GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

BULLETIN 129

STROMATOPOROIDS FROM THE DEVONIAN REEF COMPLEXES CANNING BASIN WESTERN AUSTRALIA

DEPARTMENT OF MINES
WESTERN AUSTRALIA

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by

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FOREWORD

The Geological Survey's continuing research programme on the Devonian reef complexes in the Canning Basin has resulted in several publications on their stratigraphy and palaeontology, a number of which have been published by the Geological Survey (including Bulletins 118 and 121, and Reports 1 and 5).

Stromatoporoids are major reef builders in the complexes. Their occurrence in the area was first recorded almost a century ago, but this Bulletin is the first publication to figure and describe them in detail. It should assist those seeking to understand the geology of these important carbonate deposits, which form prime exploration targets for petroleum, and lead-zinc mineralization.

September, 1982

A. F. Trendall
Director

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ABSTRACT

Twenty-five species and two varieties of stromatoporoid belonging to twelve genera are described and figured from the Devonian reef complexes of the Canning Basin. Three species are new—*Actinostroma windjanicum*, *Hermatostroma ambiguum* and *Stromatopora lennardensis*. Only two rare species (*Clathrocoilona saginata*, *Stromatopora lennardensis*) are recorded from Famennian strata; the other species are abundant in the Givetian and Frasnian complexes.

Stromatoporoids are almost confined to the platform facies and are most common at the platform margin. *Clathrocoilona spissa*, *Hermatostroma ambiguum* and *Stachyodes costulata* together with *Actinostroma papillosum*, *A. windjanicum* and *H. schlueteri* are common at the margin; in the platform interior the dominant species is *Amphipora rudis*, with *Actinostroma* spp. as subdominants. Most stromatoporoids in the marginal-slope facies are fragmentary and derived; a few—mainly tabular—forms e.g. *Stachyodes australe* and *Hermatostroma schlueteri* lived in the reefal-slope subfacies.

Amphipora is reconstructed on the basis of silicified material and *Euryamphipora* is interpreted as an upright blade-like form of *Amphipora* and not as a tabular form. The microstructure, gross morphology and unique growth form of *Amphipora* suggest that it should be classed separately from all other stromatoporoids.

STROMATOPOROIDS FROM THE DEVONIAN REEF COMPLEXES CANNING BASIN, WESTERN AUSTRALIA

It may be doubted if there be any small group of fossil organisms which has given greater trouble to its investigators than that of the Stromatoporoids.

Nicholson (1886b, p. i)

INTRODUCTION

Stromatoporoids were amongst the first fossils to be recorded from the Devonian reef complexes of the Canning Basin. Indeed, Nicholson's (1890) determination of two stromatoporoid species was one of the factors upon which the Devonian age was based. Despite this early recognition of stromatoporoids in Western Australia very little has been written concerning them and no systematic survey of the species has been made hitherto.

Stromatoporoids are an extinct group of carbonate-secreting sessile skeletal organisms. Good general accounts of the group are given by Lecompte (1956) and Galloway (1957). Nicholson's (1886b-1892) monograph, while somewhat dated, is still a mine of ideas and observations. Nevertheless, well over a century of active work on stromatoporoids has not solved the problem of the affinities of the group, has failed to provide an adequate classification, and has not even produced agreement on the time range of the organisms. Nicholson's remarks quoted at the heading of this section are still applicable today.

The stromatoporoids have been variously referred to the foraminifers, sponges and coelenterates (see Lecompte, 1956 and Galloway, 1957 for reviews of the group's systematic position). Prior to 1970, most workers considered them to be an order of the coelenterate class Hydrozoa, close to the modern milleporines and hydractinians in their organisation. Kazmierczak (1971) is one of the more recent studies which adopts this viewpoint. However, following the establishment of the new poriferan class Sclerospongiae by Hartman and Goreau (1970), sponge affinities have once more gained favour. Stearn (1972, p. 369), while supporting this, maintains that stromatoporoids "... cannot be placed with confidence in either the sclerosponges or the hydrozoans and should be recognised as a separate subphylum of the Porifera". More recently Kazmierczak (1976, 1981) has claimed the stromatoporoids are colonies of coccoid cyanophytes, a view vigorously disputed by Riding and Kershaw (1977) and by Monty (1981).

With regard to their time range, the chief problem is whether to restrict the Stromatoporoidea to only Ordovician, Silurian and Devonian genera or to expand it to include certain Mesozoic genera. Those authors who do not recognise Mesozoic stromatoporoids place the genera in question in the Order Sphaeractinoidea. Naturally which opinion is held materially affects the classification adopted. Lecompte (1956) integrated both Mesozoic and Palaeozoic genera in 10 families while Galloway (1957) considered the group to be confined to the Ordovician to Devonian and placed the genera in 5 families. More recent classifications of the Palaeozoic stromatoporoids include Khalfina and Yavorsky's (1973) recognition of 25 families, Stearn's (1980) 19 families distributed in 5 orders and Kazmierczak's (1971) informal 16 lineages assigned to 2 morphological groups.

I consider the stromatoporoids to be a wholly Palaeozoic group of organisms at about the Porifera-Coelenterata grade of organisation but (like the Archaeocyathids) belonging to neither phylum. I think it is still premature to attempt a classification of the group and prefer not to recognise any families.

STRATIGRAPHIC SETTING

Although work had been done on the limestone ranges of the Canning Basin intermittently since the 1880s, they were not recognised as reef complexes until 1924 when Wade, with reference to Rough Range*, stated "The general appearance is that of an old coral reef deposit fringing the old Pre-Cambrian areas to the N. and E." (Wade, 1924, p. 13). An historical review of previous work on the reef

* Rough Range was the name give by J. S. Brooking in 1883 (Hardman, 1885) to the limestone ranges southeast of Fitzroy Crossing. It included what are now called the Pillara, Home, Emanuel, Laidlaw and Lawford Ranges.

complexes is given by Playford and Lowry (1966) and current knowledge is synthesised by Playford (1980); both works have comprehensive bibliographies. The following stratigraphic outline is taken from two summaries prepared by Playford (1976, 1979).

The reef complexes crop out as a series of limestone ranges in a belt 300 km long and up to 50 km wide along the northeastern margin of the Canning Basin (Figure 1). They are situated on a structural shelf (Lennard Shelf) between Precambrian rocks to the northeast and a deep graben (Fitzroy Trough) to the southwest. The reef complexes grew in the Middle and Late Devonian along the mainland shore or around islands on a basement, usually of Precambrian rocks, but in one case of Ordovician dolomite. Three basic facies are recognised: platform, marginal-slope and basin. Each facies has several named sub-facies (Playford and Cockbain, 1976) and these are shown in Figure 2 which also indicates those sub-facies in which stromatoporoids lived.

"The platforms were for the most part built by stromatoporoids, corals, and algae in the Givetian and Frasnian, and by algae in the Famennian. The platform deposits accumulated in near-horizontal beds, commonly with a massive or crudely bedded reef margin. The platforms stood some tens to hundreds of metres above the surrounding inter-reef basins, and were flanked by steeply dipping marginal-slope deposits composed largely of platform-derived debris, with contributions from indigenous organisms and terrigenous sources. Depositional dips in these deposits were commonly up to 35-40° in loose sediments, and up to vertical where algal binding and precipitation occurred together with early lithification. At the foot of the slopes the marginal-slope deposits interfingered with the flat-lying basin deposits, composed largely of terrigenous material." (Playford, 1979, p. 17).

The stratigraphic nomenclature for the reef complexes is given in Figure 3. Formations in which stromatoporoids are found are also shown on this figure. "The platform facies comprises three formations: the Pillara Limestone (reef-margin, reef-flat, patch-reef, back-reef and bank sub-facies) of late Givetian to Frasnian age, and the Nullara Limestone (mainly back-reef and bank sub-facies) and Windjana Limestone (mainly reef-margin sub-facies) of Famennian age.

"The marginal-slope and basin facies are divided into six formations. In the area northwest of the Fitzroy River both facies are included in the Frasnian to Famennian Napier Formation. Nearly all exposures of this formation belong to the fore-reef and reefal-slope sub-facies. Elsewhere in the outcrop area the marginal-slope and basin facies are divided into five formations. These are the Frasnian, and

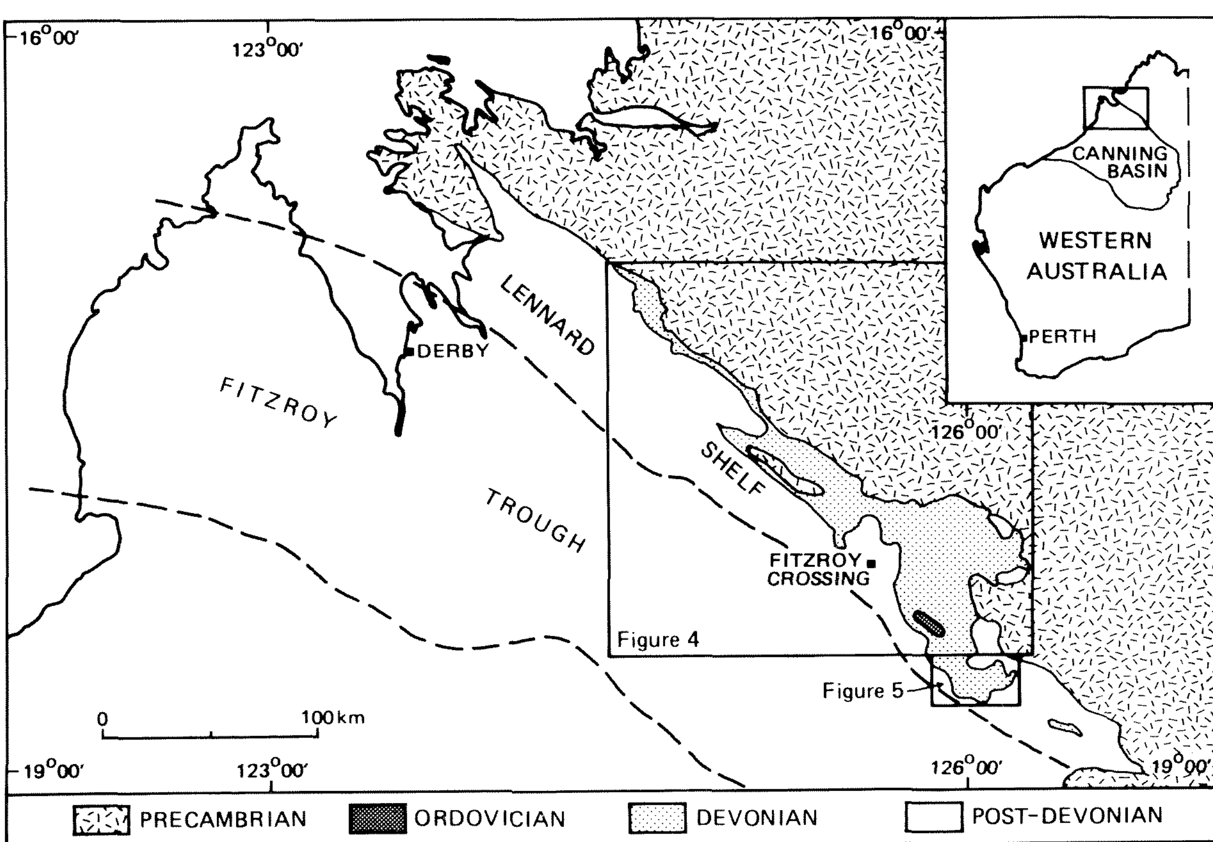

Figure 1. Locality map showing position of Devonian outcrop along northeastern margin of the Canning Basin, and location of Figures 4 and 5.

questionably late Givetian, Gogo Formation (basin facies) and its equivalent Sadler Limestone (marginal-slope facies); the Frasnian to Famennian Virgin Hills Formation (marginal-slope and basin facies), the Famennian Bugle Gap Limestone (marginal-slope facies); and the Famennian Piker Hills Formation (marginal-slope and basin facies.)" (Playford, 1976, p. 5).

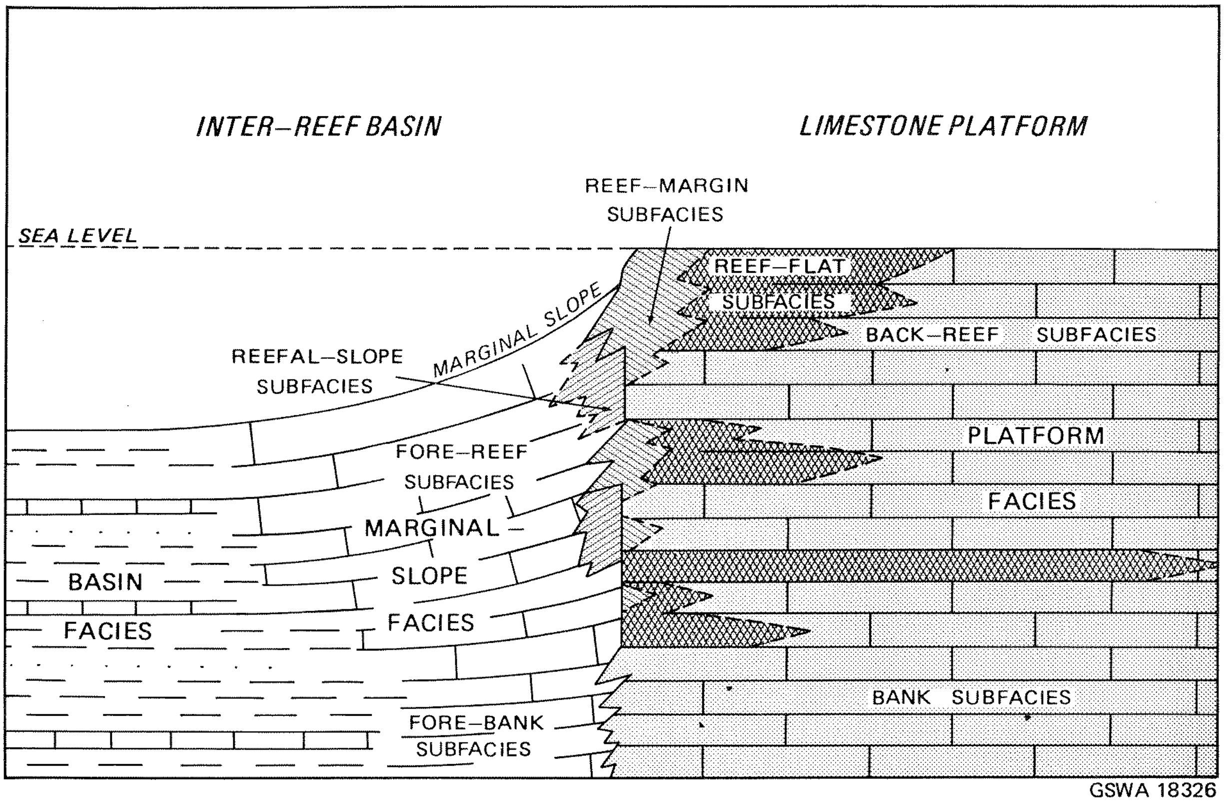

Figure 2. Facies nomenclature for Canning Basin Devonian reef complexes, showing (stippled) in-situ distribution of stromatoporoids (fragmentary coenostea occur in marginal slope and basin facies) (after Playford and Cockbain, 1976).

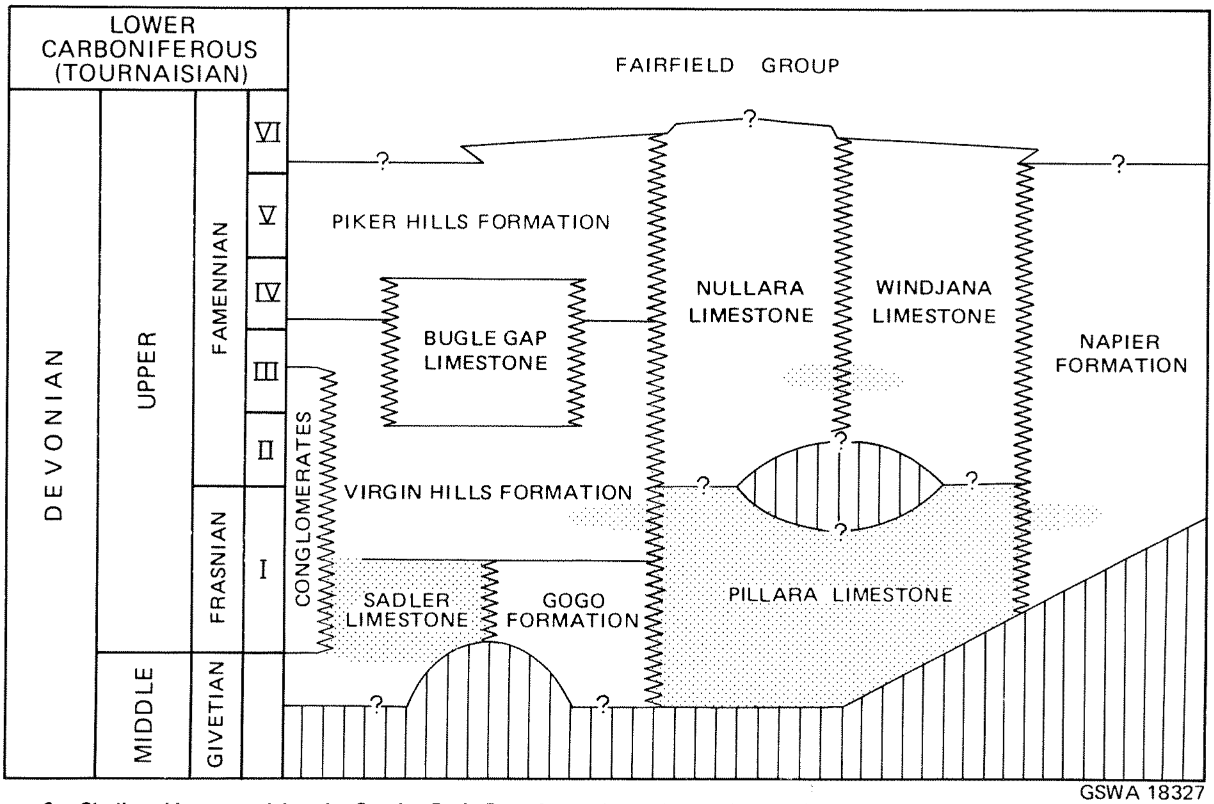

Figure 3. Stratigraphic nomenclature for Canning Basin Devonian reef complexes, showing (stippled) distribution of stromatoporoids (precise age of Famennian occurrences is not known) (after Playford and Cockbain, 1976).

PREVIOUS RECORDS OF STROMATOPOROIDS

The first record of stromatoporoids from the reef complexes is that of Hardman (1885) who mentioned the presence of *Stromatopora placenta* and *S. concentrica*? in the Mount Krauss area. In 1890, Nicholson briefly described and figured *Actinostroma clathratum* and *Stromatoporella eifeliensis* collected from "Rough Range, 'opposite Mount Krauss' ". It is possible that these records are based on the same two specimens; both are from the same area, Nicholson's material was probably collected by Hardman (see Woodward, 1890) and *A. clathratum* was frequently named *S. concentrica* before the taxonomy was clarified by Nicholson (1886a) in the interval between the publication of the two records. I have examined photographs of the material identified by Nicholson (which is now in the British Museum (Natural History)). *A. clathratum* (figured specimen BM(NH) P4967) I would name *A. papillosum* and the *S. eifeliensis* (figured slide BM(NH) P4464a cut from P4966) is possibly *Trupetostroma bassleri*. These specimens all came from the Pillara Limestone and are of Frasnian age.

Etheridge Jr. (1918) described, but did not figure, three species. Two of them, *Actinostroma subclathratum* and *Stachyodes dendroidea* were collected from the Pillara Limestone at Minnie Pool on the Margaret River by R. L. Jack (see Jack, 1906) and are of Frasnian age. They are discussed in detail in the systematic part of this work. The third species, named *Stromatoporella kimberleyensis* was collected by H. Basedow in 1916 from the Napier Range near Old Napier Downs homestead (Napier Formation, Famennian); the type has since been figured and is not a stromatoporoid but a piece of bone (Cockbain, 1976).

Three general review papers, by Maitland (1919, 1924) on the geology of Western Australia and Benson (1922) on the Devonian palaeontology of Australia, summarised previously published records but did not add anything new to the stromatoporoid fauna. Chapman (1924) identified *Stromatoporella* from Rough Range in a preliminary report on fossils collected by A. Wade. All previous records were documented by Hosking (1933) in a discussion of the Devonian fossil localities in the Kimberley area. In 1937, Ripper (1937a) reported on stromatoporoids

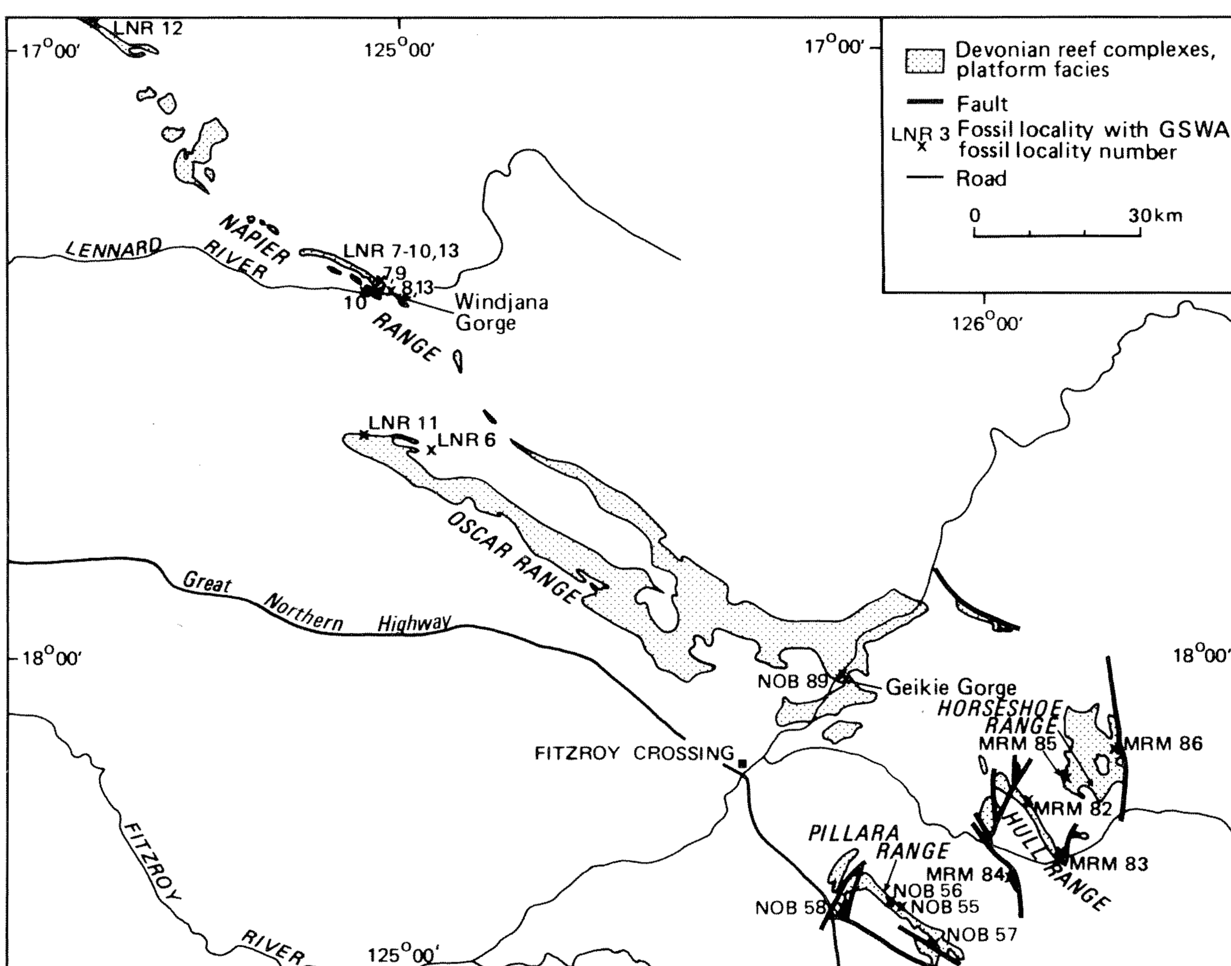

Figure 4. Fossil localities in Canning Basin reef complexes (excluding Bugle Gap area).

