	BA 2.89m	8		TR	CU	MI	Y/N	N	N		26	10.1	SO	3.9	L
A135	BA 2.89m	9		CE	SL	AB	N/N	N	N		20	5.8	SM	1.4	L+LA

A135	BA 2.89m	10		TR	CU		Y/N	N	N		22	6.6	S		MLA?
A359	U2	1	24	TR	SL	MI	Y/N	Y	N		28	11.7	LO		
A359	U2	2		TR	SL	NO	Y/N	N	ALC/MBO		28	10.9	LO	1.8	L+LA
A359	U2	3	23	TR	SL	NO	Y/N	Y	N		24	8.6	S/SO	1.9	L
A359	U2	4		TR	ST	CO			ALC				MI		L
A359	U2	5		TR	SL	AB/CO			TRY	DIST		8.9	LO	3	
A359	U2	6		TR	BE	MI	Y/N	N	N	DIST					
A359	U2	7A		TR	ST	AB									
A359	U2	7B		TR	ST	AB									
A359	U2	8	19	TR	SL	AB	N/N	N	N				LO		L+PA
A359	U2	9		TR	ST	CO			ALC		26	8.8	L/LO	3.6	L+LA
A359	U2	10		TR	SL	AB	N/N	N	N				S/SO		L
A359	U2	11		TR	SL	CO			MBO				S/SO		
A359	U2	13		TR	SL	NO	Y/N	Y	ALC		28	10.5	S	1.9	L
A359	U2	14		TR	ST	MI	N/N	N	N		22	7.6	L/SO		
A359	U2	15		TR	SL	MI	Y/N	N	MBO/ALC						
A362(2)	BA 2.89m	1		TR	CU	AB	Y/N	N	TRY/C		30	15.5	L/SO	5.1	L
A362(2)	BA 2.89m	2		TR	SL	ABK	Y/N	N	N		27	8.7	MI		L
A362(2)	BA 2.89m	3		TR	CU	AB	Y/N	N	N		18	5.9	MI		MLA?
A430b	L	1		TR	CU	AB	N/N	N	N						
A430b	L	2	17	TR	CU	AB	N/Y	N	N		26	7.2			
A430b	L	3		TR	ST	AB	N/N	N	BOR?				Y		
A430b	L	4	22	TR	ST	AB	N/N	N	N		21	7.3		2.5	
A430b	L	5		TR	ST	AB	N/N	N	N		21	5.2			
A430b	L	6		TR	ST	AB	N/N	N			24	6.7			
A430b	L	7	17	TR	ST	AB	Y/Y	N	N						
A430b	L	8	6	TR	ST	AB	N/N	N	N						
A435	BA1-2	3		TR	SL	WE			N		17	5.2			
A435	BA1-2	4		TR	SL	WE			N		27	10.8			
A435	BA1-2	8		TR	ST		Y/N				21	6.8			
A435a		1	27	TR	CU	MI	Y/Y	Y	N						
A435a		2	33	TR	CU	MI	Y/Y	Y	N						
A435a		3	31	TR	CU	MI	Y/Y	Y	N?		23	10.9		3	
A435a		4	31	TR	CU	MI	Y/Y	Y	N		26	8.3			

A435a		5		TR	SL	MI	Y/Y	Y	ENC						
A435a		6	18	TR	CU	MI	Y/Y	Y	N						
A435a		7	19	TR	CU	MI	Y/Y	N	N						
A435a		8		TR	CU	WE			N						
A436	BH	5		TR	CU	MI	Y/N	N	ALC		26	9.9	SO	3.1	
A436	BH	9		TR	CU	AB	Y/N	N	MBO	DIST/BUD?			S		L+LA
A436	BH	21		TR	CU		Y/N	N	ALC		27	8.4	S/SO	2.1	
A438c	BA-M	5		TR	ST	NO	Y/N	N	N	CALIC	23	8			
A439b	BA 1-1.2	1a	26	TR	CU/BE	AB/AL	Y/Y	N	N						
A439b	BA 1-1.2	1b		TR	CU/BE	WE	Y/Y	Y?	N						
A468a		14		TR	ST	MI	Y/Y	N	N		31	12.7	Y		MLA
A590c	BA+1-2m	2		TR	SL	MI			N		21	6.1	SSO	1.4	
A597		1	30	TR	BE	NO	Y/Y	N	N						
A597		2		TR	CU	B	Y/Y	Y	N						
A738(52)	BH	1		CE	CU	NO	Y/Y	N	BRY/ALC		35	11.2	Y		MLA
C718	BA 1-2	1		TR	CU	MI/K	N/Y	Y	BOR	DIST					
C718	BA 1-2	2	32	TR	BE	AB	N/Y	N	N						
C718	BA 1-2	3	25	TR	CU/BE	AB	N/Y	N	N						
C718	BA 1-2	4		TR	SL	AB	N/Y	Y	N						
C718	BA 1-2	5	27	TR	CU	LO	Y/Y	Y	N	DIST					
C718	BA 1-2	6	14	TR	SL	MI	N/Y	N	?						
C718	BA 1-2	7		TR	CU	AB	N/N	N	N						
C718	BA 1-2	8	17	TR	CU	AB	N/Y	N	N						
C718	BA 1-2	9	16	TR	SL	MI	Y/Y	N	N						
C718	BA 1-2	10		TR	CU	MI	Y/Y	Y							
CB	+10	1		TR	CU		Y/Y	N	N		20	7.7			
CB	+10	2	8	TR	CU		Y/Y	N	N		16	4.3			
CB	+10	3		TR	CU		Y/N	N	N		22	6.6			
CB	+10	4		TR	CU		Y/Y	N	ATT?		19	6.3			
CB	+10	6		TR	CU	MI	N/Y	N	N		16	4			
CB	+10	7a		TR			Y/Y	N	N	2SPECS		3.4			
CB	+10	7b										7.6			
CB	+10	8		TR	CU	MI	Y/Y	N	N		22	6.6			
CB	+10	9		TR	CU	CO	Y/		N		10	2.3			

CB	+10	11		TR	CU		Y/		N		19	5.7			
CB	+10	12		TR	CU	MI	Y/N	N	N						
CB	+10	13		TR	CU		Y/		N						
CB	+10	14	14	TR	CU		Y/Y	N	BOR?	DIST?	16	5.3			
CB	+10	15	6	TR	CU		Y/		N	2SPECS	16	3.9			
CB	+10	16				CO/MI	Y/N	N	N		22	6.7			
CB	+20	1		TR	CU		Y/Y	N	N		24	8.1			
CB	+30	5													
CB	+34	1	15, 13	TR	CU	MI	Y/Y	N	N						
CB	+36	1		TR	CU	MI	Y/Y	N	N		22	7.5			
CB	+56	1	10, 8	TR	CU		Y/Y	N	N						
CB	+56	2				CO			N						
CB	+75	1		TR	CU		Y/Y	N	N						
CB	+84	1				CO/MI	Y/N	N	N		21	6.5			
CB	+86	1	12, 7	TR	CU		Y/Y								
CB	A2	2		TR	CU	AB/C	Y/N	N	N		20	6.3			
CB	A2	3		TR	SL	MI	Y/N	N	N		20	6.6			
CB	A2	4		TR	CU	LO	Y/Y	N	N		24	7.5			
CB	A3	1		TR	SL	CO	Y/		N		19	7			
CB	A3	2				CO	Y/		N						
CB	A3	3		TR	SL	MI	Y/N	N	N		22	7			
CB	A3	4				CO/MI	Y/N	N	N		22	6.9			
CB	A3	5	15	TR	SL		Y/N	N	N		21	8.1			
CB	A3	6a				CO	Y/N		N						
CB	A3	6b				MI	Y/N	N	N						
CB	A3	7a				CO			N		19	6.3			
CB	A3	7b													
CB	KB3	1		TR	CU	MI/A	Y/Y	N	ALC?/A		20	7.8			
CB-EB3		1	17		SL	MI	Y/Y	N	BOR		22	8.5	L	3.2	COMP
CB-EB3		2	30		SL	MI	Y/Y	N	ALC/BOR	DIST	22	8.5	SSO/L	3.9	/COMP
											24	12.8	SSO/L	5.1	/COMP
CB-EB3		3				MI	N/Y	N	TRY/A		26	9	L	3.6	MLA
CB-EB3		4	20		SL	NO	Y/Y	N	TRY?		26	9	SO	3.1	
CB-EB3		5	16			MI	Y/Y	N	N		24	8	S	2.6	LLA

CB-EB3		6	12		SL	MI	Y/Y	N	N		21	6	SSO	1.8	
CB-EB3		7	30		CU	MI			TRY+MBO?		21	5	Y		
											27	9		2.2	
											32	12.5		5	
CF-EB2	L.CLIFF	1	25		CU	MI			N		25	12.2	LSO	4.2	
CF-EB2	L.CLIFF	4				MI	Y/Y		N		12	2.5			
CF-EB2	U.CLIFF	1	12		CU	MI	Y/N	N	N	ATT/TIP	28	6	SSO		
CF-EB2	U.CLIFF	2				MI	Y/N	N	N		14	3			
CSG		1		TR	CU	MI	Y/Y	N	N						
CSG		2	23	TR	CU	MI	Y/Y	Y	N		22	9.4			
CSG		3	19	CE	CU	MI	Y/N	N	N						
CSG		4		TR	CU	MI	Y/N	N	N		16	4.6			
CSG		5		TR	CU	MI	Y/Y	N	N		19	6			
CSG		6	19	TR	CU	MI	Y/Y	N	N		19	6.8			
CSG		7		TR	CU	MI	Y/N	N	N		22	8.4			
CSG		8		TR	CU	MI	Y/N	N	N		20	7.2			
CSG		9		TR	CU	MI	Y/N	N	N		19	6.2			
CSG		10		TR	CU	MI	Y/N	N	N		17	5.9			
CSG		11		TR	CU	MI	Y/N	N	N						
CSG		12	17	TR	CU	MI	Y/N	N	N		19	7.1			
CSG		13		TR	SL	MI	Y/N	N	N		17	5.5			
CSG		14	14	TR	CU	MI	Y/N	Y	N						
CSG		15	12	TR	CU	MI	Y/N	N	N						
CVPEB1N	T-116	1				MI	Y/N	N	N		22	5.5	Y	1.7	MLA?
CVPEB1N	T-110	1				MI	Y/N	N	N		25	9.5	Y		L+LA
CVPEB1N	T-106	1							TRY?						
CVPEB1N	T-88	1				AB			N		27	10.5	SSO	3.5	
CVPEB1N	T-80	1								DIST?					
CVPEB1N	T-80	2				MI			N		20	7	Y		MLA
CVPEB1N	T-17	1				MI	Y/N	N	N		22	8.5			
CVPEB1N	T-12	1				MI	Y/N	N	BRY		25	10.5	SSO	2.8	LA
CVPEB1N	T-9	1		TR	CU	AB	N/N	N	TRY		26	8.5		2.3	
CVPEB1N	T-9	2				AB			TRY?						
CVPEB1N	T-8	1				AB			N						

CVP-EB1S	T-7	1				MI	Y/N	N	TRY?		22	7		1.8	
CVP-EB1S	T-10	2				AB			N		26	8	Y	3.9	LCOMP
CVP-EB1S	T-10	3				AB			N						
CVP-EB1S	T-10	4				NO	Y/Y	N	N				Y		L+MLA
CVP-EB1S	T-15	1				MI	Y/N	N	N		28	10.5	Y		MLA
CVP-EB1S	T-15	2				AB			N						
CVP-EB1S	T-15	3	13			MI	Y/N	N	N		25	6.8			
CVP-EB1S	T-15	4				AB			N						
CVP-EB1S	T-15	5	12			MI	Y/Y	N	N				N		
CVP-EB1S	T-17	1	19			MI	Y/N	N	N		26	10	Y		UNU
CVP-EB1S	T-17	2				MI	Y/N		N		25	9.5	S		S CCW
CVP-EB1S	T-17	3				AB			N						
CVP-EB1S	T-17	4			BE	AB	N/N	N	CYCLO						
CVP-EB1S	T-17	5	14			MI	Y/Y	N	N	ATT					
CVP-EB1S	T-17	6				MI	Y/N	N	N		20	5	S		S CCW
CVP-EB1S	T-17	7				MI	Y/N	N	CYCLO	EMB	28	10.5	LLO	3.6	LA
CVP-EB1S	T-17	9				MI	Y/N	N	N		23	7.3	Y	2	L+LA
CVP-EB1S	T-17	10				MI	Y/N	N	N		24	10	Y	3.5	L+LA
											18	4.9			
CVP-EB1S	T-17	12				AB			N				LO		
CVP-EB1S	T-17	13	14		BE	MI	Y/N	N	N		24	7.5	L	2.8	COMP
CVP-EB1S	T-17	15				MI	Y/N	N	N		20	4.7			
											28	9.8			
CVP-EB1S	T-17	16				AB	N/N	N	N						
CVP-EB1S	T-23	2				MI	Y/N	N	N		24	9			
CVP-EB2	B+80	1	13	CE	CU	MI	Y/Y	N	N		17	4			
CVP-EB2	B+80	2	15		CU	MI	Y/N	N	N		15	4	Y		MLA
											20	7.5			
CVP-EB2	B+80	3	10		ST	MI	N/N	N	N		16	4.8			UNU?
CVP-EB2	B+80	4				MI	Y/N	N	N		21	7	Y		L/CCW
CVP-EB2	B+80	5				MI	Y/N	N	N		23	8	Y	1.4	L/MLA?
CVP-EB2	B+82	1			SL	AB	Y/N	N	N		21	7.4	LO		
CVP-EB2	B+85	1	20		SL	AB			N		16	4	SLO		
											22	8			

CVP-EB2	B+85	3	30	SL	MI	Y/N	N	N						
CVP-EB2	B+85	4			MI	N/Y	N	N		22	8.4	Y	2.7	LLA
										12	2.5			
CVP-EB2	B+85	5			MI	N/Y	N	N		20	10	LLO	3.8	
										20	7		2.4	
CVP-EB2	B+85	7	15		MI	Y/Y	N	N		20	7.1	LO	2.3	
CVP-EB2	B+85	8			MI	Y/N	N	N		19	7	L		LLA
CVP-EB2	B+85	9	10	SL	MI	Y/Y	N	N				SLO		
CVP-EB2	B+85	10			AB			N		20	5.5	SSO	1.4	
CVP-EB2	B+85	11	15	CU	NO	Y/Y	N	N		20	6.5			
CVP-EB2	B+85	12			NO	Y/Y	N	N		16	4.3			
CVP-EB2	B+85	13			NO	Y/Y*	N	N						
CVP-EB2	B+125	1a	15	CU	MI	Y/N	N	N	2SPECS	18	6			
CVP-EB2	B+125	1b								18	6.5			
CVP-EB2	B+125	2	22	BE	NO	Y/Y	N	N		15	4.5	LO		MLA
										19	7		2.6	
CVP-EB2	B+125	4			AB	N/N	N	N		22	9.5	Y	2.9	L/PAL
CVP-EB2	B+130	1a			MI	Y/N	N	N	LP/5SPECS	16	4.5			
CVP-EB2	B+130	1b									6			
CVP-EB2	B+130	1c								21	8.5		2	
CVP-EB2	B+130	1d												
CVP-EB2	B+130	1e												
CVP-EB2	B+130	2			NO	Y/Y	N	N		26	10	N		
										18	4			
										23	7.5			
CVP-EB2	B+130	3a	13	CU	AB			N						
CVP-EB2	B+130	3b			AB			N		21	6.8	LO	1.7	
CVP-EB2	B+130	4	12		MI	Y/N	N	N		16	5			
CVP-EB2	B+130	5a			MI			BOR W/OS'	2SPECS	22	10.6	Y		UNU
CVP-EB2	B+130	5b												
CVP-EB2	B+130	6			MI	Y/N	N	N				LSO		
CVP-EB2	B+135	4			MI			N		21	7			
CVP-EB2	B+135	5			MI	N/Y	N	N		22	9.5	LO	2.6	LLA
CVP-EB2	B+135	6	12		NO	Y/Y	N	N		19	6.5	S	2.1	

CVP-EB2	B+135	7			MI			N		22	9		2.8	
CVP-EB2	B+135	8		CU	AB			N		20	7.5	SSO	1.6	
CVP-EB2	B+135	9			NO	Y/Y	N	N		20	7	SSO	1.9	
CVP-EB2	B+135	10			MI	Y/Y	N	N		17	6.5	SO	1.6	
CVP-EB2	B+135	11	17	CU	MI	Y/N	N	N		21	8	LLO	2.6	
CVP-EB2	B+135	12			MI	Y/Y	N	N		24	8.7	N		
CVP-EB2	B+135	13			MI	Y/Y	N	N		21	8	SO	1.9	
CVP-EB2	B+150	1			MI	Y/Y	N	N		23	7.5		1.8	
CVP-EB2	B+150	2	20		MI	Y/Y	N	N		19	7.5		2.8	
CVP-EB2	B+150	3	15	CU	NO	Y/Y	N	N						
CVP-EB2	B+155	1	13	CU	NO	Y/Y	N	N		17	6			
CVP-EB2	B+155	2			AB			N		20	8		2.6	
CVP-EB2	B+155	3			MI	Y/N	N	N		20	6.5			
CVP-EB2	B+155	4			AB			N		25	8.9	N		
CVP-EB2	B+165	1a	13	BE	NO	Y/Y	N	N		19	5.5			
CVP-EB2	B+165	1b								17	4.5			
CVP-EB2	B+165	2			MI			N	2SPECS	23	10.5	L	4.2	COMP
CVP-EB2	B+165	3a			MI			N	4SPECS	20	7		1.8	
CVP-EB2	B+165	3b												
CVP-EB2	B+165	3c												
CVP-EB2	B+165	3d												
CVP-EB2	B+165	4			AB			N		23	7.7		2	
CVP-EB2	B+165	5			MI	Y/N	N	N		22	8		2.4	
CVP-EB2	B+165	6	7	CU	MI	Y/N	N	N						
CVP-EB2	B+165	7			AB			N						
CVP-EB2	B+165	8			MI	Y/N	N	N		21	8	S		MLA
CVP-EB2	B+165	9	9	CU	AB			N		22	6.7			
CVP-EB2	B+180	1			AB			N		20	7.5	SSO		
CVP-EB2	B+180	2			MI	Y/N	N	N		21	6			
CVP-EB2	B+180	3			MI			N		18	6	LO		
CVP-EB2	B+180	4		SL	AB			N		20	7.5	SO	3	
CVP-EB2	B+180	5	11		MI	Y/N	N	ALC?		18	5.4			
CVP-EB2	B+180	6			MI	Y/N	N	N		21	7.9	LO		
CVP-EB2	B+195	1	20	CU	MI	Y/Y	N	N		18	5			

											22	9.5		3.3	
CVP-EB2	B+195	2				MI			ENC?		19	5.5	LSO	2.1	1L
CVP-EB2	B+200	2				MI	Y/N	N	N		24	9.5	Y	3.4	MLA
CVP-EB2	B+200	3				MI	Y/Y	N	N		19	7	SLO	1.9	LLA
CVP-EB2	B+200	5				AB			N		19	5.5	Y	1.8	L
CVP-EB2	B+200	6a			CU	AB			N	2SPECS	22	8	S	1.5	
CVP-EB2	B+200	6b													
CVP-EB2	B+200	7				MI	Y/N		N		19	6.7	Y		
CVP-EB2	B+200	8			SL	MI	Y/Y	N	N		16	4.4			
CVP-EB2	B+200	9			CU	MI	Y/N	N	TRY	DIST?					
CVP-EB2	B+200	10				NO	Y/Y	N	N		20	6		1.4	
CVP-EB2	B+200	11				AB			N		18	5.3			
CVP-EB2	B+230	1	15		SL	MI	Y/N	N	N				Y		PALLI
CVP-EB2	B+230	3	20			MI	Y/N	N	N		22	7.3	S	1.9	
CVP-EB2	B+230	4	16			MI	Y/N	N	N				Y		PALLI
CVP-EB2	B+230	5	15		CU	MI	Y/N	N	N				SO		
CVP-EB2	B+230	6	12			AB									
CVP-EB2	B+235	2	17		SL	MI	Y/Y	N	N		23	7.8	LSO	3.5	
CVP-EB2	B+235	8				MI	Y/Y	N	N						
CVP-EB2	B+235	10	20		CU	NO	Y/Y	N	?		21	8	SSO	2.1	
CVP-EB2	B+235	11	17		BE	NO	Y/Y	N	N						
CVP-EB2	B+239	5				MI	Y/Y	N	N		18	6	S		
CVP-EB2	B+239	6	12			MI	Y/Y	N	N		17	4.5	SSO		
CVP-EB2	B+239	7				AB			ENC?		20	6.5	Y	2.1	COMP
CVP-EB2	B+245	1				AB			N		23	10	L	3.2	COMP
CVP-EB2	B+245	2				MI	Y/N		N		17	5.5	SSO		
CVP-EB2	B+257	1.00							N		22	10.5		3.4	
FC	IN SITU	1	24	TR	CU	AB	N/N	N	N						
FC	IN SITU	2	34	TR		NO	Y/Y	N	N						
FC	SLABS	1		TR	CU	WE	Y/Y	N	N						
FC	SLABS	2				CO	Y/Y	N	N		18	4.4			
FC	SLABS	3		TR	CU	WE			N	2 SPECS		6.1			
FC	SLABS	3	13									5.4			
FC	SLABS	4				CO	Y/N		N		17	4.8			

FC	SLABS	5				CO/WE	Y/		N		20	6.4
FC	SLABS	6		TR	CU	WE	Y/N	N	N		10	2.2
FC	SLABS	9		TR	CU	MI	N/Y	Y	N			
FP	+10	1		TR	ST	MI	Y/N	N	N		27	11.6
FP	+10	2		TR	ST	MI	N/N	N	N		17	5.9
FP	+10	4		TR		CO/MI	N/N	N	N			
FP	+90	1		TR	ST	CO/	Y/Y	N	N		23	7.7
FP	+103	1				CO/MI	N/N	N	N			
FP	+103	2				CO/MI	Y/N	N	N		28	7.9
FP	+150	1		TR	CU	MI	Y/N	N	N			
FP	+150	3		TR	CU	MI	Y/N	N	N		19	5.6
FP	+7 BH	1		CE	SL	AB	N/N	N	N			
FP	+7 BH	2a		TR	ST	MI	N/N	N	N	2SPECS		5
FP	+7 BH	2b										2.7
FP	+7 BH	3				AB	N/N	N	N			
FP	-1.5H BH	2		TR	ST	MI	Y/N	N	N		30	12
FP	-1.5H BH	3	38	TR	SL	AB	N/N	N	N		30	10.6
FP	-1.5H BH	5		TR	ST	AB	N/N	N	N	DIST	31	11.9
FP	-1.5H BH	6	19	TR	ST	AB	N/N	N	N			
FP	-1.5H BH	7		TR	SL	AB	N/N	N	N		29	9.1
FP	-1.5H BH	8		TR	CU	AB	N/N	N	N		29	9.7
FP	-1.5H BH	9		TR	CU	MI	Y/N	N	N		32	10.9
FP	-1.5H BH	10		TR	CU	MI	N/N	N	N		27	8.8
FP	-1.5H BH	11		TR	SL	AB	N/N	N	N	DIST?	28	9.5
FP	-1.5H BH	12		TR	ST	MI	Y/N	N	ALC?		22	6.6
FP	-1.5H BH	13		TR	ST	AB	N/N	N	N			
FP	-1.5H BH	14							N		30	12.4
FP	-1.5H BH	15				AB						
FP	-10 BH	2		TR	ST	AB	N/N	N	N		30	11.6
FP	-10 BH	3				CO/MI	N/N	N	N		30	13.2
FP	-10 BH	4	23	TR	SL	AB	N/N	N	N		28	9
FP	-10 BH	5		TR	SL	MI	N/N	N	N		24	7.5
FP	-10 BH	6		TR	SL	MI	Y/N	N	N			
FP	-10 BH	7		TR	CU	MI	N/N	N	N		27	11.4