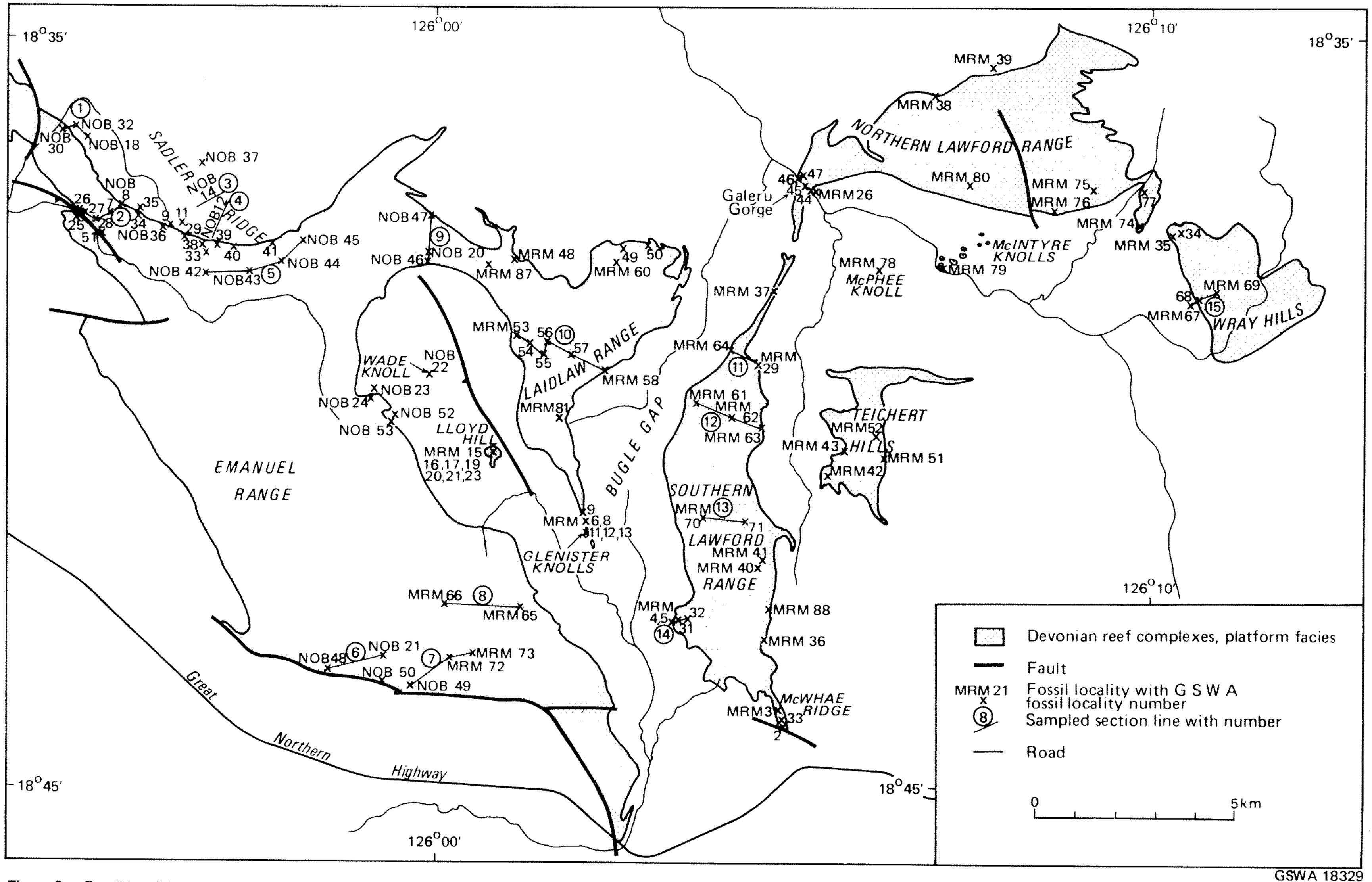

Figure 5. Fossil localities and section lines in Bugle Gap reef complexes.

collected by Wade; she figured *Amphipora ramosa* from four localities southeast of Fitzroy Crossing—Mountain Home Spring valley (Givetian), Bugle Gap, near Little Mount Pierre and Rough Range (all probably Frasnian)—and identified *Actinostroma clathratum* and *Stachyodes verticillata* from Palm Spring Gorge in the Oscar Range (Frasnian). Her *A. ramosa* specimens are in the University of Western Australia Geology Department and are discussed under *A. rudis*; the other specimens have not been found.

The importance of Ripper's record of *Amphipora ramosa* was emphasised by Teichert (1943) who pointed out that the species was most abundant in the Givetian. Teichert (1949) summarised his work on the geology of the reef complexes and named several stromatoporoids in his faunal lists. The most significant records are (a) *Syringostroma* sp. in his *Amphipora* Zone and (b) *Actinostroma* sp. and 'stromatoporoid, gen. et sp. ind. (cylindrical structure)' from his Famennian *Sporadoceras* Zone. In the absence of the original specimens it is uncertain what species are involved.

Playford and Lowry (1966) reviewed most of the previous fossil records and established the formations in which they occurred. Calcareous algae collected by these authors were described in Wray (1967). One of Wray's new taxa, *Keega australe*, has subsequently been shown to be a species of *Stachyodes* (Riding, 1974).

THE SAMPLES

The bulk of the material was collected by P. E. Playford and A. E. Cockbain in the Bugle Gap area in May-August, 1968. Limited collecting has been done in later years including an intensive search for Famennian stromatoporoids in August 1975. Some material collected by Bureau of Mineral Resources parties in the early 1950s has also been examined.

The position of localities where stromatoporoids have been collected are shown in Figures 4 and 5. Localities are numbered according to the GSWA fossil-locality numbering system which uses a three-letter code for the 1:250 000 map sheet followed by a number (e.g. MRM 3 is locality 3 on the Mount Ramsay map sheet). Some samples in the Bugle Gap area were collected along section lines (see Figure 5) and their position is reported as being between two fossil localities (e.g. NOB 44/45).

About 560 specimens from 263 samples at 147 localities have been examined. Appendix 1 lists the stromatoporoids identified from all the samples. The latitude and longitude of each fossil locality are given in Appendix 3.

STROMATOPOROID SPECIES

Twenty-five species and two varieties of stromatoporoids have been identified from the reef complexes. The taxa are listed in Table 1 and are ranked in order of relative abundance. Relative abundance was determined from the number of specimens of each taxon identified (include "cf" but excluding "?" identifications). The dendroid forms are underestimated because each block containing *Amphipora* spp. or *Stachyodes* spp. was recorded as "1" without counting the total number of individual coenostea within the block. Furthermore, volumetrically *Amphipora* is by far the most abundant stromatoporoid, forming thick beds in the back-reef and bank subfacies and it is under-represented in the collection. With this proviso the table gives an indication of which species are common and which are rare.

TABLE 1. RELATIVE ABUNDANCE OF STROMATOPOROIDS IN THE CANNING BASIN

Species	No. of Specimens
Stachyodes costulata Lecompte	80
Actinostroma papillosum (Bargatzky)	75
Amphipora rudis Lecompte	62
Clathrocoilona spissa (Lecompte)	54
Actinostroma windjanicum n. sp.	44
Hermatostroma schlueteri Nicholson	37
Anostylostroma ponderosum (Nicholson)	16
Trupetostroma bassleri Lecompte	16
Hermatostroma ambiguum n. sp.	15
Stromatopora cooperi Lecompte	15
Clathrocoilona saginata (Lecompte)	13
Stachyodes crassa (Lecompte)	12
Actinostroma papillosum var. A	10
Hermatostroma perseptatum Lecompte	10
Amphipora pervesiculata Lecompte	8
Hermatostroma roemeri (Nicholson)	7
Trupetostroma laceratum Lecompte	7
Stachyodes australe (Wray)	5
Stromatoporella laminata (Bargatzky)	5
Atelodictyon stelliferum Stearn	4
Dendrostroma oculatum (Nicholson)	4
Actinostroma papillosum var. B	3
Pseudoactinodictyon dartingtoniensis (Carter)	3
Trupetostroma mclearni (Stearn)	3
Stachyodes dendroidea Etheridge Jr	2
Stromatopora lennardensis n. sp.	1
Stromatopora minutitextum (Lecompte)	1

STRATIGRAPHIC DISTRIBUTION

Stromatoporoids occur in six formations in the reef complexes (see Table 2). They are abundant in the Givetian and Frasnian Pillara and Sadler Limestones and infrequent in the Frasnian part of the Virgin Hills and Napier Formations. Stromatoporoids are rare in the Famennian, having been found in the Windjana and Nullara Limestones at only a few localities, despite an intensive search. McLaren (1970) amongst others has remarked on the scarcity of Famennian stromatoporoids, which seems to be part of a world-wide change in faunas across the Frasnian-Famennian boundary.

The stromatoporoid species present in the Canning Basin reef complexes are mostly fairly widespread forms which occur in Middle and Upper Devonian rocks in other parts of the world (see Flügel and Flügel-Kahler, 1968 for distribution data). Three broad assemblage zones can be recognised:

3. *Clathrocoilona saginata—Stromatopora lennardensis* n. sp. zone in the Famennian; this is essentially a zone devoid of stromatoporoids and is found in the Windjana and Nullara Limestones.
2. *Stachyodes costulata—Clathrocoilona spissa* zone characteristic of the Frasnian Pillara and Sadler Limestones. Most of the abundant stromatoporoids described herein, including *Actinostroma windjanicum* n. sp. and various species of *Hermatostroma*, come from this assemblage zone.
1. *Anostylostroma ponderosum — Stromatopora cooperi* zone. These two species plus *Stachyodes crassa* are abundant near the Givetian-Frasnian boundary in the northwest Emanuel Range area (Kunian Gap, Kuniandi Gap). This zone should perhaps be considered as a subdivision of zone 2 because many forms, e.g. *Actinostroma papillosum* and *Amphipora* spp., occur in both zones.

TABLE 2. STRATIGRAPHIC DISTRIBUTION OF STROMATOPOROID TAXA

Species	Sadler Limestone	Virgin Hills Formation	Pillara Limestone	Windjana Limestone	Nullara Limestone
Actinostroma papillosum	x		x		
A. papillosum var. A	x		x		
A. papillosum var. B			x		
A. windjanicum	x		x		
Amphipora pervesiculata	x		x		
A. rudis	x		x		
Anostylostroma ponderosum	x		x		
Atelodictyon stelliferum	cf.		x		
Clathrocoilona saginata				x	?
C. spissa	x		x		
Dendrostroma oculatum	x		x		
Hermatostroma ambiguum	x	x	x		
H. perseptatum	x		x		
H. roemeri			x		
H. schlueteri	x		x		
Pseudoactinodictyon dartingtoniensis	x		x		
Stachyodes australe	x	x	x		
S. costulata	x		x		
S. crassa	x		x		
S. dendroidea			x		
Stromatopora cooperi	x		x		
S. lennardensis				x	
S. minutitextum			x		
Stromatoporella laminata	x		x		
Trupetostroma bassleri	x		x		
T. laceratum			x		
T. mclearni			x		

The Napier Formation has yielded a few indeterminate specimens of *Hermatostroma*, *Amphipora* and *Stachyodes*.

DISTRIBUTION IN THE REEF COMPLEXES

Because the Bugle Gap area was mapped in considerable detail (Playford, 1980) and because more collecting was done there, only samples from there will be considered in discussing the distribution of species in the reef complexes. In this area (Figure 5) nearly 250 samples yielded 22 stromatoporoid species. The distribution of each species in the reef complexes was determined by grouping the samples according to their relative distance from the platform margin. The distribution pattern so obtained is shown in Figure 6. Note that the vertical scale is based on the number of samples and not on the total number of specimens.

The species fall into one of three major groups:

1. Dominant platform species.
   (a) very abundant at platform margin: *Clathrocoilona spissa, Stachyodes costulata*
   (b) only slightly more abundant at platform margin: *Actinostroma papillosum, A. windjanicum, Hermatostroma schlueteri*
   (c) most abundant in platform interior: *Amphipora rudis*

2. Infrequent but widespread species: *Actinostroma papillosum* var. A, *Amphipora pervesiculata, Anostylostroma ponderosum, Atelodictyon stelliferum, Hermatostroma perseptatum, Stromatopora cooperi, Stromatoporella laminata, Trupetostroma bassleri, T. laceratum.*

3. Patchily distributed species.
   (a) mainly platform margin and upper marginal slope: *Dendrostroma oculatum, Hermatostroma ambiguum, H. roemeri, Stachyodes australe.*
   (b) mainly platform interior: *Actinostroma papillosum* var. B, *Pseudoactinodictyon dartingtoniensis, Stachyodes crassa, S. dendroidea, Trupetostroma mclearni.*

There are three main areas of interest in species distribution, (a) marginal slope, (b) platform margin and (c) platform interior.

(a) Marginal slope. As with other groups of organisms in marginal-slope deposits, it is difficult to determine which specimens are in situ and which came to rest on the marginal slope after death. Many species obviously occur as fragmentary coenostea in breccia beds (e.g. at Sadler Ridge). However, a few—mainly tabular—forms are in situ and probably lived in the reefal-slope subfacies, e.g. *Stachyodes australe, Hermatostroma schlueteri.*

(b) Platform margin. The reef-margin subfacies and the reef-flat subfacies (which usually does not extend far into the interior of the platform) are dominated by *Clathrocoilona spissa, Hermatostroma ambiguum* and *Stachyodes costulata,* with *Actinostroma papillosum, A. windjanicum* and *H. schlueteri* as subdominants. *H. roemeri* is restricted to the reef-margin subfacies and *D. oculatum* and *S. australe* also occur there.

(c) Platform interior. The dominant species here is *Amphipora rudis,* with *Actinostroma* spp. as subdominants. Numerous other species occur on the platform, usually in relatively low numbers.

No attempt has been made in this work to analyse the distribution of stromatoporoid growth forms in the reef complexes (as has been done, for example, by Kobluk (1975) in Canada) although Playford (1980) has included them in a general review of the biotic distribution in the reefs. However, a few comments can be made on some features of interest.

1. Stachyodiform (see p. 9) coenostea occur in the reef-margin subfacies (*S. costulata*) and in the platform interior (*S. crassa, S. dendroidea* and some *S. costulata*). Hence this growth form is not restricted to one environment.

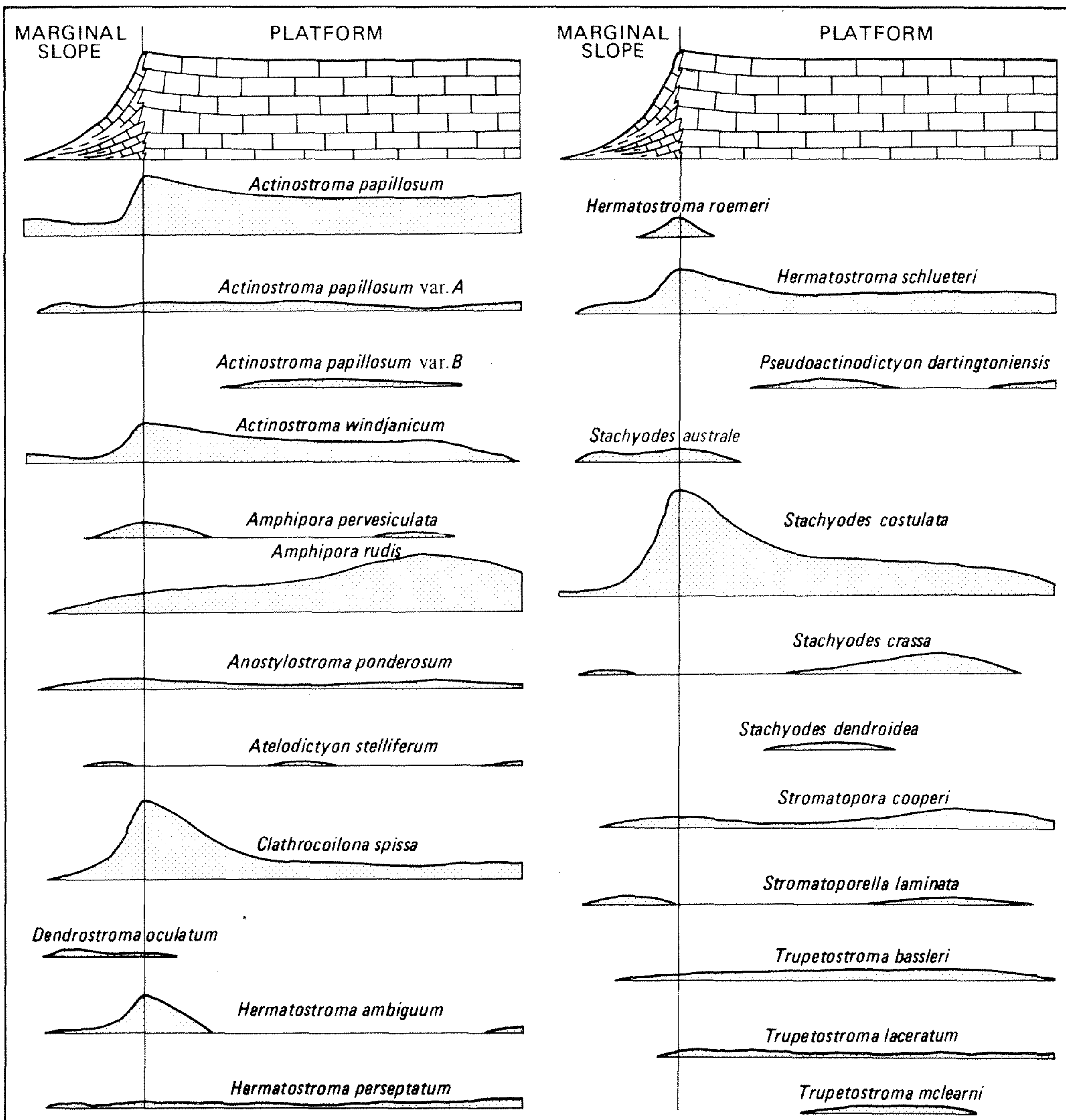

Figure 6. Distribution of stromatoporoid taxa in the Bugle Gap reef complexes. Vertical scale is proportional to number of samples. The observed distribution is plotted and overestimates the abundance of in-situ stromatoporoids in the marginal-slope facies.

2. Amphiporiform (see below) coenostea occur in all facies of the reef complex, although they are most abundant in the plaform interior. However, all specimens are fragmentary and none are found in growth position, so it is conjectural that they lived only in the sheltered platform lagoon areas.

3. Large ("massive") tabular coenostea are confined to the reef-margin and reef-flat subfacies.

4. Tabular coenostea frequently grew on the slopes associated with patch reefs or the platform margins and seem to be a particularly stable growth form. Similar growth forms could roof cavities (which were later filled with spar and/or mud, e.g. Playford and Lowry, 1966, Figs 12, 13) and presumably must have had considerable strength.

GENERAL OBSERVATIONS ON STROMATOPOROIDS

This is not the place to review the morphology of stromatoporoids in detail. However, a number of general observations on some aspects of stromatoporoid organisation have been made and are discussed below. The topics covered are growth-form terminology; microstructure; mamelon columns and stachyodiform coenostea; latilamination; basal layer and epitheca and inquilinism in stromatoporoids.

GROWTH-FORM TERMINOLOGY

The growth form of a stromatoporoid may be considered under three headings, shape, size, and relation to substratum.

Shape

Many different names have been given to the shapes assumed by stromatoporoids. For recent summaries of the terminology see Abbott (1973), Kobluk (1975, 1978) and Kershaw and Riding (1978). The scheme used in this work is shown in Table 3. Essentially it follows the simplified system of Kershaw and Riding (with some changes of name) for the non-dendroid coenostea. The dendroid forms are subdivided into the two classes recognised by Kobluk (1978), namely robust branching and delicate branching, but are named stachyodiform and amphiporiform (cf. the naming of bryozoan growth forms, e.g. in Cockbain, 1970) after the genera which typify the respective growth habits. Amphiporiform coenostea have small-diameter (usually less than 5 mm) cylindrical stems which bifurcate; sometimes the stems are slightly flattened in the plane of branching. In stachyodiform coenostea the stems are usually larger in diameter (over 5 mm) and, as well as branching, adjacent stems may be joined by bridges (Plate 19B) or may fuse together to produce a much more complex coenosteum than the amphiporiform type.

Both Abbott (1973) and Kershaw and Riding (1978) have pointed out that "massive" and "encrusting" are inappropriate terms for stromatoporoid shapes and they are not used in this context.

Size

Size is best indicated by actual measurements. However, an indication of relative size can be given by the use of adjectives such as "large", "thin" or "high" etc. qualifying the shape term. "Massive" should only be used to refer to size.

Relation to substratum

"Encrusting" is a term which involves the relation of the coenosteum to the substratum. Abbott (1973, p. 805) comments that "..... presumably all colonies started life this way" while Kobluk (1975, p. 243) states "..... encrusting stromatoporoids seem to have been able to grown into any one of the other forms, so that the encrusting mode may actually represent an initial attachment and early growth morphology."

TABLE 3. STROMATOPOROID GROWTH-FORM TERMINOLOGY

Abbott, 1973	Kershaw & Riding, 1978	Kobluk, 1978	This paper
LAMELLAR TABULAR	LAMINAR	TABULAR	TABULAR
HEMISPHERICAL DOMAL (CONICAL) (CYLINDRICAL)	DOMICAL	HEMISPHERICAL	HEMISPHERICAL
BULBOUS SUBSPHERICAL NODULAR	BULBOUS	BULBOUS	BULBOUS
DENDROID	DENDROID	ROBUST BRANCHING DELICATE BRANCHING	STACHYODIFORM AMPHIPORIFORM
	IRREGULAR		IRREGULAR

"Encrusting" means covering a hard surface with a thin coating and, as used for stromatoporoids, has the additional but implied property of being attached to the underlying surface. While nearly all non-dendroid stromatoporoids may encrust in the limited sense, it is uncertain how many are attached, even initially. This is because it is not always possible to see or collect (or even to recognise) the first-formed part of a coenosteum. Dendroid forms, both stachyodiform and amphiporiform, presumably had some form of initial attachment but I am not aware of any illustrations of such in the literature.

Stromatoporoids were probably either (a) free, i.e. unattached, (b) attached to the substratum (mainly dendroid forms), or, (c) encrusting, i.e. growing over a hard surface (which may be another stromatoporoid thus forming compound coenostea). The growth forms of the Canning Basin stromatoporoids are summarised in Table 4.

ON MICROSTRUCTURE

The stromatoporoid coenosteum is made up of **skeletal elements** (e.g. laminae, pillars, dissepiments) and **coenosteal spaces** (e.g. galleries, astrorhizal canals). The gross arrangement of the skeletal elements gives a stromatoporoid a characteristic **macrostructure**. The skeletal elements themselves have a **microstructure.**

The nature of the microstructure is one of the most controversial aspects of stromatoporoid morphology. The problem is partly one of terminology but mainly one of distinguishing primary and secondary microstructures. Diagenetic alteration is extensive (universal?) in stromatoporoids, but has not always been recognised as such. This has prompted Bathurst (1971, p. 33) to comment that "..... the divorce of palaeontology from petrography is nowhere more complete than here." Opinion regarding the importance of microstructure ranges from the wholehearted acceptance of Sleumer ((1969, p. 17) "In spite of the difficulties encountered with microstructure, this remains a basic character for any classification of stromatoporoids") to the bare tolerance of Mori ((1970, p. 72) "An exaggeration of the taxonomic value of the microstructures and a minimization of the taxonomic importance of the gross structures is not a sound development.").

Stearn (1966a) distinguished 14 different types of microstructure, of which only 4 (compact, fibrous, cellular, striated) were believed to be primary (Stearn, 1972). Later, he (Stearn, 1975b) seemed to consider the original microstructure as (fibrous) trabecular or spherulitic and regarded all the observed microstructures as being due to diagenesis to a greater or lesser degree. A somewhat more conservative treatment is adopted here.

TABLE 4. GROWTH FORMS EXHIBITED BY CANNING BASIN STROMATOPOROID SPECIES.

Species	Tabular	Hemi-spherical	Bulbous	Irregular	Stachy-odiform	Amphi-poriform
Actinostroma papillosum	x	x	(x)			
A. windjanicum		x		x		
Amphipora pervesiculata						x
A. rudis						x
Anostylostroma ponderosum	x	(x)				
Atelodictyon stelliferum		x				
Clathrocoilona saginata	x					
C. spissa	x	(x)				
Dendrostroma oculatum					x	
Hermatostroma ambiguum	x			(x)		
H. perseptatum	x		x			
H. roemeri	(x)				x	
H. schlueteri	x	x	x			
Pseudoactinodictyon dartingtoniensis	x					
Stachyodes australe	x				x	
S. costulata					x	
S. crassa					x	
S. dendroidea					x	
Stromatopora cooperi	x		x			
S. lennardensis		?	?			
S. minutitextum			x			
Stromatoporella laminata	x					
Trupetostroma bassleri	(x)		x			
T. laceratum	x	x				
T. mclearni				x	x	

x—common (x)—rare

The microstructure is usually studied in the laminae and pillars (the dissepiments are too thin for detailed examination). The laminae and pillars are made up of tissue ("skeleton fibre" of Nicholson (1886b); "ultimate fibre" of Parks (1936)) which appears to be of two types:

(a) compact tissue made up of equidimensional micritic crystals (specks or flecks) 1 to 5 micrometres in diameter.

(b) Fibrous tissue with elongated crystals aligned at right angles to the length of the skeletal elements.

True fibrous tissue is found only in *Amphipora* and is discussed more fully under that genus. Compact tissue is widespread in stromatoporoids; with modifications it makes up the microstructure of all other genera. The chief modifications take the form of spaces (cellules) *within* the tissue giving rise to ordinicellular, microreticulate, striated etc. microstructure. Skeletal elements of unmodified compact tissue are said to have compact microstructure. It is potentially confusing to use the term "compact" in two senses and I therefore suggest "acellular" for this type of microstructure leaving the name "compact" for the tissue. I stress this point because stromatoporoids with acellular microstructure and those with, for example, microreticulate microstructure both have compact tissue.

Among the many problems regarding microstructure two deserve special mention:

(a) The presence of "dark lines" within laminae and pillars. "Dark lines" or microlaminae frequently occur in the pillars of microreticulate forms e.g. *Stromatopora cooperi*; the microlaminae appear as layers of compact tissue between the rows of cellules and are often continuous with dissepiments which cross the galleries (see also Petryk, 1967 p. 27 and 33 for a report of similar features). Dark lines in laminae may represent a similar structure or may be subsequently infilled lines of cellules and hence a form of tissue reversal (see Stearn, 1966a, p. 84 for further discussion). In other words, some microlaminae may be primary and others may be secondary.