FP	-10 BH	8	19	CE	BE	MI	N/N	Y	N			
FP	-10 BH	9	24	TR	CU	AB	N/N	N	ALC		25	7.9
FP	-10 BH	10a		TR	SL	MI	N/N	N	N	2SPECS		9.9
FP	-10 BH	10b										10.8
FP	-10 BH	11				CO/MI	Y/N	Y	N			
FP	-10 BH	12		TR	SL	MI	N/N	N	N		25	7.2
FP	-10 BH	13		TR	SL	MI	N/N	N	N		24	6.5
FP	-10 BH	14		TR		CO			ALC			
FP	-10 BH	16				CO/MI			N	2SPECS	25	9.1
FP	-10 BH	17	23	CE	ST	MI	Y/N	Y	N		23	8.6
FP	-10 BH	18		TR	ST	MI	N/N	N	N			
FP	-10 BH	20		TR	SL	MI	N/N	N	N		24	6.8
FP	-10 BH	21		TR		CO	Y/N	N	N		19	6
FP	-10 BH	22		CE	ST	MI	N/N	N	N		22	6.6
FP	-10 BH	23		TR	ST	CO/AB	N/N	N	N			
FP	-10 BH	24		TR	ST	MI	N/N	N	N			
FP	-1H BH	4a		TR	SL	MI	N/N	N	N	2SPECS		8.7
FP	-1H BH	4b										12.8
FP	-1H BH	7		TR	SL	AB/C	N/N	N	N		33	14.9
FP	-1H BH	8		TR	ST	AB	N/N	N	N		30	9.5
FP	-1H BH	9		TR	ST	AB	N/N	N	N		32	13.7
FP	-1H BH	10		TR	ST	MI	N/N	N	N		29	12
FP	-1H BH	11		TR		AB	N/N	N	N			10.4
FP	-1H BH	12		TR	ST	CO	N/N	N	N		32	12.7
FP	-1H BH	13		TR	CU	AB	N/N	N	N		24	8.5
FP	-1H BH	14		TR	SL	MI	N/N	N	ALC?/C		25	7.3
FP	-1H BH	15		TR	ST	MI	Y/N	N	N		28	10.5
FP	-1H BH	19		TR	ST	AB	Y/N	Y	ALC		29	13.1
FP	-1H BH	20a				CO	Y/		ALC	2SPECS		16.3
FP	-1H BH	20b										11.7
FP	-20 BH	2		TR		CO/MI	N/N	N	N		21	5.4
FP	-2H BH	2		TR	ST	MI	N/N	N	ALC		32	12.1
FP	-2H BH	4		TR	ST	MI	N/N	N	N			16.5
FP	BH?	4	32	TR	SL	CO/MI	N/N	N	N		33	14.7

FP	BH?	5		TR	SL	MI	Y/N	Y	N		25	7.9
FP	BH?	9									31	11
FP	BH?	12		TR	SL	CO/MI	N/N	N	N			
FP	BH?	14		TR		MI	N/N	N	N			
FP	BHT	1		TR		CO	Y/N	N	ALC		32	15.4
FP	BHT	2		TR	SL	WE/MI	Y/N	N	N		26	10.6
FP	BHT	4		TR	SL	WE	N/N	N	N			
FP	BHT	6				CO			N		19	5.5
FP	BHT	7		TR	SL	CO	N/N	N	N			
FP	BHT	8		TR		CO/AB	N/N	N	N		22	6.5
LAF	-419	1	6	TR	CU		Y/N	N	N		25	7.9
LAF	-419	2		TR		MI/K	Y/N	N	N		19	5.9
LAF	-419	3		TR		CO			N		25	7.6
LAF	-419	4		TR	SL	AB	Y/N	N	N			
LAF	-419	5		TR	SL		Y/N	N	BRY/K			
LAF	-410	1		TR			Y/Y	N	N		29	7.9
LAF	-410	2		TR	SL	AB						
LAF	-403	1		TR	CU		Y/N	N	N			
LAF	-98	1		TR	ST	AB	N/N	N	N		28	8.9
LAF	-59	1	18	TR	CU	MI	N/N	N	BRY?		25	8.2
LAF	-20	1	14	TR	CU	NO	Y/Y	N	N		19	4.3
LAF	-20	2		TR			Y/N	Y	N	DIST?	27	9.9
LAF	HCB	1		TR	CU	NO	Y/N	N	N	LP?	28	10.7
LAF	+89	1	28	TR	CU	MI	Y/Y	N	N		24	9
LAF	+89	2	35	TR	SL	MI	N/N	N	N	DIST?	28	13.5
LAF	+89	3	32	TR	CU	AB	N/N	N	N	DIST?		12.5
LAF	-425	1		TR		AB/CO			N		27	12.4
LAF	-425	2		TR	SL	AB	N/N	N	N		25	8.9
LAF	-425	3	30	TR	CU	MI	Y/N	N	BRY/C	DIST?		
LAF	-425	4		TR	SL		Y/N	N	N			
LAF	-425	6		TR	SL	MI	N/N	N	TRY			
LAF	-425	7		TR	CU	MI	Y/N	N	BRY	DIST	19	4.5
LAF	-425	8		CE		AB	N/N	N	N			
LAF	-425	12	6	TR	SL	MI	Y/N	N	N			

LAF	-425	13		TR		MI	Y/Y	N	N	DIST		
LAF	-425	14										
LAF	-425	15	8	TR	ST	MI	Y/N	N	N			
LAF	-425	16		TR	ST	NO	Y/Y	N	BRY			
LAF	-425	17		TR		AB	N/N	N	N			
LAF	-425	18	6	TR	SL	MI	Y/N	N	N			
LAF	-425	19		TR	CU	MI	Y/Y	N	BRY			
LAF	-425	20	3	TR	CU	MI	N/Y	N	N			
LAF	-425	21	3.5	TR	SL				N			
LAF	-425	22		TR	SL	MI	Y/N	N	N			
LAF	-425	23	5	TR	CU				N			
LAF	-425	24	4	TR	CU	MI	Y/N	N	N			
LAF	ENC	1										
LAF	ENC	2		TR		MI	N/N	N	N		25	10.5
LAF	MID	1		TR		NO	Y/Y	Y	AUL?	DIST		
LAF	MID	2				CO/MI			N	2 SPECS		5.9
												6.7
LAF	MID	3a				MI	Y/N	N	TRY	3 SPECS		5.3
LAF	MID	3b										6.7
LAF	MID	3c										9.7
LAF	MID	4	16	TR	CU	NO	Y/Y	N	N			
LAF	MID	5	18	TR	CU	NO	Y/Y	Y	N			
LAF	MID	6		TR	CU	MI	Y/N	N	N		26	8.9
LAF	MID	7	14	TR	CU	NO	Y/Y	N	N		18	5.7
LAF	TI	1		TR		CO			ALC			
LAF	TI	2a		TR		WE/CO	Y/N	N	N		20	5.1
LAF	TI	2b		TR	CU	AB	N/N	N	N		27	8.8
LAF	TI	4		TR	SL	WE	Y/N	N	N		21	7.7
LAF	TOP-30	1		TR	ST		Y/N	N	N		31	12.3
LC	BA U3	1				MI			BOR?	DIST?	24	9.1
LC	MIDU3	2		TR	ST	AB	N/N	N	N		27	13.5
LC	U2+105	1				CO/MI	Y/N	N	N		25	7.9
LC	U2+115	1		TR	CU	MI	Y/N	N	N		26	8.9
LC	U3-105	3		TR	SL	MI/K	Y/N	N	ALC/BRY/C		29	9.5

LC	U4-50	1				CO/AB	N/N	N	MBO?						
LC	U4-70	1				CO/MI	N/N	N	N		29	12.7			
LC	U4-70	2				CO/MI	N/N	N	N		27	9			
LC	U4-75	1		TR	ST	CO			N		24	7.5			
LC	U4-75	4				CO/MI	N/N	N	N		26	9.5			
LC	U4-75	5				CO	Y/N	N	N		31	11			
LC	U4-85	1				CO/MI	Y/		N		32	14			
LC	U4-90	1				CO/MI	Y/N	N	N		30	13.7			
LC	U4-90	2		TR		AB/CO	N/N	N	N		25	8.9			
LC	U4-100	1				CO/AB			N		21	4			
LC	U4-100?	1		TR		CO	Y/N	N	N		24	9.2			
LC	U4-110	1							N		27	13.3			
LC	U4-130	1				MI	N/N	N	N						
LC	U4-135	1				CO/MI	Y/N	N	N	2SPECS	25	7.6			
LC	U4-135	2		TR	ST	AB	N/N	N	N		28	9.8			
LC	U4-150	1		TR	BE	MI	N/N	N	N		26	9			
LC	U4-150	2		TR	ST	MI	Y/N	N	N		26	7.9			
LC	U4-190	1		TR		CO	Y/N		N		34	18.5			
PI-B1	B+1063	1	5			MI	Y/N	N	N		14	2.5			
PI-B1	B+1121	1			SL	AB			N				LO		
PI-B1	B+1121	2	7		SL	MI	Y/N	N	N		18	4.6			
PI-B1	B+1143	1	15			MI			N		28	9.6	LO	3.2	
PI-B1	B+1144	1				AB			N	RUG EMB			LLO		HOLE?
PI-B1	B+1144	2	7		SL	AB			N		18	4.2	S		
PI-B1	B+1190	1	20	TR	SL	AB			N		27	10.4	LO	3.6	L+LA
PI-B1	B+1204	1	10		SL	NO	Y/Y	N	N	ATT/TIP	18	4.2	N?		
PI-B1	B+1230	1	11		SL	NO	Y/Y	N	N		20	5.4	N		
PI-B1	B+1380	1	16	TR	CU/BE	MI	Y/N		N		18	5.3	Y		MLA
											25	9.6		2.6	
PI-B1	B+1735	1	5			AB			N				Y		PALLI?
PI-B1	B+1841	1	8		SL	AB			N		18	4.5	N		
PI-B1	B+1841	2	6		SL	MI	Y/N	N	N	ATT/TIP	14	2.7			
PLEB5	T-40	1				MI	Y/N	N	ALC		24	7.9	S	2.4	MLA
PLEB5	T-50	1	8		SL	MI	Y/N	N	N		20	5.2		1.4	MLA

PLEB5	T-50	2						ALC						
PLEB5	T-50	3			MI	Y/N	N	TRY/A ALC		26	7.3	SSO	2.2	
PLEB5	T-60	1			AB			N		20	6.8	L	2	
PLEB5	T-100	1			AB									
PLEB5	T-100	2			AB			ALC				Y		MLA
PLEB5	T-160	1	13		MI	Y/Y	N	N		21	6.3	S	2	L+LA
PLEB5	T-200	1			AB			N				Y		MLA
PLEB5	T-478	1	18	SL	MI	Y/N	N	N		24	9.6	Y	2.8	MLA
										22	7.2		1.7	
										19	4.3			
PLEB5	T-495	1			AB	N/N	N	N		23	9.5	Y	2.6	MLA
PLEB5	T-495	2			AB			ALC?		18	5.3	Y		MLA?
PLEB5	T-495	3			MI	N/Y	N	ALC/K		20	5.5	Y	1.4	MLA
PLEB5	T-505	1			MI	N/Y	N	TRY/AS		22	7.2	SO	1.7	MLA?
PLEB5	T-545	1			AB			N		24	8.5	LSSO	2.3	MLA?
PLEB5	T-545	2			AB			TRY*	INTDIST	28	10.4	LSSO	4.3	
PLEB5	T-560	1			MI	Y/Y	N	ALC?C		27	9.1	SSO		ATT-CS
PLEB5	T-590	1			AB	N/N	N	N		26	10.2	L	2.9	L+LA/MLA
PLEB5	T-615	1	15	CU	MI	Y/N	N	N		21	6.8			
PLEB5	T-615	2			MI			MBO/ALC/K		28	10.2	LSO	3.6	MLA?
PLEB5	T-615	3	13	CU	MI	Y/Y	N	N		24	6.5	SO	2.1	MLA?
PLEB5	T-670	1			AB			ALC?		25	9.2	SO	2.9	
PLEB5	T-700	1		CU	MI	Y/Y	N	MBO/C		23	7.3	SSO	2	
PLEB5	T-700	2		CU	MI	Y/Y	N	N		24	7.8	Y		MLA
										14	3.7			
PLEB5	T-700	3		CU	MI	Y/N	N	N		21	6.1	S	1.7	
PLEB5	T-705	1			MI	Y/Y	N	N		24	8.4	LSO	2	MLA
PLEB5	T-705	2						BRY+TRY/	DIST	25	9.8	SO	3.5	MLA
PLEB5	T-725	1	13	CU	MI	Y/Y	N	N		15	4.2	S		MLA
										23	6.5		1.6	
PLEB5	T-725	2			AB			N		19	4.4	Y		MLA
PLEB5	T-725	3			MI	Y/Y	N	N		23	7.3	SSO	1.5	
PLEB5	T-760	1		CU	AB	Y/N	N	N	INTDIST?	23	8.7	Y	2.8	
										17	5			

PL-EB7	OPB	2				AB			MBO		32	13.8	LLO	5	
											29	10.1		2.5	
PL-EB7	OPB	4				AB			ALC		31	11.7	LLO	4.5	
											29	10.4		3.3	
											24	6.8			
PL-EB7	OPB	5				AB					29	10.5	LO	4.2	MLA
PL-EB7	OPB	6				AB			ALC						
PL-EB7	SR-L1	5				AB			BRY	INTDIST?	23	7.3	SSO	1.4	
PL-EB7	SR-U1	2							N		22	6.7			
PL-EB7	SR-U1	7				MI	Y/N	N	N		21	7	N		
PL-EB7	SR-U1	9				MI	Y/N	N	N		20	5.9	SSO	1.6	
PL-EB7	SR-U1	12	16						WE/BRY/H	DIST	26	6.9	S	1.7	MLA
PL-EB7	SR-U1	16				MI	Y/N	N	ALC		23	8.8	Y	3	
PL-EB7	SR-U1	17				MI	Y/N	N	ALC		19	6.4	SSO	1.7	
PL-EB7	SR-U1	18							WE/BRY/COR		26	8.6	LO		
PL-EB7	SR-U1	19				MI	Y/N	N	ALC		18	5.1	VS		
PL-EB7	SR-U1	20				MI	Y/N	N	WE/ALC		22	7.5	Y		MLA+LA
PL-EB7	SR-U1	21	5			MI	Y/N	N	N		12	2.5			
PL-EB7	SR-U1	22				MI	Y/N	N	N		24	7.5	SO		
PL-EB7	SR-U1	23							BRY+TRY		22	4.2	S~>A		
PL-EB7	SR-U1	24	13		SL				ALC		22	6.4	SO?	2.3	MLA?
PL-EB7	SR-U1	25				MI	Y/N	N	ALC		20	5.8	Y		
PL-EB7	SR-2	1				AB			ALC				LSO		
PL-EB7	SR-2	2				AB			ALC				Y		MLA
PL-EB7	SR-2	3	6			AB			N		16	3.3	SSO		
PL-EB7	SR-2	4				AB			N		22	7.1	SO	2.4	
PL-EB7	SR-2	11				AB			ALC		29	9.2	SO	2.4	
PL-EB7	SR-2	12				AB			ALC		32	12			
PL-EB7	SR-2	13							ALC		24	4.4	S		
PL-EB7	SR-3	4	30	TR	CU	AB			ALC		31	13.2	LSO	4.4	
PL-EB7	SR-3	5				MI	Y/N	N	WE/ALC		29	10.1	Y		MLA/CCW?
PL-EB7	SR-3	7				MI	Y/N	N	N		18	5	N		
											23	8.4			
PL-EB7	SR-3	8				AB			ALC				SSO		

PL-EB7	SR-3	9			MI	Y/N	N	N				?		
PL-EB7	SR-3	10	7		MI	Y/N	N	N				LSO		
PL-EB7	SR-3	11						ALC		19	4.6	Y	1.5	MLA
PL-EB7	SR-3	12						ALC				Y		LA
PL-EB7	SR-3	13			MI	Y/N	N	N				Y		MLA
PL-EB7	SR-3	14			MI			N		20	5.1	LSO	2.1	
PL-EB7	SR-3	16			MI	Y/N	N	N				Y?		MLA?
PL-EB7	SR-3	17			MI			N	OST?	26	7.5	LSO	3.1	
PL-EB7	SR-3	18	28	CU	AB			ALC				Y		L+LA
PL-EB7	SR-3	21			MI	Y/N	N	ALC		28	10.7	LSO	4.4	
PL-EB7	SR-3	23			MI	Y/N	N	ALC		30	10.4	LSO		
PL-EB7	SR-3	25			MI	Y/N	N	N		21	5.7			
PL-EB7	SR-3	26	15	CU	MI	Y/N	N	N						
PL-EB7	SR-3	27						ALC		26	7.6	SO	2	
PL-EB7	FR-L	2	19	CU	AB			ALC						
PL-EB7	FR-U	1			AB	N/N	N	ALC		22	5.6			
PL-EB7	FR-U	3		SL	MI	Y/N	N	ALC		26	9.2	SSO	3.5	
PL-EB7	FR-U	9			MI	Y/N	N	N		29	9	LLO	3.2	
PL-EB7	FR-U	10	17	SL	NO	Y/Y	N	N		22	6.3	SSO	2.1	
PL-EB7	FR-U	13								28	8		1.7	
PL-EB7	RC-L2	1			MI	Y/N	N	MBO/BRY		25	6.4	Y	1.3	MLA
PL-EB7	RC-L2	10						ALC/WE/BRY		26	6.6	SSSO	2.3	
PL-EB7	RC-L3	6				Y/N		ALC		26	8.8	SS0	2.9	
PL-EB7	RC-M1	1	18	CU	MI	Y/N	N	WE		19	5.1			
PL-EB7	RC-M1	6						ALC	DIST					
PL-EB7	RC-M2	7	17	CU	MI	Y/N	N	N		18	5.2	LSO		
PL-EB7	RC-M3	6			MI	Y/Y	N	ALC/K		18	4.3	LSO		
										32	10.8		4.1	
PL-EB7	RC-M3	11						WE				Y		MLA
PL-EB7	RC-U1	14						WE		18	4.3	Y		MLA
PL-EB7	RC-U1	15			WE			WE*		19	4.5	Y	1.8	MLA
PL-EB7	RC-U2	2			MI	Y/N		N				Y		MLA
PL-EB7	RC-U2	7			AB	Y/N		BRY/SPI				SLO		

PL-EB7	RC-U2	8				MI	Y/N		N		14	3.3			
PL-EB7	RF-L1	1	20		SL	AB			ALC		27	11.5	SO	4	
PL-EB7	RF-L1	8				MI	Y/Y	N	WE/K		22	6.1	LSO		
											30	10		2.9	
PL-EB7	RF-L1	9				AB			ALC/K				SSO		
PL-EB7	RF-L2	1				MI	Y/Y	N	ALC/K		25	9.4	UNU	3.1	MLA
PL-EB7	RF-L2	3				AB	Y/N	N	N		21	5.1	SO		MLA
											26	8		2.7	
PL-EB7	RF-L2	4	25		CU				ALC		26	8.7	SSO	2.7	
PL-EB7	RF-L2	5		TR	SL	AB			ALC/K		15	4.6	SO		
											26	10.6		3.4	
											28	10.9		3.5	
											23	6.8			
PL-EB7	RF-L2	7	10		SL				N		20	4.5	Y		MLA
PL-EB7	RF-L2	8				AB			N		27	8.1	SSO		
PL-EB7	RF-U1	4	15		CU	MI	Y/N	N	N		23	6.5	Y	2.2	LA+PALLI
PL-EB7	RF-U1	6				MI	Y/N	N	N		23	6.9	Y		MLA+LA
PL-EB7	RF-U1	11	13		SL	MI	Y/N	N	N		22	5.8	S		L+LA
PL-EB7	RF-U1	17				MI	Y/Y	N	N		26	8.2	Y	1.9	MLA
PL-EB7	RF-U1	19				AB			N		22	5.2	SO		
PL-EB7	RF-U1	21				MI	Y/N	N	ALC/WE		29	10.9	Y	3.8	MLA?+PALLI
PL-EB7	RF-U1	22	11		BE	MI	Y/N	N	ALC		16	4.7	Y		MLA
PL-EB7	RF-U1	23				AB			ALC		26	9.2	SO	3.2	
PL-EB7	RF-U2	1	19		SL	MI	Y/N	N	ALC/AK		14	3	N/LS/Y		/MLA**
											22	7.2			
											27	10.5		3.4	
PL-EB7	RF-U2	4				MI	Y/N		ALC/WE				Y		MLA
PL-EB7	RF-U2	6			SL	MI	Y/N	N	N		18	3.9	SSO		
PL-EB7	RF-U2	7				NO	Y/Y	N	N		22	6.6	Y		MLA
PL-EB7	RF-U2	9			BE	MI	Y/Y	N	N		22	7	Y		MLA
PL-EB7	RF-U2	11	9		ST	MI	Y/N	N	N		18	4.7		1.2	
PL-EB7	RF-U2	12	7		SL	NO	Y/Y	N	N	ATT	13	3			
PL-EB7	RF-U2	13				AB	N/N	N	N		27	10.9			
PL-EB7	RF-U2	14				MI	Y/Y	N	N		20	5.9			

PL-EB7	RF-U2	16	10		SL	MI	Y/N	N	N		19	5.8			
PL-EB7	RF-U2	17						N	N		23	8		2.5	
PL-EB7	IR-L1	2				MI	Y/N		N		14	3.6	SO		
PL-EB7	IR-L2	1			SL	AB					20	5.2	Y		MLA
PL-EB7	IR-L2	2				MI	Y/N		ALC		21	5.7	LSO	1.6	
PL-EB7	IR-L2	3				AB			ALC		28	8.6	SO	2.1	
PL-EB7	IR-L2	6	14		SL	AB	N/N	N	N		20	4.9	SSO		
PL-EB7	IR-L2	7							ALC		29	7.2	Y		MLA
PL-EB7	IR-L3	1			SL	MI	Y/N		ALC		28	10.8	LSO	3.2	MLA?
PL-EB7	IR-L3	3			SL	MI			ALC		19	4.7	LSO		MLA*
											32	13.3		3.9	
PL-EB7	IR-L3	4				AB			ALC		22	5.3	SO		LA
PL-EB7	IR-L3	6				AB			WE		28	7.3	L/	3	L+LA//MLA
											20	4.2			
PL-EB7	IR-L3	7	6			MI	Y/N	N	N		19	3.8	SSO		
PL-EB7	IR-L3	9	18		SL	MI	Y/N	N	ALC		26	8.1	SSO	2.4	
PL-EB7	IR-L4	1				AB			ALC		24	6.5	SO		COMP
											30	11		3.9	
PL-EB7	IR-L4	2				AB			ALC->CAL		31	11.2	VL*	5	COMP
PL-EB7	IR-L4	3				AB	Y/N	N	N						
PL-EB7	IR-U1	1	32	TR	CU	AB	N/N	N	ALC		19	5.7	LSO		COMP
											32	13.7		5.6	
											31	10.6		4.2	
PL-EB7	IR-U1	2	12		SL	MI	Y/Y	N	N		22	5.3	SO		
PL-EB7	IR-U1	3				AB			ALC		17	3.4			
PL-EB7	IR-U2	1				MI	Y/N	N	ALC		23	7.5	SSO	2	
PL-EB7	IR-U2	2				AB	Y/N	N	ALC		30	9.9	SO	3.6	PALLI
PL-EB7	IR-U2	5				MI	Y/Y	N	N		24	6.7	SSO	2.2	
PL-EB7	IR-U2	6	5		SL	MI	Y/N	N	N	ATT/TIP	12	3.1	SSO		
PL-EB7	IR-U2	7	15		CU	AB			ALC		14	3.6	/Y		/MLA
											25	7.8			
PL-EB7	IR-U2	8				MI	Y/N		N		15	3.7			
PL-EB7	IR-U2	9							ALC				Y		MLA
PL-EB7	IR-U2	11				MI	Y/N		ALC		19	4.5	Y		MLA

PL-EB7	IR-U2	12	7		SL	NO	Y/Y	N	N		13	2.4			
PL-EB7	IR-U2	13	17		SL	MI	Y/Y	N	N		27	7.7	SO	2	
PL-EB7	IR-U2	14			SL	MI	Y/N	N	ALC		29	8.3	SO	2.9	
PL-EB7	IR-U3	1			SL	MI	Y/N		ALC		19	5.7	SO		
											28	11.2		4	
PL-EB7	IR-U3	2				AB	Y/N	N	ALC		28	10.7	SSO	3.6	
											21	6.2			
PL-EB7	IR-U3	4				MI	Y/N	N	ALC		14	3.7			
											10	2.2			
PL-EB7	IR-U3	6			SL	MI	Y/Y	N	ALC		22	6.2	SO	1.7	
PL-EB7	IR-U3	7				MI	Y/N		ALC		27	9.6	SO	2.8	COMP
PL-EB7	IR-U4	1							ALC				Y		MLA
PL-EB7	IR-U4	2				MI			ALC/TUB		23	6	LO	1.9	
PL-EB7	IR-U4	4				MI	Y/N		N		20	5	SSO		
											27	8.3		2.3	
PL-B1	L1	3			SL	AB			N		25	7.7	Y		TN MLA
PL-B1	L2	1				AB			N		29	12.9	LSO		
PL-B1	L2	4				AB			N		26	9.8	S		L+LA
PL-B1	L2	5	15			AB			N	ATT	27	7.3	N		
PL-B1	L3	1				AB			N				Y		LA
PL-B1	L3	2				MI	Y/N	N	N		24	6.3	N?		
PL-B1	L3	3				AB			N				LO		L+LA
PL-B1	L4	2	16		SL	MI	Y/N	N	N		23	7.6	LO	2.5	L+LA
PL-B1	L5	2				NO	Y/Y	N	N		21	5.5	S		L+LA
PL-B1	L5	4				AB			N	ATT		6.4	Y		MLA
PL-B1	L5	5	15		SL	MI			N						
POR	BH	2		TR	SL	MI	N/N	N	N		41	13.3			
POR	BH	6		TR	ST	AB	Y/N	N	N		34	15.7			
POR	OPB	1	35	CE	SL	WE	N/N	N	BOR/A+AL	2SPECS	33	10.6			
POR	OPB	2		TR	SL	AB	N/N	N	N						
POR	OPB	11		CY	ST	CO			ALC?		38	13.2			
POR	OPB	15				CO									
POR	OPB	17		TR	ST	AB	N/N	N	N						
POR	OPB	19				CO			ALC						

ROS	?	1		TR	SL	MI	N/Y	N	N		21	7
ROS	?	2		TR		AB/CO			N		20	6.9
ROS	?	3		TR		AB	N/N	N	BOR		22	6.7
ROS	?	4		TR	SL	AB/WE	N/N	N	AUL/C			
ROS	?	5		CE	ST	AB/WE	N/N	N	N		20	5.8
ROS	?	6	15	TR	CU	MI	N/Y	N	N			
ROS	?	7		TR	CU		Y/Y	N	N			
ROS	?	8		TR	CU		Y/Y	Y	N		17	3.5
ROS	-65	1				CO/AB			N			
ROS	-115	1	10	TR	CU	AB	N/N	N	N		16	4.3
ROS	-115	2		TR	SL	AB/WE	N/N	N	N		22	6.7
ROS	-115	3		TR	SL	AB	N/N	N	N		23	7.2
ROS	-115	5	14	TR	CU	AB	N/N	N	N		22	6.7
ROS	-115	6		TR		AB	N/N	N	N			
ROS	-115	7		TR		AB	N/N	N	N		28	9.8
ROS	-115	9		TR		AB	N/N	N	N		21	6.9
ROS	-115	10				CO/MI			N		19	5.3
ROS	-115	11				AB/CO			N		23	7.2
ROS	-115	12				CO/AB			N			
ROS	-115	13		TR		CO/AB			N		24	7.7
ROS	- 125	1		TR	CU	AB	N/N	N	N		21	6.1
ROS	- 125	2		TR		CO			N		26	8.2
ROS	- 125	3		TR		WE/CO			N		22	8
ROS	-135	1	9, 6	TR	CU	AB/WE	Y/N	N	N			
ROS	-135	2	20	TR	SL	AB	N/N	Y	N		22	6.7
ROS	-135	3		TR	CU	AB	Y/N	N	N			
ROS	-135	4		TR	SL	AB	N/N	N	N			
ROS	-135	5		TR	CU	CO			N			
ROS	-145	1		TR		AB/CO			N		20	6.6
ROS	-145	2	18	TR	CU	AB	N/Y	N	N		20	6
ROS	-150	1		TR		AB	N/N	N	N		22	7.1
ROS	-175	1		TR	CU	NO	Y/Y	N	N	DIST	19	5.3
ROS	-175	2		TR	CU	AB	N/Y	N	N			
ROS	-435	1			CU	CO	Y/Y	N	N		23	7.2

ROS	-435	2	22, 17	TR	SL/BE	AB/K	Y/Y	N	N		26	9.1
ROS	-435	3		TR			Y/Y	N	N		27	10.3
ROS	-435	4		TR		CO	Y/N	N	N		26	8.8
ROS	-435	5	13	TR	CU	AB	Y/N	N	N		20	5.1
ROS	-455	1		CE	SL	AB/WE	N/N	N	N		24	8.3
ROS	-455	2		TR	ST	MI	N/Y	Y	N		26	11.6
ROS	-510	2	24, 14	TR	CU	MI/K	Y/Y	Y	N		23	8.9
ROS	-510	3		TR	CU	NO	Y/Y	N	N			
ROS	-510	4		TR	CU		Y/Y	N	N			
ROS	-550	1	22	TR	CU	AB/WE	N/N	N	BRY/A			
ROS	-610	1		TR	ST	AB	N/N	N	N		26	11.7
ROS	-610	2		TR	ST	CO			N		21	7.1
ROS	-610	3	16	TR	CU	MI	N/Y	N	N		22	8.2
ROS	-610	4		TR		MI	N/Y	Y	N		24	9
ROS	-610	5		TR	SL	NO	Y/Y	N	N			
ROS	-610	6	15	TR	CU	MI	N/Y	N	N		25	7.8
ROS	-610	7	13	TR	CU	AB	N/N	N	N			
ROS	-610	8	9	TR	CU	AB	N/N	N	N		19	4.7
ROS	-610	9										
ROS	-625	1				CO			BOR?	DIST		
ROS	-666	1	26	CE	CU	NO	Y/Y	N	N			
ROS	-666	2				CO			N		20	5.5
ROS	-666	3		TR	CU		Y/Y	N	N		23	5.5
ROS	-666	4		TR		AB	N/N	N	N		22	8.4
ROS	-666	5	21	TR	CU	AB	Y/N	N	N		23	7.7
ROS	-720	1		TR	CU	CO/AB			?/K			
ROS	-720	2		TR	CU	WE/CO			N			
ROS	-720	3		TR	SL	MI/A	Y/Y	N	N		22	6.6
ROS	-720	4		TR			Y/Y	N	?	DIST		
ROS	-790	2		TR	CU	AB	N/Y	N	N		21	7.4
ROS	-790	3	19	TR	CU	LO	Y/Y	N	N		22	6.7
ROS	-800	1		TR	CU	MI	N/Y	N	N		24	9.4
ROS	-800	2		TR	CU	AB	N/Y	N	N		23	8.7
ROS	-805	1	12	TR	CU	AB/WE	N/N	N	N		21	5.7

ROS	-805	2	16	TR	CU	MI	Y/N	N	N		20	6.2		
ROS	-805	3		TR	ST	AB	Y/N	N	N		22	6.7		
ROS	-805	4	16	TR	CU	AB	N/N	N	N		22	7.6		
ROS	-805	5		TR		MI	Y/N	N	N		19	5		
ROS	-810	1a		TR	SL	WE/AB	N/Y	Y?	N		21	7.3		
ROS	-810	1b		TR	ST	WE	N/Y	N	N					
ROS	-810	2		TR	ST	WE/CO			N					
ROS	-870	1	20	TR	CU		Y/Y	N	N					
ROS	-875	1		TR	SL	MI	N/Y	N	N		23	6.9		
ROS	+250	1		TR	SL	AB/WE			N					
SGC-V-1	?	1a				MI	Y/N	N	N	3SPECS	19	5.9	N	
SGC-V-1	?	1b												
SGC-V-1	?	1c												
SGC-V-1	?	2	18	TR	CU	NO	Y/Y	N	N		19	5.9	N	
SGC-V-1	?	3a	17	TR	CU	MI	Y/N	N	N		25	9.9		
SGC-V-1	?	3b	18	TR	CU	MI	Y/N	N	N				Y	PALLI?
SGC-V-1	?	4				NO	Y/Y	N	N					
SGC-V-1	?	5		TR		NO	Y/Y	N	N		21	8.6	Y	PALLI?
SGC-V-1	?	6	12			MI	Y/N	N	N		18	6.7	Y	FEW LOB
SGC-V-1	?	7	8		SL	NO	Y/Y	N	N	ATT/TIP	15	4.1	Y	1 LG SEP
SGC-V-1	?	8		TR		NO	Y/Y	N	N		22	8.1	Y	2 LOB
SGC-V-1	?	9a	13	TR		MI	Y/N	N	N	5SPECS	16	4.8		
SGC-V-1	?	9b		TR		MI	Y/N	N	N		16	4.6		
SGC-V-1	?	10a							N	2SPECS	17	4.7	Y	FEW L+PAL
SGC-V-1	?	10b									20	8		
SGC-V-1	?	11		TR		MI	Y/N	N	?		19	5.7	Y	L+PAL
SGC-V-1	?	12							N	3SPECS	18	4.4	N	
SGC-V-1	?	13		TR		NO	Y/Y	N	N		18	4	N	
SGC-V-1	?	14a	15	TR	CU	NO	Y/Y	N	N	14SPECS	20	6.7	Y	L
SGC-V-1	?	14b	15								20	6.1		
SGC-V-1	?	15		TR		MI	Y/N	N	N	13SPECS	20	6.7		
SR	BBBH	1		TR	ST	MI	Y/N	Y	N		29	6.6		
SR	BBBH	2		TR		CO	Y/N	Y	N		21	4.9		
SR	BBBH	4		TR	ST	CO			N					

SR	BBBH	7a		TR	ST		Y/N	N	N	4SPECS	25	9			
SR	BBBH	7b									18	3.1			
SR	BBBH	7c									18	3			
SR	BH -180	1				CO			ALC		40	13.7			
SR	B+45	3		TR	CU	MI/WE	N/N	N	N	4SPECS	33	15.2			
SR	B+45	4		TR	ST	MI	N/N	N	BRY?		32	15.5			
SR	B+390	4		TR	CU	MI	Y/N	N	N		26	10.2		3.4	
SR	B+419	13a	27	TR	SL	MI	Y/Y	N	N		22	7.8			
SR	B+460	1	30	TR		MI	Y/N	N	N						
SR	B+460	5		TR		CO					30	14.1	LSSO	4.7	
WC-EB2	T-250	1				AB	N/N	N	N		24	10	SSO	2.2	
WC-EB2	T-250	2		TR		MI	Y/Y	N	BOR/A?	SEPTDIST	25	10.5		2.7	
WC-EB3	BA 0-80	1		TR		NO	Y/Y	N	MBO?K		17	5	SSO/Y		/MLA
											26	11		3.4	
											23	8		1.9	
WC-EB3	BA 0-80	2	20	TR	CU	MI	Y/N	N	MBO?		17	4.5			
											26	11.4		3.9	
											22	8.6		3.1	
WC-EB3	BA 0-80	3	25	TR	SL	NO	Y/Y	Y	BOR?		26	11.8		4.3	
											24	8.5			
WC-EB3	BA 0-80	4	22	TR	CU	MI	Y/Y	N	BOR?	CON+HINJ	22	6.5	Y	1.9	MLA
											23	10.5		3	
WC-EB3	BA 0-80	5		TR	SL	MI	Y/Y	N	N		21	6.5	S		
											25	9.6		3.1	
WC-EB3	B+230	1		TR	CU	AB	Y/N	N	N		20	5.8	SSO	1.7	
WC-EB3	MID	1		TR	SL	AB	N/N	N	BRY/KAC		24	7.8	LSSO	2.8	
WC-EB3	T-550	1		CE		WE	N/N	N	N		23	7.2	SSO	1.7	
WC-EB3	T-270	1		TR		MI	Y/N	N	N	EPIDIST	19	6	SSO	1.9	MLA
WC-EB3	T-185	1		TR	CU	MI	Y/Y	N	N		23	7.5	S	1.8	
WC-EB3	T-160-215	1		TR	CU	AB	N/N	N	BOR?	REXTLD					
WC-EB3	T-160-215	2				MI	Y/N	N	MBO?		20	7	Y	2.4	PALLI
WC-EB3	T-155	1	13	TR		MI	Y/N	N	N		20	7.5	Y	2.6	PALLI
WC-EB3	T-115	1	8	TR	CU	NO	Y/Y	N	N	EMB/K			SSO		
WC-EB3	T-95	1	18	TR		MI	Y/Y	N	ALC*		24	9.8	S	3.1	LA

WC-EB3	T-95	2		TR	CU	MI	Y/Y	N	N		18	5.5			
											27	10		3.1	
WC-EB3	T-95	3	16	TR	CU/BE	MI	Y/N	N	N		22	8.5	Y	3.2	LLA
WC-EB3	T-77	1	18	TR		WE	Y/N	N	BRY/C+BO	CON/ATT	24	7.7	SO	2.4	
WC-EB3	T-35	1	9	TR		MI	Y/N	N	N						
WC-EB3	T-25	1		TR		MI	Y/N	N	N				SSO		
WC-EB4	B+55	1		TR	CU	MI	Y/Y	N	BOR(AS)		21	9	LSO	2.9	
WC-EB4	B+55	2		TR	CU	MI	Y/N	N	ALC		25	8.4	LSO	3.3	
WC-EB4	B+115	1				MI	N/Y	N	MBO		21	6.9	LSO	2	
WC-EB4	B+150	1	7			NO	N/Y*	N	N						
WC-EB4	U	2				AB			N		19	6.8	Y	1.9	MLA
WC-EB4	U	3				MI			ENC?/A		17	4.9	LSO		
											23	8.1		2.3	
WC-EB4	U	4			CU	WE			N		22	7.4	SSO	2.2	LA
WC-EB4	U	5a	25		CU	NO	Y/Y	N	N		27	10	Y		MLA
											16	3.5			
WC-EB4	U	5b				MI	Y/N	N	N		22	6.9	S		
WC-EB4	U	6								6SPECS					

Bodophyllum englishheadense

LABEL	LEVEL	NUM	SIZE	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTHER	MAJ	DIAM	STEREO	AS	ASD
83AP11-2	BA 1M	12		TR	SL	AB			N		37	17			
83AP17-BH	BH20-380	5		CE	ST		Y/N	Y	WE/BR/CO						
83AP18-1-R6	BA 1M	2				AB			N		39	16			
A435a		9		TR	SL	WE		Y	N		31	9.1	1.1		
A436	BH	3		CE	ST	AB	N/N	Y	BR/AL?	TALONS	33	12.8	2.2	L/LO	L+LA
A466b(1)	BA .7-2	2		TR	SL	AB	N/N	N	BR/K	ATT	30	10.8	1.3		
A466b(1)	BA .7-2	3		CE	ST	AB	N/N	N	?	OST	37	11.3	2.3	SO	
A466b(1)	BA .7-2	4	22	TR	CU	AB	N/N	N	?	DIST	35	10.6	2	Y	MLA
A466b(1)	BA .7-2	7		CE	ST	AB	N/N	N	N		31	8		RE	MLA
A468a		6	45x22	CE		AB			TRY	DIST	47	17.2			
											53	21.4	3.7		
A468a		8	34x15	CY	ST	MI	Y/N	Y	N	REJUV	42	14.1	1.6	MI	MLA
											42	8.8	1		
A468a		9	32x19	TR		AB	N/N	N	TRY	REJUV	49	18			
A468a		10		TR	ST	AB			TRY		43	17.2			
										DIST	42	9.2			
A468a		12	D=17	TR		AB	N/N	N	N	DIST	48	14.3	2.9	MI	MLA
											46	12.3	2.3		
A468a		13	D=19	TR	ST	AB	Y/N		N		47	16.9	2.1		
A468a		15	D=16	CE	ST	MI	N/N	N	BRY	DIST	46	14.1	1.8	Y	MLA
A468a		17	D=16	CY	DI	AB/CO	N/N	Y	ALC	DIST	49	16.1		S/CX	
											33	9	0.9		
A468a		20		TR	ST	AB	N/N	N	TRY		40	11	1.7	Y	MLA+L
											40	9.2	1.6		
A468a		21		CE		AB	N/N	N	TRY		45	13	3.2		MLA
A595	BA 1-2.5	7		TR				N			30	8.3	1.7		
BMacV	FB+4	1		CE	ST	AB			N		29	7.9	1.4	MIN	L
CAS-V	LCB+45	1				AB			N?					?	
CA-V	500-600	1	16			AB			N	ATT					
CA-V	E+145	1				AB						20.1	4.8		
CA-V	E+145	2				AB				ATT	34	8.4	1.1	N	

CA-V	E+145	3							N		35	12.1	1.6	Y	MLA?
CA-V	E+145	5a		TR					N	2ATT	26	7.1	2.5		
CA-V	E+145	5b									26	6.2	2.1		
CA-V	E+225	1		CY	ST	AB	N/N	N	TRY	ATT					
CA-V	E+225	3							TRY		32	7.6	1.4		
CA-V	E+225	4		CY		AB			N		36	10.7	1.8	Y	MLA
CA-V	E+340	2		CE	ST	MI	Y/N	N	BRY	ATT-BRY	37	9.6	1.8	Y	MLA
CA-V	E+340	3				WE				ATT	34	9.8	1.8	Y	
CA-V	E+340	4							N		40	11.4	1.1		
CA-V	E+340	5							N						
CA-V	E+340	7				MI	Y/N		N		31	9.2	1.7	S	LO
CA-V	E+340	8				WE			BRY	DIST	35	10.6	1.4		
CA-V	E+340	9				AB				2ATT				S	
CA-V	E+340	10		CY	ST				N		31	6.4	0.9	LSSO	MLA
											36	9.8	1.9		
CA-V	E+340	11				MI	Y/Y	Y?	ALC?						
CA-V	E+340	12							BRYC?						
CA-V	E+340	13							N		40	10.5	1.8	Y	L+LA
CA-V	E+340	14	14			AB			N	ATT					
CA-V	E+340	15				MI	Y/Y	N	TRY		33	8.9	1.6		
CA-V	E+340	16		CY		AB			?	ATT->?					
CA-V	E+340	18								ATT					
CA-V	E+340	23				AB			N						
CA-V	E+340	27		CE		AB			TRY		30	8.9	1.1	LSSO	L
CA-V	E+340	28				AB				2ATT	30	8.5	1.8	Y	L+MLA
CA-V	E+340	29													
CA-V	E+340	30				AB			TRY	ATT	32	6.9	1.2		
CA-V	E+340	31		TR		AB			N		29	7	0.9	Y	MLA
CA-V	E+340	32		TR		AB	N/Y?		N	ATT					
CA-V	E+380	1				AB	Y/N		BRY/A	ATT	38	7.4	1.2		
											26	4.4			
CA-V	E+380	2				AB	Y/N		N					Y	COMP
CA-V	E+380	3				AB			N						
CA-V	E+380	4				AB				ATT					

CA-V	E+380	5			AB			BRY	ATT-BRY?	38	10.5	2.1	Y	MLA
CA-V	E+380	6			AB			TRY					L	
CA-V	E+380	7	15		AB			TRY	ATT	32	10	1.5	LSO	L+LA
CA-V	E+380	8			AB			TRY					Y	MLA
CA-V	E+380	9			AB			TRY?	ATT	28	7.8	0.8	S	ISO LA
CA-V	E+380	10	20		AB			N	ATT				Y	MLA
CA-V	E+380	11			AB			N						
CA-V	E+380	12			AB			N					Y	L+LA
CA-V	E+380	14			AB			N	ATT->BRY?	19	4.3	0.7	Y	MLA
CA-V	E+380	15			AB			?	ATT*				Y	LA
CA-V	E+380	16			AB			N	ATT	28	6.4	1.1	LO	
										37	11.1	2.3		
CA-V	E+380	17			AB			N	ATT					
CA-V	E+380	18						N	2SPECSATT	27	8	1.3	N	
CA-V	E+380	19			AB			N	ATT					
CA-V	E+380	20	17		AB			N	2SPECSATT				Y	MLA?
CA-V	E+380	21			AB			N	13+TRY	41	10.7			
CA-V	E+380	22	10		AB	Y/N		N	ATT?	30	7		N	
CA-V	E+380	23			AB			TRY		30	10			
CA-V	E+380	25			?	N/Y		BRY	ATT*	36	11.4	2.7		
CA-V	E+380	26			AB			TRYS	2SPECSATT	24	5.6	0.6		
CA-V	E+380	30			AB			N		29	9.5		N	
CA-V	E+380	31						N		30	9.4	1.2		
CA-V	E+380	33			AB			N	ATT					
CA-V	E+410	1			AB			N		30	6.9	1.1	N	
CA-V	E+410	5	17		MI		Y?	BRY	2SPECSATT	40	9.1	2.4	LSSO	L
CA-V	E+410	7			AB			12+TRY						
CA-V	E+410	8			AB			TRY?	ATT					
CA-V	E+410	9			AB			BRY	ATT-?BRY*					
CA-V	E+410	10			AB	Y/N		TRY	ATT	34	8.5	1.4		
CA-V	E+410	11	25	CY	MI	Y/Y		BRY	ATT->BRY	27	5.5	0.8	Y	MLA
										33	10.5	1.6		
CA-V	E+410	13			AB			N						
CA-V	E+410	14						BRY	DIST/2SPEC	26	6.9	0.7	Y	MLA

CA-V	E+410	15				AB			N	2SPECSATT*					
CA-V	E+410	16				AB			TRY		36	9.7	1.5	LO	
CA-V	E+410	17	15			AB			N	ATT	34	9.1	2.1	SO	L+MLA
CA-V	E+410	19		TR		AB			N	2SPECSATT	33	11.5	2.3		
CA-V	E+410	20				AB			N		35	10.7	2	Y	MLA+L
CA-V	E+410	24				AB			N		31	9.5	1.2	Y	MLA
CA-V	E+410	25		TR					N		34	11.5	1.5	Y	MLA?
CA-V	E+410	26		TR		AB	Y/N		N	ATT	28	7.3		Y	PALLI?
CA-V	E+410	27				AB			N	ATT					
CA-V	E+410	28		CY		MI	Y/N		N	REJUV	32	8.8	1.7		
CA-V	E+410	30				AB			TRY/A		35	11.7	2.3	Y	LA
CA-V	E+410	31		CE	ST	AB			TRY/C?		31	9.2	2	L	COMP
CA-V	E+410	32a		TR		AB			BRY	ATT*->BRY					
CA-V	E+410	32b	10			AB			BRY/TR	ATT					
CA-V	E+410	33				AB			N						
CA-V	E+410	34				AB			BRY	ATT->BRY*					
CA-V	E+410	35							N	ATT?	41	12.7	2.9	LSSO	L+LA
CA-V	E+410	36	15			AB			N		35	10.9	1.5	Y	COMP
CA-V	E+410	38	30			MI	Y/N		BRY	ATT->BRY	41	12.5	2.7	LSSO	
											25	5.9	1.2		
CA-V	E+450	1	45	CY		AB			N	ATT	41	11.4	2.7	Y	UNU
											41	15.3	3.7		
CA-V	E+450	2				AB			N	ATT					
CA-V	E+450	3		TR		AB		Y?	N	ATT	41	10	1.6	L	MLA+L
CVPEB1N	T-45	1				AB			N					Y	L+LA
GR-V		2							N						
LC	TOPU2	4				CO/MI			N	DIST	39	11.5	1.7		
LC	U4-75	2													
LSMV		2A		TR	ST	AB/WE	Y/N	Y	N		35	15	1.8	MIN	L+LA
MB	IB(TOP)	1		TR	ST	AB	Y/N	Y	N	DIST?	44	16.9	1.8		
											40	13.5	1.2		
MB	IB(TOP)	2	35x37	TR	ST	AB/CO			N		53	21.4	3.8		
											49	12.8	1.3		
MB	IB(TOP)	4		TR	ST	AB	N/N	Y	N		41				

											41		
MB	IB(TOP)	6		TR	ST	MI	Y/Y	Y	BRY				
MB	IB(TOP)	7		TR	ST	WE/CO			N	DIST	49	18	3.4
MB	IB(TOP)	8		TR		WE/CO			N		46		
MB	IB(TOP)	12				WE/CO			N	DIST			
MB	IB(TOP)	14	45	TR	ST	WE/MI	Y/Y	Y	BRY				
MB	OB(TOP)	1	35x20	TR	ST	AB	N/N	N	TRY		55	16.3	
MB	OB(TOP)	2	42x21	TR	SL	AB	N/N	N	TRY		49	20.4	3.5
											45	18	
MB	OB(TOP)	3		FRAG		AB							
MB	OB(TOP)	4		TR	CU	AB	N/N	N	N		46		
			32x19								40		
MB	OB(TOP)	5											
MB	OB(TOP)	6				AB/CO	N/N	N	TRY	DIST	51	14.4	2.3
											49	13.3	1.9
MB	OB(TOP)	8	28x19			MI/CO	N/N	N	ALC?		50	19	
												21	3.7
											47	9.9	1.2
MB	OB(TOP)	9		TR		AB/CO	N/N	N	N		41	18.2	2.9
MB	OB(TOP)	10	60									22	3.6
MB	OB(TOP)	11a				CO			N	2SPECS	42	12.8	1.5
MB	OB(TOP)	11b									41	12.1	0.8
MB	OB(TOP)	12		TR		AB	N/Y	Y	N				
MB	OB(TOP)	14											
MB	OB(TOP)	18		TR		AB/CO	N/N	N	N	DIST	46	11.6	2
MB	OB(TOP)	19		TR	SL	WE/CO	N/N	N	BRY	2SPECS	44		
											51		
MB	OB(TOP)	20				CO			N				
MB	OB(TOP)	21		TR	ST	WE/CO	N/N	N	N		43	14.7	2.1
MB	OB(TOP)	22		TR	ST	AB	N/N	N	N	BUD(2x)	39	10.9	1.2
												12.7	1.7
MB	OB(TOP)	23							N		38	9.7	0.7
											23	3.7	
MB	OB(TOP)	24		TR		WE/CO			N		44		

MB	OB(TOP)	25	52	CY	ST	MI	N/N	N	N		44	16	3.4		
												15.1	2.7		
MB	OB(TOP)	26							N						
MB	OB(TOP)	27		TR		WE/CO			BRY/A			18	4.4		
MB	OB(TOP)	28		TR		WE/BR			N			21.2	5.7		
MB	OB(TOP)	29													
MB	OB(TOP)	30		TR		WE/CO			N	DIST	48	13.8	1.9		
MB	OB(TOP)	31													
MB	OB(TOP)	32		TR	ST	AB	Y/Y	N	TRY	DIST?					
MB	OB(TOP)	33		TR	ST	WE			N		40	12.6	2.3		
MHVS		3				CO					29	11.4	2.5	S<>A	
MHVS		4	60	CE	ST	AB	N/N	Y	N	ATT	30	9.4	1.7	N	MLA?
NAF-V	LST-220	1				AB				ATT					
NAF-V	LST-220	2							TRY/?TAB		31	9.4	2	SO	
PL-B1	L2	3				MI			N	REJUV?	33	13.4	2.8	L	L+PAL
PL-B1	L6	2				AB								Y	COMP
PL-EB7	IR-U1	4				MI	Y/N		N	BUD?	27	6.5	1	L	L+MLA
PL-EB7	RC-L2	13				AB			BRY	DIST					
PL-EB7	RC-L2	14				MI	Y/N		ALC		27	6.1	1		
PL-EB7	RC-M1	4													
PL-EB7	RC-U1	1				MI	Y/N	N	WE/CO/BRY		26	9.1	1.8		CCW
PL-EB7	RF-U1	13				MI	Y/N	N	ENC	DIST	27	5.9	1.1	LSO	L
POR	OPB	3				MI			MBO						
RH-V	+50	1				CO									
RH-V	+50	3		TR		WE/CO			N						
RSM-V	BH	1							N						
RSM-V	BH	4		CE		AB	N/Y?	N	N						
RSM-V	BH	5		CE		WE			N					SSO	
SPO-V	+55	2		TR		CO/MI	N/N	N	N	DIST	38	13.3	2.7		
SPO-V	+70	1		TR	SL	MI	N/Y	Y	N	DIST (2SP)	35	12	2.1		
SPO-V	+95	2				CO/MI	N/N	N	N	DIST	33				
SPO-V	+95	5		TR		WE/CO			N	DIST	28				
SPO-V	+95	6		TR	CU	MI	N/N	N	N		32	9	2.1		
SPO-V	+95	8				CO/MI			N		35	11.2	2.4		

SPO-V	+95	10	TR	CO/MI	N/N	N	BRY/A		35	9.5	1.6		
SPO-V	+95	12	TR	CO			ALC/K?		36	12.1	2.2		
SPO-V	B1	1					BRY	ATT?	39	11.1	3	LO	L
SPO-V	B1	2	CE	AB			N		35	10.2	2.3	Y	L+LA
SPO-V	B1	4	CE	AB	N/Y?		N	ATT					
SPO-V	B1	6					N		33	8.9	2.1	Y	L+LA
SPO-V	B2	1					N	2SPECSATT	28	8.1	1.7	Y	L+MLA
SPO-V	B3	1	CE				N		32	6.5	1		
									33	11	2.2		
SPO-V	B3	2		AB		Y?	N						
SPO-V	B3	3		AB			N						
SPO-V	B4	1d		AB			N?	ATT/DIST	35	12			

Bodophyllum n. sp.