(b) "Primary and secondary tissue." The terms as originally used by Galloway (1957) refer to the inner and outer parts respectively of laminae and pillars. Petryk (1967, p. 10) uses the more acceptable terms "epitissue" and "endotissue". Whether in fact the skeletal elements are laid down in two stages or consist of two parts is still uncertain, although the concept goes back to Nicholson (1892, p. 224 where he deals with the structure of *Amphipora*). The Canning Basin specimens do not show any such differentiation of laminae and pillars.

MAMELON COLUMNS AND STACHYODIFORM COENOSTEA

Mamelon columns, that is vertical columns of superposed mamelons, are a feature of *Actinostroma windjanicum*. There is a tendency for the columns to separate from each other slightly to produce a "pseudo-dendroid" coenosteum, often with bridges connecting adjacent columns. This is reminiscent of the condition in some cerioid rugose corals which become phaceloid in the upper part or at the edges of the corallum. It also suggests how stachyodiform coenostea may have arisen.

In some specimens of *Stachyodes crassa* (e.g. F10856) the central part of the coenosteum has adjacent branches in contact and more widely spaced branches on the outside. Many specimens of *S. costulata* have irregular bridges connecting the branches (e.g. F7885, Pl.19B). Stearn (1966a, p. 118) describes *S. fasciculata* Heinrich as having skeletal material ". . . . continuous between the columns, which are merely high mamelons in a massive coenosteum." The stachyodiform growth habit is possibly the result of the separation of once-contiguous mamelon columns, perhaps as a means of increasing the surface area of the coenosteum without increasing the mass or volume of the skeleton. This possibility implies that the axial canal system in stachyodiform coenostea is the same as the astrorhizal system of non-dendroid growth forms.

LATILAMINATION, THE BASAL LAYER AND THE EPITHECA

In many latilaminate stromatoporoids the macrostructure differs in the upper and lower parts of the latilamina. For example, in *Clathrocoilona spissa* the upper part is more regular than the lower part; in *Stromatopora cooperi* the vertical skeletal elements are better developed in the upper part and are more widely spaced; in *Actinostroma papillosum* the laminae are more widely spaced at the top of the latilamina than at the bottom.

This differentiation within the latilaminae is less marked when growth was not interrupted, e.g. in some *A. papillosum* where a cyclicity in laminar spacing is evident from measurements made across the coenosteum but is not obvious from a visual inspection of thin sections. It is well marked when growth was interrupted and there is a slight erosion surface. Here there is often quite irregular growth at the base of the next latilamina, frequently in the form of a basal layer.

The term "basal layer" was introduced by Riding (1974, p. 572) who defined it as "... the structurally modified basal part of a latilamina characterised by bending or folding, often arcuate, of the laminae and microlaminae and subhorizontality of the canals; the pillars and laminae may be thickened and the lower surface is commonly irregular." He recognised a basal layer in *Stachyodes australe*, ?*Hammatostroma* sp. and ("to a lesser extent") in *Actinostroma* (*A. devonense* = *A. papillosum*). In the Canning Basin stromatoporoids it is well developed in *A. papillosum*, *Hermatostroma ambiguum*, *H. schlueteri*, *S. australe* and *Stromatopora cooperi*. Like Riding, I regard the basal layer as a lateral-growth mechanism which enabled the stromatoporoid to spread rapidly.

Riding (1974, p. 574) was uncertain regarding the relationship of the basal layer to the epitheca (also called "peritheca" or "holotheca"). The term "epitheca" was first applied to stromatoporoids by Nicholson (1886b, p. 58) who stated: "In a very large number of Stromatoporoids the under surface of the coenosteum is covered by a thin, imperforate, concentrically striated, calcareous membrane ..... which has all the characters of the "epitheca" of many composite Corals, and to which the same name may be applied. In microscopic structure it appears to be merely composed of granular calcareous matter." Galloway (1957, p. 387), who preferred the name "peritheca" described it as: "..... a wrinkled, thin, compact, lower layer ..... a millimeter or less in thickness, and of more dense structure than the overlying normal skeletal tissue. In some cases it consists of cystose vesicles." St. Jean (1971, p. 1416) considered that some stromatoporoids: "..... tend to develop a peritheca which on the outer surface is wrinkled ..... Where the peritheca is present, laminae and pillars are not usually well organized ..... skeletal tissue tends to be abnormally thick and irregular, and gallery spaces are oval to irregular shape with a random distribution. Abruptly, the laminae and pillars become well defined without a physical break in the skeleton."

It is not clear from these descriptions whether the epitheca is a membrane (Nicholson) or a zone of skeletal elements (Galloway) or perhaps both (St. Jean). No sign of a membrane can be seen in the Canning Basin specimens nor in any figures I have examined. However, there is a distinct zone of skeletal material at the base of many stromatoporoids and frequently this zone has the arcuate character of Riding's 'basal layer'. Furthermore, in a silicified specimen of *A. papillosum* (F10869) which has a basal layer, the under surface has the typical concentric wrinkles associated with an epitheca.

I therefore consider the basal layer to be the same as the epitheca and use the former term in this work. The basal layer marks the initial growth phase of a stromatoporoid. Whether initial growth was noticeably different from later growth (and hence whether a basal layer occurs or not) was probably dependent on the nature of the substratum, rate of growth and other variables. I see no reason to call this change "metamorphosis" as St Jean (1971) (admittedly with qualifications) has done.

The term epitheca has also been given to the fibrous peripheral layer of *Amphipora* by several authors (e.g. Lecompte, 1952, Zukalová, 1971, Ripper, 1937a). However, Nicholson (1886b, p. 59) specifically stated that *Amphipora* had no epitheca ("Lastly, in the dendroid types, such as *Amphipora ramosa*, Phill, sp., and *Stachyodes verticillata*, M'Coy, sp., the colony resembled that of the ordinary dendroid Corals in being fixed at its base and in having no epitheca"). I am uncertain who first applied the term "epitheca" to *Amphipora*; the earliest reference known to me is that of Le Maitre (1934, p. 202). Strictly speaking another name should be applied to this structure and I suggest "outer wall".

INQUILINISM IN STROMATOPOROIDS

Organisms which are engulfed by later growth of the stromatoporoid are a special case of inquilinism. This is defined as a "..... particular kind of commensalism in which one organism lives within another ....." (Dales, 1957, p. 391) and comes from the Latin " 'inquilinus', an indweller in a place not his own" (Shorter Oxford English Dictionary, 3rd ed.).

A living stromatoporoid may have been intimately associated with a variety of other organisms. Depending on the stromatoporoid growth form, the associated organisms may or may not have been engulfed by the stromatoporoid. In stachyodiform coenostea, where growth presumably occurred at the tips of the branches, the branches may be surrounded by *Renalcis* colonies (forming a "glove" over the stachyodiform "fingers") e.g. around *Stachyodes costulata* (Playford and Lowry, 1966, Fig. 11) or *Hermatostroma roemeri* (pl. 15C). In non-dendroid coenostea the associated organism will be enclosed by later growth of the stromatoporoid, the best-known example being "*Caunopora*".

There are two types of inquiline organisms in stromatoporoids.

1. Caunopora. The caunopore state is now usually interpreted as inquilinism, with corals allied to *Syringopora* and *Aulopora* growing within the stromatoporoid (see Nicholson, 1886b, p. 110 for a full discussion). The condition has been illustrated frequently and warrants no further comment here.

2. Spirally-coiled tubes. The spirally-coiled tubes occurring within stromatoporoids are of two sizes; (a) tube diameter less than 0.5 mm and, (b) tube diameter around 1.5 mm or larger. Examples of small-diameter tubes are figured by Lecompte (1951, pl. 5, Fig. 3) and Sleumer (1969, pl. 24, Figs 1, 2), while larger-diameter tubes are illustrated by Majewske (1969, pl. 53, 1) and Zukalová (1971, pl. 26, Fig. 4) and Plates 14A, C, 26C and 27A, B herein. The tubes have been referred to as worms (e.g. Sleumer, 1969) or gastropods (e.g. Zukalová, 1971).

The small diameter tubes may have internal partitions, but their presence cannot be demonstrated unequivocably. Possibly they are the shells of a calcareous worm.

The larger-diameter tubes contain internal partitions and the initial whorls are in contact and have a flat base. The whorl cross section is highly arched. Later whorls are more rounded and not in contact. Coiling is sinistral when viewed with the apex upwards. The internal partitions may be simple or complex and are generally convex towards the apex. The wall of the tubes is apparently two layered; the outer layer is prismatic and the inner one laminated.

Very similar tubes from the Carboniferous of Great Britain have been interpreted by Burchette and Riding (1977) as gastropods having similarities to the euomphalids and the vermetids. The British examples form biostromes and bioherms or encrust subtidal stromatolites, whereas the Canning Basin forms occur within stromatoporoids.

The coiling in the Canning Basin specimens is probably hyperstropic dextral and they may be allied to the macluritids or euomphalids, some of which have internal septa (Yochelson, 1971). As Burchette and Riding (1977) point out, these gastropods show similarities to the vermetids. This is well brought out by comparison with vermetids which are growing within corals in the Quaternary raised reefs in the Cape Cuvier region (Carnarvon Basin, Western Australia). Although the vermetids are much larger in size, the ecological association is similar to the inquiline gastropods in the Devonian stromatoporoids. G. W. Kendrick (pers. comm. 1979) has drawn my attention to the present-day vermetid *Tenagodus* which lives embedded in sponges, a habit which it also possessed in the late Eocene to judge by its occurrence in the sponge-bearing Plantagenet Group (Bremer Basin, Western Australia).

Presumably the gastropod became attached to the surface of a stromatoporoid and grew upwards at a similar pace to the growth of its host. As the gastropod became embedded within the stromatoporoid it gained protection. The animal moved along its shell and cut off the earlier, lower, abandoned parts by means of septa. Finally after the death of the gastropod the stromatoporoid grew over the shell, laying down "repair tissue" (see Sleumer, 1969, pl. 2, Fig. 4) over the aperture (pl. 26C).

The genus *Streptindytes* (Devonian; Iowa) was erected by Calvin (1888) for a sinistrally coiled shell growing in the rugose coral *Acervularia* and was considered to be a worm. According to Howell (1962) the genus also grew inside stromatoporoids as well as corals. In size *Streptindytes* agrees with the larger tubes here ascribed to the Gastropoda; whether this generic name can be applied to the Canning Basin specimens can only be resolved by a study of the type specimen.

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SYSTEMATIC PALAEONTOLOGY

Species are variable entities, and, in the final analysis (statistical studies notwithstanding), the assessment of variation in any species is subjective. The name to be given to a species depends on the type specimen regardless of where it lies within the range of variation of the species. Published figures and illustrations of the holotype are obviously secondary to the examination of the actual specimen in determining the characteristic features of a species. The corollary to this, that palaeontographical publications are of limited value, has not met with acceptance.

In this work, reliance has been placed on published illustrations and descriptions of species. The only holotypes I have been able to examine are those of Etheridge's (1918) species. In assessing variability I have been conservative, preferring to side with the "lumpers" rather than "splitters". While this may result in too many seemingly wide-ranging (in space and time) species, it avoids the needless erection of local species based on minutiae.

The synonymies are incomplete except for the citation of Western Australian specimens. Flügel and Flügel-Kahler (1968) is the starting point for the compilation of any stromatoporoid synonymy. The main purpose of the synonymies in this work is to convey an idea of the species concepts used in naming the Canning Basin specimens.

The specimens identified are cited in the following manner: Registered fossil number and fossil locality number (with sample number) e.g. F9861, MRM 2 (18660). All the fossils are in the collection of the Geological Survey of Western Australia (F numbers) except for a few which are reposited with the Bureau of Mineral Resources (CPC numbers).

Measurements of various characters are reported as follows:

$\bar{x}$	arithmetic mean
s	standard deviation
min.	minimum of observed range
max.	maximum of observed range
n	number of measurements
V	coefficient of variation

All dimensions are given in millimetres.

The variables measured most frequently are abbreviated as follows:

L5, L2	number of laminae in 5 mm (or 2 mm)
P5, P2	number of pillars in 5 mm (or 2 mm)
t	thickness of laminae
d	diameter of pillars

Usually the number of laminae and pillars in 5 mm were counted; sometimes because of the small size of the thin section or the undulating nature of the laminae it was possible to count only over a distance of 2 mm. All measurements of each specimen were made on the same (vertical) thin section. Caution must be used in interpreting measurements of stromatoporoids because intracoenosteal variation may be quite high (Cockbain, 1979).

Gallery index (GI) was calculated for *Actinostroma* only (see Appendix 2).

It is probably still too early to accept any of the classifications of stromatoporoids that have been proposed. No classification is attempted here, beyond noting that the peculiar combination of features in *Amphipora* warrants its separation from all other Stromatoporoidea (see p. 20). The genera are discussed in alphabetical order.

Group Incertae Sedis STROMATOPOROIDEA Nicholson and Murie

Section Stromatoporoidea Nicholson and Murie (1878)

Order Stromatoporoidea Nicholson (1886b), Lecompte (1951, 1956), Galloway (1957), Birkhead (1967), Sleumer (1969) Mori (1970)

Class Stromatoporoidea Shimer and Shrock (1944), Stearn (1980)

Subphylum Stromatoporata Stearn (1972)

Genus **Actinostroma** Nicholson

Type species: *Actinostroma clathratum* Nicholson

Actinostroma subclathratum Etheridge Jr

Plate 4A-D

1918 *Actinostroma subclathratum* Etheridge Jr.: p. 258
1919 *Actinostroma subclathratum* Etheridge Jr.; Maitland: p. 29, 32
1922 *Actinostroma subclathratum* Etheridge Jr.; Benson: p. 166
1924 *Actinostroma subclathratum* Etheridge Jr.; Maitland: p. 30
1933 *Actinostroma subclathratum* Etheridge Jr.; Hosking: p. 68
1966 *Actinostroma subclathratum* Etheridge Jr.; Playford and Lowry: p. 61
1971 *Actinostroma subclathratum* Etheridge Jr.; Fletcher: p. 17

Material: Two specimens, AM F10796 and 2 slides (AM791 and 791a), labelled "lectotype" (presumably chosen by Fletcher, 1971) and AM F10798 and 2 slides (both numbered AM992) in the collection of The Australian Museum; from Devonian, Minnie Pool, Margaret River, Kimberley District, Western Australia. Presented to The Australian Museum by R. L. Jack in 1906. Pillara Limestone, Frasnian.

Description: The lectotype, which is the larger of the two specimens, is a portion of an hemispherical coenosteum, 6.5 cm high and 9.0 by 8.5 cm in area. Both specimens are partly silicified and the underside of the lectotype has well-developed beekite rings. The lectotype is indistinctly latilaminate, the latilaminae being about 6 mm thick. There are no mamelons. Pillars thick, continuous, usually structureless but occasionally with a light-coloured axial region; they are circular in tangential section. Laminae gently curved, thin and discontinuous forming a typical "hexactinellid" network in tangential section. Galleries nearly square with rounded corners; superposed. Astrorhizae may be present but are very vague. Microstructure acellular, tissue compact or rarely slightly flocculent particularly at the pillar margins.

Measurements: Measurements of lamina and pillar spacing were made over 2 mm instead of 5 mm because of the small size of the slides.

Specimen No.		$\bar{x}$	s	min.	max.	n
AM F10796	L2	10.6	1.17	8	12	10
	P2	9.5	0.53	9	10	10
GI 1.26	t	0.045	0.014	0.02	0.07	20
	d	0.098	0.023	0.05	0.13	20
AM F10798	L2	10.0	1.07	8	11	8
	P2	8.4	0.70	7	9	10
GI 1.04	t	0.061	0.018	0.03	0.09	10
	d	0.107	0.020	0.08	0.14	11

Remarks: The zooidal tubes in the pillars, mentioned by Etheridge Jr. (1918), may refer to the clear axial areas seen in some pillars. The two circular tubes intersected by the tangential section of the lectotype (pl. 4C) are probably the Caunopora tubes referred to by him.

Etheridge considered his species to be closely related to *A. clathratum*. *A. subclathratum* is figured here for the first time in order to justify placing it in synonymy with *A. papillosum*.

Actinostroma papillosum (Bargatzky)

Plate 1A-D, 2A-C

1881a *Stromatopora papillosa* Bargatzky: p. 281
1886a *Actinostroma clathratum* Nicholson: p. 226, pl. 11 figs 1-3
1886b *Actinostroma clathratum* Nicholson; Nicholson: p. 76, pl. 1 figs 8-13
1889 *Actinostroma clathratum* Nicholson; Nicholson: p. 131, pl. 12 figs 1-5, pl. 13 figs 1, 2
1890 *Actinostroma clathratum* Nicholson; Nicholson: p. 193, pl. 8 figs 8a, 8b
1918 *Actinostroma subclathratum* Etheridge Jr.: p. 258 (and subsequent references)
1919 *Actinostroma clathratum* Nicholson; Maitland: p. 29
1922 *Actinostroma clathratum* Nicholson; Benson: p. 166
1924 *Actinostroma clathratum* Nicholson; Maitland: p. 30
1933 *Actinostroma clathratum* Nicholson; Hosking: p. 68, 69
1937a *Actinostroma clathratum* Nicholson; Ripper: p. 37
1938 *Actinostroma clathratum* Nicholson; Ripper: p. 223
1949 *Actinostroma clathratum* Nicholson; Teichert: p. 10
1951 *Actinostroma clathratum* Nicholson; Lecompte: p. 77, pl. 1 figs 1-12
1951 *Actinostroma devonense* Lecompte: p. 88, pl. 2 figs 3-6 pl. 3 figs 1-3
1966 *Actinostroma clathratum* Nicholson; Playford and Lowry: p. 61
1969 *Actinostroma papillosum* (Bargatzky); Sleumer: p. 30, pl. 15 figs 1-4, pl. 16 figs 1-4, pl. 17 figs 1-4, pl. 18 figs 1, 2
1971 *Actinostroma clathratum* Nicholson; Mallett: p. 237, pl. 13 figs 2, 4
1971 *Actinostroma papillosum* (Bargatzky); Mallett: p. 238, pl. 13 fig.1
1971 *Actinostroma clathratum* Nicholson; Zukalová: p. 31, pl. 3 figs 3-5
1971 *Actinostroma devonense* Lecompte; Zukalová: p. 33, pl. 4 figs 1-5
1971 *Actinostroma papillosum* (Bargatzky); Zukalová: p. 34, pl. 3 fig. 6
1971 *Actinostroma papillosum* (Bargatzky); Kazmierczak: p. 134, pl. 38 figs 1a, 1b, pl. 40 figs 1a, 1b
1975a *Actinostroma clathratum* Nicholson; Stearn: p.1645
1980 *Actinostroma clathratum* Nicholson; Mistiaen: p. 178, pl. 1 1-4
1980 *Actinostroma papillosum* (Bargatzky); Mistiaen: p. 180, pl. 1 5-8

Material: F9861, MRM 2 (18660); F10365, MRM 31 (18698); F10417, MRM 2 (18660); cf. F10427, MRM 36 (19302); F10445, MRM 12 (19322); F10457, MRM 13 (19324); F10463, MRM 19 (19339); F10502, NOB 26/27 (19395); F10503, NOB 26/27 (19396); F10506, F10507, NOB 26/27 (19397); F10546, NOB 7/8 (19707); F10565, NOB 36 (19717); F10569, NOB 9 (19719); F10580, NOB 12 (19727); F10582, F10583, NOB 12 (19730); F10585, NOB 12 (19732); F10591, NOB 12 (19740); F10597, NOB 14 (19750); F10600, NOB 14 (19751); F10601, F10602, NOB 37 (19766); F10611, NOB 31 (19776); cf. F10628, NOB 33 (19787); F10639, NOB 42 (19797); F10649, NOB 42/43 (19805); F10667, NOB 44/45 (19821); F10676, NOB 45 (19825); F10685, F10686, NOB 20 (19831); F10689, NOB 20/47 (19833); F10690, F10691, F10692, F10693, NOB 20/47 (19834); F10696, NOB 20/47 (19836); F10700, NOB 20/47 (19839); F10701, NOB 47 (19840); F10703, NOB 47 (19841); F10714, MRM 56/57 (19851); F10724, MRM 59 (19862); F10725, MRM 60 (19863); F10734, MRM 62 (19872); F10740, MRM 63 (19876); F10752, MRM 29/64 (19885); F10754, NOB 48 (19889); F10758, NOB 21/48 (19892); F10759, NOB 21/48 (19894); F10760, NOB 21/48 (19896); F10770, F10771, F10772, MRM 66 (19911); F10774, F10777, MRM 68 (19913); F10778, MRM 68/69 (19914), F10788, MRM 72/73 (19930); F10790, F10791, MRM 73 (19932); F10804, F10805, NOB 50 (21631); F10816, MRM 35 (19961); F10817, MRM 78 (3496); F10821, MRM 79 (3497); F10837, LNR 6 (21661); F10854, F10855, NOB 51 (29454); F10861, F10862, MRM 78 (37245); F10869, F10870, F10871, NOB 53 (37257); F10875, MRM 79 (37262); cf. F10900, LNR 12 (37274); F10923, MRM 84 (29471).

Description: Coenosteum hemispherical to tabular, up to 22 cm thick and 1 m across; occasionally bulbous, rarely thin tabular (F10817, Pl. 2A; F10869, Pl. 2C); specimen F10869 (Pl. 2B, C) has a well-developed basal layer with typical "epithecal wrinkles" on the underside. Often latilaminate with latilaminae 5-10 mm thick. Macrostructure a regular rectangular network with continuous pillars, about 16 in 5 mm, and arcuate or straight laminae, about 20 in 5 mm. "Hexactinellid" meshwork very prominent in tangential sections. Astrorhizae present but difficult to make out. Microstructure acellular with compact tissue.

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10417	L5	20.80	1.40	19	23	10
	P5	17.20	1.32	15	19	10
GI 0.95	t	0.067	0.020	0.038	0.091	10
	d	0.110	0.034	0.061	0.168	10
F10463	L5	17.90	1.91	15	20	10
	P5	15.30	0.67	14	16	10
GI 1.01	t	0.094	0.009	0.074	0.107	10
	d	0.145	0.021	0.104	0.170	10
F10565	L5	17.90	1.20	16	20	10
	P5	15.90	1.10	14	17	10
GI 1.09	t	0.087	0.008	0.076	0.099	10
	d	0.140	0.026	0.102	0.183	10
F10580	L5	13.70	1.06	12	15	10
	P5	10.90	0.88	9	12	10
GI 0.87	t	0.102	0.015	0.076	0.119	10
	d	0.161	0.030	0.104	0.218	10
F10591	L5	20.10	1.10	18	22	10
	P5	15.00	0.67	14	16	10
GI 0.80	t	0.084	0.010	0.069	0.099	10
	d	0.132	0.013	0.114	0.160	10
F10597	L5	22.00	2.00	18	24	10
	P5	16.80	1.23	15	19	10
GI 0.96	t	0.086	0.013	0.063	0.102	10
	d	0.154	0.027	0.112	0.190	9
F10600	L5	17.30	1.06	16	19	10
	P5	15.80	1.14	15	18	10
GI 1.08	t	0.060	0.015	0.030	0.076	10
	d	0.106	0.023	0.074	0.137	10
F10601	L5	17.60	1.26	16	19	10
	P5	16.20	1.23	14	18	10
GI 1.40	t	0.091	0.051	0.056	0.231	10
	d	0.171	0.044	0.107	0.234	10
F10639	L5	21.80	0.63	21	23	10
	P5	19.30	1.57	17	22	10
GI 1.12	t	0.078	0.024	0.056	0.124	10
	d	0.125	0.024	0.091	0.175	10
F10649	L5	17.20	1.48	15	19	10
	P5	15.50	1.51	13	18	10
GI 1.16	t	0.088	0.019	0.063	0.127	10
	d	0.149	0.064	0.086	0.274	10
F10667	L5	20.70	2.16	17	25	10
	P5	20.50	0.97	19	22	10
GI 1.00	t	0.080	0.011	0.069	0.107	10
	d	0.082	0.014	0.066	0.107	10
F10676	L5	15.90	1.37	14	18	10
	P5	11.80	1.03	10	13	10
GI 0.74	t	0.101	0.031	0.056	0.147	10
	d	0.143	0.044	0.048	0.183	10
F10685	L5	21.80	1.32	20	24	10
	P5	17.00	1.76	15	21	10
GI 0.89	t	0.052	0.014	0.036	0.074	10
	d	0.098	0.032	0.061	0.160	10
F10686	L5	18.00	1.49	16	20	10
	P5	14.60	1.35	13	16	10
GI 0.97	t	0.048	0.016	0.028	0.069	10
	d	0.110	0.030	0.071	0.165	10
F10689	L5	22.90	1.52	20	25	10
	P5	17.50	1.43	16	20	10
GI 0.93	t	0.046	0.013	0.025	0.066	10
	d	0.103	0.028	0.069	0.137	10
F10691	L5	24.40	1.84	22	28	10
	P5	17.10	1.29	15	19	10
GI 0.92	t	0.039	0.013	0.025	0.063	10
	d	0.115	0.051	0.056	0.241	10
F10700	L5	24.60	1.43	23	28	10
	P5	19.40	1.43	17	21	10
GI 0.98	t	0.044	0.014	0.020	0.069	10
	d	0.097	0.033	0.061	0.162	10
F10701	L5	24.10	1.73	21	27	10
	P5	15.90	1.20	14	17	10
GI 0.72	t	0.066	0.016	0.046	0.094	10
	d	0.123	0.021	0.096	0.150	10
F10703	L5	23.30	1.42	22	26	10
	P5	15.80	0.92	15	17	10
GI 0.73	t	0.056	0.011	0.038	0.069	10
	d	0.103	0.025	0.063	0.137	10