LABEL	LEVEL	NUM	SIZE	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTH	MAJ	DIAM	STEREO	AS	ARD
83AP11-2	BH<30	11		CE/CY	BE		N/N		WE/TRY?		39	12	1.6		4.7
											32	7	0.9		2.8
83AP14-1	BH380-430	20	ca.55	CY	BE	MI	Y/N	Y	WE		27	6	1	Y	
											41	14	1.4		6.4
83AP14-1	BH380-430	21				MI	Y/N	N	WE		33	9			
											40	14			
83AP14-1	BH380-430	22b				MI					22	7			
83AP16-1-1B	BA 1M	1a				AB			N		26	9			
											30	14			
83AP16-1-BH	BH250-380	4		CY	ST	MI			WE	CONSTRI	39	12	2.2		5.3
83AP16-1-BH	BH250-380	5		CY					WE		39	9.5	1.6	Y	4.3
											40	15.5	4.6		5.3
83AP17-1-1B	BA 1M	12		CE	ST	MI			WE		32	8.5			2.7
											35	11.5	2.1		5
83AP17-1-1B	BA 1M	13	20								26	7			
					BE	NO	Y/Y			ATT->TAB	25	6			
											22	5			
83AP17-BH	BH20-380	1	25X15		SL	MI	Y/N		WE/BR		39	12	2.1		4.1
											27	5			
83AP17-BH	BH20-380	5		CE	ST		Y/N	Y	WE/BR						
83AP17-BH	BH20-380	6a		CE	ST	MI	Y/N	N	COR+??		33	10	1.6		4.3
83AP17-BH	BH20-380	10	45X21		ST	MI			WE		34	10.5	1.5		3.8
											34	15.5	2.4		6.8
											24	6.5	0.8		2.5
											34	18.7	3.6		7
83AP17-BH	BH20-380	12c		CE	ST	NO	Y/Y	N	BR*/COR	BUD?	33	11.8	1		3.7
83AP17-BH	BH20-380	16		CE/CY	ST	MI	Y/N	N	WE/BR	CONSTRI	35	11.5	1.8		4.4
											39	15	3.7		5.8
83AP17-BH	BH20-380	17		CE	BE	MI	Y/N	Y	BR*						
83AP17-BH	BH20-380	20		CE	ST	MI			WE/TRY		40	13.5	2.6		6.1
											31	8	1.3		2.5

83AP17-BH	BH20-380	22a	CE/CY	ST	MI	Y/N	N	SERP/WE	CONSTRI	36	11.8	2		4.6
										32	8.5	1		3.4
83AP17-BH	BH20-380	24c	CE		NO	Y/Y	N	N		19	5			
										23	8			
83AP17-BH	BH20-380	27b	CE	ST				WE		32	10	1.4		4.2
										32	9	1.2		3.3
83AP17-BH	BH20-380	35e	CE	ST				WE		39	14	2.1		5.6
										37	12	1.3		3.6
83AP17-BH	BH20-380	38b	CE	BE	MI			WE		37	10.5	2		3
										44	16	2.5		5.2
A41	BH	5	CE	SL	CO			VL BR/WE		33	10.8		M/Y	1.4
										35	15.9	3		2.7
A41	BH	12	CY	ST	AB		Y	WE		33	8.7	0.6		2.9
										37	14.2	1		5.1
A41	BH	17	CY	BE	MI	Y/N	Y	N		28	8	0.8	N	2.8
A41	BH	20	CY	ST	AB	N/N	Y	N		28	8.4	1.1	Y	2.4
A41	BH	22	CY	ST	AB	N/N	N	ALC		31	9.5	2.2	Y	2.6
A41	BH	23	CY	ST	MI	Y/N		N		32	10	1.2		
A41	BH	24	CY	ST	CO		Y	ALC/MBO		31	9.3	2.8	Y	3.1
A41	BH	30	CY	ST	AB	N/N	Y	N		28	8.4	2.2	Y	2.4
A86		2	CY	ST	MI	N/N	Y	WE/ENCS		41	14.9	2.6	R	5.8
A436	BH	7	CE		WE	N/N	Y	N		40	11.9	2.4	Y	4.3
A436	BH	8	CY	ST	CO		Y	WE+ALC		38	11	2.8	Y	4.7
A436	BH	10	CY	ST	CO			ALC/WE	DIST(3SP)	27	8.1	0.9	Y	3.5
										31	9.1			3.6
										27	8	1.1		2.6
A436	BH	18	CY	ST	CO			ALC+WE		37	12.3	2.2	Y	5
A436	BH	24	CE		AB	N/N	Y	N		37	9.2	1.2	Y	3.6
A436	BH	25	CY	BE	AB			BRYO/WE		37	11.4	1.6		4
A442	BH	1						WE		29	6.4			
A738(43)	BH	1	CY	CU	AB	N/N	Y	ALC/WE		39	12	1.6	MI	4.6
FP	-10 BH	1			CO			BRYO+WE		45	12	1.5		4.5
FP	-1H BH	6			CO			ALC		38	11.4	2.1		2.6
FP	-20 BH	1			CO			ALC*		41	12.2	1.8		4.7

FP	-5 BH	1		FRAG					ALC						
FP	BH?	3		CE	CU	MI	N/N	Y	N		37	10.8	1		
FP	BH?	6		CY	ST	MI/CO	N/N	Y	N		40	14.5	1		7.2
FP	BH?	7		TR		CO	N/N	N	WE		39	11			
FP	BH?	8				CO/AB			WE?	DIST?	50	16.6			
FP	BH?	11		TR		CO			ALC+TUB?		37	10			
FP	BH?	15		FRAG		AB	N/N	N	ALC+MBO		41	11.6	0.9		4.6
LAF	BH	2b		TR	SL	CO			N		31	8.5	2.3		1.1
LAF	BH-TM	3c		CY		CO			WE		41	11.3			
PL-B1	L5	3				AB									
PL-EB7	FR-L	1													
PL-EB7	FR-U	2							WE/BR/SPI		37	11.1	1.6	Y	5.4
PL-EB7	FR-U	4							WE->CAT	DIST/ATT					MLA
PL-EB7	FR-U	6							ALC		29	6.6	0.6	Y	2.2
PL-EB7	FR-U	7							ALC	BUDS?	29	6.2	1.2	Y	1.9
PL-EB7	FR-U	8				AB			WE/COR		30	7.4	1.2		1.6
PL-EB7	FR-U	12							ALC			9.9	1.4	Y	3.8
PL-EB7	SR-L1	3		CY	ST						39	13.9	1.7	Y	4.4
PL-EB7	SR-L1	4							ALC			9.2	1	Y	3.6
PL-EB7	SR-U1	1				MI	N/Y		WE/BRYO		41	12	1.6	Y	3.8
PL-EB7	SR-U1	3							ALC/WE	DIST	30	7.5	0.8	Y	MLA
PL-EB7	SR-U1	4				MI	Y/N				21	5.6	0.6	Y	2.6
PL-EB7	SR-U1	8				AB			ALC		33	6.9	1	Y	1.9
PL-EB7	SR-2	6				MI	N/Y	N	COR/ALC		33	7.1	0.8	Y	2.4
PL-EB7	SR-2	7							WE/BR		38	11.1	2	Y	3.8
PL-EB7	SR-2	9							WE/BR/HEL/TRY		36	11.4	1.6	Y	3.7
PL-EB7	SR-3	1							WE/2COR(U)		35	12.4	1.4	Y	5.4
PL-EB7	SR-3	2							WE/BRYO		33	7.4	1.4	Y	2.5
PL-EB7	SR-3	6	50	CY	BE			5,5,4,6,4,4,5,5	ALC/WE/BR		40	8.8	1.4	Y	3.1
PL-EB7	SR-3	19				AB			ALC		43	11	1.6	Y	4.6
PL-EB7	SR-3	20				MI	Y/N		WE/COR(D)		32	8.7	1.4	Y	2.8
PL-EB7	SR-3	22							ALC/WE		42	12.8	1.8	Y	5.1
PL-EB7	SR-3	24							ALC		31	7.8	1.2	Y	2.2
PL-EB7	RC-L2	2		CY	ST				BRYO		38	12.8	1.6	Y	5.9

PL-EB7	RC-L2	3	33	CE/CY	SL				BRYO/A	DIST	42	12.7	2.4	Y	5
PL-EB7	RC-L2	4				MI	Y/N		WE/3COR		40	13	2	Y	5.7
PL-EB7	RC-L2	5							WE/TRY/BR		36	11.1	1	Y	4.6
PL-EB7	RC-L2	6									35	10.8	1.2		3.9
PL-EB7	RC-L2	8				AB			->CATEN						
PL-EB7	RC-L2	9				MI	Y/N		ALC		35	10.7	1.2	Y	3.8
PL-EB7	RC-L2	12				AB			BRYO?ALC?						
PL-EB7	RC-L3	1							WE/BRYO		37	10.4	1.4	Y	4.1
PL-EB7	RC-L3	3									32	7.4	1		2.4
PL-EB7	RC-L3	7				WE	Y/N		WE		37	10.5		Y	MLA
PL-EB7	RC-L3	8									37	10.6	1.4		4
PL-EB7	RC-L3	11													
PL-EB7	RC-M1	2				NO	Y/Y	N	WE	CONSTRI	30	8.4	1.6	S	
PL-EB7	RC-M1	5							ALC/WE					Y	MLA
PL-EB7	RC-M1	7				MI			ALC		37	9.9	1.6	Y	3.6
PL-EB7	RC-M1	8							BR+ALC					Y	MLA
PL-EB7	RC-M2	1				MI	Y/N	N	WE		33	9.5	1.1	N	
PL-EB7	RC-M2	3							ALC/WE		45	13.5	2	Y	6
PL-EB7	RC-M2	6							WE/COR	EPIDIST	28	6.1	1	Y	2.1
PL-EB7	RC-M3	1							ALC		36	10.1		Y	MLA/L
PL-EB7	RC-M3	3							ALC*/WE		38	14.5	2.6	Y	6.4
PL-EB7	RC-M3	4							WE/BR/TRY/COR		35	11	2	Y	3.8
PL-EB7	RC-M3	8							BRS/WE		32	8.1	1.2	Y	2.4
PL-EB7	RC-M3	10				MI	Y/N		ALC/WE	DIST?	27	6.1		Y	MLA
PL-EB7	RC-U1	2									35	9.4	1.8		2.7
PL-EB7	RC-U1	6			BE	AB			WE					Y	MLA
PL-EB7	RC-U1	9							WE		30	7.9	1.2	Y	2.7
PL-EB7	RC-U1	12				MI	Y/N		WE		36	8.7	1.4	Y	3.4
PL-EB7	RC-U1	13			BE				ALC		24	5.4	1.2	Y	1.8
PL-EB7	RC-U1	16				MI	Y/N		N		33	8.2	1.4	Y	2.7
PL-EB7	RC-U2	5							WE					Y	MLA
PL-EB7	RF-L1	4				MI	Y/N		WE		37	9.9	1.8	Y	4.9
PL-EB7	RF-L2	6							ALC/WE*		38	10.5	1.6	Y	4.3
PL-EB7	RF-U1	1							ALC/WE		37	10.5	2.2	Y	3.4

PL-EB7	RF-U1	2							WE/RUGS*	BUDS	26	7.3	2.2	Y	?/MLA
											37	11.9	1.8		4.8
PL-EB7	RF-U1	5				AB	N/N	5,5.5,4.5	WE		28	8.1	2.8	N	
PL-EB7	RF-U1	7							ALC		36	9.4	1.6	Y	3.6
PL-EB7	RF-U1	9				AB			WE		38	12.8	1.6	Y	4.8
PL-EB7	RF-U1	10				MI	Y/N		N		35	10.4	2	Y	3.9
PL-EB7	RF-U1	12							ALC/WE	BUD	32	8.5	0.8	Y	3.9
PL-EB7	RF-U1	13				MI	Y/N	N	ENC	DIST	27	5.9	TK	LSO	L
PL-EB7	RF-U1	15							WE		24	6.2	1.6	S	2.2
PL-EB7	RF-U1	16							UNU?	DIST*				LSSO	COMP
PL-EB7	RF-U1	18							WE		36	10.8	1.6	Y	3.6
PL-EB7	RF-U1	20					Y/N		WE		35	8.4	0.5		2.8
PL-EB7	RF-U2	2				MI	Y/N		WE		40	11	1.2	LO	3.5
PL-EB7	RF-U2	3				AB			ALC		28	5.6	0.8	Y	2.1
PL-EB7	RF-U2	5							WE		21	5.6	0.3		
PL-EB7	RF-U2	15				MI	Y/N		ALC		30	7.5	1.2	Y	2.6
PL-EB7	IR-L1	1							ALC/WE*		38	9.4		Y	MLA
PL-EB7	IR-L2	5	25		ST	AB			N	ATT+REJU	32	10.4	2.8		
PL-EB7	IR-L3	6				AB			WE	ATT->SOLI	20	4.2		L/	L+LA/MLA
PL-EB7	IR-U1	4				MI	Y/N		N	BUD?	27	6.5		L	L+MLA
PL-EB7	IR-U4	3				MI	Y/N		ALC		27	6.9			
PL-EB7	IR-U4	5				MI	Y/N		ALC		35	10.2	1.4	Y	4.4
POR	BH	3		TR	ST	AB	N/N	N	N						
POR	OPB	21				WE/CO			ALC						
SR	BH	TS1													
SR	BH?	8		TR	ST	WE	N/N		WE/ALC		39	14.6	1.9	Y	5.3

Dinophyllum hannah

LABEL	LEVEL	NUM	SIZE	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTHER	MAJ	DIAM	STEREO	AS	ASD
1.9.75		3=2-1				MI			N		30	11.1			
											23	5			
1.9.75		3=2-2				MI			N		28	7.9			
											31	10.4			
1.9.75		3=3-1													
A96		2		TR	ST	SID			N		31	11.6		N	
A142		1		TR		AB			BRY/C		35	15		CCW	
A149		2	19	TR	CU	AB	N/N	N	N		29	10.2			
A149		4		TR	CU	AB	N/N	N	N						
A149		5		TR	CU	AB	N/N	N	N		23	6.2			
A149		8		TR	CU	AB	N/N	N	N		24	6.5			
C677		1													
BB2	-230	2		TR	SL	MI	Y/N	Y	N			12.1			
BB2	L-C350	1		TR	ST	AB			BOR?	DIST	30	13.4	1.1	N	5
BB2	V	1				MI	Y/N	N	N		33	12.5	1.6		6.2
BB2	V	3				AB			N		38	13.7	2.5	N	0.8
											35	9	2.6		0.7
BB2	V	4				AB			N		39	20.1	2		7.2
BB2	V	11				MI			N		31	9.9	1.9	CCW	1.8
BB2	V	15				FRAG									
BB2	V	16				AB			N		26	6.7	1.2		1.7
											38	13.1	1.5		6.4
BB2	V	17				AB			N		33	15.4			3.9
BB2	V	19				AB			N		31	12.6	2.1	CCW	3.5
BB2	V	20				AB			N		37	14.5	2.6	?	2
											28	7.4	0.6		
BB2	V	22				MI	Y/N		N		35	11.7	2.1		2.7
BB2	V	25				AB			N		31	10		CCW	3.3
BB2	V	26				MI			N		30	7.9	1.4		0
BB2	V	27				MI	Y/N		N		28	8	1.8		1.8
BB2	V	28				AB			N						

BB2	V	31				MI	Y/N		N						
BB2	V	32				MI	Y/N					7.5	1.9		1.1
CA-B	MID	1		TR		MI	Y/N	N	N		26	11.1		N	1.8
CO	-200	1	25	TR	ST	MI	N/N	N	N		28	9.3		N	0
CO	-200	2		TR	ST	WE/MI	N/N	Y	N		31	11.4	2.2	CCW	1.9
CO	-200	3		TR	ST	MI	Y/N	Y	N		35	14.9	1.8	N	6.1
CO	-200	4		TR	ST	MI	Y/N	N	N	2SPECS	30	10	2.1	CCW	0
CO	-200	5		TR	ST	MI	Y/N	Y	N		31	10.9	1.4		0.7
CO	-200	6	23	TR	SL	MI	Y/N	Y	N						
CO	-200	7		TR	ST	AB/WE	N/N	N	N		34	11.4	1.4	CCW	1.8
CO	-200	8				AB/WE			N						
CO	-200	9		TR	ST	AB/WE	N/N	N	N		30	9.6	1.5	CCW	1
CO	-200	10		TR		WE/CO			N						
CO	-200	11		TR	ST	AB	Y/N	N	N		29	8.7		N	1.9
CO	-200	12		TR		AB/WE	N/N	N	N		29	7.2	1.6	CCW	1
CO	-200	13		TR	ST	MI/WE	N/N	N	N		26	6.5		CCW	
CO	-200	14												CCW	
CO	-200	15				WE									
CO	A2	1	45	TR	ST	WE/AB	N/N	Y	N		34	23.6			16.5
CO	A2	2													
CO	A2	3		TR	ST	MI/WE	Y/N	3,3.5,3,4,4.5,3			33	13.3		CCW	3.7
CO	A2	4	42	TR	ST	MI	Y/N	N	N	2SPECS	33	13.7	1.5	N	4.6
CO	A2	5		TR	SL	MI	Y/N	6,6.5	N		37	19.7	2.2	CCW	8.9
CO	A2	6		TR	ST	MI	N/N	Y	N		30	10.8	1.9		3.4
CO	A2	7		TR	ST	MI	N/N	N	N		33	15.3	1.4	CCW	6.8
CO	A2	8	30	TR	ST	WE/AB	Y/N	N	N						
CO	A2	9		TR	ST	AB/WE	Y/N	N	N		32	14.4	1.4	CCW	5.6
CO	A2	10		TR	ST	MI	Y/Y	Y	TRY		29	13.5	2.4	CCW	1.4
CO	A2	11		TR	ST	MI	Y/N	N	N		30	10.9	1.8	CCW	2.6
CO	A2	12													
CO	A2	13													
CO	A2	14		TR	ST	AB/WE	Y/N	N	N		27	9.9	2.1	CCW	1.5
CO	A2	15													
CO	A2	16		TR	ST	WE/AB	N/N	N	N		26	10.4		CCW	0.5

CO	A2	17		TR	ST				N		23	7.8			0.9
CO	A2	18		TR	ST	MI	N/N	Y	N		32	14.4	2	CCW	2
CO	A2	19		TR	ST	MI	N/N	Y	N		33	13.8	3.4	CCW	3.4
CO	A2	20		TR	ST	MI	Y/N	Y	N		28	11.8	2	N	4.2
CO	A2	TS1													
CO	A2	TS2													
CO	BA 150	2				CO/MI	N/N	N	N		27	7.2	1.8	N	1
FP	+38	1	28	TR	CU	MI	Y/N	N	N		28	11.1			
FP	+100	1		TR	ST	WE/CO			N		25	7		CCW	0.9
FP	+100	2		TR	SL	CO/MI			N		28	8		CCW	1
FP	+103	3		TR		CO/MI			N		27	9.1		CCW	
FP	+105	1				CO/MI			N						
FP	+135	1				CO/MI	N/N	N	N						
FP	+135	2				CO/MI			N		21	5			
FP	+140	1		TR	ST	MI/WE	Y/N	N	N					N	
FP	+140	3		TR	ST	MI	Y/N	N	N						
FP	+150	2		TR	CU	MI	Y/N	N	N						
FP	+200	1		TR	ST	AB/WE	N/N	N	N					N	
FP	+200	2		TR	SL	AB	N/N	N	N						
JR24	F	1	25	TR	ST	MI	Y/N	N	N	3SPECS	28	6.3	1	N	0
JR24	F	4	42	TR	ST	MI	Y/N	N	N		33	16		N	0
JR24	F	6		TR		MI	Y/N		N						
JR24	F	7		TR	ST	AB	Y/N	N	N		25	5.6	0.8		0
JR24	F	8A		TR	ST	MI	Y/N								
JR24	F	8C				MI									
JR24	F	8D				AB									
JR24	F	8E				AB					26	8.2			
JR24	F	8F				AB									
JR24	V	1				MI			N		21	5.8		N	0.4
JR24	V	2		TR		MI	Y/Y	N	BOR?						
JR24	V+60	1		TR		AB	Y/N		N		24	7.7	2	CCW	0
JR24	W	1A		TR		AB			N		24	5.1		N	0
JR24	W	2		TR	ST	AB			N		32	9		CCW	0
JR24	W	3A		TR	ST	MI			N		27	10.2		CCW	0.8

JR24SE	M-115	1		TR	SL	MI	Y/N		N		31	12.3	2.5	CCW	1.5
JR24SE	M-118	1		TR		MI	Y/N	N	N		30	11.3	2	CCW	1.8
JR24SE	M-120	1A		TR	SL	MI			N	2SPECS	29	8.5	2		0
JR24SE	M-120	1B	13								14	4.2	1	CCW	
JR24SE	M-120	2				MI	Y/N		N		32	9.4	3.4	CCW	0
JR24SE	M-120	3				MI	Y/N		N		23	5.8	2		0
JR24SE	M-130	1		TR		MI	Y/N	N	N	HINJ?	36	14			
JR24SE	M-145	1	D=32	TR		MI			N		41	18.2	4	N	0
JR24SE	M-160	1		TR		AB	N/Y	N	N		39	16.7	3.9	CALICE	3.9
JR24SE	M-160	2		TR		WE	Y/N		N		25	7.1	1.9	CCW	1.1
JR24SE	M-160	3		TR		AB			N			5.6	1.7		0.4
JR24SE	M-160	4		TR	SL	WE			N		26	7.2	1.8	CCW	1.1
JR24SE	M-165	1	25	TR	SL	WE	Y/N	Y	N		32	8.8	1.7	CCW	0
JR24SE	M-235	1		TR	ST	WE			TRYP						
JR24SE	M-235	3		TR		MI	Y/Y	N	N		26	7.9	1.3	N	1
JR24SE	M-235	4													
JR24SE	M-235	5A				CO					24	6.3	1.7	N	0
JR24SE	M-235	5B				CO					26	7.8	2.2	CCW	0
JR24SE	M-235	5C				CO			N		31	9.7	2.4	CCW	0
JR24SE	M-235	6A				CO					33	11.8	2.9	VS?	0
JR24SE	M-300	1A		TR		MI	Y/N		BOR		34	12.8	3.1	SLCCW	1.1
JR24SE	M-300	1B		TR		MI	Y/N		BOR		27	9.2	2.2	SLCCW	3.1
JR24SE	M-300	1C		TR		MI	Y/N		BOR+STR		30	11.9	3	SLCCW	1.1
JR24SE	M-300	2				MI			N		35	15	3.8	N	3.5
JR24SE	M-345	1				MI			COL?		29	11		CCW	
JR24SE	M-345	4		TR	ST	MI			N		33	7.8	1.6	CCW	0
JR24SE	M-350	1				AB			N		23	5.8			
JR24SE	M-365	1		TR		MI			N		27	7.8	2.6	N	0
JR24SE	M-365	2				AB					32	12.1	2.7	CCW	0.9
JR24SE	M-390	1A		TR		AB			N		29	10.9			
JR24SE	M-390	3				MI	Y/N		N		13	2.6			
LLR	11.5km	1							N		29	8.4		SCCW	0
LLR	11.5km	3							N		28	7.7		CCW	2.1
LLR	16.1km	1	23	TR	ST	MI	Y/Y	N	N		28	9.1		CCW	1.4

LLR	16.1km	3		TR	ST	MI			ALC?		29	10.3		CCW	1.8
LLR	16.1km	4	28	TR	CU	NO	Y/N		N		33	10.1	2		
LLR	16.1km	5		TR	ST	AB	Y/N		N	2SPECS					
LLR	16.1km	6		TR	CU	NO	Y/N		N						
LLR	16.1km	7A		TR	SL	AB			N		26	7.3		CCW	2.2
LLR	16.1km	7B		TR	SL	AB			N		23	5.8		CCW	1.4
LLR	16.1km	8		TR	CU	NO	Y/N		N						
LLR	16.1km	9		TR	CU	NO	Y/N		N		21	6			
LLR	16.1km	10		TR	CU	NO	Y/N		N		26	6.5	1.7		
LLR	16.1km	11		CE	CU	NO	Y/N		N		20	4.2			
LLR	16.1km	12		CE	CU	NO	Y/N		N		25	8.6			
LLR	16.1km	18		TR	CU	NO	Y/N		N						
LLR	16.1km	19		TR	CU	NO	Y/N		N		24	5.6	1.3		
LLR	16.1km	20	42	TR	SL				N		32	10.6		CCW	0
LLR	16.1km	21A		TR	BE	NO	Y/Y	Y	N						
LLR	16.1km	21B		TR	BE	NO	Y/Y	Y	N						
LLR	16.1km	21C		TR		NO	Y/Y	Y	N						
PL-B1	L1	2				SL			N		28	9		N	
SR	ENC+20	1	27	TR	CU	WE/CO	Y/Y	N	N		30	11.4			
SR	ENC+25	1		TR	CU	AB	Y/N	N	BRY?	DIST	26	7.1			
SR	ENC+30	1		TR	CU	MI/C	N/N	N	N		23	7			
SR	ENC+60	1	11	TR	OB	NO	Y/Y	N	BRY?						
SR	+45	1							N		31	18.3			
									N		31	23			
									N		29	12.1			
SR	+45	3		TR		CO			N		33	15.2	2.3		2.8
SR	+45	4		TR	ST	MI	Y/N		N		32	15.5	1.8		0
SR	+45	6		TR	CU	MI	Y/N		N		28	8.3			
SR	+60	1		TR		MI			N		30	12.9	2		0.2
SR	+60	2		TR					N					N	
SR	+75	1		TR	SL	WE			N		31	10.7	2		
SR	+75	2							N		27	8.3	1.8		
SR	+75	3		TR	ST	MI	Y/Y	Y	N						
SR	+75	4		TR	ST	MI	Y/Y	N	N		29	8.4		MIN	S->A

SR	+75	5		TR	ST	AB			N		20	4.9		N	S->A
SR	+350	3		TR		MI	Y/N		N			9.7	2.3		
SR	+360	1		TR		MI			N		32	15.9	1.8		2
SR	+360	3									32	14.8	1.9	N	2.2
SR	+390	1		TR	CU	MI	Y/N		N		34	14.6	1.8	SLCCW	3.1
SR	+390	2				MI	Y/N				20	5.5	1.3		
SR	+390	3				MI	Y/N		N		30	13.2	2.7	N	6.6
SR	+390	7									32	11.5	1.5	N	1.9
SR	+390	8								2SPECS					
SR	+397	1		TR	CU	MI	Y/N		N			13.1	2.5	SLCCW	0.9
SR	+397	2									32	17.8	2.3		11.1
SR	+408	1	30	TR	CU	NO	Y/Y	Y	MBO	RUGDIST	26	7.5	1.6		
									MBO		33	13.9	1.5		
SR	+408	2		TR	ST	MI	Y/N	Y	MBO		31	13	1.6		
SR	+408	3							MBO						
SR	+408	4							MBO						
SR	+419	1	28	TR	ST	AB	Y/N	N	N		26	10.4			
SR	+419	2	29	TR	SL	AB	Y/N	N	N		25	9.1	2.6		0
SR	+419	3		TR	SL	AB	N/N	N	N						
SR	+419	9		TR		MI	Y/N	N	N		30	9.6	1.8		0.5
SR	+419	11		TR	CU	MI	Y/N	N	N		27	7.3			
SR	+419	12		TR	CU	MI	Y/Y	N	N						
SR	+419	13B	10	TR	SL	MI	Y/N	Y	N		20	5	2.2		
SR	+419	16	23	TR	CU	MI	N/N	Y	N						
SR	+419	17		TR	CU	MI	Y/N	N	N		24	7.8	1.6		1.5
SR	+419	18		TR	CU	MI		N	N			6.7	1.2		0.7
SR	+419	21	19	TR	CU	MI			N						
SR	+419	23		TR	ST	MI	Y/N	N	N						
SR	+460	6							MBO						
SR	+460	7B		TR	SL	MI		Y	N		26	10.2	5.1	CCW	0
SR16	+387	1		TR		WE	Y?/		N		27	9.2	1.6	CCW	0
SR16	+430	1	19	TR	CU	WE	Y/		N					CCW	
SR16	+450	9		TR		WE			N		24	7.5	3.1		
SR16	+520	1C													

SR16	+1375	1		TR					ALC?		19	4.5			
SR16	+1375	3		TR											
SR16	+1375	5		TR							28	8.2			
SR16	+1780	1		TR		WE	N/N	Y	N		25	6.8			0
SR16	+1780	3		TR	ST	MI	N/N	Y	N						
SR16	+1780	4		TR		AB	N/N	Y	N						
SR16	+1780	5		TR	ST	MI	N/N	Y	N		28	8			
SR16	+1780	6		TR	ST	MI	N/N	Y	N						
SR16	+1780	7	14	TR	ST	MI	N/Y	Y	N		25	9.5			
SR16	+1780	9		TR	ST	MI	N/N	Y	N						
SR16	+1780	10		TR	ST	MI	N/N	Y	N		22	5.4			
SR16	+1780	12		TR					N		24	8			
SR16	+1780	15		TR	ST	MI	N/N	Y	N						
SR16	+1780	16							N						
SR16	+1920	2		TR					N						
SR16	+1920	3		TR	SL			Y	N						
SR16	+2090	1C				CO	Y/N		N		30	7.4			0.9
SR16	+2090	2		TR	ST	MI		Y*	N		30	8.3	1.2	CCW	1.7
SR16	+2090	3				MI	Y/N		N		25	6.4	1.1		1
SR16	+2090	6A		TR	ST				N		30	10.7			7.8
SR16	+2090	6B		TR	ST				N		24	6.6			
SR16	+2090	6C		TR	SL				N		32	10.9	1.8		0
SR16	+2090	6D		TR	ST				N	4SPECS	21	5	1.2		
SR16	+2190	1		TR		BR			N	2SPECS					
SR16	+2295	2		CE	BE	CO		Y	N		30	8.5	1.5	CCW	0
SR16	+2295	3		TR	ST	AB			N		34	9.4	0.9		1.5
SR16	+2295	4		TR	SL				N						
SR16	+2295	5	31	TR	ST	MI		Y	N						
SR16	+2295	6		TR		AB			N		25	7.3			0
SR16	+2295	7		TR	ST	MI		Y*	N		32	12.2	1.8	CCW	1.5
SR16	+2295	8				MI			N	CONSTRI	25	6.2		CCW	0
SR16	+2295	9		TR		CO								CCW	
SR16	+2295	10		TR	SL	CO			N		24	5.9			0.8
SR16	+2295	11		TR	ST						32	9	1.1	CCW	0.9

SR16	+2295	12		TR							35	12	1.3	CCW	1.1
SR16	+2295	13	21	TR	ST	CO				5SPECS					
SR16	+2300	2		TR	ST	MI			N		27	8.5			
SR16	+2300	3		TR	ST				N		30	12.2	1.7		
SR16	+2300	4		TR							28	10			
SR16	+2500	1		TR	ST										
SR16	+2500	2	24	TR	ST	MI									
SR16	+2500	3		TR	ST										
SR16	+2500	5		TR		MI									
SR16	+2500	6	25	TR	ST	MI					36	9.8			
SR16	+2500	8A		TR							32	10.5			
SR16	+2500	8B		TR											
SR16	+2500	10		TR	ST										
SR16	+2500	11		TR							29	8.8			
SR16	+2500	12		TR	SL						23	5			
SR16	+2500	13		TR											
SR16	+2500	14		TR	ST						25	7.5			
SR16	+2500	15		TR							29	9.6			
SR16	+2500	16		TR	ST						29	8.4			
SR16	+2500	18A		TR	SL	MI					31	10.8			
SR16	+2500	18B		TR	SL	MI						5.3			
SR16	+2500	18C		TR	SL	MI									
SR16	+2500	19		TR											
SR16	+2500	20A		TR							26	7.9			
SR16	+2500	20B		TR							25	7			
SR16	+2530	2		TR							27	8.3			
SR16	+2530	3									19	3.9			
SR16	+2635	1		TR		AB			N		28	8.6	1.2		
SR16	+2635	2		TR	ST			Y	N						
SR16	+2635	3		TR											
SR16	+2635	4		TR							31	8.7			
SR16	+2715	1				CO					17	3.9			0
SR16	+2715	2		TR		MI	Y/N		N						
SR16	+2715	3				CO					27	7.5			

SR16	+2715	4	TR		AB/CO		N				
SR16	+2715	5	TR	ST		Y	N	21	4.2	S->A	
SR16	+2715	6	TR	SL	CO						
SR16	+2715	8	TR		CO						CCW

Rhegmaphyllum n. sp.

LABEL	LEVEL	NUM	SIZE	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTHER	MAJ	DIAM	AS	ASD
83AP16-1-1B	BA 1M	1c					Y/?		ENC		20	5		C->KMLA?
											16	4		
83AP17-1-1B	BA 1M	10		TR		NO	Y/Y	N	BRY		26	9.5		
											27	10.5		
											24	8		
											29	12		
83AP24-2-35	B+246	1	14,12	TR	ST	NO	Y/Y	N	N		18	4		
											22	7		
83AP29-1-34	B+603	1a			SL						24	6		
											30	10		
						AB					33	14		
1.9.75		3=3-2				AB								
A142		2		TR	ST	CO			N	CALBUD	21	5.5	N	
A149		1		TR	ST	AB			N		25	11.7		
A149		3	12	TR	CU	AB			N	CALBUD?	24	8.2		
A149		7		TR	SL	AB			BOR?		30	10.4		
CA-B	+250	1				CO			N					
FP	+5	1				CO			ALC					
FP	+5	2												
FP	+5	3												
FP	+5	4												
FP	+10	5												
FP	+140	4		TR	ST	MI	Y/Y	N	N					
LAF	B+235	9												
LAF	B+235	10		TR	SL	MI	Y/N	N	N		20	6.5		
LLR	5.9km	1		TR		AB					11	2.5		
LLR	5.9km	3				MI					23	7.5		
LLR	5.9km	4a				WE					19	4.4		
LLR	5.9km	4b									15	2.2		
LLR	5.9km	4c									22	6.7		
LLR	5.9km	5		TR	CU	WE								

LLR	5.9km	6		TR	SL	WE					17	5.4		
PL-B1	L3	3												
PL-B1	L5	5												
SR	B+45	2		TR	ST	MI			N					
SR	B+45	7		TR	CU	MI	Y/N	N	N					
SR	B+45	8		TR		CO	Y/N		N		20	5		
SR	B+75	4		TR	ST	MI	Y/Y	N	N		29	8.4	MIN	S->A
SR	B+75	5		TR	ST	AB			N		20	4.9	N	S->A
SR	B+350	1		TR		MI			N		24	8.4	N	S->A
SR	B+350	2		TR		MI	Y/N		N		25	7.4		S->A
SR	B+350	4	8	TR	CU	MI	Y/N	N	N				N	
SR	B+380	1		TR	SL	MI	Y/N	Y	N		20	5.1		S->A
SR	B+390	5												
SR	B+390	6											N	S~->A
SR	B+419	4		TR	SL	MI	Y/ N/N	N	N					
SR	B+419	5	28	TR	SL	MI	Y/N	Y	N	PERPFIB	23	6.6		
SR	B+419	6	25	TR	SL	MI	Y/N	Y	N	REJUV?	23	8.2		
SR	B+419	7	22	TR	CU	MI	N/N	N	N		21	6.4		1
SR	B+419	8		TR	ST	MI	Y/N	N	N		20	6.3		
SR	B+419	14	19	TR	CU	MI	Y/N	N	N			6.9		
SR	B+419	15		TR	CU	MI	Y/N	N	N	OST	20	5.3		
SR	B+419	19		TR	CU	MI	N/N	N	N					
SR	B+419	20		TR	CU	MI	Y/Y	N	N		26	7.6		
SR	B+460	2	15	TR	ST	MI	Y/N	N	N		26	11		
SR	B+460	3		TR	CU				N	BASDIST			N	S~>A
SR	B+460	4				CO	Y/N			N	28	8.1		
SR	B+460	7a		TR	SL	MI	N/N	Y	N		25	10.7		
SR	B+460	8		TR	ST	MI		Y	N		24	7	N	S->A
SR	B+495	1a							N	PERPFIB	26	6.3		
SR	B+495	1b							N					
SR16	+115	1	6,5	TR	ST	MI	Y/N	N	N	2SPECS	13	2.8	N	S->A
SR16	+145	2				CO			N		18	5	N	S->A
SR16	+145	4				CO				2SPECS	20	4.8		L?
SR16	+165	2		TR		AB			N					

SR16	+165	4	9	TR	ST	MI	Y/N	N	N		16	3.6		S->A
SR16	+165	5				MI	Y/Y		N	2SPECS				S->A
SR16	+165	6a	9	TR	SL	WE		Y	N	PERPFIB				
SR16	+165	6b	12	TR	SL	WE			N	PERPFIB				
SR16	+198	1		TR		WE			N					
SR16	+198	2		TR		WE			N	2SPECS		6.1		S<>A
SR16	+250	1		TR	CU	WE			N	2SPECS				
SR16	+250	2		TR	CU	MI			N		22	7	S	
SR16	+250	3		TR	ST	MI	N/Y		N	CON	21	7	Y	MLA+L
SR16	+250	4		TR		WE			N					
SR16	+250	5				CO								
SR16	+250	6		TR		CO			N					S->A
SR16	+250	7		TR		CO					19	5		
SR16	+250	8		TR	CU	MI	Y/N		N					
SR16	+370	2		TR		WE			N					S->A
SR16	+420	1		TR		WE			N					
SR16	+420	2		TR	ST	MI	Y/N	Y	N	2SPECS	21	7.4		
SR16	+420	3		TR		WE			N					
SR16	+430	2		TR	SL	WE			N	CON	22	8.2		S<>A
SR16	+450	2				CO			N	2SPECS				S->A
SR16	+450	3		TR	ST	MI			N	2SPECS	17	5.3		S<>A
SR16	+450	5		TR	CU	WE			N	PERPFIB				
SR16	+450	7				CO			N	2SPECS		10		S<>A
SR16	+450	8a				CO				2SPECS				
SR16	+450	8b												
SR16	+450	9a		TR		WE			N		24	7.5		
SR16	+450	9b												
SR16	+520	1b												
SR16	+520	1d												
SR16	+520	2a				WE								
SR16	+520	2b				WE					33	7.2		
SR16	+520	3				CO	/Y		N	2SP/CAR?				
SR16	+520	5a				CO					20	6.1		S<>A
SR16	+520	5b									27	9.8		S<>A

SR16	+520	6a			WE		
SR16	+1375	4	TR	SL		24	6.5

A summary of corallum mean values is given in Table XII.
For number of tabulae/5 mm, each number represents a different corallite.

Palaeophyllum lyterion

A731

d	n	nn	Msl	msl	wt
4.8	18	10	2.3	0.7	0.1
2.8	16	6	1.2	0.4	0.05
3.5	16	2	1.6	0.5	0.2
4.1	18	7	2	0.7	0.1
1.7	12	5	0.8	0.2	0.05
2.3	14	5	1.1	0.2	0.05
4.6	18	8	2.2	0.6	0.1
2.9	17	6	1.3	0.4	0.1
3.3	17	6	1.5	0.5	0.1
4.5	20	8	2	0.7	0.1
1.7	13	4	0.8	0.3	0.05
3.2	16	6	1.5	0.4	0.1
2.8	14	6	1.2	0.4	0.1
3.9	17	8	1.9	0.5	0.1
2	15	4	0.8	0.3	0.05
4	17	2	1.6		0.2
2.7	15	6	1.2	0.3	0.15
4.5	19	9	2.2	0.5	0.1
2.8	16	6	1.2	0.2	0.05
4.3	18	10	2.1	0.5	0.1

A737-2

d	n	nn	Msl	msl	wt
4.6	16	8	1.8	0.62	0.12
3.2	16	5	1.1	0.38	0.12
4.6	18	5	1.8	0.54	0.12
4.1	16	6	1.7	0.62	0.12
2.8	15	4	1.1	0.35	0.08
5.0	18	5	2.4	0.85	0.15
4.8	18	6	1.9	0.54	0.15
4.6	16	6	1.8	0.65	0.08
1.5	11	4	0.7	0.23	0.08
3.8	17	4	1.8	0.69	0.15
3.5	18	3	1.6	0.46	0.15
5.2	17	10	2.3	0.54	0.12
2.8	15	4	1.0	0.23	0.08
4.5	16	7	2.1	0.46	0.12
5.0	19	8	2.2	0.62	0.15
6.2	17	5	2.8	0.77	0.12
3.5	18	5	1.7	0.54	0.12
3.8	16	6	1.6	0.50	0.15
4.7	16	5	2.0	0.46	0.12

5.8	18	7	2.8	0.62	0.15

A892-1

d	n	nn	Msl	msl	wt
4.2	18	9	1.5	0.27	0.19
5.0	15	4	1.8	0.31	0.23
4.1	18	7	1.6	0.23	0.15
4.5	18	5	1.8	0.46	0.12
3.5	18	5	1.4	0.31	0.15
3.0	18	3	1.2	0.23	0.12
5.2	18	1	2.1	0.23	0.23
4.6	18	5	1.7	0.23	0.23
4.2	18	8	1.6	0.46	0.27
4.2	16	5	1.5	0.23	0.12
4.0	18	8	1.7	0.15	0.27
3.8	18	2	1.7	0.15	0.27
4.2	18	10	1.7	0.23	0.08
4.2	16	3	1.7	0.38	0.08
4.6	18	5	1.7	0.23	0.31
4.2	14	4	1.5	0.23	0.12
4.2	18	5	1.4	0.31	0.12
4.4	18	8	1.5	0.23	0.23
4.4	19	6	1.4	0.27	0.19
4.8	19	6	2.0	0.23	0.23

PORc-1

d	n	nn	Msl	msl	wt
5.2	17	6	2.3	0.6	0.15
2.9	16	4	1.4	0.5	0.2
5.6	16	6	2.7	0.5	0.15
2.8	16	3	1.3	0.3	0.1
5.1	18	9	2.4	0.4	0.15
5.2	18	7	2.2	0.7	0.2
4	18	6	1.9	0.5	0.1
4	16	6	1.7	0.3	0.1
4.5	18	8	2.1	0.6	0.15
3.8	19	6	1.9	0.4	0.1
4.7	18	7	2.1	0.3	0.1
3.4	16	5	1.5	0.4	0.1
4	17	5	1.6	0.4	0.1
5.4	19	6	2.4	0.5	0.1
3	17	5	1.4	0.3	0.1
4.2	17	5	1.8	0.4	0.1
3.7	16	5	1.6	0.4	0.1
5.3	19	7	2.4	0.6	0.1
2	13	4	0.8	0.2	0.05
4.9	17	5	2	0.7	0.15

PORc-2

d	n	nn	Msl	msl	wt
3.8	15	2	1.5	0.69	0.19
2.4	15	2	0.8	0.15	0.12
4.8	16	4	2.3	0.69	0.23
3.2	16	1	1.5	0.38	0.19
5.2	18	4	2.4	0.54	0.19
5.2	19	6	2.1	0.69	0.23
4.5	17	4	2.2	0.54	0.12
4.9	18	7	1.9	0.54	0.15
3.6	16	3	1.6	0.38	0.12
3.4	16	4	1.3	0.54	0.15
5.7	19	6	2.5	0.69	0.31
4.5	16	4	2.0	0.46	0.23
3.7	16	3	1.7	0.38	0.15
5.9	18	4	2.2	0.54	0.35

PORc-4lg

d	n	nn	Msl	msl	wt
5.4	18	6	2.5	0.54	0.12
5.0	18	4	2.3	0.58	0.12
2.8	16	4	1.2	0.31	0.08
4.6	17	2	2.0	0.62	0.08
4.7	17	8	2.1	0.54	0.12
4.8	19	5	2.3	0.46	0.12
2.4	14	4	1.1	0.23	0.08
4.4	18	5	2.0	0.46	0.08
5.2	18	7	2.3	0.54	0.12
4.8	17	7	2.2	0.54	0.12
4.5	16	7	2.2	0.46	0.08
2.8	15	4	1.3	0.31	0.08
3.2	17	5	1.4	0.38	0.12
5.0	18	4	2.4	0.54	0.08
3.7	16	6	1.8	0.31	0.08
4.8	18	7	2.3	0.62	0.08
5.0	17	9	2.5	0.69	0.08
3.1	16	5	1.3	0.23	0.08
2.5	15	5	1.1	0.23	0.04
5.2	18	6	2.4	0.85	0.08

PORc-4sm

d	n	nn	Msl	msl	wt
4.8	15	4	2.1	0.62	0.19
5.5	18	6	2.6	0.92	0.12
4.8	18	7	2.2	0.69	0.15
3.6	18	5	1.7	0.54	0.08
5.0	17		2.4	0.62	0.19
5.3	17	9	2.5	0.54	0.19
4.4	18	6	2.0	0.77	0.15

3.1	16	5	1.7	0.46	0.15
4.7	17	8	2.0	0.46	0.19
3.8	17	5	1.8	0.46	0.08
4.8	17	4	2.2	1.00	0.15
3.5	18	6	1.7	0.46	0.15
3.3	16	2	1.5	0.46	0.15
3.7	17	5	1.7	0.54	0.19
5.6	17	4	2.6	0.85	0.27
3.7	17	2	1.7	0.62	0.15
4.5	17	6	2.1	0.69	0.15
3.6	17	5	1.8	0.54	0.08
3.5	16	4	1.7	0.69	0.08
4.7	17	3	2.1	0.62	0.19

PORc-5

d	n	nn	Msl	msl	wt	tab/5 mm
4.1	17	6	1.7	0.33	0.17	8
5.4	17	8	2.3	0.56	0.17	7
4.1	15	5	1.6	0.39	0.11	
3.1	16	4	1.4	0.33	0.11	
5.1	17	4	2.2	0.56	0.11	
4.3	18	5	1.8	0.44	0.17	
3.8	18	2	1.5	0.39	0.22	
5.2	18	5	2.3	0.61	0.11	
3.8	16	4	1.6	0.33	0.11	
4.4	18	6	1.7	0.44	0.17	
4.2	17	4	1.7	0.39	0.08	
4.0	17	5	1.6	0.33	0.08	
5.3	19	7	2.0	0.67	0.11	
4.1	18	5	1.9	0.44	0.17	
5.9	17	7	2.6	0.67	0.11	

PORc-6

d	n	nn	Msl	msl	wt	tab/5 mm
6.4	17	8	2.9	0.85	0.08	7
5.2	15	7	2.2	0.31	0.08	5
4.6	15	5	2.0	0.23	0.08	6
4.5	14	5	2.2	0.23	0.12	6
5.5	16	8	2.6	0.54	0.08	
5.3	18	5	2.3	0.85	0.08	
5.8	18	7	2.5	0.92	0.08	
3.8	16	5	1.7	0.42	0.08	
5.2	16	7	2.4	0.23	0.12	
4.8	15	6	2.1	0.27	0.06	
2.5	15	5	1.1	0.23	0.06	
4.1	15	7	1.7	0.27	0.08	
4.6	20	9	2.2	0.35	0.12	
3.7	18	7	1.5	0.54	0.15	
3.2	16	6	1.4	0.31	0.08	