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10760	L5	20.50	1.58	17	22	10
	P5	17.00	0.67	16	18	10
GI 0.82	t	0.098	0.040	0.069	0.206	10
	d	0.119	0.020	0.089	0.155	10
F10816	L5	23.50	2.84	18	27	10
	P5	16.80	1.23	15	19	10
GI 0.78	t	0.058	0.014	0.036	0.086	10
	d	0.103	0.020	0.074	0.137	10
F10854	L5	17.90	0.99	16	19	10
	P5	17.20	1.03	16	19	10
GI 1.04	t	0.089	0.018	0.063	0.117	10
	d	0.109	0.019	0.071	0.137	10

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10923[(1)]	L5	18.80	2.66	15	24	30
	P5	21.10	1.52	18	24	30
GI 1.27	t	0.071	0.013	0.051	0.099	30
	d	0.082	0.014	0.061	0.117	30
P4967[(2)]	L5	22.25	1.71	20	24	4
	P5	18.50	1.29	17	20	4
GI 1.23	t	0.057	0.008	0.050	0.070	5
	d	0.135	0.023	0.110	0.170	5

(1) topotype of *Actinostroma subclathratum*

(2) BM(NH) P4967, the original of Nicholson, 1890 pl. 8 fig. 8a; measurements made on photograph of slide P4463b cut from this specimen

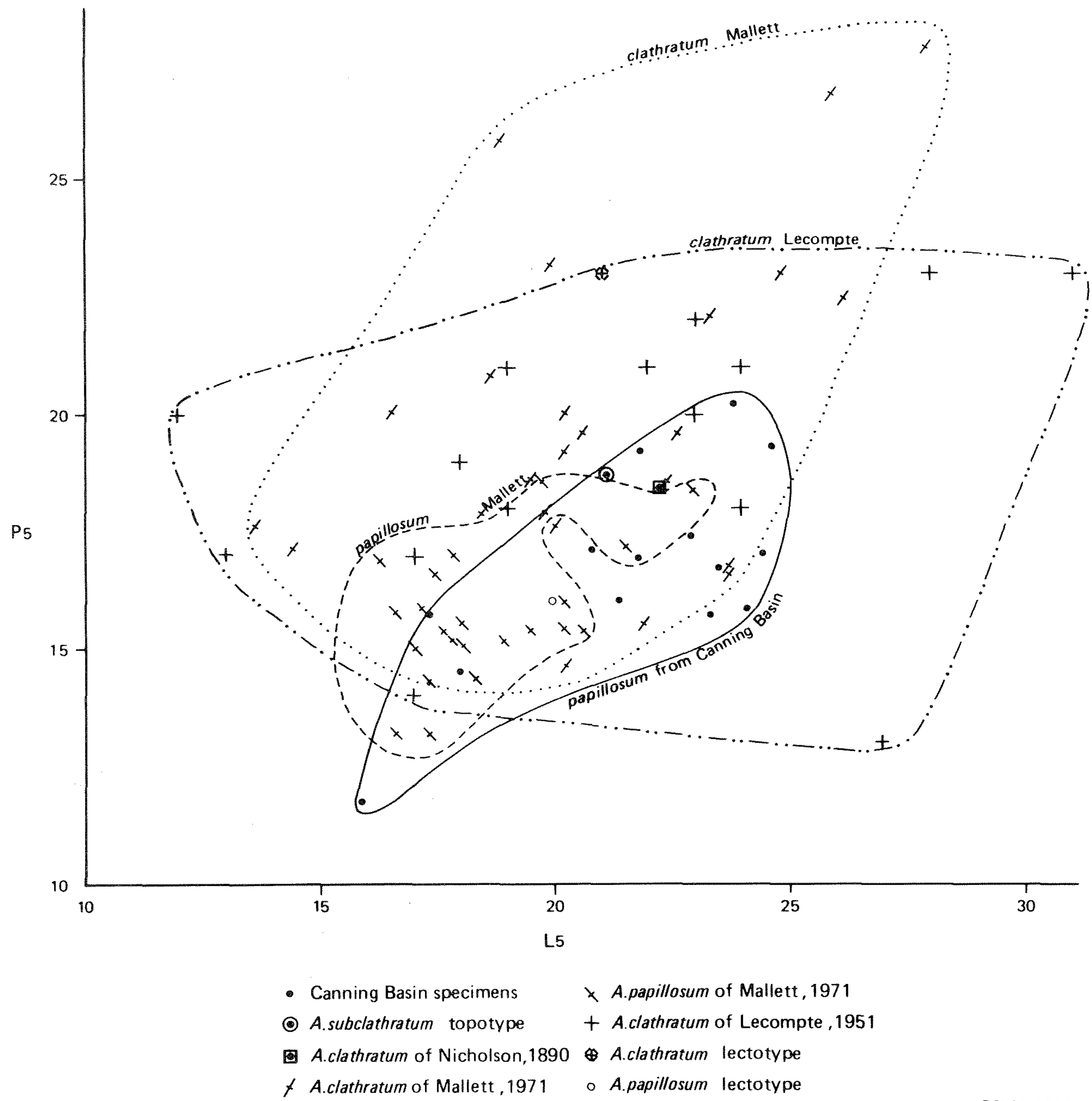

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Figure 7. ***Actinostroma papillosum.*** **Scatter diagram of number of pillars in 5 mm (P5) against number of laminae in 5 mm (L5). Note on the source of data—*A. subclathratum,* topotype; F10923. *A. clathratum* of Nicholson (1890); BM(NH) slide no. P4463b cut from P4967, measured from photograph. *A. clathratum* and *A. papillosum* of Mallett (1971); original data supplied by C. W. Mallett. *A. clathratum* of Lecompte (1951); data from Lecompte, 1951, p. 80-83. *A. clathratum,* lectotype; BM(NH) specimen no. 141, data from Lecompte, 1951, p. 80. *A. papillosum,* lectotype; specimen no. 5 in Bargatzky's collection, University of Bonn, measured from figure of Lecompte, 1951, pl. 1 fig. 11 (Mallet (1971) accepted Lecompte's (1951) measurements which place the specimen much closer to the type of *A. clathratum*).**

Remarks: The taxonomy of this variable species is confused. For a review of the species see Lecompte (1951), Flügel (1959) Sleumer (1969), Mallett (1971) and Zukalová (1971).

Mistiaen (1980) pointed out that *A. papillosum* is intermediate between *A. clathratum* and *A. devonense* in the spacing and thickness of skeletal elements and accepted all three as valid species. Flügel (1959) acknowledged that the species *papillosum* and *clathratum* were very similar and separated them on the basis of lamina and pillar spacing. In this connection it is worthwhile recalling Nicholson's (1889, p. 132) remarks ..... "It must be borne in mind, however, that precise measurements of this kind possess but a limited and general value, even individual specimens commonly showing more or less variability as regards the closeness of the pillars and laminae." Mallett (1971) attempted to refine the quantitative differentiation of these two species by using Klovan's (1966) gallery index.

On Figure 7 are plotted pillar and lamina spacing for Canning Basin *A. papillosum* together with data for *A. clathratum* of Lecompte (1951) and Mallett's (1971) *A. clathratum* and *A. papillosum* (see Appendix 2 for source of data). There is a wide scatter of points although the fields occupied by the different taxa overlap considerably. In Figure 8 the fields, eliminating the more extreme points, are compared with Flügel's (1959) 'Art-Felds' for *A. clathratum* and *A. papillosum*. The 'Art-Felds' were obtained by multiplying Flügel's 'Art-Diagrams' by 5 which facilitates comparison between spacings in 1 mm and spacings in 5 mm. While this is not a very reliable procedure, again the fields overlap to a large extent.

An analysis of the use of gallery index in distinguishing between *A. papillosum* and *A. clathratum* is made in Appendix 2 where it is shown that no distinction can be made. In summary, neither gallery index nor the 'Art-Feld' enables a clear discrimination of specimens to be made and it is best to regard the variation as falling within the limits of one species to which the name *papillosum* should be given. As Kazmierczak (1971) has pointed out, this means that *A. papillosum* has a very widespread (indeed world-wide) geographical distribution.

A few specimens differ from typical *A. papillosum* (as here interpreted), and are considered below as varieties.

Distribution: Pillara Limestone, Sadler Limestone; Givetian and Frasnian.

Actinostroma papillosum var. A

Plate 3A, C

Material: F10419, MRM 88 (18691); F10425, MRM 36 (19302); F10490, MRM 41 (19384); F10527, MRM 49 (19671); F10581, NOB 12 (19729); F10594, NOB 14 (19748); F10704, NOB 47 (19841); F10712, MRM 55 (19849); F10813, F10815, MRM 35 (19960).

Remarks: This variety has somewhat variably-spaced laminae and is reminiscent of *A. dehornae* Lecompte, although Lecompte (1951, p. 97) was insistent on its distinction from *A. clathratum* (=*A. papillosum*). However, as Sleumer (1969, p. 32) has averred, *A. dehornae* may be only a variety of *A. papillosum*.

Distribution: Pillara Limestone, Sadler Limestone; Frasnian.

Actinostroma papillosum var. B

Plate 3B, D

Material: F10511, NOB 26/27 (19398); F10547, NOB 7/8 (19709); F10802, F10803, MRM 80 (11671).

Remarks: Specimens assigned to this variety have some laminae which tend to become double recalling the situation in *A. verrucosum*. The development of complex laminae has been made the basis of a new genus—*Nexililamina*—by Mallett (1971) who points out that *A. clathratum* (=*A. papillosum*) also shows some grouping of laminae. Whether this feature is ecologically controlled and therefore is not a reliable systematic character is uncertain.

Distribution: Pillara Limestone; Givetian and Frasnian.

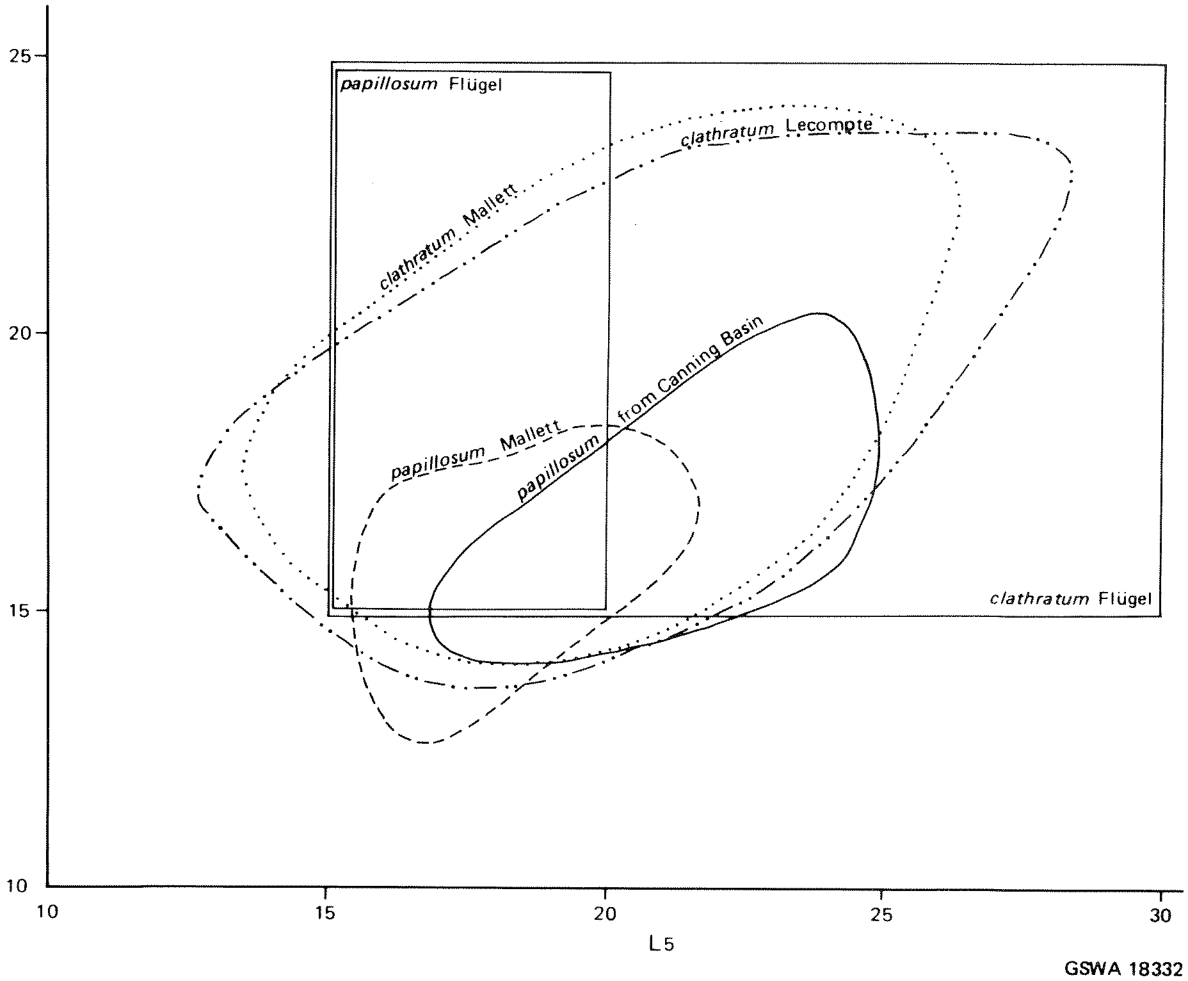

Figure 8. 'Art-Felds' (Species fields) for various populations of *Actinostroma papillosum* (see text for explanation).

Actinostroma windjanicum n. sp.

Plate 2D, 5A-D

Material: Holotype—F10839, LNR 7 (21663); Paratypes—F10363, F10364, F10366, MRM 31 (18698), F10414, MRM3 (18667); F10421, MRM 36 (19302); F10441, MRM 9 (19316); F10444, MRM 12 (19322); F10487, MRM 37 (19355); F10496, MRM 43 (19388); F10520, MRM 45 (19617); F10530, MRM 52 (19691); F10587, F10588, F10589, NOB 12 (19736); F10590, NOB 12 (19738); F10595, F10596, NOB 14 (19749); F10598, F10599, NOB 14 (19751); F10603, NOB 30 (19769); F10633, NOB 40 (19790); F10677, NOB 45 (19825); F10682, NOB 20/46 (19829); F10684, NOB 20 (19830); F10727, MRM 61/62 (19866); F10747, MRM 29/64 (19881); F10768, MRM 65 (19907); F10784, MRM 71 (19922); F10810, MRM 34 (19959); F10826, MRM 60 (21577); F10828, MRM 75 (21580); F10840, F10841, LNR 7 (21663); F10901, LNR 12 (37274); F10912, NOB 59 (29479); F10915, LNR 7 (37058). Other specimens—cf. F10404, MRM 33 (18665); cf. F10488, MRM 37 (19355); cf. F10785, MRM 71 (19922); cf. F10809, MRM 74 (19958); cf. F10844, LNR 7 (21663); cf. F10882, LNR 9 (37264); cf. F10905, LNR 12 (37274).

Description: Coenosteum hemispherical to irregular with very closely-spaced mamelon columns which tend to separate giving rise to a dendroid coenosteum with tabular bridges connecting adjacent columns. Columns range from 7-25 mm in diameter and the spacing between columns ranges from 0-10 mm; columns may be at least 10 cm high. Pillars thick, continuous, often with a light-coloured central zone; about 16 in 5 mm. They have a characteristic fan-like arrangement in the columns. Laminae thin, about 21 in 5 mm. Astrorhizae absent. Latilamination very rare. Microstructure acellular, tissue compact.

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10441	L5	19.88	1.64	18	22	8
	P5	16.25	1.16	14	18	8
GI 0.97	t	0.094	0.011	0.079	0.114	10
	d	0.141	0.030	0.099	0.183	10
F10496	L5	24.70	2.21	22	28	10
	P5	13.20	0.92	12	15	10
GI 0.56	t	0.070	0.014	0.048	0.089	10
	d	0.151	0.045	0.081	0.218	10
F10588	L5	19.80	1.69	16	22	10
	P5	14.60	1.58	13	17	10
GI 0.81	t	0.088	0.016	0.063	0.114	10
	d	0.142	0.033	0.071	0.195	10
F10589	L5	22.00	1.66	20	25	9
	P5	17.90	1.20	16	20	10
GI 0.97	t	0.091	0.017	0.066	0.117	10
	d	0.140	0.024	0.091	0.173	10
F10595	L5	21.70	1.42	19	24	10
	P5	18.10	1.37	16	20	10
GI 0.91	t	0.091	0.013	0.069	0.112	10
	d	0.125	0.025	0.094	0.160	10
F10596	L5	24.30	1.49	22	27	10
	P5	19.20	2.82	15	24	10
GI 0.81	t	0.077	0.015	0.041	0.094	10
	d	0.104	0.024	0.076	0.150	10
F10603	L5	22.13	1.13	20	23	8
	P5	16.75	1.04	15	18	8
GI 1.02	t	0.079	0.014	0.056	0.099	10
	d	0.156	0.019	0.132	0.193	10
F10633	L5	16.70	0.95	15	18	10
	P5	14.20	1.14	13	16	10
GI 1.03	t	0.097	0.016	0.069	0.124	10
	d	0.157	0.028	0.122	0.218	10
F10768	L5	19.60	1.51	17	21	10
	P5	14.70	1.16	13	17	10
GI 0.81	t	0.085	0.021	0.043	0.124	10
	d	0.135	0.017	0.112	0.155	10
F10784	L5	17.20	1.87	14	20	10
	P5	16.70	1.06	15	19	10
GI 1.14	t	0.098	0.022	0.069	0.145	10
	d	0.130	0.027	0.086	0.180	10

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10809	L5	17.10	3.00	13	22	10
	P5	17.10	1.45	16	20	10
GI 1.32	t	0.084	0.025	0.048	0.135	10
	d	0.134	0.019	0.112	0.168	10
F10810	L5	20.80	2.86	17	25	10
	P5	15.60	0.84	14	17	10
GI 0.83	t	0.079	0.013	0.061	0.099	10
	d	0.130	0.027	0.099	0.178	10
F10826	L5	18.60	2.17	14	21	10
	P5	15.00	1.05	14	17	10
GI 0.97	t	0.077	0.014	0.053	0.096	10
	d	0.139	0.019	0.102	0.162	10
F10828	L5	26.60	0.97	25	28	10
	P5	18.90	0.88	18	20	10
GI 0.70	t	0.068	0.016	0.051	0.104	10
	d	0.095	0.021	0.056	0.122	10
F10839	L5	19.50	1.60	17	21	8
Holotype	P5	14.00	0.82	13	15	10
GI 0.94	t	0.083	0.012	0.069	0.099	10
	d	0.177	0.026	0.137	0.226	10

Remarks: The distinguishing feature of this species is the great development of mamelon columns which frequently give a dendroid appearance to the coenosteum. The columns recall those of *A. stellulatum* var. *maureri* Heinrich (=*A. stellulatum* var. 3 of Nicholson, 1889) but *A. windjanicum* has larger diameter pillars and more widely-spaced laminae and pillars than that variety. Pillar and lamina size and spacing are similar in *A. windjanicum* and *A. papillosum* although *windjanicum* is much less variable in pillar diameter and lamina thickness (Table 5). It is possible that *A. windjanicum* is a geographically-restricted species which has evolved from *A. papillosum*. The trivial name is taken from Windjana Gorge, the type locality for the species.

TABLE 5. COMPARISON OF MEASUREMENTS OF *Actinostroma papillosum* AND *A. windjanicum*

		L5	P5	t	d	GI
A. papillosum	$\bar{x}$	20.38	16.45	0.071	0.120	0.95
n = 24	s	3.01	2.22	0.021	0.025	0.16
	V	14.77	13.49	29.46	20.77	
A. windjanicum	$\bar{x}$	20.74	16.26	0.084	0.137	0.92
n = 18	s	2.86	1.80	0.010	0.019	0.17
	V	13.79	11.10	11.85	13.53	

Distribution: Pillara Limestone, Sadler Limestone; Frasnian.

Genus **Amphipora** Schulz

1883 *Amphipora* Schulz: p. 245 (not seen).
?1955 *Paramphipora* Yavorsky: p. 154.
1966 *Euryamphipora* Klovan: p. 14.

Type species: *Caunopora ramosa* Phillips

Diagnosis: Coenosteum slender, branching (amphiporiform), with or without an axial canal. Macrostructure of pillars, diverging upwards and outwards from the axis, with lateral processes connecting adjacent pillars and forming an irregular amalgamate network. No laminae. Coenosteum covered by an outer wall which is attached to pillars and lateral processes. Dissepiments scattered irregularly through galleries. Microstructure of fibrous tissue, with fibres at right angles to length of pillars and outer wall; fibrous layer double in pillars and lateral processes, with or without a central dark line, outer wall a single layer of fibres.

Remarks: Good discussions of the generic concept of *Amphipora* are given by Lecompte (1952), Stearn (1966a) and Zukalová (1971). Most discussion has centred on the macrostructure, the microstructure, the nature of the axial canal and the presence of marginal vesicles.

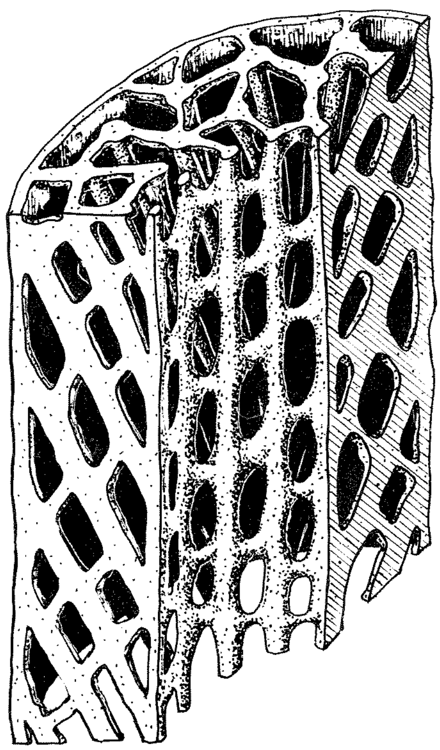

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Figure 9. Reconstruction of *Amphipora* based mainly on silicified specimens of *A. rudis* (F10867)

1. Macrostructure. Well-preserved silicified specimens assigned to *Amphipora rudis* (F10867) show that the macrostructure consists of pillars with lateral processes connecting adjacent pillars. There are no laminae. A diagrammatic sketch showing the macrostructure is given in Figure 9. The outer wall covers the outside of each branch and is attached to the ends of pillars and lateral processes.

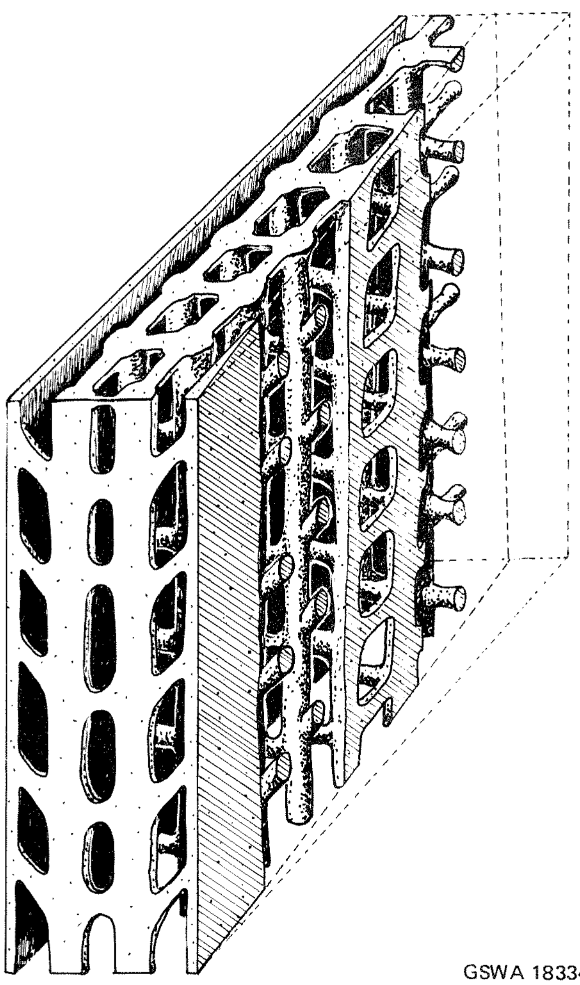
An examination of specimens of *Euryamphipora platyformis* Klovan, the type species of *Euryamphipora* suggests that this genus has a similar structure (Figure 10). I consider *Euryamphipora* to be a laterally flattened *Amphipora* rather than a vertically flattened and hence tabular form. Consequently I regard what Klovan (1966) interprets as laminae to be pillars; his Plate 4 Figure 6 shows the diverging pillars with lateral processes (the figure is upside down) and his Plate 4 Figure 4 shows the diverging pillars in contact with the outer wall (the figure is on its side, top is to the right). Similar lateral flattening in *Amphipora* is commonly seen where branching occurs (Pl. 6C) and the "euryamphipora" condition developed when the branches failed to separate.

2. Microstructure. The microstructure of *Amphipora* is fibrous. Nicholson (1892, p. 224) described it as "..... apparently solid, without pores or tubuli, each lamina being traversed by a median, dense, and dark-coloured primordial layer, thickened on both sides by lighter-coloured, fibro-crystalline, secondary sclerenchyma ....." There seems to be no good reason for regarding the fibrous material as secondary. The pillars and lateral processes apparently consist of two layers of fibrous material with a dark line at the junction of the two layers, although the dark line is not always present. The outer wall consists of only one layer of fibres, as Galloway and St. Jean (1957, p. 234) and Fischbuch (1970a, p. 66) recognized, and is about half the thickness of the pillars and lateral processes. For a rod-like structure to be transversely fibrous at right angles to its length, the fibres must radiate out from a central axis. Furthermore, the central dark line is probably an optical effect due to fibres meeting "back-to-back" along the axis and is not an actual structure. Hence if the fibres grew to a uniform length, the "double-layered" rod-like skeletal elements (pillars and lateral processes) will be twice as thick as "single-layered" sheet-like elements (outer wall). This can be seen from the measurements given below for *A. rudis* and *A. pervesiculata* and from those of other authors (e.g. Fischbuch, 1970a, p. 69, Galloway and St. Jean, 1957, p. 234).

The distinctness of the central dark line depends on how well the thin section follows the axis of the pillars and lateral processes. For this reason I follow those authors (e.g. Stearn, 1966a, Zukalová, 1971) who advocate caution in accepting Yavorsky's genus *Paramphipora*. The figures of the type species *Paramphipora mirabilis* (Yavorsky, 1955, pl. 84 figs 3, 4) do not clearly show the microstructure. His Figure 3 in particular appears to be a very poorly preserved specimen.

3. The axial canal. There are two main problems regarding the axial canal; (a) is it homologous with the astrorhizal system of other stromatoporoids and (b) should its presence or absence be used as a basis for discriminating species?

Most authors have been reluctant to homologise the axial canal with an astrorhizal canal. I agree with this on the grounds that in *Amphipora* the axial canal is an integral part of the macrostructure and does not interrupt or cut across the skeletal



GSWA 18334

Figure 10. Reconstruction of *Euryamphipora* based on specimens of *E. platyformis* from Eastgate No. 1, 1307.6-1307.9 m, Redwater reef complex, Alberta.

elements as does a true astrorhizal system. In fact the canal bears the same relationship to the pillars and lateral processes as do the galleries and is nothing more than an enlarged axial gallery.

Nicholson (1892) and Le Maitre (1934), amongst others, have considered *A. ramosa* to include forms with and without an axial canal. On the other hand, Lecompte (1952) and Zukalová (1971) have placed forms without an axial canal in *A. angusta*. In the two species recognized from the Canning Basin (*A. rudis* and *A. pervesiculata*) there are specimens assigned to each, differing only in the presence or absence of a canal. At least in my material I do not regard the axial canal as a specific character.

4. Marginal vesicles. Marginal or peripheral vesicles are merely the galleries bounded on the outside by the outer wall. They may be larger than the other galleries (as in *A. ramosa*) or the same size as the other galleries (as in *A. laxeperforata*). There seems to be some confusion in the literature regarding the presence or absence of marginal vesicles in any one species. Nicholson (1886b, p. 110) considered *A. ramosa* to include forms without marginal vesicles, but the specimens have the outer wall eroded away and consequently it is not possible to determine the size of the vesicles. *A. laxeperforata* was described by Lecompte (1952, p. 33) as lacking marginal vesicles; however they are present (see his Plate 70 Fig. 1b) and are bounded by an outer wall but are the same size as the other gallery spaces. Fischbuch (1970a, p. 66) apparently equated lack of marginal vesicles with absence of an outer wall (his "peripheral" or "outer rim"). He claimed that *A. rudis* and *A. laxeperforata* were erected for specimens lacking an outer wall although Lecompte's (1952) descriptions and figures clearly indicate that an outer wall is present in these species. In other words marginal vesicles in the sense of marginal galleries are always present; however, because of poor preservation, the outer wall may be lacking in some specimens.

The systematic position of *Amphipora* has been the subject of some debate. Ruhkin (1938, quoted by Zukalová, 1971) removed it (and some other genera) from the stromatoporoids while Lecompte (1956) placed it in "Family Incertae Sedis". Galloway (1957) and Klovan (1966) referred *Amphipora* to the Family Idiostromatidae although Klovan (1966) and Fischbuch (1970a) suggested that it probably belonged to the Clathrodictyidae. Stearn (1966a) thought that the genus should be classed with *Dendrostroma* and *Anostylostroma* and not with the Idiostromatidae. Birkhead (1967) also suggested affinity with *Anostylostroma*.

The gross structure of *Amphipora*—a continuous amalgamate network dominated by pillars—suggests that the genus should be retained in the Stromatoporoidea. The distinguishing features of *Amphipora*, namely (a) the fibrous microstructure (double in the pillars and lateral processes, single in the outer wall), (b) the lack of laminae, (c) the possession of an outer wall and (d) the presence (potentially at least) of enlarged galleries at the margins or at the centre of the coenosteum, together with the characteristic amphiporiform shape, are sufficiently distinct to separate the genus from all other stromatoporoids. Therefore I would divide the Stromatoporoidea into two subdivisions, comprising *Amphipora* on the one hand and all the remaining genera on the other.

The main features for distinguishing species of *Amphipora* seem to be: (a) branch diameter, (b) diameter of axial canal when present, (c) differentiation of marginal vesicles and (d) number of cycles of pillars in cross section, i.e. density of macrostructure.

Amphipora rudis Lecompte

Plate 6A-E

1937a *Amphipora ramosa* (Phillips); Ripper: p. 38, pl. 1 text figs 1-3
1952 *Amphipora rudis* Lecompte: p. 329, pl. 69 figs 3-5
1971 *Amphipora rudis* Lecompte; Zukalová: p. 123, pl. 36 figs 5,6, pl. 37 fig. 2, text fig. 13.
1971 *Amphipora moravica* Zukalová: p. 126, pl. 39 figs 3-6, text figs 15a,b.

Material: F10353, MRM 4 (18693); F10359, F10360, MRM 31 (18696); F10369, MRM 32 (18700); F10422, F10423, F10426, MRM 36 (19302); F10429, MRM 17 (19333); F10447, MRM 13 (19323); F10476, F10479, MRM 23 (19350); F10485, NOB 23 (19352); F10531, MRM 52 (19691); F10533, NOB 7/28 (19702); F10535, NOB 7/28 (19703); F10540, NOB 7/28 (19704); F10541, NOB 7/28 (19705); F10544, NOB 7/28 (19706); F10586, NOB 12 (19735); F10593, NOB 14 (19745); F10605, NOB 30 (19769); F10606, NOB 30/31 (19770); F10650, NOB 42/43 (19805); F10657, NOB 43/44 (19814); F10663, F10664, NOB 44 (19818); F10665, NOB 44/45 (19819); F10671, NOB 44/45 (19824); F10674, NOB 45 (19825); F10681, NOB 46 (19827); F10688, NOB 20/47 (19833); F10707, MRM 53/54 (19845); F10713, MRM 56 (19850); F10715, MRM 56/57 (19852); cf. F10722, MRM 57/58 (19859); F10726, MRM 61 (19865); F10728, F10729, MRM 61/62 (19867); F10731, MRM 61/62 (19869); F10746, MRM 29/64 (19880); F10750, MRM 64 (19884); F10766, MRM 65 (19906); F10781, MRM 69 (19916); F10782, MRM 70 (19919); F10783, MRM 70/71 (19921); F10784, MRM 71 (19922); F10787, MRM 72 (19929); F10806, NOB 50 (21631); F10827, MRM 75 (21580); F10847, NOB 57 (3364); F10850, F10851, F10852, F10853, NOB 51 (29454); F10857, NOB 25 (29455); F10867, NOB 53 (37257); F10873, MRM 81 (37259); F10878, NOB 58 (37244); F10908, F10909, F10910, F10911, NOB 57 (29473).

Description: Coenosteum amphiporiform, the branches are between 1.6 and 5.5 mm in diameter (mean 3.22 mm; standard deviation 0.72 mm; n = 77). Axial canal, if present is from 0.35 to 1.25 mm in diameter (mean 0.70 mm; standard deviation 0.18; n = 69). The coenosteum contains 2 or 3 (rarely more) cycles of pillars at any one level and the marginal vesicles are clearly larger than the other gallery spaces. Dissepiments present in axial canal and galleries. Microstructure fibrous.

Measurements:

Specimen No.	x̄	s	min.	max.	n
F10533					
Branch diameter	3.33	0.50	2.25	4.20	17
Axial canal diameter	0.75	0.16	0.40	0.95	17
Pillar thickness	0.22	0.05	0.15	0.30	10
Outer wall thickness	0.07	0.03	0.04	0.12	10
Max. diagonal in gallery	0.28	0.05	0.20	0.35	10
Radial length marginal vesicles	0.44	0.06	0.35	0.55	10
F10674					
Branch diameter	3.89	1.00	3.20	5.50	5
Axial canal diameter	0.85	0.28	0.50	1.25	5
F10782					
Branch diameter	2.79	0.56	2.15	3.70	9
Axial canal diameter	0.62	0.15	0.40	0.80	9
Branch diameter (no axial canal)	2.26	0.48	1.60	2.75	4
F10787					
Branch diameter	3.51	0.33	3.10	3.90	4
Axial canal diameter	0.58	0.06	0.50	0.65	4
F10851					
Branch diameter	3.33	0.60	2.55	4.50	10
Axial canal diameter	0.72	0.12	0.50	0.90	10
Branch diameter (no axial canal)	3.19	0.36	2.65	3.40	4
F10852					
Branch diameter	2.26	0.66	1.60	3.15	4
Axial canal diameter	0.60	0.07	0.50	0.65	4
F10873					
Branch diameter	3.60	0.57	2.95	4.30	4
Axial canal diameter	0.66	0.21	0.40	0.90	4
UWA40309 (Ripper, 1937a)					
Branch diameter	4.20	—	—	—	1
Axial canal diameter	0.65	—	—	—	1

Figure 11 is a scatter diagram of branch diameter and diameter of axial canal in *A. rudis*.

Remarks: The general features of this form, the commonest of the two Canning Basin species, agree well with *A. rudis*. Lecompte (1952) did not record dissepiments in his material (although they may be present in his pl.69 fig.5) but they do occur in the Canning Basin specimens. Zukalová (1971) included a greater size range of specimens in her concept of *A. rudis*. In fact this is true of her concept of several of Lecompte's species as is shown in Figure 12. The Canning Basin material resembles Zukalová's Moravian material in size range rather than the restricted range of Lecompte's Belgian specimens (see Figure 13).

Zukalová (1971) erected a new species, *A. moravica*, which differs from *A. rudis* in being somewhat larger with larger marginal vesicles and in having a slight radial arrangement of the macrostructure. The latter feature is difficult to see; her pl. 39 fig. 5 is probably a slightly oblique section. The other differences are of degree and I regard the species as comprising larger specimens of *A. rudis* as is suggested by the scatter diagrams (Figures 11, 12).

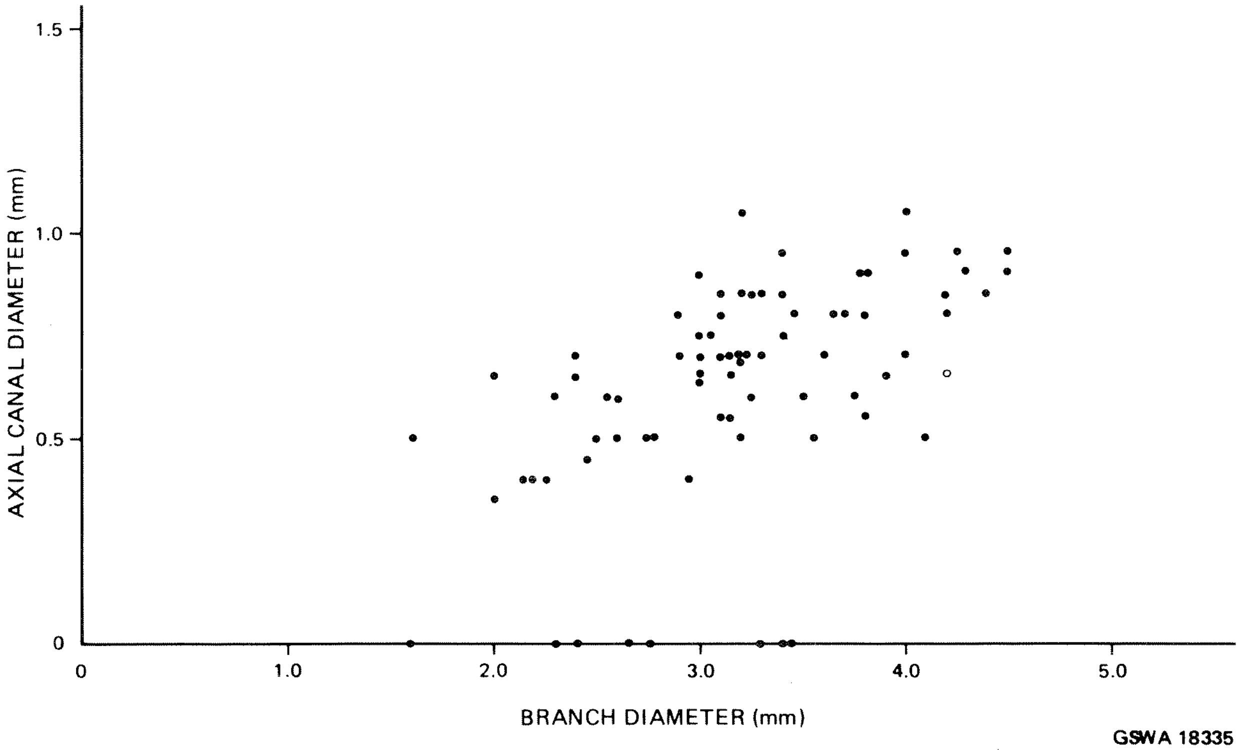


Figure 11. ***Amphipora rudis.*** **Scatter diagram of axial canal diameter against branch diameter; circle represents Ripper's (1937a) figured specimen (UWA 40309, her text figure 3).**

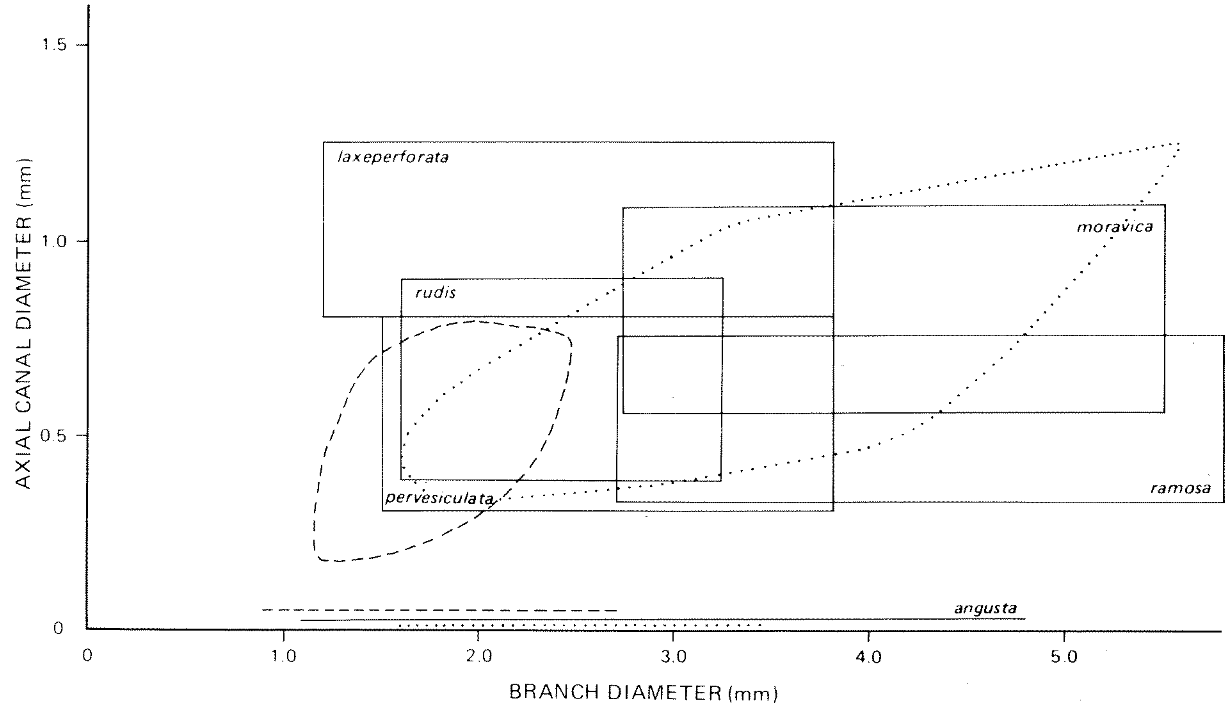


Figure 12. Scatter diagram of axial canal diameter against branch diameter for Canning Basin specimens of *Amphipora rudis* (dotted line) and *A. pervesiculata* (broken line) compared with measurements for various species given by Zukalová (1971).

Examination of the original specimens of Ripper's (1937a) *A. ramosa* (University of Western Australia Geology Department specimen Nos. UWA19984, UWA40307, UWA40308, UWA40309) confirms Zukalová's (1971) opinion that they are better considered as *A. rudis.*

Associated with typical *A. rudis* in several samples is a form almost identical in appearance but lacking an axial canal. Lecompte (1952) reported similar specimens from samples containing *A. rudis.* Zukalová (1971) regarded all forms without an axial canal as *A. angusta.* Typical *A. angusta* is a small form of Givetian age, but Zukalová also included in it larger diameter *Amphipora* of late Givetian and Frasnian age.

Specimens lacking an axial canal are rare in the Canning Basin. Usually they comprise no more than 10% of any sample. However in a silicified sample (F10867) up to 40% of the branches lack an axial canal. In all the samples those branches without an axial canal are slightly smaller in diameter than canal-bearing branches, although the t-test suggests that the size difference is not significant (Table 6).

TABLE 6. *Amphipora rudis*—COMPARISON OF FORMS WITH AND WITHOUT AXIAL CANAL

Specimen No.		Branch diameter with canal	Branch diameter without canal	t-test
F10782	$\bar{x}$	2.79	2.26	t = 1.63
	s	0.56	0.48	with 11 d.f.
	n	9	4	$p > 0.05$
F10851	$\bar{x}$	3.33	3.19	t = 0.42
	s	0.60	0.36	with 12 d.f.
	n	10	4	$p > 0.05$
F10867	$\bar{x}$	2.74	2.59	t = 1.86
	s	0.34	0.36	with 78 d.f.
	n	46	34	$p > 0.05$

Longitudinal sections of specimens show some interesting features which may be summarised as follows. The axial canal is not continuous throughout the coenosteum. When branching occurs, the axial canal from the stem below the branching continues up one branch. In the other branch a new axial canal develops a little above the point of branching. Rarely the canal from the stem ends in the fork of the branching and neither branch has a canal. In one specimen a stem without an axial canal branches and one branch contains a canal. I interpret these observations as showing that canaliculate and non-canaliculate branches can occur in the same coenosteum. A diagrammatic sketch of this interpretation is shown in Figure 14.

I suggest that many of the larger forms that Zukalová (1971) included in *A. angusta* may be *rudis.* Whether *A. angusta* typically has some canaliculate branches is uncertain. Although it is associated stratigraphically with *ramosa* in the Ardennes, it differs from that species (not least in size) and cannot be a non-canaliculate *ramosa.*

Distribution: Pillara Limestone, Sadler Limestone; Givetian and Frasnian. There is no difference between Givetian and Frasnian specimens in the Canning Basin material.

Amphipora pervesiculata Lecompte

Plate 7A, B

1952 *Amphipora pervesiculata* Lecompte; p. 331, pl. 70 figs 3-5.
1956 *Amphipora pervesiculata* Lecompte; Gogolczyk; p. 232, fig. 6
1971 *Amphipora pervesiculata* Lecompte; Zukalová; p. 123, pl. 39 figs 1, 2, text fig. 12

Material: F10351, MRM 4 (18693); F10422, F10426, F10427, MRM 36 (19302); cf. F10528, MRM 50 (19673); F10688, NOB 20/47 (19833); F10726, MRM 61 (19865); F10750, MRM 64 (19884).

Description: Coenosteum amphiporiform with small branches between 0.9 and 2.7 mm in diameter (mean 1.73 mm; standard deviation 0.47 mm; n = 43). Axial canal, when present, ranges from 0.20 to 0.75 mm in diameter (mean 0.54 mm; standard deviation 0.16 mm; n = 24). There are up to 2 cycles of pillars in a cross section. Marginal vesicles larger than galleries. Dissepiments are present in the axial canal and galleries. Microstructure fibrous.

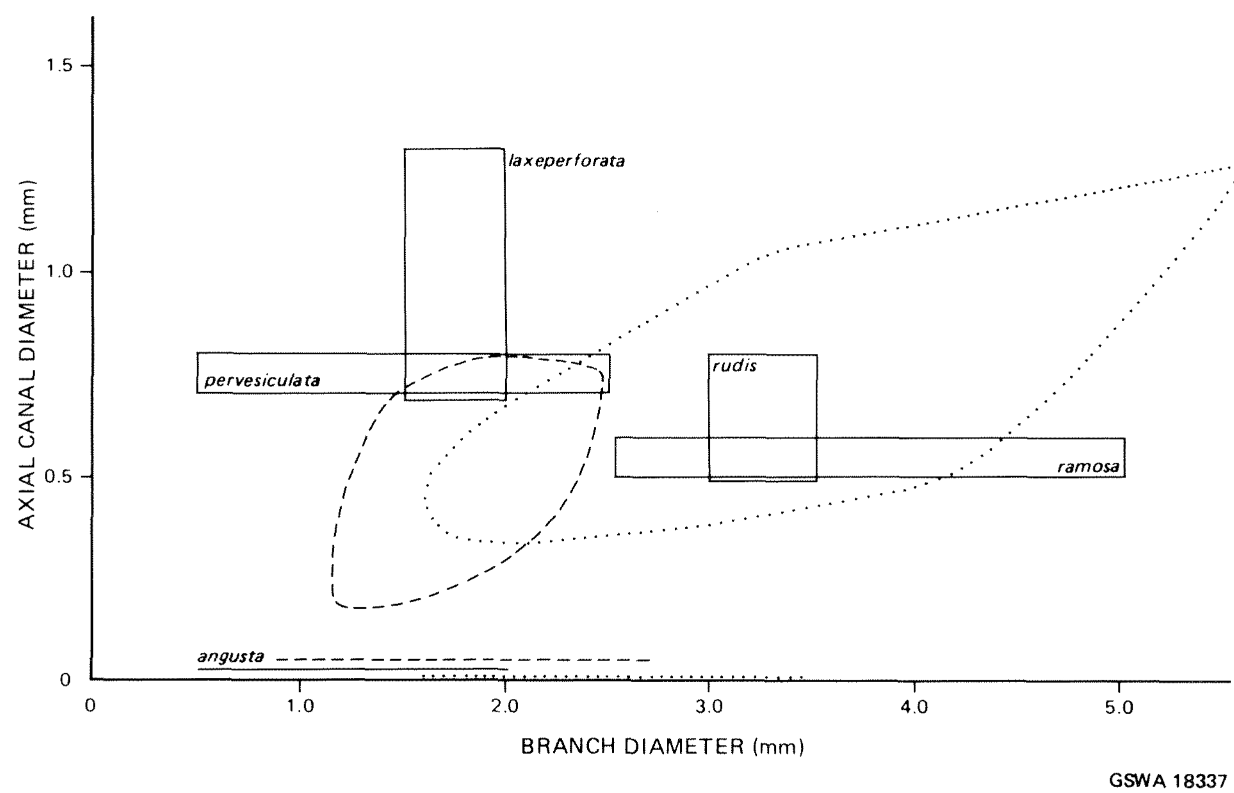


Figure 13. Scatter diagram of axial canal diameter against branch diameter for Canning Basin specimens of *Amphipora rudis* (dotted line) and *A. pervesiculata* (broken line) compared with measurements for various species given by Lecompte (1952).

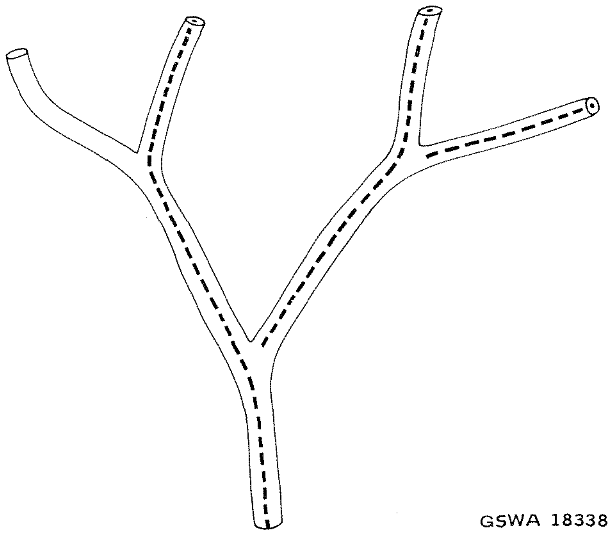


Figure 14. Diagrammatic sketch showing relationship of axial canal to branching in *Amphipora rudis*.

Measurements:

Specimen No.	$\bar{x}$	s	min.	max.	n
F10351					
Branch diameter	1.88	0.51	1.30	2.25	3
Axial canal diameter	0.52	0.15	0.35	0.65	3
Branch diameter (no axial canal)	1.35	0.05	1.30	1.40	3
F10422					
Branch diameter	1.87	0.32	1.30	2.30	9
Axial canal diameter	0.60	0.12	0.35	0.75	9
F10688					
Branch diameter	1.50	0.42	1.20	1.80	2
Axial canal diameter	0.48	0.39	0.20	0.75	2
Branch diameter (no axial canal)	1.23	0.14	1.05	1.50	9
F10750					
Branch diameter	1.90	0.33	1.55	2.40	9
Axial canal diameter	0.51	0.15	0.25	0.75	9
Branch diameter (no axial canal)	2.16	0.60	0.90	2.70	7
Pillar thickness	0.14	0.02	0.10	0.18	10
Outer wall thickness	0.06	0.01	0.05	0.08	10
Max. diagonal in gallery	0.27	0.07	0.15	0.40	10
Radial length marginal vesicles	0.40	0.09	0.25	0.50	10

Figure 15 is a scatter diagram of branch diameter and diameter of axial canal in *A. pervesiculata*.