4.3	17	8	1.9	0.50	0.27
3.2	18	6	1.4	0.38	0.12
3.2	17	6	1.4	0.23	0.08
5.2	18	10	2.4	0.38	0.08
4.6	20	11	2.0	0.31	0.10

PORc-10

d	n	nn	Msl	msl	wt
4.4	18	7	1.8	0.5	0.06
4.4	18	6	1.8	0.5	0.07
4.0	18	6	1.6	0.5	0.07
3.3	18	5	1.4	0.4	0.06
3.2	18	6	1.3	0.4	0.06
1.6	10	3	0.7	0.2	0.06
4.4	18	7	1.7	0.4	0.06
4.1	18	6	1.8	0.6	0.07
5.1	19	8	2.0	0.4	0.07
2.8	18	5	0.9	0.3	0.06
2.6	17	5	1.1	0.2	0.07
5.1	18	6	2.3	0.6	0.13
4.1	17	5	1.7	0.5	0.14
4.3	17	6	1.9	0.5	0.13
4.8	18	7	1.8	0.3	0.13
3.0	17	5	1.3	0.4	0.07
4.2	18	5	1.8	0.4	0.17
2.8	17	5	1.2	0.2	0.07
3.4	18	7	1.4	0.2	0.06
2.4	16	4	1.0		0.07

PORc-13

d	n	nn	Msl	msl	wt	tab/5 mm
6.9	20	9	2.9	0.61	0.17	5
6.7	18	7	2.8	0.56	0.11	
5.1	18	6	1.8	0.39	0.11	
6.7	21	7	2.9	0.67	0.14	
3.6	19	5	1.6	0.22	0.11	
5.6	21	6	2.7	0.72	0.14	
5.2	22	6	2.3	0.50	0.08	
5.2	18	8	2.2	0.56	0.08	
4.3	19	3	1.9	0.72	0.06	
5.2	20	6	2.4	0.67	0.06	
4.1	18	4	1.7	0.33	0.06	
5.1	18	7	2.2	0.50	0.08	
5.6	21	6	2.7	0.56	0.08	
5.3	20	7	2.4	0.44	0.14	
4.3	20	6	1.9	0.39	0.11	
7.9	32	7	2.9	0.50	0.11	
4.9	19	9	1.8	0.44	0.08	
5.2	19	6	2.6	0.50	0.14	

4.0	18	7	1.7	0.33	0.08
5.2	18	7	2.2	0.44	0.08

PORc-14

tab/5 mm
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PORc-17

d	n	nn	Msl	msl	wt	tab/5 mm
5.6	20	6	2.1	0.54	0.13	4
2.8	13	6	1.3	0.38	0.12	5
4.8	17	3	2.1	0.62	0.12	6
3.2	17	4	1.3	0.38	0.08	5
2.8	16	4	1.3	0.31	0.06	5
5.6	20	7	2.1	0.46	0.08	7
4.8	18	7	1.8	0.54	0.08	5
6.5	20	8	2.2	0.58	0.06	5
3.4	19	4	1.4	0.27	0.06	5
4.8	18	5	1.8	0.46	0.06	7
3.7	17	4	1.3	0.35	0.08	
3.4	17	5	1.3	0.23	0.06	
6.0	20	6	2.1	0.46	0.08	
4.4	18	5	1.7	0.38	0.06	
2.7	17	4	1.3	0.38	0.10	
4.0	19	4	1.5	0.38	0.08	
3.6	17	3	1.6	0.23	0.06	
2.8	15	6	1.1	0.23	0.12	
3.5	19	4	1.6	0.31	0.08	
4.5	17	6	1.8	0.54	0.08	

RPJc-1

tab/5 mm
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RPJc-2

d	n	nn	Msl	msl	wt	tab/5mm
5.2	16	6	1.9	0.5	0.15	9
4.2	16	6	1.9	0.6	0.15	7
5.8	18	6	2.5	0.7	0.15	8
3.6	16	5	1.3	0.6	0.15	7
5	18	8	1.9	0.7	0.15	9
2.8	17	4	1	0.4	0.1	9
4.8	18	7	2.2	0.7	0.1	7
3.6	16	5	1.6	0.7	0.15	9
2.9	14	6	1.3	0.4	0.1	
3.5	16	5	1.4	0.5	0.15	
4.4	16	7	1.9	0.8	0.15	
3.8	16	6	1.8	0.5	0.15	
3.1	15	5	1.1	0.5	0.1	
4.7	18	7	2.1	0.6	0.1	
4	17	7	1.6	0.7	0.15	
1.9	13	4	0.8	0.4	0.1	
4.2	18	8	1.7	0.8	0.15	
4.8	18	7	2.2	0.6	0.15	
3.3	15	6	1.5	0.6	0.1	
3.7	16	7	1.7	0.4	0.1	

RPJc-3-1

d	n	nn
2.9	14	5
2.8	14	5
2.4	14	6
3.3	15	7
2.8	15	7
2.2	15	5
2.6	14	6
4.1	17	5
2.6	14	6
1.4	10	3
4.4	16	8
4.1	15	6
4	16	9
1.9	14	4

4.1	15	8
2.1	14	4
4.2	16	7
3.2	15	5
3.7	14	6
2.2	13	4

RPJc-3-2

d	n	nn
3.9	17	4
1.9	11	5
1.3	10	3
1.3	11	4
2	13	6
1.8	13	5
4	20	8
3.1	17	5
4	18	6
3.8	16	7
1.9	13	4
3.4	18	5
4.5	18	8
2.7	16	5
3.4	16	5
4.6	16	7
4.3	16	9
1.9	14	4
3.9	17	6
3.2	16	5

RPJc-5

d	n	nn	Msl	msl	wt
4.2	16	6	1.7	0.46	0.08
5.4	17	9	2.2	0.54	0.08
3.4	14	5	1.5	0.38	0.08
5.2	17	9	2.2	0.65	0.08
4.2	15	6	2.0	0.38	0.08
2.8	14	7	1.1	0.23	0.08
5.2	17	8	2.2	0.46	0.08
5.6	16	8	2.5	0.77	0.08
2.8	15	5	1.2	0.23	0.08
4.0	16	6	1.7	0.38	0.08
3.5	15	6	1.3	0.23	0.08
5.2	17	8	2.5	0.85	0.12
3.8	15	6	1.7	0.31	0.08
4.0	16	7	1.7	0.46	0.06
4.2	17	6	1.8	0.38	0.12
5.4	16	8	2.4	0.69	0.08
3.0	14	5	1.2	0.23	0.06

5.6	17	7	2.5	0.77	0.10
2.6	14	5	1.2	0.23	0.12
4.5	17	7	2.1	0.54	0.08

RPJc-7

d	n	nn	Msl	msl	wt
3.8	22	2	1.3	0.31	0.27
4.4	17	4	2.0	0.46	0.23
4.8	19	6	2.0	0.38	0.19
4.6	18	1	2.0	0.46	0.15
4.6	18	4	1.8	0.54	0.15
3.6	16	6	1.5	0.38	0.08
6.3	18	7	2.5	1.00	0.12
3.4	16	6	1.7	0.46	0.15
3.5	18	1	1.5	0.38	0.15
4.5	17	5	2.1	0.69	0.08
5.3	19	5	2.5	0.38	0.08
4.9	18	6	2.3	0.46	0.12
3.4	17	4	1.4	0.31	0.15
4.2	18	5	1.9	0.38	0.08
4.5	18	6	2.1	0.46	0.12
3.0	16	5	1.3	0.38	0.08
3.0	17	2	1.2	0.15	0.23
4.4	20	3	1.8	0.23	0.19
3.2	15	1	1.2	0.08	0.19
4.6	18	6	2.0	0.46	0.15

RPJc-8lg

d	n	nn	Msl	msl	wt	tab/5 mm
4.5	16	7	2.0	0.54	0.15	7
4.3	16	7	1.5	0.54	0.19	
3.1	16	2	1.3	0.38	0.15	
4.3	16	7	2.0	0.46	0.15	
4.2	18	7	1.8	0.62	0.23	
4.5	17	3	1.9	0.54	0.15	
3.9	17	0	1.9	0.46	0.31	
4.5	19	4	2.0	0.38	0.19	
2.8	15	4	1.2	0.31	0.19	
3.8	16	5	1.5	0.54	0.19	
3.5	16	6	1.6	0.31	0.15	
2.8	15	5	1.2	0.31	0.12	
3.0	15	2	1.3	0.54	0.15	
4.4	19	4	2.1	0.62	0.17	
4.6	18	8	2.2	0.62	0.15	
2.4	15	1	1.1	0.27	0.12	
4.2	17	2	1.9	0.62	0.19	
3.7	18	5	1.4	0.54	0.23	
4.5	17	9	2.1	0.38	0.15	
2.9	16	5	1.2	0.35	0.08	

RPJc-8sm

d	n	nn	Msl	msl	wt
3.5	18	2	1.7	0.58	0.19
4.2	17	4	1.5	0.46	0.19
4.1	16	2	2.0	0.46	0.15
2.6	19	0	1.8	0.50	0.19
5.8	14	0	1.2	0.42	0.15
3.2		9	2.3	0.69	0.12
3.5	16	7	1.3	0.38	0.08
4.3	16	1	1.5	0.31	0.12
2.4	17	9	1.8	0.31	0.12
5.8	14	5	1.1	0.23	0.08
5.2	17	9	2.4	0.54	0.15
5.4	17	7	2.2	0.69	0.12
3.5	17	7	2.6	0.46	0.12
4.8	17	6	1.6	0.35	0.08
3.3	17	9	2.2	0.54	0.12
4.1	18	8	1.3	0.35	0.12
4.9	17	5	1.8	0.38	0.15
3.4	18	7	2.2	0.62	0.15
3.8	15	4	1.5	0.38	0.12
3.8	16	6	1.7	0.31	0.10

RPJc-9

d	n	nn	Msl	msl	wt	tab/5 mm
2.4	15	5	1.0	0.23	0.06	6
4.5	15	8	1.7	0.65	0.06	7
3.7	15	5	1.7	0.35	0.08	
3.5	14	3	1.6	0.38	0.08	
4.0	16	6	1.4	0.23	0.08	
4.3	15	8	1.8	0.77	0.06	
4.2	15	8	1.9	0.73	0.06	
2.8	16	4	1.4	0.23	0.08	
3.4	14	3	1.5	0.46	0.08	
4.2	17	5	1.9	0.54	0.08	
3.5	17	6	1.5	0.23	0.08	
3.9	16	4	1.7	0.54	0.08	
4.1	16	7	1.8	0.65	0.06	
3.7	15	6	1.7	0.50	0.06	
4.6	16	9	2.1	0.69	0.06	
3.6	15	4	1.7	0.65	0.06	
3.1	15	4	1.4	0.31	0.06	
4.4	15	8	1.9	0.65	0.06	
3.6	15	6	1.5	0.54	0.04	
4.7	17	6	2.1	0.85	0.08	

SRc-1

d	n	nn	Msl	msl	wt
3.9	21	1	1.8	0.31	0.19
4.2	20	1	1.5	0.31	0.15
5.8	21	1	2.1	0.38	0.19
4.7	20	0	1.9	0.38	0.12
5.0	19	0	1.5	0.38	0.15
4.2	20	1	1.8	0.46	0.15
5.8	20	1	2.2	0.38	0.15
4.4	21	3	1.8	0.38	0.19
6.0	18	0	2.2	0.38	0.19
4.5	19	0	1.9	0.38	0.15
4.9	21	0	1.8	0.31	0.15
5.8	19	0	1.9	0.38	0.19

SRc-2-1

d	n	nn	Msl	wt	tab/5 mm
5.1	17	3	1.8	0.15	5
2.6	17	3	1.4	0.12	5
3.1	18	3	1.2	0.12	4
5.3	18	3	2.1	0.08	4
2.5	14	2	0.8	0.12	5
4.1	17	3	1.0	0.12	5
5.2	17	3	2.2	0.15	6
4.7	18	3	1.5	0.12	5
5.2	17	4	1.4	0.15	
5.1	19	2	1.8	0.12	
4.6	21	4	1.5	0.15	
2.9	17	3	1.2	0.12	
3.8	17	3	2.3	0.15	
4.7	18	5	2.2	0.08	
5.2	18	5	1.6	0.12	
3.2	18	2	1.8	0.15	
4.2	16	6	2.2	0.08	
3	16	5	2.0	0.12	
2	16	4	2.0	0.08	
5	17	6	1.5	0.12	

SRc-2-2

n	d	nn	Msl	msl
15	2.5	2	2.1	0.5
18	5.3	4	1.2	0.4
16	3.2	4	1.4	0.5
17	4.1	3	1.5	0.4
18	4.8	6	0.9	0.35
17	3.5	2	1.6	0.5
19	4.5	3	1.8	0.5
18	4.1	4	1.8	0.3
17	4.4	2	1.9	0.5
20	5.9	1	1.4	0.4

17	4.7	1	1.7	0.5
17	4	2	1.9	0.6
18	4	0	1.9	0.5
19	3.7	2	1.2	0.3
19	4.8	2	1.2	0.4
18	5.2	2	2.3	0.5
17	4.1	1	1.3	0.4
19	5.2	0	1.7	0.5
16	3.2	0	1.4	0.5
17	3.9	2	1.4	0.3

SRc-2-3

d	n	nn	Msl	msl	wt
5.8	19	2	2.4	0.31	0.12
3.8	17	3	2.0	0.31	0.12
5.9	18	2	2.4	0.46	0.15
5.3	18	0	1.9	0.38	0.15
4.2	18	3	1.8	0.31	0.08
5.5	19	3	2.4	0.31	0.12
3.8	19	3	1.7	0.23	0.08
4.5	19	4	2.2	0.23	0.08
4.1	19	1	2.2	0.23	0.12
5.7	18	2	2.1	0.54	0.12
4.6	18	3	1.8	0.31	0.12
5.0	19	4	2.3	0.46	0.08
5.1	16	4	1.5	0.46	0.12
4.9	19	2	2.5	0.31	0.08
5.8	19	2	1.8	0.38	0.12
5.1	18	4	1.7	0.46	0.12
5.3	19	2	2.1	0.38	0.12
5.5	16	3	1.3	0.38	0.12
5.6	18	1	1.9	0.46	0.15
4.8	18	2	1.8	0.31	0.08

SRc-2-4

d	n	nn	Msl	msl	wt
3.6	17	6	1.3	0.23	0.08
5.5	20	8	1.7	0.15	0.08
5.1	18	7	1.8	0.23	0.12
5.5	18	5	2.1	0.38	0.12
4.7	18	7	1.5	0.38	0.12
5.4	19	9	2.0	0.42	0.12
3.6	17	6	1.2	0.31	0.08
4.5	18	7	1.4	0.31	0.12
5.3	19	5	1.9	0.38	0.12
5.0	18	7	1.8	0.31	0.08
4.1	18	7	1.4	0.19	0.12
5.5	18	6	1.6	0.15	0.12
5.3	18	5	2.2	0.38	0.12

3.9	18	3	1.6	0.23	0.08
4.1	17	8	1.6	0.31	0.08
4.1	18	6	1.5	0.23	0.08
6.0	21	6	1.5	0.38	0.08
5.4	19	5	1.8	0.38	0.08
5.2	18	5	2.1	0.31	0.15
5.5	18	2	2.0	0.62	0.23

SRc-3

tab/5 mm
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SRc-5-1

d	n	nn	Msl	msl	wt
5.4	17	2	2.2	0.46	0.08
5.4	20	4	1.3	0.23	0.12
4.2	19	3	2.2	0.31	0.15
5.1	19	5	1.5	0.31	0.15
5	19	7	2.3	0.31	0.19
3.2	19	4	2.4	0.46	0.15
4	19	4	1.7	0.46	0.08
3.2	18	4	2.4	0.54	0.08
5.2	19	7	2.1	0.38	0.08
3.4	19	5	2.7	0.77	0.15
5.3	19	7	2.2	0.23	0.19
2.9	16	4	2.2	0.46	0.08
4.1	19	7	2.2	0.62	0.08
6.2	20	6	2.7	0.54	0.12
5	18	4	2.7	0.54	0.19
4	19	5	2.2	0.54	0.08
5.6	20	7	1.9	0.38	0.08
2.7	18	5	2.5	0.54	0.08
3.6	19	5	2.2	0.46	0.08
4.5	19	5	2.3	0.54	0.12

SRc-5-2

d	n	nn	Msl	msl	wt	tab/5 mm
4.6	18	2	1.8	0.62	0.15	7

4.1	18	1	2.1	0.85	0.12	6
5.4	19	3	1.5	0.62	0.08	6
5.4	19	0	1.8	0.54	0.23	7
4.3	19	0	2.2	0.85	0.12	7
2.3	16	3	1.8	0.46	0.12	6
5.2	20	1	2.1	0.85	0.12	
4.6	20	1	1.8	0.54	0.12	
5	19	2	2.3	0.69	0.12	
5.5	19	3	2.2	0.77	0.12	
2.6	17	2	1.9	0.54	0.15	
3.6	18	2	2.5	0.54	0.19	
2.8	16	2	1.9	0.54	0.23	
4.6	18	5	1.8	0.38	0.12	
2.9	16	4	1.8	0.38	0.12	
5.4	20	4	2.2	0.62	0.12	
5.8	19	2	2.4	0.54	0.19	
2.8	17	3	2.1	0.46	0.15	
3.7	18	1	2.6	1.38	0.15	
4.4	18	5	1.8	0.54	0.12	

SRc-7

tab/5 mm
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SRc-8-1

d	n	nn	Msl	msl	wt
4.2	15	1	1.5	0.15	0.12
5.8	16	4	2.2	0.15	0.23
4.4	17	1	1.5	0.00	0.15
6.2	17	2	1.5	0.08	0.23
5.4	18	0	1.8	0.08	0.23
4.4	16	2	2.0		0.23
6	16	0	1.8	0.31	0.15
6.1	18	0	2.2	0.23	0.19
5	18	0	2.3	0.15	0.23
5.7	17	0	2.5	0.15	0.15
6	19	2	1.8	0.23	0.15
3	16	2	2.0	0.08	0.15
3.7	16	4	2.1	0.19	0.23
5.9	17	3	1.9	0.23	0.23
4	16	2	2.2	0.12	0.12
5.6	17	3	2.2	0.31	0.12
5.5	16	3	2.4	0.23	0.15
5.1	17	1	1.5		0.19
5.2	17	1		0.23	0.27
4.9	16	2	1.8	0.31	0.15

SRc-8-2

d	n	nn	Msl	msl	wt	tab/5 mm
5.2	16	2	2.2	0.23	0.15	7
5.4	16	2	2.0	0.23	0.15	6
5.7	17	1	1.8	0.23	0.19	6
5.3	16	3	2.2	0.38	0.12	5
2.8	14	2	2.1	0.15	0.19	6
4.5	16	5	1.8		0.19	6
5	16	2	1.8	0.08	0.27	6
4.9	16	2	2.1	0.08	0.19	7
5.4	18	3	1.8	0.15	0.19	7
5.1	16	2	2.2	0.15	0.15	5
5.7	18	4	2.3	0.15	0.23	6
5.6	16	3	1.9	0.08	0.23	7
4.6	16	2	1.8	0.15	0.19	
4.9	16	3	1.9	0.08	0.15	
5.2	17	3	2.2		0.19	
5	15	1	1.8	0.08	0.23	
3.4	16	3	1.8	0.15	0.23	
4.2	16	3	1.8	0.08	0.27	
3.3	16	3	2.2		0.19	
5.3	16	3	2.0	0.15	0.19	

SRc-9

d	n	nn	Msl	msl	wt
6	17	10	2.7	1	0.2
5.6	17	7	2.4	0.9	0.2
2.3	13	4	1.1	0.4	0.1
2.7	15	5	1.3	0.4	0.1
3.8	15	7	1.9	0.5	0.1
5.8	17	9	2.6	0.8	0.2
4.3	16	5	2.1	0.5	0.1
4.2	15	7	2	0.5	0.15
4.1	16	5	2	0.6	0.15
4.4	14	6	2.1	0.7	0.15
4	14	7	2	0.6	0.2
3.8	14	6	1.8	0.6	0.15
2.5	13	4	1.2	0.4	0.1
4.2	14	5	2	0.6	0.2
4.6	16	6	2.2	0.6	0.15
5.2	18	8	2.5	0.9	
4.3	14	6	2.1	0.6	0.15
5.6	19	10	2.6	0.5	0.2
2.6	13	5	1.3	0.4	0.15
5	16	8	2.1	0.9	0.2

SRc-10

d	n	nn	Msl	msl	wt	tab/5 mm
5.1	19	3	2.4	0.58	0.31	7

4.1	17	2	1.7	0.77	0.23	5
4.5	18	5	1.8	0.46	0.12	5
5.2	18	3	2.4	0.62	0.19	7
3.7	18	4	1.7	0.65	0.15	7
5.5	18	7	2.0	0.69	0.15	
3.4	18	5	1.5	0.54	0.12	
4.8	19	2	2.0	0.62	0.19	
3.8	19	2	1.7	0.46	0.15	
3.2	16	3	1.4	0.38	0.12	
5.2	19	1	2.2	0.54	0.23	
4.5	19	3	2.1	0.46	0.15	
3.4	16	4	1.7	0.46	0.23	
5.0	18	3	2.2	0.42	0.19	
4.0	18	4	1.6	0.46	0.13	
4.8	17	7	2.3	0.69	0.12	
3.5	17	1	1.4	0.58	0.23	
4.6	19	4	1.9	0.54	0.23	
2.8	17	4	1.2	0.54	0.15	
4.5	18	5	1.9	0.62	0.15	

Corallum mean values shown in Table XIII.
For number of tabulae/5 mm, each number represents a different corallite.