Remarks: The small size, large axial canal and distinct marginal vesicles indicate that this form is *A. pervesiculata*. As with *A. rudis*, Lecompte's and Zukalová's concepts of these species differ somewhat as regards size range; again the Canning Basin specimens agree better with Zukalová's concept (see Figs 12 & 13).

Specimens without an axial canal occur together with typical *A. pervesiculata* and a t-test suggests no significant difference in the size of the two forms (Table 7).

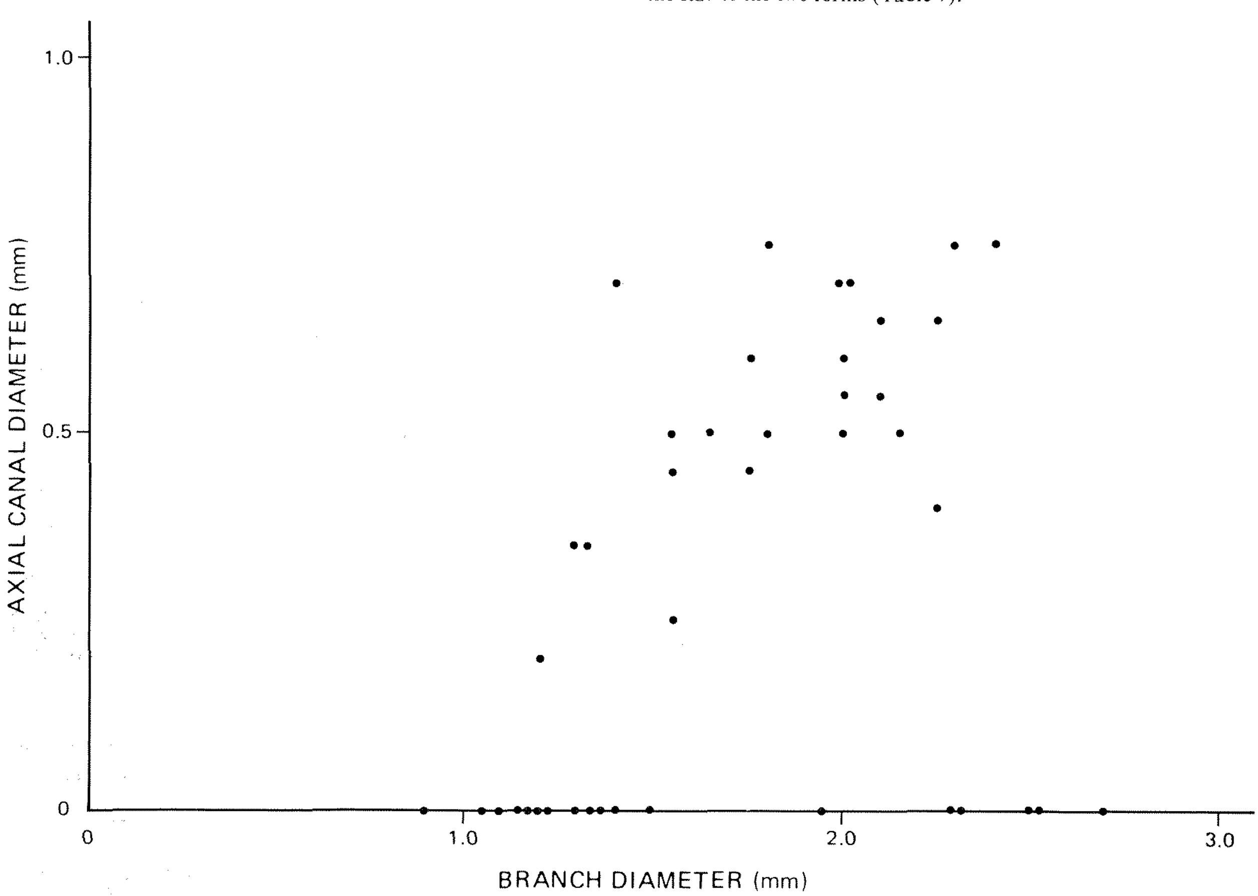


Figure 15. ***Amphipora pervesiculata*. Scatter diagram of axial canal diameter against branch diameter.**

TABLE 7. *Amphipora pervesiculata*—COMPARISON OF FORMS WITH AND WITHOUT AXIAL CANAL

Specimen No.		Branch diameter with canal	without canal	t-test
F10351	x̄	1.88	1.35	t = 1.80
	s	0.51	0.50	with 4 d.f.
	n	3	3	p > 0.05
F10688	x̄	1.50	1.23	t = 1.78
	s	0.42	0.39	with 9 d.f.
	n	2	9	p > 0.05
F10750	x̄	1.90	2.16	t = 1.12
	s	0.33	0.60	with 14 d.f.
	n	9	7	p > 0.05

The holotype slide of *A. pervesiculata* (Lecompte, 1952, pl. 70 fig. 3) shows one cross section lacking a canal. As in the case of *A. rudis* it seems more reasonable to regard the co-existing canaliculate and non-canaliculate forms as belonging to the same species.

Distribution: Pillara Limestone, Sadler Limestone; Frasnian.

Genus **Anostylostroma** Parks

Type species: *Anostylostroma hamiltonense* Parks

Anostylostroma ponderosum (Nicholson)

Plate 8A-D

1875 *Stromatopora ponderosa* Nicholson: p. 246, pl. 24 figs 4, 4a, 4b.
1936 *Clathrodictyon arvense* Parks: p. 23, pl. 3 figs 1-4.
1936 *Clathrodictyon ponderosum* (Nicholson); Parks: p. 42, pl. 5 figs 5, 6.
1957 *Anostylostroma arvense* (Parks); Galloway and St. Jean: p. 110, pl. 4 figs 1a, 1b.
1957 *Anostylostroma ponderosum* (Nicholson); Galloway and St. Jean p. 111, pl. 4 figs 2a, 2b.
1960 *Anostylostroma arvense* (Parks); Galloway and Ehlers: p. 82, pl. 8 figs 1a, 1b, 2.
1962 *Anostylostroma ponderosum* (Nicholson); Fagerstrom: p. 425, pl. 65 figs 1-8.
1970 *Anostylostroma ponderosum* (Nicholson); Stearn and Mehrotra: p. 6, pl. 1 figs 1, 2.
1971 *Anostylostroma ponderosum* (Nicholson); Kazmierczak: p. 81, pl. 14 figs 2a, 2b, 3.

Material: ?F10458, MRM 15 (19327); cf. F10499, NOB 26/27 (19394); F10562, NOB 35 (19716); F10570, NOB 9 (19719); F10572, NOB 9 (19720); F10575, F10576, NOB 9 (19721); F10618, F10619, NOB 18 (19781); F10623, NOB 38 (19783); F10632, NOB 39 (19789); F10644, NOB 42/43 (19801); F10648, NOB 42/43 (19805); F10702, NOB 47 (19841); F10765, NOB 21 (19902); F10801, MRM 83 (19937); cf. F10858, NOB 25 (29455).

Description: Coenosteum tabular (5 to 20 mm thick), rarely hemispherical, latilaminate. Low mamelons are common and arise abruptly above gently undulating laminae. Mamelons are from 5 to 8 mm in diameter and are spaced from 9 to 17 mm apart. Laminae are very variable in thickness and there are from 12-21 in 5 mm; they are minutely perforate. Pillars are also variable in thickness, show some tendency to superposition and are upwardly branching. They tend to be rounded at the base and become transversely elongate at the top where they branch; a space develops within the top of each pillar and is enclosed by the overlying lamina. There are 13-19 pillars in 5 mm. Astrorhizal canals in mamelons, inconspicuous, about 0.3-0.4 mm in diameter. Dissepiments are irregularly scattered throughout the galleries. Microstructure of compact tissue, with some transverse fibrosity in the lower part of the pillars.

Measurements:

Specimen No.		x̄	s	min.	max.	n
F10644	L5	18.29	1.38	17	21	7
	P5	18.00	0.82	17	19	4
	t	0.083	0.019	0.043	0.109	12
	d	0.089	0.017	0.066	0.122	12
F10755	L5	18.14	0.90	17	19	7
	P5	15.83	1.72	14	19	6
	t	0.078	0.015	0.046	0.102	12
	d	0.088	0.011	0.074	0.114	12
F10801	L5	16.00	2.65	12	20	7
	P5	15.80	1.64	13	17	5
	t	0.087	0.021	0.056	0.137	12
	d	0.094	0.018	0.063	0.127	12

Remarks: The species is highly variable in its appearance, depending on the thickness of the skeletal elements. I follow Fagerstrom (1962), who also pointed out the considerable variation in this species, in considering *arvense* a junior synonym of *A. ponderosum.*

The correct name for this species is in doubt. Fagerstrom (1981, pers. comm.) now considers *A. laxum* (Nicholson) to be a synonym of *A. ponderosum* and since the type of the latter species must be presumed lost (see Benton, 1979) he calls the taxon *A. laxum*. On the other hand, Stearn and Mehrotra (1970) recognise both species. Perhaps the solution to the problem must await the selection of a neotype for *A. ponderosum* from the type locality in the Columbus Limestone at Kelley's Island, Ohio.

Distribution: Pillara Limestone, Sadler Limestone; Givetian and Frasnian.

Genus: **Atelodictyon** Lecompte

Type species: *Atelodictyon fallax* Lecompte

Atelodictyon stelliferum Stearn

Plate 9A-D

1961 *Atelodictyon stelliferum* Stearn: p. 937, pl. 105 figs 6-8.
1963 *Atelodictyon stelliferum* Stearn; Stearn: p. 656, pl. 86 figs 2, 3.
not 1966 *Atelodictyon* cf. *A. stelliferum* Stearn; Klovan: p. 7, pl. 1, figs 3a, 3b, which is *Stromatopora mikkwaensis* Stearn (see Stearn, 1975a, p. 1646).
1966b *Atelodictyon stelliferum* Stearn; Stearn: p. 46, pl. 15 figs 4-6.
1969 *Atelodictyon stelliferum* Stearn; Fischbuch: p. 170, pl. 2 figs 1-5.
1975a *Atelodictyon stelliferum* Stearn; Stearn: p. 1646

Material cf. F10474, MRM 23 (19350); F10789, MRM 72/73 (19930); F10829, MRM 75 (21580); F10907, LNR 9 (37278).

Description: Coenosteum hemispherical, rarely latilaminate. Laminae prominent, closely spaced, 9-14 in 2 mm, continuous; marked by numerous dark granules. Pillars thicker than laminae, paler in colour, confined to one interlaminar space, 8-11 in 2 mm. Pillars may branch and join to form a vertically-aligned interlaminar network. Galleries consequently very irregular in shape. Dissepiments rare. Astrorhizal canals prominent as circular spaces or elongated tubes up to 0.5 mm in diameter; crossed by dissepiments. A few laminae (up to about 10) are upturned around the centre of an astrorhizal system but mamelons are not present. Microstructure acellular, compact tissue.

Measurements:

Specimen No.		x̄	s	min.	max.	n
F10789	L2	9.83	1.60	9	13	6
	P2	9.75	1.26	8	11	4
	t	0.060	0.009	0.041	0.071	12
	d	0.074	0.015	0.043	0.094	12
F10829	L2	11.40	1.35	10	14	10
	P2	9.25	1.04	8	11	8
	t	0.052	0.008	0.041	0.071	12
	d	0.070	0.015	0.038	0.094	12

Remarks: One coenosteum has inquiline tabulates disrupting the macrostructure. *A. stelliferum* seems to occupy a position between *A. moravicum* Zukalová with more widely-spaced laminae and *A. microfibrosum* (Lecompte) which has more closely-spaced laminae (see Table 8) with the Canning Basin specimens being somewhat intermediate between *A. stelliferum* and *A. microfibrosum*.In other respects the three species seem to be very similar.

TABLE 8. LAMINA SPACING IN 3 SPECIES OF *Atelodictyon*

Species	Reference	L5
moravicum	Zukalová, 1971, p. 41	11-13
stelliferum	Stearn, 1961, p. 937	15-30 (reported as 6-12 in L2)
microfibrosum	Lecompte, 1951, p. 201	30-40

Distribution: Pillara Limestone, Sadler Limestone (cf.); Frasnian.

Genus **Clathrocoilona** Yavorsky

Type species: *Clathrocoilona abeona* Yavorsky

Clathrocoilona saginata (Lecompte)

Plate 10A-D

1951 *Stromatoporella saginata* Lecompte: p. 171, pl. 22 figs 5-7, pl. 23 figs 1-3.

Material: ?F10879, ?F10880, MRM 85 (37252); F10883, LNR 10 (37265); F10884, F10885, F10886, F10887, F10888, F10889, F10890, F10891, LNR 11 (37267); F10892, F10893, F10894, F10895, LNR 11 (37268).

Description: Coenosteum undulating tabular, 2-3 cm thick usually, about 9 cm thick in one specimen; latilaminate. Pillars usually superposed, sometimes confined to one interlaminar space. Laminae well marked, continuous, usually with conspicuous clear centre. Galleries distinct, sometimes restricted due to enlargement of pillars and laminae which often occurs at top of a latilamina. Dissepiments rare, apparently confined to irregular basal layer of latilamina. Astrorhizae inconspicuous, can just be made out in tangential section. Microstructure with compact to flocculent tissue.

Measurements:

Specimen No.		x̄	s	min.	max.	n
F10887	L5	13.50	0.84	12	14	6
	P5	14.00	1.22	13	16	5
	t	0.093	0.017	0.066	0.122	12
	d	0.133	0.033	0.071	0.201	12
F10888	L5	13.17	1.17	12	15	6
	P5	13.67	1.75	11	15	6
	t	0.084	0.014	0.063	0.104	12
	d	0.120	0.027	0.086	0.188	12
F10892	L5	14.25	1.71	12	16	4
	P5	13.50	1.29	12	15	4
	t	0.117	0.022	0.081	0.150	12
	d	0.123	0.028	0.084	0.175	11

Remarks: The Canning Basin specimens resemble Lecompte's species in their superposed pillars and partly-restricted galleries, although astrorhizae are not so well-developed as in the Belgian specimens. However, all the Canning Basin specimens are of Famennian age whereas Lecompte's material is Frasnian; hence the identification is somewhat tentative. I follow Stearn (1966a, p. 98) in considering the species to belong to *Clathrocoilona*.

Distribution: Windjana Limestone, Nullara Limestone (?); Famennian.

Clathrocoilona spissa (Lecompte)

Plate 11A-D

1951 *Stromatoporella spissa* Lecompte: p. 187, pl. 27 figs 1-4.

1971 *Clathrocoilona spissa* (Lecompte); Zukalová: p. 56, pl. 15 figs 1, 2.

1971 *Stromatopora spissa* (Lecompte); Kazmierczak: p. 92, pl. 21 figs 2a, 2b.

1974 *Clathrocoilona spissa* (Lecompte); Flügel: p. 1165, pl. 24 figs 2, 4, pl. 26 fig. 4, pl. 27 fig. 5.

1980 *Clathrocoilona spissa* (Lecompte); Mistiaen: p. 196, pl. VII 3-9.

Material: F10354, F10356, MRM 5 (18694); F10405, F10406, F10408, MRM 33 (18665); F10403, F10456, F10950, MRM 13 (19324); F10409, F10410, F10411, F10412, MRM 3 (18666); F10416, MRM 33 (18645); ?F10429, MRM 17 (19333); F10431, F10432, MRM 8 (19311); ?F10434, MRM 8 (19312); F10440, MRM 9 (19314); F10442, MRM 11 (19321); F10443, F10446, MRM 12 (19322); F10448, F10451, F10453, MRM 13 (19323); F10459, MRM 15 (19328); F10460, MRM 16 (19331); ?F10461, F10462, MRM 19 (19338); F10468, MRM 19 (19344); ?F10473, MRM 23 (19349); F10477, MRM 23 (19350); F10481, F10483, NOB 22 (19351); ?F10550, NOB 7/8 (19709); F10569, NOB 9 (19719); F10592, NOB 14 (19745); F10606, NOB 30/31 (19770); F10620, F10621, NOB 38 (19782); F10647, NOB 42/43 (19804); F10659, NOB 43/44 (19816); F10670, NOB 44/45 (19822); F10671, NOB 44/45 (19824); F10678, F10679, NOB 45 (19825); F10683, NOB 20/46 (19829); F10692, NOB 20/47 (19834); F10718, MRM 57/58 (19855); F10734, F10735, MRM 62 (19872); F10760, NOB 21/48 (19896); F10776, MRM 68 (19913); F10806, NOB 50 (21631); F10812, MRM 34 (19959); F10824, F10825, MRM 79 (3497); F10834, MRM 34 (21585); F10859, NOB 22 (30454); F10874, NOB 22 (37261); ?F10896, ?F10902, LNR 12 (37274).

Description: Coenosteum tabular up to 8 cm thick, rarely hemispherical, frequently encrusting other organisms. Latilaminae are well marked and range in thickness from 1 to 5 mm. Usually the lower 2/3 of each latilamina has an irregular macrostructure in which laminae and pillars cannot be differentiated and tubular galleries ramify through the skeletal elements. In the upper 1/3 pillars and laminae are present. There are about 3 or 4 laminae in 1 mm; they range in thickness from 0.04-0.10 mm. Pillars are superposed and range from 0.10-0.15 mm in diameter. Galleries are vertically elonged in upper 1/3 of latilaminae. The latilaminae are undulating but no definite mamelons occur. Some tubular galleries in the irregular macrotissue are up to 0.5 mm in diameter and cut obliquely up through the overlying regular macrotissue and are part of an astrorhizal system. The microstructure is uncertain; much of the tissue seems to be flocculent with rare thin light lines both in the laminae and running horizontally through the basal irregular macrostructure.

Remarks: There is a group of *Clathrocoilona* species with 'obliterated galleries' and well-developed latilamination; in addition to *C. spissa* it includes *C. solida* Yavorsky (1955), *C. inconstans* Stearn (1962), *Stromatoporella obliterata* Lecompte (1951) and *Stromatopora rugosa* Le Maitre (1933). The taxonomy of, and relationships within, this group must await re-examination of the type specimens.

There seems to be considerable variation in the ratio of basal irregular macrostructure to upper regular macrostructure in the latilaminae. Some specimens have only the irregular part and a few show only the regular macrostructure. However, as Stearn (1962, p. 15) remarked concerning *C. inconstans* "..... The structure of the laminae and pillars varies so greatly from place to place..... that it may be difficult to distinguish included stromatoporoids of different species from variations in structure within the species."

C. spissa often encrusts other stromatoporoids. It forms a thin skin around *Stachyodes costulata* branches (e.g. F10834) and is intergrown (as 'compound tabular coenostea') with *Stromatoporella laminata* and ?*Stachyodes australe* (F10592, pl. 22C), *Actinostroma* sp. (F10812) and ?*Hermatostroma schlueteri* (F10459). Stearn (1966b) suggested that *C. inconstans* was an algal/stromatoporoid consortium. In specimen F10621 there are small filaments (about 0.06 mm in diameter), which may be of algal origin, running vertically through the coenosteum but otherwise the Canning Basin specimens of *C. spissa* seem to be of purely stromatoporoid origin.

Distribution: Pillara Limestone, Sadler Limestone; Frasnian.

Genus **Dendrostroma** Lecompte

Type species: *Idiostroma oculatum* Nicholson

Lecompte (1952, p. 320) erected the genus *Dendrostroma* for Nicholson's species *Idiostroma oculatum* in which the pillars are restricted to an interlaminar space and are not superposed. Ripper (1937b) had similarly concluded that *oculatum* was generically distinct from other *Idiostroma* species and commented (Ripper, 1937b, p. 194) that ".....*I. oculatum* may be a form of *Stromatoporella*." Lecompte (1951, p. 46) also considered *oculatum* to be close to *Stromatoporella*.

Ripper (1937b) recorded both hemispherical and cylindrical forms of *D. oculatum* from the Lilydale Limestone (Victoria); Stearn (1966a) remarked that it would be difficult to distinguish hemispherical coenostea of *Dendrostroma* from *Stictostroma*. Galloway (in Galloway and Ehlers, 1960) described *D. fibrosum* from the Petoskey Formation (Michigan); this species has rare ring pillars and is associated with *Stromatoporella mudlakensis* which is also irregularly dendroid in growth form. Such observations suggest that *Dendrostroma* is merely a dendroid form of *Stromatoporella*. However, the microstructure of *Dendrostroma* is transversely fibrous while *Stromatoporella* is ordinicellular, although it may appear to be transversely porous (Stearn, 1966a).

Dendrostroma oculatum (Nicholson)

Plate 12A-D

1886 *Idiostroma oculatum* Nicholson: p. 101, text figs 14, 15.

1892 *Idiostroma oculatum* Nicholson; Nicholson: p. 225, pl. 29 figs 10, 11, text figs 32, 33 (copies of text figs 14, 15). Not pl. 29 figs 8, 9 which are *Hermatostroma roemeri* (see Lecompte, 1952, p. 320).

1937b *Idiostroma oculatum* Nicholson; Ripper: p. 195, pl. 9 fig. 6, text fig. 4.

1952 *Dendrostroma oculatum* (Nicholson); Lecompte: p. 320, pl. 61 figs 1, 1a, 1b.

Material: CPC 21177, NOB 56 (K459); F10555, NOB 35 (19715); ?F10577, ?F10578, NOB 11 (19725); F10848, F10849, NOB 11 (29451).

Description: Coenosteum stachyodiform, branches from 4 to 10 mm in diameter. Axial canal conspicuous, surrounded by axial region of irregular, often thin, skeletal elements; peripheral zone with laminae and pillars clearly differentiated. Laminae 5-9 in 2 mm. Pillars restricted to an interlaminar space, 6-9 in 2 mm. Galleries oval. Dissepiments rare. Ring pillars rare. Microstructure of transversely fibrous tissue.

Measurements:

Specimen No.		$\bar{x}$	s	*min.*	*max.*	*n*
CPC 21177						
Branch diameter		5.73	1.45	4.4	7.5	4
Axial canal diameter		0.72	0.10	0.6	0.8	3
	L2	7.60	1.34	6	9	5
	P2	7.20	1.30	6	9	5
	t	0.068	0.036	0.025	0.137	10
	d	0.078	0.023	0.046	0.114	10
F10848						
Branch diameter		4.96	1.13	3.1	6.3	7
Axial canal diameter		0.49	0.05	0.45	0.55	5

Remarks: In general features the specimens agree with *D. oculatum* as described and figured by Lecompte (1952). The laminae and pillars seem to be somewhat thicker in the type material (0.15 to 0.20 mm) but in the Canning Basin specimens these dimensions are variable. In particular the laminae are frequently quite thin in the outer part of the branches. Such thin laminae may be what Zukalová (1971) described as a thin epitheca in *D. mutabile*; no signs of an epitheca were seen in the Canning Basin specimens.

The presence of rare ring pillars, recorded also in *D. fibrosum*, suggest that the species may be allied to *Stromatoporella*.

Distribution: Pillara Limestone, Sadler Limestone; Frasnian.

Genus **Hermatostroma** Nicholson

Type species: *Hermatostroma schlueteri* Nicholson

Hermatostroma ambiguum n. sp.

Plate 13A-D

?1952 *Hermatostroma polymorphum* Lecompte (part): p. 258, pl. 47 figs 4, 4a, pl. 48 figs 2, 2a, 3, 3a. Not pl. 47 figs 3,3a, pl. 48 figs 1, 1a which are *H. schlueteri*.

Material: Holotype—F10916, LNR 7 (37059); Paratypes—F10430, MRM 15 (19335); F10433, MRM 8 (19312); F10435, MRM 9 (19315); F10449, MRM 13 (19323); F10454, MRM 13 (19324); F10464, F10465, MRM 19 (19339); F10514, F10515, MRM 26 (19615); F10573, NOB 9 (19720); F10631, NOB 39 (19789); F10662, NOB 43/44 (19817); F10830, F10831, MRM 76 (21582); F10917, LNR 7 (37060); Other specimens—?F10450, MRM 13 (19323); ?F10461, MRM 19 (19338); ?F10466, MRM 19 (19339); ?F10467, MRM 16 (19340); ?F10838, ?F10843, ?F10846, LNR 7 (21633).

Description: Coenosteum tabular, about 20 mm thick with basal layer; obscurely latilaminate. Macrostructure dominated by thick continuous pillars, 13 to 16 in 5 mm. Laminae may be thick or thin and are irregularly developed (so that it is impossible to measure the number in 5 mm); with light-coloured central line which crosses the pillars. Galleries rounded or vertically elongated, crossed by dissepiments. Astrorhizae scattered throughout coenosteum, conspicuous only in tangential section. Peripheral membranes fairly distinct especially in tangential section. Microstructure acellular with apparently compact tissue.

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10449	P5	12.67	1.03	11	14	6
	t	0.171	0.063	0.104	0.330	12
	d	0.184	0.045	0.127	0.279	12
F10454	P5	13.44	0.88	12	15	9
	t	0.081	0.014	0.056	0.102	12
	d	0.123	0.016	0.102	0.155	13
F10916	P5	14.44	1.01	13	16	9
Holotype	t	0.134	0.043	0.071	0.218	11
	d	0.181	0.037	0.109	0.246	14
F10917	P5	15.00	1.07	13	16	8
	t	0.125	0.026	0.086	0.185	11
	d	0.141	0.029	0.091	0.198	15

Remarks: This new species is distinguished from the other Canning Basin *Hermatostromas* by its very thick pillars, variably developed laminae and lack of mamelons. Some specimens show a close resemblance to those assigned by Lecompte (1952) to *H. polymorphum* groups (1) and (2). He observed (p. 258) that the marginal vesicles characteristic of *Hermatostroma* were present only locally in some of his material. In specimens questionably assigned to *H. ambiguum* peripheral membranes are apparently lacking and this may be due to diagenetic alteration. This is true of F10838 in which the coenosteum is a complex of interconnected tabular sheets, each with a basal layer. Two specimens questionably placed in this species (F10461 and F10467) have very thin tabular coenostea and are somewhat altered; in this state they are very difficult to distinguish from *Stachyodes australe*.

The trivial name refers to the doubtful presence of peripheral membranes in some specimens.

Distribution: Pillara Limestone, Sadler Limestone, Virgin Hills Formation; Frasnian.

Hermatostroma perseptatum Lecompte

Plate 14A-D

1952 *Hermatostroma perseptatum* Lecompte: p.251, pl.45 figs 2, 2a, 2b.

Material: F10579, NOB 11 (19725); F10635, NOB 40 (19791); F10637, NOB 41 (19794); F10656, NOB 43/44 (19814); F10660, NOB 43/44 (19816); F10666, NOB 44/45 (19820); F10672, NOB 44/45 (19824); F10761, NOB 21/48 (19898); F10792, F10793, MRM 82 (19936).

Description: Coenosteum tabular (up to 14 cm thick) or bulbous. Laminae undulating with numerous mamelons about 5 mm in diameter. Laminae thin. Pillars thick, peripheral membranes poorly developed. Dissepiments are irregularly scattered in the galleries. Astrorhizal canals well-developed, up to 0.55 mm in diameter, crossed by numerous dissepiments. Microstructure acellular with compact tissue.

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10637	L2	7.00	0.71	6	8	5
	P2	5.80	0.45	5	6	5
	t	0.095	0.011	0.079	0.109	11
	d	0.126	0.017	0.081	0.142	12
F10761	L2	9.00	1.00	8	10	5
	P2	5.00	0.58	4	6	7
	t	0.087	0.025	0.061	0.147	11
	d	0.136	0.027	0.102	0.198	12

Remarks: This species is distinguished from *H. schlueteri* by the better developed astrorhizal canals with dissepiments and from *H. ambiguum* by the mamelons and more continuous laminae. In some specimens new tissue may grow around the mamelons giving the coenosteum the appearance of incorporating 'foreign' tissue (see pl.14B). This is due to the new growth taking place over the hummocky upper surface of a coenosteum. Other specimens e.g. F10792 have inquiline gastropods (pl.14A,C) growing within the coenosteum.

Distribution: Pillara Limestone, Sadler Limestone; Frasnian.

Hermatostroma roemeri (Nicholson)

Plate 15A-C

1886 *Idiostroma roemeri* Nicholson: p.100, pl.9 figs 6-11.

1892 *Idiostroma oculatum* Nicholson (part): pl. 29 figs 8, 9 (see Lecompte, 1952, p.320).

1952 *Idiostroma roemeri* Nicholson: Lecompte: p. 316, pl.66 figs 3, 3a, 3b.

1966b *Hermatostroma roemeri* (Nicholson): Stearn: p.106.

1974 *Hermatostroma roemeri* (Nicholson): Flügel: p.170, pl.24 fig. 3, pl. 26 fig. 5, pl. 27 fig. 1.

Material: F10807, MRM 74 (19957); F10818, F10820, cf. F10822, F10823, MRM 79 (3497); F10833, MRM 74 (21584); ?F10860, MRM 78 (37245); ?F10876, MRM 79 (37262); cf. F10877, NOB 58 (37244).

Description: Coenosteum stachyodiform, arising from a tabular portion in F10807. Macrostructure regular with thick superposed pillars and thin concentric laminae. Axial zone of poorly organised structure about ¼ to ⅓ of branch diameter. Axial canal conspicuous, fairly large, with dissepiments. Galleries well developed, occasionally cut by branches of astrorhizal system especially in peripheral zone. Peripheral membranes obvious. Microstructure acellular with compact tissue.

Measurements:

Specimen No.		x̄	s	min.	max.	n
F10807						
Branch diameter		7.30	1.42	4.8	10.1	16
Axial canal diameter		0.61	0.13	0.3	0.85	16
No. of axial canals				1	1	16
	L2	6.20	0.79	5	7	10
	P2	5.90	0.74	5	7	10
	t	0.090	0.020	0.069	0.135	10
	d	0.112	0.021	0.089	0.140	10
F10833						
Branch diameter		7.72	2.37	4.2	10.0	5
Axial canal diameter		0.57	0.12	0.4	0.7	5
No. of axial canals				1	1	5
	L2	6.80	0.84	6	8	5
	P2	6.00	0.71	5	7	5
	t	0.065	0.009	0.056	0.079	5
	d	0.106	0.021	0.081	0.135	5

Remarks: As is usual with *Hermatostroma*, it is difficult to be certain whether the marginal vesicles are included in measurements of lamina thickness and pillar diameter because of poor preservation. The above measurements exclude marginal vesicles, which may account for the measurements being smaller than Lecompte's (1952) measurements. Otherwise the specimens agree well with *H. roemeri* as redescribed by Lecompte.

There are several species of *Idiostroma* which resemble *roemeri*, e.g. *I. moravicum* Zukalová (1971) and *I. jipaoense* Yang and Dong (1963), but differ in lacking marginal vesicles characteristic of *Hermatostroma*.

Superficially this species looks like *Stachyodes*; some specimens (e.g. F10833, Pl.15C) have a rim of *Renalcis* around the branches as in *Stachyodes costulata*. In F10877 the branches are up to 18 mm in diameter and the specimen is compared to *H. roemeri*. Two specimens (F10860, F10876) questionably assigned to this species are somewhat reminiscent of *H. ambiguum* with a dense macrostructure.

Distribution: Pillara Limestone; Frasnian.

Hermatostroma schlueteri Nicholson

Plate 16A-D

1886 *Hermatostroma schlueteri* Nicholson: p. 105, pl. 3 figs 1, 2, text figs 1, 16.

1892 *Hermatostroma schlueteri* Nicholson; Nicholson: p. 215, pl. 28 figs 12, 13, text figs 29-31.

1952 *Hermatostroma schlueteri* Nicholson; Lecompte: p. 250, pl. 45 figs 1, 1a, 1b.

1952 *Hermatostroma polymorphum* Lecompte: p. 258, pl. 47, figs 3, 3a, pl. 48 figs 1, 1a. Not pl. 47 figs 4, 4a, pl. 48 figs 2, 2a, 3, 3a, which are probably *H. ambiguum*.

1971 *Hermatostroma schlueteri* Nicholson; Kazmierczak: p. 125 pl. 35 figs 2a, 2b.

1974 *Hermatostroma schlueteri* Nicholson; Flügel: p. 172, pl. 24 fig. 1, pl. 27 fig. 2.

Material: F10424, F10426, MRM 36 (19302); F10436, MRM 9 (19314); ?F10459, F10951, MRM 15 (19328); F10475, F10478, MRM 23 (19350); F10482, F10483; NOB 22 (19351); F10484, NOB 23 (19352); F10486, NOB 24 (19354); F10489, MRM 40 (19383); F10493, MRM 42 (19386); F10529, MRM 51 (19690); F10563, NOB 35 (19716); F10568, NOB 36 (19718); F10584, NOB 12 (19731); F10626, NOB 33 (19786); F10629, F10630, NOB 33 (19787); F10636, NOB 41 (19793); F10640, F10642, NOB 42/43 (19798); F10645, NOB 42/43 (19801); ?F10652, NOB 42/43 (19811); F10654, NOB 43 (19812); F10680, NOB 46 (19827); F10695, NOB 20/47 (19836); F10697, F10698, NOB 20/47 (19837); F10730, MRM 61/62 (19868); F10735, MRM 62 (19872); F10738, F10739, MRM 62/63 (19875); F10819, MRM 79 (3497); F10847, NOB 57 (3364); F10864, F10865, NOB 52 (37256); ?F10918, NOB 22 (37068); F10919, F10921, MRM 84 (37256).

Description: Coenosteum tabular to hemispherical (up to 15 cm thick) or bulbous, rarely latilaminate. Macrostructure a regular network with pillars and laminae of about equal thickness. There are 9 to 20 laminae in 5 mm and 12 to 18 pillars in 5 mm. Undulations in the lamination give rise to small mamelons about 2 to 6 mm across (up to 15 mm in diameter in F10630). Galleries square to horizontally rectangular in vertical section, with rounded corners. Dissepiments rare. Astrorhizae poorly developed. Microstructure acellular with compact tissue; peripheral membranes well developed.

Measurements:

Specimen No.		x̄	s	min.	max	n
F10486	L5	13.60	0.84	12	15	10
	P5	16.20	1.48	14	18	10
	t	0.091	0.019	0.056	0.114	10
	d	0.095	0.012	0.079	0.114	10
F10493	L5	13.80	1.32	12	16	10
	P5	14.70	1.25	13	17	10
	t	0.070	0.010	0.058	0.091	10
	d	0.072	0.016	0.051	0.094	10
F10680	L5	12.10	1.45	9	14	10
	P5	13.20	1.14	12	15	10
	t	0.077	0.013	0.058	0.099	10
	d	0.089	0.009	0.079	0.104	10
F10695	L5	17.00	1.41	15	20	10
	P5	13.20	1.23	12	15	10
	t	0.080	0.009	0.071	0.094	10
	d	0.099	0.012	0.081	0.117	10
F10698	L5	12.80	1.03	11	14	10
	P5	14.30	1.34	12	17	10
	t	0.079	0.013	0.058	0.102	10
	d	0.089	0.020	0.061	0.132	10

Remarks: The specimens agree well with the species as figured by Lecompte (1952) with regularly developed macrostructure, square to horizontally rectangular galleries and good peripheral membranes. A basal layer is present in some specimens, e.g. F10864, F10697, F10698.

Lecompte (1952) in erecting *H. polymorphum* remarked on the considerable variation in specimens assigned to the species. He recognised four groups of specimens. Kazmierczak (1971) placed groups (3) and (4) in synonymy with *H. schlueteri* without, however, pointing out that group (4) (Lecompte, 1952, pl. 47 figs 3, 3a) is the holotype of *H. polymorphum*. I agree with Kazmierczak's synonymy and consequently consider *H. polymorphum* to be a junior synonym of *H. schlueteri*. *H. polymorphum* groups (1) and (2) are discussed under *H. ambiguum* n. sp.

Distribution: Pillara Limestone, Sadler Limestone; Givetian and Frasnian.

Genus **Pseudoactinodictyon** Flügel

Type species: *Pseudoactinodictyon juxi* Flugel

Pseudoactinodictyon dartingtoniensis (Carter)

Plate 17A-D

1880 *Stromatopora dartingtoniensis* Carter: p. 346, pl. 18 figs 1-5.

1891 *Parallelopora dartingtonensis* (Carter); Nicholson: p. 199 pl. 4 fig. 1, pl. 24 figs 13-15, pl. 25 fig. 1.

1891 *Parallelopora dartingtonensis* var. *filitexta* Nicholson: p. 201, pl. 25 figs 2, 3.

1952 *Parallelopora dartingtonensis* var. *filitextum* Nicholson; Lecompte: p. 296, pl. 49 figs 4, 4a.

1961 *Parallelopora ponomarevi* Yavorsky: p. 47, pl. 28 figs 7, 8, pl. 29, figs 1-3.

1966b *Pseudoactinodictyon bullulosum* Stearn: p. 53, pl. 21 figs 1-3, pl. 22 fig. 4, pl. 26 fig. 1.

1966b *Stromatopora mikkwaensis* Stearn: p. 55, pl. 19 fig. 5, pl. 20 figs 1-4.

1967 *Parallelopora dartingtonensis* (Carter); Birkhead: p. 75, pl. 3 fig. 8, pl. 14 figs 2a, 2b, 2c.

1969 *Parallelopora ponomarevi* Yavorsky; Fischbuch: p. 179, pl. 12 figs 1-5.

1971 *Pseudoactinodictyon actinostromiforme* (Riabinin); Kazmierczak: p. 108, pl. 27 figs 2a, 2b, 2c.

1971 ?*Pseudoactinodictyon dartingtonense* (Carter); Kazmierczak: p. 109, pl. 8 fig. 4, pl. 28 figs 1a, 1b, 2, 3.

Material: CPC 21178, NOB 55 (K312); F10361, MRM 31 (18696); F10694 NOB 20/47 (19835).

Description: Coenosteum tabular. Pillars superposed but discontinuous in vertical section, long and short; forming a vermiform network of vertical walls in tangential section. Galleries irregular in shape in tangential section but occasionally small and circular recalling 'ring pillars'. Numerous upwardly arched dissepiments; apparently no laminae. Large astrorhizal canals present with dissepiments. Pillars have cellular microstructure with compact tissue.

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
CPC21178	P2	7.40	0.84	6	9	10
	d	0.106	0.031	0.069	0.168	12
F10361	P2	8.00	0.89	7	9	6
	d	0.097	0.016	0.069	0.129	12

Remarks: The Canning Basin specimens are most similar to the *dartingtoniensis* figured and described by Kazmierczak (1971) and Birkhead (1967). Similar forms have been given a variety of names and the above synonymy draws attention to this.

The generic assignment of *dartingtoniensis* has given some difficulty. Carter's original specimens are lost but Stearn (1966a, p. 104) has designated as lectotype specimen BM(NH) P5746 (figured by Nicholson, 1891, pl. 24 fig. 15, pl. 25 fig. 1) and stated that the microstructure is indeterminate. Stearn's (1966a) suggestion that the type of Nicholson's variety *filitexta* is close to *Pseudoactinodictyon* is accepted here, while acknowledging that he believed this genus to have compact (i.e. acellular) microstructure. Lecompte (1952, p. 297) has commented that the microstructure in one of Nicholson's specimens of *filitexta* is striated, recalling the microstructure in *Stachyodes*. Other authors (Flügel, 1958, Kazmierczak, 1971) have considered *Pseudoactinodictyon* to be cellular. The illustrations of *dartingtoniensis* published by Birkhead (1967, pl. 14 Fig. 2a) and (as ?*P. dartingtoniensis*) by Kazmierczak (1971, pl. 8 fig. 4) show a cellular microstructure.

As Flügel and Flügel-Kahler (1968) remark the original spelling is "*dartingtoniensis*"; there seems to be no good reason to continue to use Nicholson's spelling "*dartingtonensis*".

Distribution: Pillara Limestone, Sadler Limestone; Frasnian.

Genus **Stachyodes** Bargatzky

1881 *Stachyodes* Bargatzky: p. 688.
1896 *Sphaerostroma* Gürich: p. 128 (not seen).
1967 *Keega* Wray: p. 16.

Type species: *Stachyodes ramosa* Bargatzky.

Most authors, following Nicholson (1886b), have considered Bargatzky's species to be a junior synonym of *Stachyodes verticillata* (M'Coy). However, as Nicholson (1892, p. 223) himself pointed out, the two species differ considerably in size. *S. ramosa* was described as being 5-10 mm in diameter (Bargatzky, 1881b, p. 688). On the other hand, *S. verticillata* was stated to be "1 or 2 lines in diameter" (M'Coy, 1850, p. 377; see also M'Coy, 1851, p. 67) i.e. 2-4 mm in diameter and M'Coy's figure (1851, p. 66 fig. a) shows a fragment 4-5 mm in diameter. The work of Lecompte (1952) suggests that branch diameter is an important character in differentiating species of *Stachyodes* (see also Figure 16) and it is therefore possible that *verticillata* and *ramosa* are not synonyms. Furthermore the original figures and descriptions of the two species are inadequate and the type specimen of neither species has been refigured. Consequently it seems unwise to use these two names at present.

I follow Lecompte (1952) and Gogolczyk (1959) in regarding *Sphaerostroma* as a synonym of *Stachyodes* (see under *S. crassa* for discussion). Riding (1974) has discussed the synonym of *Keega* with *Stachyodes* and his conclusions are accepted here.

Stachyodes australe (Wray)

Plate 18A-E

1967 *Keega australe* Wray; p. 18, pl. 3 figs 1-6, text fig. 6
1970 *Keega* sp. cf. *K. australe* Wray; Wray and Playford: p. 548, pl. 2 fig. 5.
1972 *Keega* sp. Machielse: p. 224, pl. 16 figs 1?,2?,3, pl. 17 figs 1-3.
1974 *Stachyodes australe* (Wray); Riding: p. 572, pl. 85 figs 1-5.
1975a *Stachyodes jonelrayi* Stearn: p. 1664, pl. 4 figs 3-6.

Material: F10472, MRM 21 (19347); F10514, MRM 26 (19615), F10516, MRM 46 (19618); F10517, MRM 44 (19616); F10521, MRM 47 (19621); ?F10592, NOB 14 (19745).

Description: Coenosteum tabular with latilaminae usually less than 4 mm thick and with rare stachyodiform branches up to 3.5 mm in diameter. Latilaminae have a basal layer, in which the horizontal skeletal elements are arcuately curved, which usually makes up three-quarters of the latilamina but may be only one-third in some forms (e.g. F10521). Macrostructure obscure in basal layer. In the upper part of each latilamina pillars become conspicuous, about 7-9 in 2 mm, separated by vertically superposed galleries. Galleries more or less absent in basal layer; most coenosteal spaces are probably part of the astrorhizal system. Microstructure obscurely striated.

Remarks: The species has been redescribed by Riding (1974) who showed that Wray's *Keega australe* is a tabular form of *Stachyodes*. The holotype (F6160) and figured paratypes (F6161, F6162, F6163) come from the same sample (LNR 13 (2)); all are somewhat recrystallised (confertum microstructure of Stearn, 1975a). Variation in *S. australe* and *S. jonelrayi* is quite considerable; both include very thin forms (e.g. Wray, 1967, pl. 3 fig. 5 (*S. australe*); Machielse, 1972, pl.17 fig. 1 (*S. jonelrayi*)) and thick forms (e.g. pl. 18C, (*S. australe*); Stearn, 1975a, pl. 4 fig. 4 (*S. jonelrayi*)), and there seems to be little point in separating them. I therefore place *S. jonelrayi* in synonymy with *S. australe*.

Wray (1967) gives the age range of *S. australe* as Frasnian and ?Famennian. All his samples are now considered to be Frasnian in age. The species is frequently associated with *Sphaerocodium* or with other stromatoporoids.

Distribution: Pillara Limestone, Sadler Limestone, Virgin Hills Formation; Frasnian.

Stachyodes costulata Lecompte

Plate 19A-D, 20A

1952 *Stachyodes costulata* Lecompte: p. 309, pl. 64 fig. 3, pl. 65 figs 1-4.
1966 *Stachyodes costulata* Lecompte; Klovan: p. 31, pl. 11 figs 1-6.
1970 *Syringostroma? costulatum* (Lecompte); Fischbuch: p. 1078 pl. 148 figs 5-7.
1971 *Stachyodes costulata* Lecompte; Zukalová: p. 101, pl. 34 figs 5-6.
1975a *Stachyodes costulata* Lecompte; Stearn: p. 1663.

Material: F7885, NOB 32 (3233); F10357, F10358, MRM 31 (18698); F10367, MRM 31 (18698); F10407, MRM 33 (18665); F10409, F10411, MRM 3 (18666); F10413, MRM 3 (18667); F10418, MRM 2 (18660); F10420, MRM 6 (19308); F10429, MRM 17 (19333); F10431, MRM 8 (19311); F10437, F10438, F10440, MRM 9 (19314); F10447, F10450, F10452, F10453, MRM 13 (19323); F10469, F10470, MRM 20 (19346); F10476, MRM 23 (19350); F10480, NOB 22 (19351); F10488, MRM 37 (19355); F10492, MRM 41 (19384); F10522, NOB 29 (19632); F10532, NOB 31 (19638); F10524, NOB 31 (19639); F10525, MRM 48 (19661); F10526, NOB 33 (19664); F10531, MRM 52 (19691); F10548, F10549, NOB 7/8 (19709); F10551, NOB 7/8 (19710); F10552, F10553, F10554, NOB 34 (19714); F10559, NOB 8 (19711); F10566, NOB 36 (19717); F10586, NOB 12 (19735); F10598, NOB 14 (19751); F10612, F10613, NOB 32 (19778); F10614, NOB 18/32 (19779); F10620, NOB 38 (19782); F10624, NOB 33 (19785); F10625, NOB 33 (19786); F10638, NOB 42 (19797); F10643, NOB 42/43 (19800); F10657, NOB 43/44 (19814); F10671, NOB 44/45 (19824); F10675, NOB 45 (19825); F10681, NOB 46 (19827); F10683, NOB 20/46 (19829); F10707, MRM 53/54 (19845); F10719, F10720, MRM 57/58 (19855); F10727, MRM 61/62 (19866); F10733, F10735, MRM 62 (19872); F10742, MRM 29 (19877); F10744, MRM 29/64 (19879); F10745, MRM 29/64 (19880); F10753, MRM 29/64 (19886); F10766, MRM 65 (19906); F10775, F10776, MRM 68 (19913); F10779, MRM 68/69 (19914); F10784, MRM 71 (19922); F10811, MRM 34 (19959); F10813, F10814, MRM 35 (19960); F10832, MRM 77 (21583); F10834, MRM 34 (21585); F10835, F10836, LNR 6 (21661); F10868, NOB 53 (37257); F10881, MRM 86 (37254); F10897, F10904, LNR 12 (37274).

Description: Coenosteum stachyodiform with closely packed branches which may join to form a complex reticulate coenosteum (Pl. 19B). Branches range in diameter from 3.5 to 11.3 mm and have from 1 to 5 (usually 1 or 2) axial canals which are between 0.25 and 0.90 mm in diameter. Galleries poorly defined because the pillars and laminae are very thick. The only readily discernible spaces are branches of the canal system and ?superposed galleries. Towards the periphery there are large spaces (part of the ?astrorhizal canal system) which open to the exterior. Dissepiments occur in the axial canals. The microstructure consists of radial striations and concentric microlaminae. In some specimens a thin microlamina coats the outside of the branch.

Measurements:

Specimen No.	$\bar{x}$	s	min.	max.	n
F10552					
Branch diameter	7.85	1.74	5.80	11.30	7
Axial canal diameter	0.71	0.10	0.60	0.90	7
No. of axial canals			1	3	7

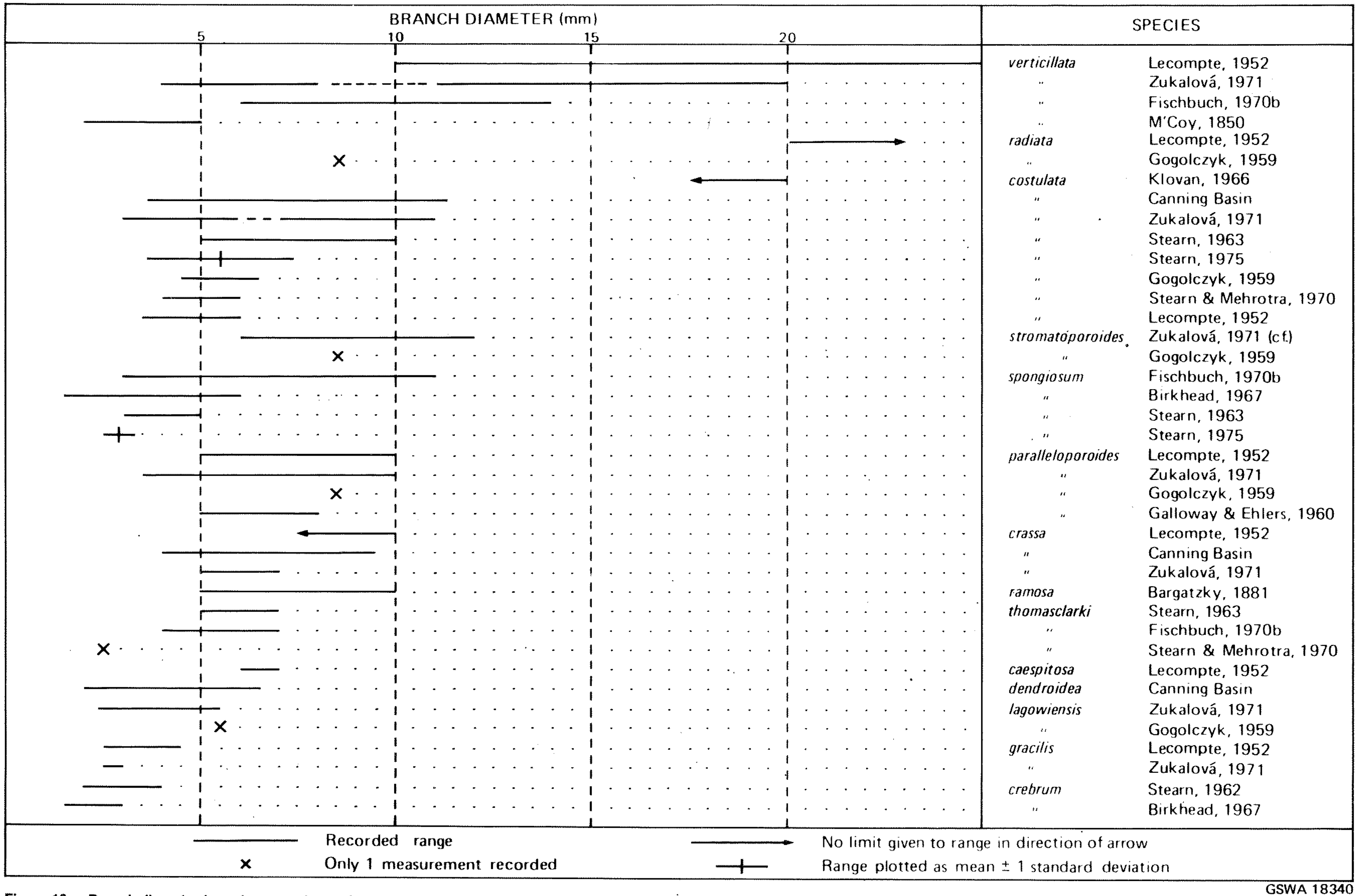


Figure 16. Branch diameter in various species of *Stachyodes* as recorded in the literature.