Palaeophyllum vaurealense

A14

d	n	nn	Msl	msl	wt
2.4	14	6	0.9	0.23	0.08
3.4	16	5	1.2	0.23	0.08
2.9	16	5	1.3	0.50	0.12
3.1	15	5	1.2	0.35	0.08
2.8	14	4	1.5	0.50	0.12
3.3	15	6	1.3	0.38	0.08
3	14	4	1.2	0.31	0.08
3.1	15	6	1.0	0.31	0.08
4.3	17	5	1.2	0.23	0.08
2.6	15	4	1.2	0.38	0.08
3.3	16	5	1.3	0.15	0.08
3.2	15	6	1.1	0.46	0.08
3.3	16	6	0.9	0.27	0.08
3.2	16	5	0.9	0.42	0.08
3.5	15	6	1.2	0.31	0.08
3.6	14	2	0.8	0.15	0.08
3.2	15	5	1.1	0.31	0.08
3.8	17	6	1.6	0.35	0.12
2.3	14	3	1.4		0.12
3.6	16	4	1.1	0.46	0.08

A35

d	n	nn	Msl	msl	wt	tab/5mm
4	18	2	1.9	0.4	0.2	6
3.8	16	2	1.7	0.45	0.15	5
3.7	16	3	1.8	0.4	0.2	6
4.1	17	1	1.8	0.5	0.2	5
3.8	16	2	1.8	0.5	0.2	5
4.1	17	2	1.9	0.4	0.15	5
4.1	18	2	2	0.5	0.2	5
3	18	2	1.4	0.4	0.1	
3.7	18	4	1.7	0.4	0.15	
3.3	18	3	1.5	0.35	0.1	
3.8	16		1.6	0.4	0.2	
4	19	1	1.8	0.5	0.2	
3.7	17	0	1.4	0.4	0.25	
4.1	16	2	1.9	0.55	0.2	
4	17	2	1.9	0.35	0.15	
3.9	17	0	1.7	0.4	0.25	
3.6	16	2	1.7	0.5	0.15	
4.1	18	0	1.8	0.6	0.2	
3.3	16	1	1.6	0.3	0.15	

3.8	17	3	1.8	0.5	0.15

A80

d	n	nn	Msl	msl	wt
3.8	16	3	1	0.3	0.15
3.1	15	3	1.2	0.5	0.1
3.6	16	2	1.3	0.4	0.1
3.4	15	1	1.4	0.4	0.2
2.3	15	1	0.9	0.2	0.1
3.8	16	3	1	0.15	0.15
2.9	16	3	1.3	0.2	0.1
3.6	16	1	1.3	0.4	0.15
3.6	15	2	1.3	0.3	0.15
3.6	16	3	1.7	0.4	0.2
3.6	15	2	1.7	0.4	0.2
3.3	16	1	1.6	0.2	0.1
4.1	17	4	1.6	0.3	0.15
4	15	1	1	0.2	0.15
3.1	16	1	1.4	0.2	0.1
3.6	16	1	1.1	0.4	0.1
3.7	15	1	1.7	0.5	0.15
2.8	16	3	1.2	0.2	0.15
3	14	3	1	0.2	0.1
3	16	1	1.2	0.4	0.15

A466b-2

d	n	nn	Msl	msl	wt
3.2	15	1	0.7	0.15	0.15
3.4	16	2	0.6	0.192	0.19
3.0	15	3	0.5	0.115	0.12
3.2	14	2	1.0	0.154	0.15
3.2	16	3	1.1	0.154	0.15
3.4	16	2	1.0	0.077	0.08
2.9	15	4	0.6	0.077	0.08
2.8	15	3	0.7	0.115	0.12
2.9	16	2	0.5	0.115	0.12
3.6	18	3	0.6	0.154	0.15
3.5	16	2	0.6	0.154	0.15
2.5	16	3	0.8	0.192	0.19
3.3	16	4	1.2	0.192	0.19
3.3	17	2	1.2	0.192	0.19
3.3	16	2	1.2	0.192	0.19
3.8	16	2	1.2	0.154	0.15
2.8	15	0	0.9	0.154	0.15
3.2	15	3	1.1	0.192	0.19
2.3	15	2	0.7	0.115	0.12
3.6	17	3	0.6	0.154	0.15

LSMc-1

d	n	nn	Msl	msl	wt
3.1	16	2	11		1.5
2	14	1	9		1
2.3	15	0	11		2.5
2.2	14	1	11		2
2.1	16	2	10		2
2	15	1	13		3.5
2.8	16	0	13		1.5
2.3	15	0	10		2
1.9	14	1	12		3
2.3	15	1	10		2.5
2	13	0	12		2
2.5	15	0	10		2
2.4	15	1	9		1
2.7	14	1	8		1
2.4	14	1	8		1
2.1	16	1	8		2
2.4	14	1	10		2
1.9	14	0	12		3
2	14	1	9		2
1.7	14	1	9		1.5

MBSC-15

d	n	nn	Msl	msl	wt
4.7	14	3	1.4		0.31
4	15	3	1.1		0.23
3.7	11	3	1.1		0.23
3.3	16	2	1.2		
4.7	15	5	1.1		0.15
3.6	14	4	1.4		0.38
3.4	14	4	1.3		0.31
3.4	13	4	1.0		0.12
3.7	15	3	1.2		0.12
3.7	15	2	1.5		0.12
3.1	16	3	1.7		0.15
4.4	14	1	1.7		0.23
3.7	14	3	2.0		0.15
3.8	15	2	1.4		0.08
2.8	14	2	1.5		0.23
2.8	14	2	1.7		0.23
3.1	14	2	0.9		0.12
3.1	14	3	1.8		0.19
2.8	14	1	0.9		0.15
2.1	13	0	0.8		0.15

MBtop

d	n	nn	Msl	msl	wt
3.2	17	1	0.6	0.38	0.23

3.5	15	1	1.0	0.38	0.23
2.6	17	1	1.3	0.31	0.23
3	17	1	1.0		0.23
3.3	17	0	1.2	0.31	0.23
2.9	16	1	1.3		0.31
3	17	1	0.9		0.23
3.6	17	1	1.2	0.31	0.23
3.1	16	0	1.1		0.23
3.3	17	2	1.2	0.38	0.23
3.4	16	1	1.2		0.23
3.2	16	0			
3.1	16	0			

MHc1

d	n	nn	Msl	msl	wt
3.2	14	2	1.3		0.15
3	15	1	1.2		0.15
2.6	13	1	1.3	0.58	0.19
2.8	14	1	1.2	0.50	0.19
2.8	14	1	1.3	0.50	0.19
3.5	15	3	1.3	0.46	0.15
3.5	16	1	1.3	0.23	0.15
2.8	14	1	1.1	0.12	0.12
3.1	15	0	1.0	0.23	0.15
3.5	14	2	1.2	0.46	0.15
3	15	2	1.3	0.31	0.15
3.2	14	2	1.1		0.15
3.2	16	1	1.2	0.23	0.15
2.9	15	2	1.2	0.27	0.12
3	14	1	1.1		0.08
2.8	15	1	1.2	0.42	0.15
3	15	1	1.4	0.31	0.15
2.9	14	2	1.2	0.38	0.15
3	16	2	1.3	0.38	0.15
3	14	4	1.1		0.15

MHc2lg

d	n	nn	Msl	msl	wt
3	14	1	1.1	0.28	0.15
2.7	14	0	1.1	0.46	0.19
2.6	15	1	1.0	0.15	0.15
2.5	14	1	1.1	0.00	0.19
2.3	14	1	1.1	0.31	0.15
2.8	14	2	1.2	0.62	0.15
2.6	13	1	1.1	0.31	0.19
2.8	14	0	1.1	0.31	0.19
2.6	14	0	1.1	0.31	0.19

2.9	14	1	1.1	0.00	0.19
3.1	14	2	1.2	0.46	0.12
2.7	13	1	1.2	0.62	0.15
2.6	14	1	1.1	0.46	0.15
2.8	14	3	1.2	0.00	0.15
2.8	15	4	1.1	0.62	0.12
3	14	2	1.1	0.15	0.15
2.7	14	2	0.9	0.31	0.15
2.6	14	1	1.1	0.46	0.15
2.6	14	0	1.2	0.15	0.23
3	14	1	1.2	0.62	0.19

MHc2sm

d	n	nn	Msl	msl	wt
2.4	14	2	1.0	0.42	0.19
2.9	14	2	1.1	0.46	0.08
2.6	13	1	0.9	0.77	0.15
2.8	14	0	1.2	0.85	0.19
2.8	14	1	0.6	0.38	0.08
3	14	2	1.1	0.62	0.12
2	12	2	0.9	0.54	0.12
2.8	14	1	1.0	0.62	0.15
2.8	14	1	0.9	0.69	0.15
2.7	14	1	1.2	0.85	0.19
2.3	14	1	1.0	1.38	0.31
3	14	2	1.1	0.62	0.15
3	14	1	1.2	0.77	0.15
2.9	13	1	1.0	0.77	0.15
2.7	16	1	0.9	0.62	0.12
2.3	13	1	1.2	0.85	0.15
2.4	14	2	1.2	0.62	0.12
2.9	14	2	1.1	0.62	0.12
2.7	14	2	1.0	0.77	0.15
2.9	14	2	1.2	0.69	0.12

MHc-4-1

d	n	nn	Msl	msl	wt
2.1	14	2	1.3	0.4	0.28
2.9	14	1	1.7	0.15	0.28
2.5	14	0	1.1	0	0.33
2.3	14	2	1.2	0.25	0.33
2.6	13	2	1.25	0.3	0.28
2	13	1	1	0.1	0.17
2.8	16	0	1	0.1	0.28
2.7	14	1	1.25	0.3	0.28
2	14	0	1	0.15	0.28
2.3	14	1	1.15	0	0.17
2.5	14	2	1.1	0.25	0.17
2.9	14	1	1.1	0.3	0.28

2.4	14	1	1.2	0.2	0.28
3	14	0	1.3	0.3	0.28
2.4	14	1	1.1	0.3	0.33
3.1	18	2	1	0.1	0.28
3	14	2	1.15	0.2	0.17
3.1	14	3	1.2	0.25	0.28
2.8	13	1	1.2		0.22
2.9	14	0	1.2		0.33

MHc4-3

d	n	nn	Msl	msl	wt
2.5	14	0	1.6	0.3	0.2
2	13	1	1.4	0.2	0.2
2.5	14	1	1.6	0.3	0.2
2.3	14	1	1.6	0.3	0.2
2.4	14	0	1.6	0.3	0.1
2.5	15	0	1.7	0.3	0.3
2.3	14	0	1.6	0.3	0.2
2.6	14	0	1.6	0.3	0.2
2.3	13	0	1.4	0.3	0.3
2.4	14	0	1.6	0.3	0.2
2.5	14	0	1.6	0.3	0.3
2.1	14	0	1.6	0.2	0.3
2.6	15	1	1.7	0.3	0.3
2.2	14	0	1.6	0.2	0.3
2.5	15	1	1.7	0.3	0.2
2.5	15	0	1.7	0.3	0.3
2.8	14	1	1.6	0.3	0.3
2	12	2	1.3	0.2	0.2
2.8	13	2	1.4	0.3	0.3
2.8	14	2	1.6	0.3	0.1

RHc1-1

d	n	nn	Msl	msl	wt
3.5	16	1	1.5	0.4	0.2
3.1	16	1	1.0	0.2	0.2
3.1	16	1	1.5	0.3	0.2
3.3	14	0	1.3	0.3	0.2
3.3	16	1	1.1	0.3	0.1
2.4	15	3	1.2		0.2
2	14	2	1.0	0.2	0.1
2.8	15	2	1.4		0.2
2.9	15	3	1.2	0.3	0.2
3.4	15	3	1.1	0.3	0.2
3.4	14	1	1.2		0.2
2.2	11	1	1.2	0.3	0.2
3.6	16	2	1.1	0.3	0.2
3.3	16	2	1.0	0.2	0.1
3	15	2	1.3		0.2

3.3	16	3	1.0	0.2	0.1
2.6	16	2	1.3	0.3	0.2
3.3	16	4	0.8		0.2
3.9	16	2	1.4	0.3	0.2
2.4	16	1	1.0	0.2	0.1

RHc-1-4

d	n	nn	Msl	msl	wt
3.6	16	2	1.46		2
4.1	16	3	1.15	2.5	2
3.6	16	3	0.85	1	1
2.8	16	2	1.54	2	1.5
3.3	16	1	1.23	1	1.5
3.5	16	1	1.31		2
3.1	15	1	0.92		2.5
3.3	16	3	1.31	1	3
3.4	15	1	1.23		2.5
3.2	16	1	1.31	1.5	1.5
3.5	16	2	1.31	1.5	3
3.4	16	1	1.46	2.5	1.5
3.8	17	2	1.38	4	1.5
3.2	15	2	1.23	3	3
3.3	15	1	1.08	1	2
3.4	16	2	0.92	1	1
3.4	16		1.46	3	2.5
3.1	16	2	1.23	1	3
3.8	16	3	1.31		1.5
3.2	15	1	1.54		2.5

RHc-OB

d	n	nn	Msl	msl	wt
3.4	16	2	1.1	0.23	0.19
4	16	2	1.4	0.62	0.19
3.2	15	1	1.2	0.31	0.15
2.9	15	2	1.5	0.08	0.15
3.9	16	2	1.2	0.08	0.15
4	16	3	1.2	0.54	0.15
3.8	16	2	1.3	0.00	0.19
2.8	16	3	1.1	0.38	0.19
3.6	16	2	1.2	0.23	0.23
3.3	16	2	1.2	0.46	0.23
3.8	16	1	1.2	0.23	0.19
2.5	14	2	1.2	0.08	0.15
3.5	17	2	1.2	0.23	0.15
2.4	14	2	1.2	0.31	0.23
2.5	14	3	1.3	0.62	0.19
3.2	16	3	1.1	0.38	0.15
3.1	16	1	1.2	0.54	0.19
2.3	14	2	1.1	0.00	0.19

3.7	16	3	1.2	0.31	0.23
3.4	16	2	1.1	0.08	0.19

RHc-PE

d	n	nn	Msl	wt
3.2	15	1	1.5	0.12
3.3	16	2	1.2	0.12
3.1	16	0	1.2	0.15
3.5	16	3	1.5	0.15
3.5	16	2	1.6	0.15
3.1	15	2	1.2	0.12
3.6	17	3	1.1	0.15
3.5	16	0	1.6	0.12
3.5	16	3	1.3	0.15
3.2	16	1	1.4	0.15
3.1	15	2	1.5	0.12
3.4	16	1	1.1	0.19
3.3	16	2	1.9	0.08
3.1	16	1	1.5	0.12
3.2	16	2	1.2	0.12
3.4	15	1	1.5	0.15
3.4	16	1	1.4	0.15
3.4	16	2	1.5	0.15
3.7	16	1	1.5	0.12
3.4	16	2	1.4	0.15

RHc-1-1 supplementary; data for Text-fig. 35.

d	n	nn	d	n	nn	d	n	nn
3.5	16	1	3.6	16	2	3.8	15	1
3.1	16	1	3	14	1	2.6	14	2
3.1	16	1	3.5	15	1	3.5	16	2
3.3	14	0	1.9	13	1	2.8	14	3
3.3	16	1	3.6	15	0	3.6	16	1
2.4	15	3	2.8	15	3	3.2	16	2
2	14	2	3.3	16	2	4	16	2
2.8	15	2	2.7	14	1	2.5	14	3
2.9	15	3	3.5	16	2			
3.4	15	3	2.7	20	2			
3.4	14	1	3.4	16	1			
2.2	11	1	2.7	13	2			
3.6	16	2	3.5	16	1			
3.3	16	2	3	15	3			
3	15	2	3.4	16	2			
3.3	16	3	3.2	14	1			
2.6	16	2	2.1	14	2			
3.3	16	4	3.1	16	4			
3.9	16	2	2.1	14	2			
2.4	16	1	2.2	14	3			
3.1	14	1	2.7	14	3			

2.5	15	1	3	15	2
3.4	16	2	2.3	14	2
3.1	16	0	3.3	16	3
3.5	14	1	2.3	13	2
3.8	15	2	3.5	16	2
3.1	14	2	2.7	14	2
3.6	17	3	3.1	15	2
3.1	14	2	3.1	14	1
2.6	14	4	1.9	13	1
3.1	15	2	3.2	15	2
2.6	14	1	2.8	15	2
3.2	16	1	2.9	16	2
3.5	16	0	3.3	16	2
3	14	1	2.3	13	3
2.9	15	2	2.8	16	2
3.3	16	2	3	15	3
3.1	14	3	3.9	17	2
2.5	14	3	2.2	12	2
4	16	2	2.5	14	2
3.2	16	2	3.1	15	1
2.8	14	3	3.4	16	1
3.5	16	1	3.4	15	1
3.5	16	2	3.6	15	0
2.7	14	2	2.9	14	1
4.1	18	3	3.9	16	2
3.8	15	1	2.8	14	2
1.8	14	3	3.4	16	3
2.1	12	2	2.1	12	2
3.3	16	4	1.9	14	3
2.8	14	2	4	18	3

Rhc-1-4 supplementary

d	n	nn	d	n	nn	d	n	nn
3.6	16	2	3.9	15	4	3.6	16	1
4.1	16	3	3.7	15	1	3.3	16	1
3.6	16	3	3.2	15	2	3.2	14	1
2.8	16	2	1.6	15	1	3.1	15	1
3.3	16	1	3.5	16	2			
3.5	16	1	3.2	16	3			
3.1	15	1	2.6	15	1			
3.3	16	3	2.3	14	4			
3.4	15	1	3.5	16	3			
3.2	16	1	2.6	15	5			
3.5	16	2	2.4	13	4			
3.4	16	1	3.8	15	4			
3.8	17	2	2.8	15	1			
3.2	15	2	3.7	16	2			
3.3	15	1	3.6	14	3			
3.4	16	2	2.7	15	4			
3.4	16		3.6	15	1			

3.1	16	2
3.8	16	3
3.2	15	1
3.3	15	3
3.1	15	1
2.8	14	1
3.3	16	2
2.9	14	2
3.1	14	1
3.4	16	1
3.1	15	2
3.3	15	2
3.5	15	1
3.5	15	1
2.6	14	1
3.9	16	3
4	16	1
2.9	15	2
2.1	13	2
2.2	14	2
3.2	16	1
3.2	16	2
2.3	12	1
3.2	15	1
3.6	16	1
3.5	16	1
2.6	14	1
3.4	16	1
2.7	14	3
3.2	16	2
3.1	14	4
2.9	15	5
3.6	16	4
2.9	14	3

3.2	16	2
4.1	16	2
3	15	2
3.3	15	2
3.3	14	1
4	16	1
4	16	3
2.7	14	2
3.1	16	4
3.4	16	1
3.2	15	4
2.9	16	2
3.1	15	1
3.5	16	1
3.3	15	3
3	16	4
3.6	17	1
3.5	15	2
2.9	15	4
3.2	15	1
2.7	15	2
3.3	15	2
3.1	16	2
3.6	15	2
3.9	18	2
3	14	1
2.8	14	0
3.7	15	0
3.5	16	1
3.9	18	2
1.9	14	1
2.5	14	0
3	15	1
3.6	16	1

Rhc-OB supplementary

n	d	nn
16	3.4	2
16	4	2
15	3.2	1
15	2.9	2
16	3.9	2
16	4	3
16	3.8	2
16	2.8	3
16	3.6	2
16	3.3	2
16	3.8	1
14	2.5	2
17	3.5	2

n	d	nn
15	3.1	3
15	3.6	3
14	3.5	3
15	3.3	1
16	3.2	1
14	3.1	0
16	3	1
15	3.1	2
15	2.9	2
15	2.8	3
16	2.8	2
16	3.3	1
16	3.4	2

n	d	nn
16	3.5	1
17	3.8	2
16	3.7	1
16	3.4	1
15	3.1	1
16	3.6	1
16	3.8	2
15	3.3	2
14	2.4	1
15	2.5	2
12	2.3	2
17	3.4	2
14	2.2	1

n	d	nn
18	3.8	2
16	3.7	2
16	2.3	1
16	3.2	3
16	3	3
16	4	3
19	3.5	4
16	3.3	2
16	3.2	2

14	2.4	2
14	2.5	3
16	3.2	3
16	3.1	1
14	2.3	2
16	3.7	3
16	3.4	2
16	3.4	3
14	2.9	1
15	3.3	1
18	4	1
16	3.5	2
14	2.7	3
15	2.6	2
14	2.3	2
17	3.6	1
16	3.3	2
15	3.3	1
16	3.4	2
16	3.2	2
17	3.3	1
14	2.3	2
15	2.8	2
16	3.2	2
15	2.9	1
16	3.4	2
15	2.7	3
14	1.7	1
16	3.3	2
16	3.2	2
15	3.4	1
16	2.8	2
16	3.5	3
15	2.4	3
14	2.3	3
16	3.6	1
14	2.9	3
16	3.5	6
15	2.5	3
16	3.3	1
15	3.5	3
16	3.6	1
16	3.9	1
15	3.4	2
16	3.2	2
15	2.6	1
16	3.3	1
16	3.1	2
16	3.7	2
16	2.7	2
16	2.8	2
15	3.5	2
16	3.7	2
16	2.6	2
16	3.2	2
13	2	2
14	2.3	2
16	3.2	2
15	3.1	1
14	2.9	2
14	2.5	1
15	2.7	2
16	3.5	2
16	3.2	2
15	2.7	0
16	3.2	0
16	2.9	1
16	3.4	0
17	2.9	1
16	3.1	1
16	2.7	1
16	2.9	0
15	3	0
15	3.5	1
16	3	2
16	3.6	1
14	2.5	2
16	3.4	1
16	3.3	0
16	3.2	0
16	3.4	0
16	3.3	2
15	3.1	1
16	3.2	0
16	3.3	1
16	2.4	1
15	3.4	1
16	2.6	1
16	3	2
16	3.1	2
16	2.5	2
16	3	2
16	3.3	1
16	3.2	3
16	2.9	1
16	3.1	1
14	2.2	3
16	2.9	1
16	3.1	1
14	2.2	0
16	2.5	1
16	2.7	2
16	2.5	2
15	3	1
16	3.1	0
16	3.1	0
16	3.6	2
16	3.3	2
16	3.4	2
17	3.3	2
16	3.3	2
16	3.4	2
15	3.4	1
16	3.4	4

RHc-pe supplementary

d	n	nn
3.2	15	1
3.3	16	2
3.1	16	0
3.5	16	3
3.5	16	2
3.1	15	2
3.6	17	3
3.5	16	0
3.5	16	3

3.2	16	1
3.1	15	2
3.4	16	1
3.3	16	2
3.1	16	1
3.2	16	2
3.4	15	1
3.4	16	1
3.4	16	2
3.7	16	1
3.4	16	2
3.1	14	1
3	15	0
3.2	17	2
3.9	17	1
2.7	14	1
3.2	15	3
2.8	14	2
3.1	16	3
3.3	16	2
2.9	14	1
3.4	16	1
4.2	17	3

Palaeophyllum n. sp.

NUM	DIAM	MAJ (n)
83AP14-1-16F-1	4.5	19
	5.6	24
	4.8	19
	9.8	31
	7.6	25
83AP17-1-1b-4	8.3	27
83AP17-1-bh-12d	8.2	26
83AP17-1-bh-22c	8.9	26
83AP17-1-bh-22d	7.6	27
83AP17-1-bh-24a	9	27
	12.3	32
	7.8	26
	7.6	23
83AP17-1-bh-24e	7	25
83AP17-1-bh-32d	9.6	30
83AP17-1-bh-35a	9.2	32
83AP18-R7-4e	12	32
A41-1	5.2	20
	6.1	24
	6.7	25
A41-13	9.8	28
A41-14	7.7	29
A41-22	9.5	31
A41-9	10.3	32
A436-12	8.2	21
A436-31	6.7	21
A436-35	5.9	20
A436-37	7.7	21
LaFEB7-I-2a	5.5	23
	4.4	19
	5.4	20
LaFEB7-I-2b	4.9	20
	5.8	22
	5.7	20
LaFEB7-I-2d	6.1	23
	9	26
	6.7	25
	7.2	25
LaFEB7-I-2e	7.3	25
	9.3	27
	8.3	26
	3.6	17
LaFEB7-LI-2	5.4	23
	5.2	21
	4.3	19
LaFEB7-M1	5	20
	4.4	16
	5.5	20
LaFEB7-M1 (cont.)	4.5	19
	4.7	19
	3.4	13
LaFEB7-TI-2		
	5	14
LaFEB7-TM-3a	7	23
LaFEB7-TM-3b	8.5	23
LaFEB7-TM-3d	7.6	20
LaFEB7-TM-4a	5	19
	8.2	25
LaFEB7-TM-4b	7.8	23
	3.2	13
	5.7	19
	2.2	13
	3	14
	7.4	21
	9.1	25
	6.6	21
	9.5	28
	10.3	28
	6.9	22
	8.4	25
PLEB7-6a	7	
	4.8	19
PLEB7-RC-M3-2	5.3	19
PLEB7-RF-LI-2	7.3	26
PLEB7-RF-LI-7	4.3	20
PLEB7-SR-2-10	6.1	24
	3	13
PLEB7-SR-U1-15	5.1	20
PLEB7-SR-U1-23	4.2	22
PLEB7-SR-U1-3	4.9	21

4.6	18
4.9	17

Palaeophyllum sp.

NUM	DIAM	MAJ (n)
JR24se-355i	2.3	13
	3.5	17
	3.8	19
	4	19
	5	20
	4.9	19
	4.2	19
JR24se-355ii	5.3	21
	5.3	20
	3.3	13
	3.6	18
	2.5	15
	3.5	17
	2.9	15
	3.9	17
	4.3	18
	2.8	15
	3.2	15
	6	19
	4.4	18
JR24se-355-2	3.8	18
	4.6	18
	3.7	18
JR24se-355-4	4.3	19
JR24se-345-3	4.1	20
JR24se-390-2	5.1	20
	3.1	15
JR24se-355?	7.4	24
JR24se-355col	3.7	17
	2.8	15
	2.6	14
	2.8	14
	2	12
	2.6	13
	3.5	16
	3.7	19
	6	19
	5	19
	5.6	19
	6.2	20
	4.9	20
	6.4	21
	4	18
	4.8	20
	3.1	16
	5.2	21
	4.5	20
	2.4	12

Cyathactis euryone

LABEL	LEVEL	NUM	SIZE	SHA	CURV	ABRAD	GRGL	RUGAE	EPIS	OTHER	MAJ	DIAM	DISS	AS	ASD	MIN
A96a		1a		CY	SL	MI	Y/N	Y	N		44 43	26.6 24.1		SLO	L/LA	VL
A504		1														
BB2	-20	1		CY		AB			N	REJUV						
BB2	-20	2							?							
BB2	-100	1a		CY	ST	AB			N							
BB2	-100	1b				MI	Y/N		BOR?							
BB2	-100	3		CY		MI	N/Y		N	REJUV	24	5		S		
BB2	-170	3		TR												
BB2	-200	3		CY	ST				STR/BR	BRANCH	41	21.1		N	0	5
BB2	-200	4		CY/CE		AB			TRY*	DIST*				S	L	
BB2	-200	5				AB			BRY		37	13.8				
BB2	-200	6		TR		AB			N							
BB2	-200	8		TR		AB	Y/Y		ENC		37	18.7		LO	2.7	5.8
BB2	-200	9		TR	SL	AB			SOLI*							
BB2	-200	10		CE	ST	AB			N							
BB2	-200	11				AB										
BB2	-200	12		CY												
BB2	-230	1		CY	ST	AB		Y	N	BRAN?	39	11.9		Y	2.6	
BB2	-230	3		CY		AB			AUL?							
BB2	-230	7				WE								CO	PALLI	
BB2	-230	8		CY		AB			N	REJUV	29	9.6			1.5	
BB2	-230	9		CY?		AB			N		46	17				
BB2	-230	13		CY					BRY	CALBUD*	23	3.2				
BB2	-230	15								REJUV	20	5				
BB2	-230	17a		CY					STR	ATT->17B	29	11.6			1.6	
BB2	-230	19		TR		AB										
BB2	-230	20		CY		AB			?		15	3.1				
BB2	-230	21		TR		AB	N/Y									
BB2	-230	22		CY		AB			?TAB							
BB2	-230	23		CY		AB			N		44	21.3	12.2			5.5

BB2	-230	24							STR/TAB							
BB2	-350	1		CY		AB										
BB2	-350	2		TR	CU	AB		Y	N	TALON						
BB2	-400	2		TR	ST	AB		Y	N		36	19.7		SCO	2.5	6
BB2	-400	4a		TR		AB		Y	BRY	ATT-BRY	34	13.9		S	2.8	
BB2	-410	2		TR		AB		Y	STR/ALC	5SPECS	44	19.7			0.4	5.3
BB2	-425	3				AB			N	INTDIST	38	19			4.3	
BB2	-425	4				AB			N					CO		
BB2	-425	5c														
BB2	-440	1				AB			N							
BB2	-440	2							STR		43	24.8	12.8	N	5.1	
											42	17.8	6.1		1.7	
BB2	-450	1		CY					STR*	STRDIST	40	20.1			1.7	
BB2	-450	3				AB			N					MOD		
BB2	AV	1	50,37	TR	ST/BE	MI	Y/N		STR*	EPIDIST	45	19.4	11.8	N	5.7	3.4
BB2	AV	2				MI	Y/N		STR*	CALICE	36	24.5		S<>->A	15.8	
BB2	AV	3		CY	ST	MI			STR*		35	12.7	5.4	N	2.2	3
BB2	AV	4				AB			ENC		30	12		N	2.6	2.5
BB2	AV	5				AB				DIST						
BB2	AV	6				AB			BR/TUB					SSO		
BB2	AV	9				AB			MBO		36	17.8		Y	3.8	
BB2	AV	10				AB	Y/N		MBO		38	17		Y	4.5	4
BB2	AV	11				AB			MBO/BR*	DIST	29	8.4		N/LO		1.5
											40	17	11.8		4.9	5.3
BB2	AV	12				AB			MBO		32	11.4		LO	3.4	1.6
BB2	AV	13				AB			MBO	3SPECS			8?ROWS			
BB2	AV	14				AB			MBO					VS		
BB2	AV	15				AB			?	DIST/REJUV	33	14.3	7.6	SLO	3.5	3.8
BB2	AV	18				MI			STR*/ALC		41	20.4	11	S	3.6	5.9
BB2	AV	20				MI			STR/ALC		39	21.1	13.8	N	4.2	6.5
BB2	L-c350	2		CY	ST	AB			N		38	16.1	8.8	S	2.9	
BB2	LO	2		CY	ST	AB		Y	N							
BB2	LO	3		CY	SL	AB		Y	N							
BB2	V	24				AB			N		42	18.3		L+LA	5.8	

											23.5	5.9		7.3	6
CO	A2	21	CY	ST	CO			STR							
CO	BB	3	TR/CY		CO/MI			N	2SPECS	40	26.6	16.7	?	2.3	
JR24	F	2	CE	ST	CO			STR		38	15.7			2.6	3.4
											19.9	10.9			
JR24	F	5	CY	ST	AB	N/N	Y	N		37	27.4	6.5	VS	2.8	6.5
JR24	WATLEV	1B			AB			N		30	9		S	2.2	
JR24SE	M-355	5	CY		MI	Y/N	N	N		33	11.4			S->A	
SR16	+520	4	TR	SL	WE	Y/N		N	3SP/DIST	21	5.9		SLO	S~A	
SR16	+520	6B			AB										

Paliphyllum ellisense

LABEL	NUM	LEVEL	SIZE	SHA	CURV	ABRAD	GRGL	RUG	EPIS	OTHER	MAJ	DIAM	ASD	MIN
83AP14-1	11	BH380-430		CY	ST/BE	MI	Y/N	Y	WETH		32	13		
											31	10.5		
83AP14-1	17a	BH380-430				MI	Y/N		HELIO?		36	14		
											37	18		
83AP14-1	17b	BH380-430				MI	Y/N		BR/WE	BUD	29	11		
83AP14-1	17c	BH380-430				MI	Y/N		BRYO					
83AP14-1	22b	BH380-430				MI					22	7		
83AP14-1	23	BH380-430				NO	Y/Y	N		GREG				
83AP16-1-BH	3	BH250-380				NO	Y/Y	Y	ALC	CONSTRI	36	19		
83AP17-1-1B	13	BA 1M	20		BE	NO	Y/Y			ATT->TAB	25	6		
											22	5		
											26	7		
83AP17-BH	6Ea	BH20-380		CE	SL	MI	Y/N	N	BRYO/WE		22	6		
											31	11		
83AP17-BH	6Eb	BH20-380		CE	SL	MI	Y/N	N			20	5		
83AP17-BH	19	BH20-380				MI			WETH		41	17.5		
83AP17-BH	22B	BH20-380		CE	ST	MI			WE/BR		33	14		
83AP17-BH	24C	BH20-380		CE		NO	Y/Y	N	N		19	5		
											23	8		
83AP17-BH	24F	BH20-380		CE		MI	Y/N	N	BRYO	DIST	31	8.5		
83AP17-BH	25A	BH20-380		CY	ST	MI	Y/N	N	BR/RUG*		34	13		
83AP17-BH	25Ca	BH20-380		CY		MI			WE/ALC/2COR		40	18		
83AP17-BH	25Cb	BH20-380		CY		MI								
83AP17-BH	27H	BH20-380									31	8		
83AP17-BH	29	BH20-380	D=13	CY	ST/BE	MI	Y/N	Y			36	12		
83AP17-BH	34	BH20-380		CE	BE				WETH		31	9		
83AP17-BH	36A	BH20-380		CY			Y/Y	N	SERP	SPECS	34	15		
											29	10		
											34	13		
83AP17-BH	37B	BH20-380		CY	ST	MI			FAV/WE/COR/BR	**	34	19		
83AP17-BH	37C	BH20-380		CY	ST				COR/WE		36	15		

83AP17-BH	39	BH20-380		CE	ST				N		27	8		
83AP17-BH	44B	BH20-380		CY	BE	AB	N/N	Y	WETH		35	15		
83AP17-BH	39	BH20-380									30	11.5		
83AP17-BH	40	BH20-380	115,23	CY	ST				BRAN					
83AP18-1-R6	1	BA 1M									30	12		
83AP18-1-R7	3A	BH<30				MI	Y/N		BR/WE/ALC		36	18		
A41	3	BH			SL	MI	Y/N				36	15.5	3	2.9
											25	7.3	2.5	1.2
A41	6	BH									35	11.5	3.4	
A41	8	BH									35	14.8	4.3	2.7
A41	11	BH		CY	SL	AB	N/N	Y	WE/ALC		29	8.4	1.9	1.8
											38	13.7	2.8	2.8
A41	16	BH		CY	ST	AB	N/N	Y	ALC					
A436	1	BH		CY	ST	MI	Y/Y	Y	N		39	14.7	4.5	3.5
A436	2	BH		CY	ST	LO	Y/Y	Y	ALC?		39	14.8	5.2	3.9
A436	4	BH		CY	ST	CO		Y	ALC		34	15	4.9	3.5
A436	11	BH		CY	ST	AB	N/N	Y	ALC	DIST	34	12.3	3	3.4
A436	13	BH		CY	ST	AB	N/N	Y		MISSING				
A436	15	BH	26	CY	ST	AB	N/N	Y	WE		35	12.7	2.9	3.4
A436	16	BH		CY	SY	CO			ALC/WE		35	14.9	5	3.8
											28	8.4	2.2	2.2
A436	17	BH		CY		AB		Y	ALC/WE		36	13.1	3.4	3.3
A436	19	BH		CY	BR	AB	Y/N	Y	BRY	4 SPECS	34	13.3	4.4	
											31	12.4	2.9	
A436	20	BH		CY	ST	AB	N/N	Y	BRYO	BUD	42	14.9	3.4	4.3
A436	23	BH	42	CY	ST	AB	Y/N	Y	ALC		38	11.3	2.8	2.8
A436	26	BH							ALB/WE		31	12.2	2.6	
A436	29	BH		CY	ST	AB	N/N	Y	WE++	DIST	34	10.4	2.8	2.1
A436	30	BH		CY	ST	AB	N/N	N	WE		37	12.5	3.7	2.5
A436	32	BH		CY	ST	AB/CO			ALC/WE	DIST	37	12.8	3.8	3
A436	34	BH		CY	ST	CO			ALC/ALB		36	15.8	5.2	4.2
A738(42)	1	BH		CY	ST	AB/A?	Y/N	Y	ALC/BR/TAB	REJUV	32	13.1	3.5	3.6
A86	3			CY	ST	MI	N/N	Y	BRYO		34	15.7	3	3.9

A86	4							35	13.7	3.9	4.2
A86	6	CY	ST	CO		Y	WE/ALC	31	9.9	1.8	2.6
A737	3 BH	CY	ST	MI	Y/N	Y	WE/BR/SP*	30	13.1	3.3	2.8
								21	4.8	1.1	
								25	8.4	0.6	1.6
								29	10.6		1.9
A737	4 BH	CY	ST	MI		Y		29	10.4	1.4	1.8
								25	7.6	1.8	1.2
								31	10.3		1.6
								27	8.3	2.2	1.4
								21	4.4	0.9	0.8
								29	11.9	3.1	2.4
								31	13.3		
								21	5.3	1	0.9
								12	2.9		0.3
								17	3.7	0.7	0.6
								30	12.1	2.8	2
A737	5 BH	CY	ST	MI		Y		31	12.6	3.3	2.3
								20	4.8	2.7	1.9
								26	7.6	3.8	
								22	6		1.3
								28	11	5.6	2.9
								32	12.9	3.6	1.9
								21	4		0.3
								30	8.6	2.4	2.3
								18	4.6	1.3	0.8
								19	3.9	2.2	1.2
								28	12.6	1.6	1.2
								33	11.4		
								31	10.7	4.1	2.8
								32	12.8	1.1	0.6

						26	5.3	3.9	1.1
						33	14	1.2	0.8
						29	12.1	1	0.7
						19	4.4	3.9	2.7
A737	6 BH	CY	ST	MI	Y	29	10.3		2.2
						27	9.4	2.4	1.8
						29	10.6	2.1	2.6
						26	9.9	2.6	2.6
						30	11.8	3.6	2.8
						30	12.6	4.2	2.8
						32	11.6	2.8	2.6
						22	6.3	2.2	1.4
						27	10.2	2.6	2.1
						32	11.1	3.3	2.1
						29	11	3.7	2.3
						28	9.6	2.8	2.2
						20	4.1	1.1	0.4
						23	6.7	1.8	1.3
						22	5.8	1.7	1.2
						27	8	1.4	1.7
						22	6	1.6	1.2
						29	10	2.4	2.6
						30	9.4	2.2	2
						27	10.8	2.8	2.3
						26	10.6	3.1	2.3
						22	6.2	1.1	1.4
						26	8.6	1.7	1.7
						28	10.6		2.7
						24	7.2	1.4	1.2
						20	5.1		0.4
						20	4.6	0.8	0.8
						29	11.8	3.9	2.4

FP	1 -5 BH	FRAG		ALC					
FP	2 -5 BH	FRAG		WE/BR		41	20		
LAF	1a BH-TM	CY	Y	N					
LAF	1b BH-TM	CY		BR/ALC/TUB		36	12.3	3.5	2.6
LAF	1c BH-TM	CY		BR/TUB		38	13.3	3.6	2.5
LAF	1d BH-TM	CY		?		37	10.6	2.8	2.4
LAF	1e BH-TM	CY		?		35	12.6	3.1	2.3
						28	7.9	2.1	
LAF	1f BH-TM	CY		N		34	10.8	3.3	3.4
LAF	1g BH-TM	CY		BRYO		38	13.4	4	2.6
						33	9	3.4	2.2
LAF	1h BH-TM	CY		N	7 SPECS	30	7.6	0.8	
						24	5	0.9	
						24	4.7	0.9	
						36	11.9	3.5	
LAF	1i BH-TM	CY		BR/ALC?		34	14.4		
LAF	1j BH-TM	CY		BR/ALC?	4 SPECS				
LAF	2a BH-TM	CY		ALC					
LAF	2b BH-TM	CY		ALC		35	12	3.6	2.4
LAF	2c BH-TM	CY		ALC		34	12.1	3	2.7
LAF	5a BH-TM	CY	Y	WETH					
LAF	5b BH-TM					37	12	3	2.5
LAF	5c BH-TM								
LAF	5d BH-TM					37	12.7	4.7	
LAF	5e BH-TM					37	12.4	2.9	2.9
LAF	5f BH-TM					34	10.7	2.8	
LAF	5g BH-TM				2SPECS	29	8	2.3	1.9
						32	9.6	3.6	2.2
LAF	5i BH-TM								
LAF	5j BH-TM					32	8.2		
LAF	1a I	FRAG			8SPECS	37	14	3.6	2.9
						19	4.6	1	1.2
						26	5.4	0.8	1.1

										22	4.2	0.9	0.8
										19	3.8	1.1	0.9
										19	3.5	0.8	1
										23	5.4	1	
										36	12.9	3.5	
										27	7.1	2.3	
LAF	1a UI		CY		CO			WETH		38	13.5	3.4	3.3
										33	11	2.3	2.9
LAF	1b UI								2SPECS	38	13.6	4.1	2.2
										39	14.4	4.2	3.5
LAF	1c UI								2SPECS	23	4.3	1	1.1
										38	14.4	3.9	3.1
LAF	1d UI								4SPECS	35	10.8	2.9	2.6
										19	3.9	0.9	
										36	10.7	3	2.1
LAF	1e UI								2SPECS	35	10.6	4.1	2.1
										34	11.1	3.7	2.2
LAF	2 BH-M		CY	ST	MI	N/N	Y	ALC		36	15.3	3.4	4
LAF	2a BH	95+	CY	ST			Y	ALC+RUG	DIST	34	11.9	3	
LAF	2d BH		CE	ST	MI	Y/Y	Y	RUG?	BUD?	37	13.8	3.3	3.2
PL-B1	1 L1				AB			N					
PL-B1	1 L4	60	CY	ST	AB	N/N	Y	BRYO	ATT/CONSTR	40	23.3	6.8	5.3
PL-B1	1 L6							N					
PL-EB7	2 BH		CY	ST	MI			WETH	PHOTO/BUDS	34	12	4.2	4.3
PL-EB7	3 BH	170+						WE/BRY/COR	PHOTO	35	14.4	2.9	3.7
										35	14.5	3.2	3.8
										35	14.8	2.9	3.5
PL-EB7	5 BH						3.6,4.6,4.7,3.8	WE/BR	PHOTO	37	16	5.4	3.3
							4,3,4,4.8						
										32	10.4	2.2	2.5
PL-EB7	4 IR-U2							ALC/WE/BR		32	10.6	MLA	
PL-EB7	5 RC-L2							WE/TRY/BR				MLA	
PL-EB7	9 RC-L2				MI	Y/N		ALC		35	10.7	MLA	

PL-EB7	12	RC-L2				AB			BRYO?ALC?					
PL-EB7	3	RC-U1				MI	Y/N		ALC	REJUV	35	15.1	4.1	3.5
PL-EB7	4	RC-U1				MI	Y/N		ALC	BUD/SAFFATT				
PL-EB7	7	RC-U1							ALC*	DIST/REJUV/BUD				
PL-EB7	3	RC-U2							WE/BR/SPI		31	13.1	5	2.8
PL-EB7	4	RC-U2							ALC		30	9.8	L+LA	
PL-EB7	6	RC-U2				MI	Y/N		ALC/ALB	REJUV	36	14.3	3.9	2.5
PL-EB7	5	SR-2							WETH		34	12.3	2.3	3.2
PL-EB7	6	SR-U1							WE/BR		34	12	2.3	2.9
PL-EB7	10	SR-U1									39	15		4.4
POR	2	ENC				CO			BR/WE/RUG	2	27	7.7	2.2	2.1
											36	15.7	4.6	3.2
POR	8	OPB										16	5.5	3.4
POR	9	OPB		CY	ST	AB	N/N	N	ALC		39	12.6	3.7	
POR	12	OPB		TR	SL/BE	MI	Y/Y	Y	ALC	2SPECS	32	12.6	3.2	2.5
											37	18.1	5	4.3
											21	5.5	1.7	
											35	12.6	3.5	2.9
POR	14	OPB		CY		CO			ALC		45	15.7	4.2	
POR	16	OPB		CY	ST	MI	N/N	N	N		30	9.3	1.6	1.8
POR	18	OPB		CY	BE	AB	N/N	N	N		35	14.6	5.7	
POR	21	OPB				WE/CO			ALC					
POR	22	OPB				CO			ALC					
POR	25	OPB		CE	BE	AB/WE	N/N	Y	N		35	14.9		
POR	27	OPB	45	CY	SL	CO			ALC				L	
SR	E1	BH		CY					ALC/WE		31	8.5	2.3	1.7
SR	E2	BH		CY							38	14.6	4	3.4
SR	E3	BH		CY							37	15.6		
SR	E4	BH		CY							33	12.4	3.8	2.8
SR	E5	BH		CY							21	4.6	1	1.1
SR	E6	BH		CY							26	6.9		1.2
SR	E8	BH		CY							24	6.3		1.2

SR	E10 BH	CY	24	5.9	1.2

Strombodes socialis

DIST is a qualitative measure of distortion of the corallite: CI = circular, SL = slightly distorted, DI = moderately distorted, GR = greatly distorted.

LABEL	NUM	DIAM	MAJ	NN	DIST
A292		-	-	-	-
		-	-	-	-
			-	-	-
		11.6	27	-	-
		-	-	-	-
		-	-	-	-
		9.3	27	-	-
		-	-	-	-
		9.4	25	-	-
		13.5	24	-	-
		9.2	20	-	-
		10.1	21	-	-
		11.1	25	-	-
		9.8	23	-	-
		7.6	25	-	-
		9.9	25	-	-
		11.4	28	-	-
		-	-	-	-
		-	-	-	-
		-	-	-	-
		10.7	24	-	-
		10.6	-	-	-
		12.7	-	-	-
BB2	TIDAL	5.8	20	0	-
		9	20	2	-
		8.6	19	1	-
		5	22	1	-
BB2	C	8	25	1	CI
		6.3	23	1	CI
		10.7	29	2	SL
		8.3	28	1	CI
		9	28	1	CI
		8.3	28	1	SL
		12.7	29	3	GR
		9.7	30	3	GR
		10.6	30	1	SL
		5.2	19	0	CI
		9.7	27	2	DI
		9.4	26	2	GR
		10.2	24	3	SL
		9.6	25	3	SL
		6.2	26	2	CI
		7.8	25	1	CI
		8.3	26	1	CI
		8.6	24	2	GR
JR24C	UP	8.6	28	1	SL
		2.8	13	0	CI
		11.8	27	5	DI
		8.4	26	0	CI
		6.3	27	0	CI
		8.5	23	2	GR
		6.9	25	0	CI
		8.6	27	2	SL
		10.5	30	3	GR
		8	28	0	SL
		7.1	25	0	CI
		5.8	29	4	SL
		11.8	25	6	DI
		3.7	17	1	CI
		11.2	28	5	DI
		6.6	25	0	CI
		7	25	5	GR
		7.9	25	3	SL
JR24C	LOW	9.4	29	1	CI
		7.6	25	2	SL
		10.1	30	1	SL
		5	21	0	CI
		4.1	19	0	CI
		10	24	0	SL
		10.1	25	2	SL
		9	26	3	GR
		5.4	23	2	SL
		7.9	24	1	SL
		8.8	27	0	CI
		5	21	1	CI
		7.2	23	0	SL
		4	19	1	CI
		9.2	27	3	SL
		4.1	20	0	CI
		7.2	27	-	CI
		7.5	26	-	CI
		6.1	24	3	GR

7.3	27	0	CI
8.3	24	0	DI

Petrozium pelagicum

LABEL	DIA	MAJ
SR16+1720	6	21
	7	23
	5.8	21
	7.1	20
	5.5	18
	12.5	27
	6.4	19
	7.2	22
	8.6	22
	7.9	22
	6	18
	4.1	18
	6.4	19
	4.8	17
	7.5	21
	5.1	16
	4.7	18
	5.7	19
	7.1	20
	6.8	20
BB2-V-10	8.7	24
	7.3	22

APPENDIX D - ORIENTATION DATA

All data from Anticosti Island, Québec; locations given with UTM coordinates and NTS 1:50000 map sheet.

All orientations measured to closest 5 degrees and subsequently corrected for magnetic declination.

WCR: West of Cap de Rabast (loc. 13), coastal outcrop between two creeks (UTM 22H/16 14200:15300), Lavache Mbr., Vauréal Fm.

Lower coral bed coral orientations:

313, 098, 338, 203, 003, 003, 013, 098, 168, 298, 348, 183, 263, 203, 043, 343, 193, 258, 018, 018, 298, 033, 223, 338, 038, 043, 293, 018, 288, 168, 178, 188, 138, 038, 193, 083, 093, 093, 178, 188, 178, 178, 148, 008, 188, 278, 338, 078, 093, 173, 253, 198, 198, 168, 208, 248, 008, 013, 178, 098, 198, 063, 248, 043, 238, 118, 103

Upper coral bed coral orientations (54 cm above lower bed):

188, 138, 043, 138, 218, 228, 088, 138, 038, 228, 098, 348, 148, 143, 358, 038, 348, 078, 348, 258, 023, 333, 178, 168, 088, 243, 228, 073, 148, 143, 293, 158, 353, 348, 123, 148, 138, 238, 298, 123, 308, 118, 178, 343, 283, 248, 298, 278, 018, 178, 158, 208, 158, 228, 318, 328, 188, 138, 158, 088, 158, 343, 098, 308, 118, 058, 163, 143, 248, 183, 188, 183, 108, 088, 108, 178, 158, 248, 328, 328, 178, 238, 178, 178, 188, 138, 238, 228, 193, 328, 178, 328, 108, 308, 248, 108, 068, 313, 148, 303, 148, 138, 238, 118, 308, 268, 173, 118, 198, 038, 068, 018, 138, 318, 348, 013, 318, 198, 038, 143, 148, 198, 208, 038

Crinoid stem segment orientations:

30 cm below lower coral bed: 098, 108, 058
10 cm below lower coral bed: 168
5 cm below lower coral bed: 068, 043, 053, 153
44 cm above lower coral bed: 038, 038, 048, 178, 063
48 cm above lower coral bed: 023, 053, 018, 168, 008, 173, 093, 078

Megaripple orientations (30 cm below lower coral bed): 103

OC-V: Observation Canyon (loc. 29), 4.9 m below culvert above waterfalls (12E/10 09350:95650), Joseph Point Mbr., Vauréal Fm.

Coral orientations (long axis): 012, 012, 017, 022, 032, 037, 042, 042, 052, 057, 057, 067, 067, 072, 082, 097, 097, 097, 10, 117, 137, 147, 147, 152, 157, 157, 162, 162, 162, 167, 167, 167,
167, 177, 187, 227, 227, 227, 237, 237, 242, 252, 287, 297, 302, 312, 312, 317, 317, 322, 322, 322, 322, 327, 332, 332, 337, 337, 337, 337, 337, 342, 342, 342, 347, 347, 347, 347, 352, 352, 352, 357, 357

Coral orientations (cardinal side): 007, 017, 027, 042, 057, 057, 057, 062, 067 067, 072, 072, 072, 072, 077, 077, 082, 097, 102, 107, 117, 147, 147, 147, 157, 207, 227, 252, 257, 257, 262, 267, 267, 307, 312, 312, 317, 342, 342, 352

MB: Mill Bay (loc. 39), coastal outcrop west of Schmitt Creek on Mill Bay (12E/8 65350-950:69600-900), Mill Bay Mbr., Vauréal Fm.

Coral orientations (nonrippled surface): 216, 146, 226, 341, 301, 236, 311, 246, 151, 171, 51, 66, 41, 291, 256, 206, 211, 256, 156, 241, 351, 236, 136, 226, 261, 026, 286, 301, 196, 196, 061, 041, 121, 301, 281, 096, 216, 051, 081, 091, 091, 241, 281

Coral orientations (left hand rippled surface [ripples @ ca. 131]): 221, 266, 231, 186, 176, 226, 101, 31, 271, 101, 246, 196, 156, 166, 281, 161, 301, 006, 316, 061, 146, 296, 326, 281, 81, 311, 276

Coral orientations (right hand rippled surface [ripples @ ca. 76]): 271, 221, 256, 311, 306, 121, 246, 351, 161, 171, 261, 156, 176, 216, 126, 251, 176, 346, 006, 346, 166, 111

SR: Salmon River, 8 mile pool (loc. 38), east side of river (12E/8 43500:71300), Fox Point Mbr., Becscie Fm.

Coral orientations (with respect to arbitrary north): 195, 030, 225, 060, 115, 200, 120, 070, 090, 090, 025, 290, 250, 170, 220, 010, 060, 305, 185, 160, 100, 025, 335, 350, 235, 195, 225, 070, 155, 180, 190, 115, 315, 310, 315, 095, 270, 320, 315, 160, 130