Measurements:

Specimen No.	x̄	s	min.	max.	n
F10553					
Branch diameter	5.90	0.96	3.55	6.90	14
Axial canal diameter	0.58	0.16	0.25	0.90	14
No. of axial canals			1	5	14
F10554					
Branch diameter	4.71	0.56	3.90	5.30	7
Axial canal diameter	0.37	0.08	0.25	0.45	7
No. of axial canals			1	3	7
F10625					
Branch diameter	6.79	1.80	4.30	9.40	13
Axial canal diameter	0.42	0.08	0.25	0.45	13
No. of axial canals			1	3	13

Figure 17 is a scatter diagram of branch diameter and diameter of axial canal.

Remarks: This species compares well with *S. costulata* as described by Lecompte (1952). It is characterised by the great development of the skeletal elements and the sparseness of gallery spaces. It seems to be more prone to recrystallisation than the other Canning Basin *Stachyodes* species. This usually consists of the development of rosettes of crystals around the spaces within the coenosteum (confertum microstructure of Stearn, 1975) with resulting loss of original microstructure. Such recrystallisation appears to be more common in the axial area which is the opposite of Riding's (1974) observation on the material which Fischbuch (1970) named *Syringostroma? costulatum*. Whether the name *costulata* has been given to specimens which are recrystallised *Stachyodes* belonging to other species is uncertain. Stearn (1975, p.1664) states "*Stachyodes costulata* appears to be a diagenetic species" . . . "the original structure of *S. costulata* before diagenetic changes is not clear . . . ." The Canning Basin specimens suggest that *costulata* has greatly thickened pillars and laminae and very minute gallery spaces. Perhaps the consequently spongy texture of the branches made them more susceptible to diagenesis.

Zukalová (1971) observed a thin epitheca in her specimens. This probably corresponds to what is here described as a microlamina coating the outside of a branch; epitheca is probably the wrong term (see p. 41).

This is the commonest Canning Basin *Stachyodes*. The branches are frequently surrounded by *Renalcis* colonies growing out from the surface. Some specimens are coated by a thin crust of *Clathrocoilona spissa*.

Distribution: Pillara Limestone, Sadler Limestone; Frasnian.

Stachyodes crassa (Lecompte)

Plate 20B, 21A-C

1952 *Idiostroma crassa* Lecompte: p. 318, pl. 66 fig. 2.
1957 *Stachyodes crassa* (Lecompte); Galloway and St. Jean: p. 248 (list).
1971 *Stachyodes (Sphaerostroma) crassa* (Lecompte); Zukalová: p. 104, pl. 35 figs 1-3, pl. 37 fig. 6.

Material: F10497, F10498, NOB 26/27 (19394); F10504, NOB 26/27 (19396); F10513, NOB 7/28 (19399); F10537, F10538, NOB 7/28 (19703), F10539, NOB 7/28 (19704); F10561, NOB 35 (19716); cf. F10603, cf. F10605, NOB 30 (19769); ?F10796, ?F10798, MRM 82 (19936); F10842, LNR 7 (21663); F10856, NOB 25 (29455).

Description: Coenosteum of stachyodiform branches ranging in diameter from 4.0 to 9.8 mm; branches may be crowded together with fusion of adjacent branches. Usually one axial canal in each branch, rarely 2 or 3. The macrostructure is a fairly open network of pillars and laminae which becomes regular towards the periphery of each branch. Pillars are superposed and range from 0.15 to 0.22 mm in diameter. Laminae are very variable in thickness (0.04 to 0.18 mm). Galleries are rounded in transverse section (about 0.20 to 0.25 mm in size) and rectangular in axial section. The axial canal gives off branches which extend between the laminae; these branches are obviously larger than the galleries towards the centre of the branches but are difficult to distinguish from the galleries peripherally. Dissepiments cross the axial canal system and also occur in many of the galleries. The microstructure is indistinctly striated.

Measurements:

Specimen No.	x̄	s	min.	max.	n
F10497					
Branch diameter	4.55	0.79	4.00	5.70	4
Axial canal diameter	0.28	0.06	0.20	0.35	4
No. of axial canals			1	2	4
F10498					
Branch diameter	7.05	1.53	6.00	8.80	3
Axial canal diameter	0.43	0.12	0.30	0.50	3
No. of axial canals			1	2?	3
F10842					
Branch diameter	8.00	1.97	5.90	9.80	3
Axial canal diameter	0.70	0.17	0.60	0.90	3
No. of axial canals			1	2?	3
F10856					
Branch diameter	6.67	1.39	5.10	9.10	17
Axial canal diameter	0.51	0.07	0.35	0.60	17
No. of axial canals			1	3?	17

Figure 18 is a scatter diagram of branch diameter and diameter of axial canal.

Remarks: The open, fairly regular, macrostructure of this species differentiates it from the much more common *S. costulata*. *S. dendroidea* has a more regular macrostructure and is usually somewhat smaller in diameter. Zukalová (1971) has suggested placing those species of *Stachyodes* with well-defined concentric laminae in the subgenus *Sphaerostroma*. However, the feature is a gradational one and no useful purpose is served by subdividing the genus in this way.

Distribution: Pillara Limestone, Sadler Limestone; Givetian and Frasnian.

Stachyodes dendroidea Etheridge Jr.

Plate 22A, B

1918 *Stachyodes dendroidea* Etheridge Jr.: p. 261.
1919 *Stachyodes dendroidea* Etheridge Jr.; Maitland: p. 29, 32.
1922 *Stachyodes dendroidea* Etheridge Jr.; Benson: p. 167.
1924 *Stachyodes dendroidea* Etheridge Jr.; Maitland: p. 30.
1933 *Stachyodes dendroidea* Etheridge Jr.; Hosking: p. 68.
1966 *Stachyodes dendroidea* Etheridge Jr.; Playford and Lowry: p. 61.
1971 *Stachyodes dendroidea* Etheridge Jr.; Fletcher: p. 17.

Material: Holotype, one specimen AM F10797 and 3 slides AM991, AM991a and AM792 all in The Australian Museum; Minnie Pool, Margaret River, Kimberley District, Western Australia. Presented to The Australian Museum by R. L. Jack in 1906. Pillara Limestone, Frasnian. Other material; F10755, NOB 48 (19889); F10920, MRM 84 (37247), topotype.

Description: (based on holotype). Coenosteum stachyodiform with branches between 2.9 and 6.5 mm in diameter and at least 25 mm long. The branches are all partly silicified on the outside. The external surface shows upstanding pillars (0.10 to 0.15 mm in diameter) which connect with adjacent pillars. The galleries (0.2 mm in diameter) are thus circular excavations between the upstanding areas. The pillars are minutely perforate.

Internally the branches consist of an axial region where the macrostructure is seen in cross section and a peripheral region where the skeletal elements are cut longitudinally. The axial region occupies about half the diameter of the branches. In the axial region the macrostructure is an amalgamate network. Two sizes of spaces occur, axial canals (up to 0.5 mm in diameter) and their branches and galleries (0.10 to 0.25 mm across). The skeletal tissue contains minute clear spaces which are the cut ends of cellules making up the striated microstructure. Usually there is only one axial canal per branch but there may be 2 or 3. The peripheral region consists of radiating striated pillars, 0.15 to 0.20 mm in diameter and indistinct laminae; intervening spaces are radially elongate and it is difficult to distinguish galleries from branches of the canal system. The skeletal tissue has an indistinct concentric structure due to the presence of light and dark lines. Dissepiments occur in the spaces.

Silicified topotype material (F10920) shows much more detail than the holotype. The striated microstructure is made up of elongate cellules which are commonest in the pillars but also occur in the laminae. Nearly all branches have only one axial canal. Laminae are thick, fairly continuous and regularly spaced; together with the pillars they separate oval to rounded galleries.

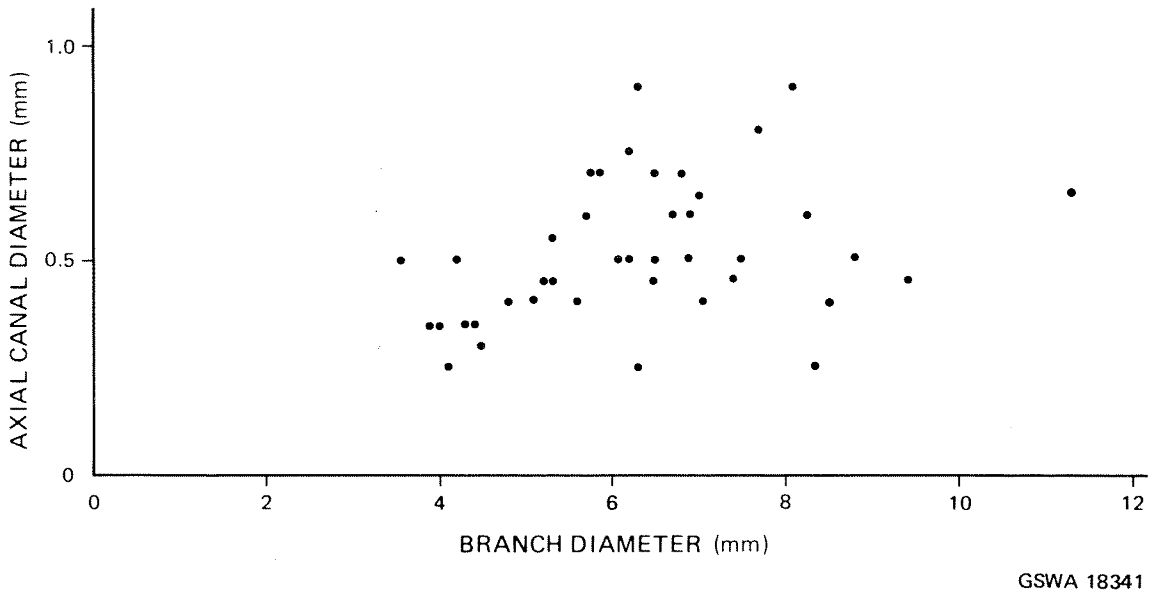


Figure 17. ***Stachyodes costulata.*** **Scatter diagram of axial canal diameter against branch diameter.**

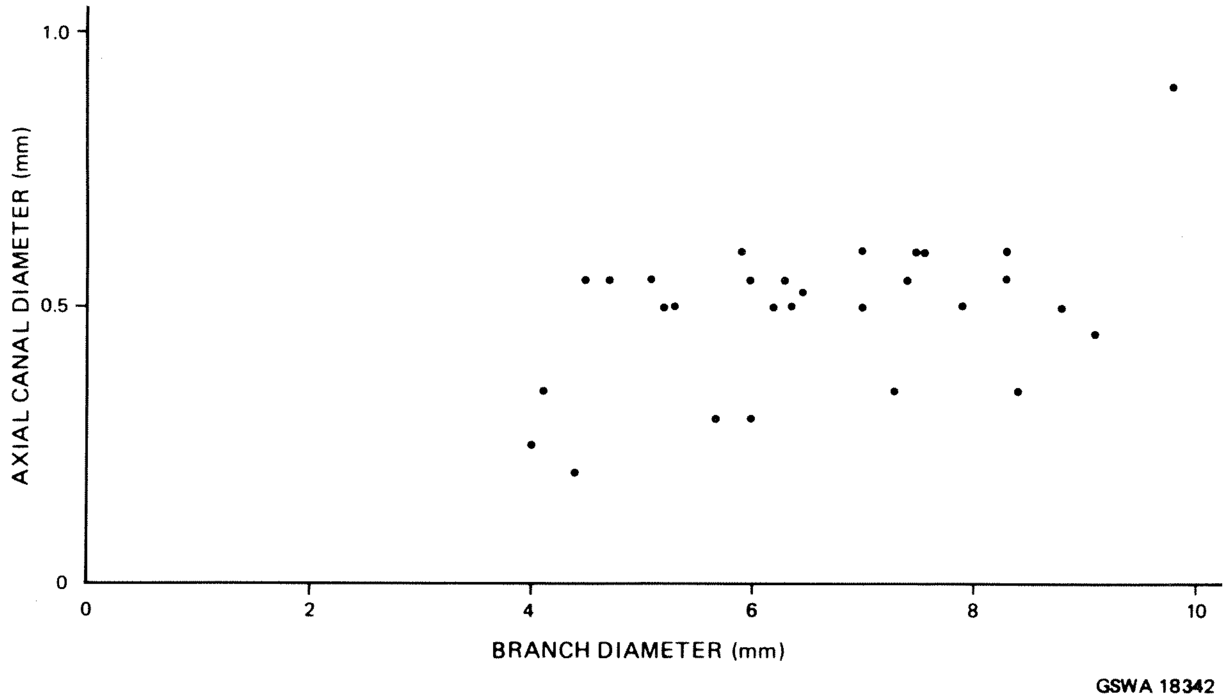


Figure 18. ***Stachyodes crassa.*** **Scatter diagram of axial canal diameter against branch diameter.**

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10920						
Branch diameter		3.31	0.66	1.95	4.60	33
Axial canal diameter		0.59	0.10	0.45	0.85	28
	t	0.108	0.016	0.075	0.125	10
	d	0.115	0.035	0.075	0.175	10
Diameter of cellules in pillars		0.041	0.008	0.025	0.050	10

Remarks: Of the previous described small species of *Stachyodes*, *S. gracilis* Lecompte most closely resembles *S. dendroidea*. However, Lecompte's (1952) species has a smaller axial canal and is of Couvinian age. Furthermore the holotype and paratype of *S. gracilis* (Lecompte, 1952, pl. 61 fig. 4 and fig. 5 respectively) appear to be so different that there is some doubt as to what constitutes this species.

The Frasnian *S. glubokensis* of Yavorsky (1957) is also very similar and examination of the type specimen may show it to be a junior synonym of the Canning Basin species, although Flügel and Flügel-Kahler (1968, p. 174) have suggested that it may be a *Dendrostroma* which *dendroidea* certainly is not.

Distribution: Pillara Limestone; Frasnian.

Genus **Stromatopora** Goldfuss

Type species: *Stromatopora concentrica* Goldfuss

Stromatopora cooperi Lecompte

Plate 23A-D

1952 *Stromatopora cooperi* Lecompte: p. 285, pl. 59 fig. 2, pl. 60 figs 1-4.

1961 *Stromatopora* cf. *cooperi* Lecompte; Stearn: p. 944, pl. 107 fig. 6.

1963 *Stromatopora cooperi* Lecompte; Stearn: p. 664, pl. 87 figs 6, 7, pl. 88 fig. 2, text fig. 3a.

1969 *Stromatopora cooperi* Lecompte; Fischbuch: p. 172, pl. 5 figs 1-5.

1971 *Stromatopora cooperi* Lecompte; Kazmierczak: p. 89, pl. 19 figs 1, 2.

1971 *Stromatopora cooperi* Lecompte; Zukalová: p. 61, pl. 18 figs 1-5.

Material: F10471, MRM 21 (19347); cf. F10500, cf. F10501, NOB 26/27 (19395); F10505, NOB 26/27 (19396); F10509, NOB 26/27 (19397); F10545, NOB 7/8 (19707); F10564, NOB 36 (19717); F10571, NOB 9 (19719); cf. F10615, NOB 18/32 (19779); ?F10620, F10622, NOB 38 (19782); cf. F10634, NOB 40 (19790); ?F10641, NOB 42/43 (19798); F10643, NOB 42/43 (19800); F10646, NOB 42/43 (19802); F10661, NOB 43/44 (19816); cf. F10769, MRM 66 (19910).

Description: Coenosteum tabular (up to 3 cm thick) or bulbous (up to 7 cm high), often with finger-like mamelons on surface or at growing edge. Latilaminate with latilaminae 3-4 mm thick. Macrostructure with vertical elements predominating and forming a network in tangential section; laminae indistinct. Galleries appear as narrow vertical tubes crossed by thin dissepiments. Sometimes galleries are obliterated by thick tissue when the only spaces in the coenostea are the astrorhizal canals which are highly developed and range from 0.4 to 0.7 mm in diameter. Latilaminae often with well-marked basal layer (e.g. in F10643, Pl. 23A) and 'open top' where galleries are vertical tubes similar in width to skeletal tissue. Microstructure microreticulate with a regular vertical and horizontal striation apparent in some specimens.

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10564	P2	6.80	0.42	6	7	10
	d	0.127	0.024	0.094	0.162	13
F10571	P2	8.00	0.82	7	9	7
	d	0.139	0.025	0.094	0.170	12
F10643	P2	8.33	0.52	8	9	6
	d	0.116	0.022	0.089	0.160	10

Remarks: Lecompte (1952), Fischbuch (1969) and Kazmierczak (1971) have all remarked on the variability of this species. The variability is due largely to the ". . . . sporadic occurrence of (horizontal) microlaminae . . . ." which ". . . . masks the usually predominant vertical (skeletal) elements." (Fischbuch, 1969, p. 173).

Galloway (1957) placed the species in *Taleastroma*, an assignment which has not been followed by other workers. Since the microstructure of *Taleastroma* cannot be interpreted unambiguously (see Stearn, 1966a) it may be best to avoid using the name.

Distribution: Pillara Limestone, Sadler Limestone; Givetian and Frasnian.

Stromatopora lennardensis n. sp.

Plate 24A-D

Material: Holotype—F10906, LNR 10 (37277)

Description: Coenosteum hemispherical or bulbous, about 15 cm high; latilaminate, upper part of latilaminae (which are 8-20 mm thick) often with very thick skeletal elements. Pillars superposed. Laminae discontinuous, sometimes with clear central line; when laminae are absent galleries appear as vertical tubes crossed by numerous dissepiments. Tangential sections suggest that laminae are regions of vermiform pillars and in the interlaminar spaces the pillars are circular. Astrorhizal canals up to 0.3 mm across, conspicuous only in tangential section. Microstructure cellular. Laminae occasionally are very thin and are microlaminae; several such microlaminae may make up a lamina which then has more than one layer of cellules. The upper surface is often covered by a microlamina.

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10906						
Holotype	L5	14.00	0.71	13	15	5
	P5	17.18	1.47	14	19	11
	t	0.124	0.034	0.071	0.188	11
	d	0.127	0.024	0.089	0.173	15

Remarks: The species does not resemble any other Canning Basin stromatoporoid. Its open macrostructure separates it from *S. cooperi* and its distinctly cellular microstructure distinguishes it from *Clathrocoilona saginata*, the only other stromatoporoid recorded from Famennian strata in the Canning Basin. *S. lennardensis* has some similarities to *Parallelopora tenuilamellatum* (Lecompte, 1952) from which it differs in the less well-developed astrorhizae and the much more widely spaced laminae. Although the species is known from only one specimen it is named because of its distinctive appearance and its Famennian age. Famennian stromatoporoids are rare both in the Canning basin and world wide.

The species is named after the Lennard River which flows through the type locality, Windjana Gorge.

Distribution: Windjana Limestone; Famennian.

Stromatopora minutitextum (Lecompte)

Plate 23A-D

?1937b *Syringostroma densum* Nicholson; Ripper: p. 182, pl. 8 figs. 3-5.

1951 *Syringostroma minutitextum* Lecompte: p. 209, pl. 34 figs. 1-4.

1971 *Stromatopora minutitextum* (Lecompte); Kazmierczak: p. 96, pl. 23 figs. 1a, 1b, 2a, 2b.

Material: F10845, LNR7 (21663)

Description: Coenosteum irregularly bulbous, poorly latilaminate. Pillars thick, long or short, often superposed; rounded in cross section between laminae, forming a network in cross section at level of laminae. Position of laminae marked by this irregular network formed by pillars; laminae are not always distinct, when they do occur they usually have a central thin clear line which extends across a few tens of pillars. Astrorhizae large and prominent. Dissepiments occur in galleries and in astrorhizal canals. Microstructure cellular.

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10845	P2	9.63	1.19	8	11	8
	d	0.079	0.017	0.056	0.117	12

Remarks: The single specimen agrees well with Lecompte's (1951) description and illustrations. The species has been variously assigned to *Syringostroma* (Lecompte, 1951), *Stromatopora* (Stearn, 1966a, Kazmierczak, 1971) and *Stictostroma* (Galloway and St. Jean, 1957). I follow Stearn and Kazmierczak in preferring *Stromatopora*, emphasising the cellular microstructure and the lack of megapillars.

Lecompte (1951, p. 210) drew attention to the resemblance between this species and Ripper's (1937b) *Syringostroma densum* from the Lilydale Limestone, Victoria. This seems to be a more appropriate comparison than his later (Lecompte, 1952, p. 227) comparison of Ripper's species with *Trupetostroma sublamellatum* Lecompte, which Stearn (1966a) suggests is also a *Stromatopora*.

Distribution: Pillara Limestone; Frasnian.

Stromatoporella Nicholson

Type species: *Stromatopora granulata* Nicholson.

Remarks: The generic nomenclature of the *Stromatoporella-Stictostroma* group of species is confused. Bargatzky's species *Diapora laminata* was placed in *Stromatoporella* by Nicholson (1886b, p. 94) who remarked: "Related to the preceding (species of *Stromatoporella*) also is the singular Stromatoporoid of the Devonian Limestones of the Paffrath district, which Bargatzky described as *Diapora laminata*, and on which he founded the genus *Diapora*. This being the case, it might have been proper, in accordance with the strict laws of priority, to retain the name *Diapora* for the present genus. Bargatzky, however, made the essential character of his genus *Diapora* to consist in the possession of thick-walled 'Caunopora' tubes, the genus being only separated from the so-called 'Caunopora' of Phillips by the character of the tissue surrounding these tubes. As, however, I am able to show that the said thick-walled tubes—whatever their nature may be—are merely of occasional occurrence, and that they only constitute a particular phase in the history of certain kinds of Stromatoporoids, it seems clear that it would be highly unadvisable to retain the names *Caunopora*, Phil., and *Diapora*, Barg., as the titles of generic divisions. It could, in fact, only lead to confusion to retain these names for forms in which the characteristic thick-walled tubes, upon the existence of which these genera were established, are commonly wholly wanting. For this reason, therefore, I have though it best to give the new name of *Stromatoporella* to the group of forms at present in question."

Nicholson rejected the generic name *Diapora* solely on the grounds of inappropriateness. Article 18 (a) of the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature, 1964) specifically excludes this as a cause for rejection of a name (the examples cited in the Code are of etymological inappropriateness but the Article is worded to admit of a wider interpretation). Consequently *Stromatoporella* is a junior synonym of *Diapora*.

In correspondence, both J. A. Fagerstrom and C. W. Stearn (pers. comm., 1979) have suggested that *laminata* is not a *Stromatoporella* but a species of *Stictostroma*. They base this on the absence of ring pillars in Lecompte's (1951) figures of the type and from the fact that Stearn was unable to see any ring pillars in Nicholson's topotype specimen No. 376. However, I think that Lecompte's figure of the type does show ring pillars, albeit poorly; furthermore the status of *Stictostroma* itself is a problem.

R. M. Jeffords, in correspondence to J. A. Fagerstrom (Fagerstrom, pers. comm., 1979) points out that *Stictostroma* Parks 1936 is invalid under Article 13 (b) of the Code since it was not accompanied by the definite fixation of a type series. Hence the generic name *Stictostroma* must be credited to Galloway and St. Jean (1957) who first validly designated the type. The type species is *Stictostroma mammilliferum* Galloway and St. Jean (1957), a new name for *Stromatopora mammillata* Nicholson (1873) not Schmidt (1858). Fagerstrom (1977) has examined the two syntypes (BM(NH) numbers P5764 and P5766) of this species, which came from Port Colborne, Ontario, and considers them unrecognisable, although no thin sections or polished surface have been prepared from the specimens. He goes on to point out that the concept of *Stictostroma* is based on Parks' specimens of *S. mammilliferum* which came from near Gorrie, Ontario and that it is uncertain whether this latter material is conspecific with the type material.

Nomenclatural difficulties aside, there is no agreement on whether *Stictostroma* is significantly different from *Stromatoporella* (see St. Jean, 1977). However, *Stromatoporella* is not free of problems; St. Jean (1977) shows that while the genus is based on *Stromatoporella granulata* Nicholson, the type of which came from Port Colborne and is now lost, our knowledge of the species *granulata* is based on specimens from Arkona. Since the Port Colborne fauna contains species of both *Stromatoporella* and *Stictostroma* (St. Jean, 1977)—including the type specimens of the type species of the two genera—a redescription of this fauna will hopefully shed some light on the question. In the meantime it is probably unwise to designate as the type of *Stromatoporella* the Arkona specimen of *S. granulata* as advocated by St. Jean (1977) in an application to the International Commission on Zoological Nomenclature. Nevertheless, the Commission will have to be asked to make some decision regarding the generic name *Diapora*.

In this work *Stromatoporella* is used in its traditional sense (see St. Jean, 1977). The genus *Stictostroma* is not recognised for two reasons: (a) the nomenclatural ambiguities associated with it and (b) the concept is not sufficiently distinct from that of *Stromatoporella*.

Stromatoporella laminata (Bargatzky)

Plate 22C, D

1881a *Diapora laminata* Bargatzky: p. 274, 288, figs 8, 9.

1886a *Stromatoporella laminata* (Bargatzky); Nicholson: p. 234 pl. 7 figs 9, 10.

1886b *Stromatoporella laminata* (Bargatzky); Nicholson: pl. 10 figs 1-4, pl. 11 fig. 10.

1951 *Stromatoporella laminata* (Bargatzky); Lecompte: p. 167, pl. 24 figs 1-5.

1970 *Stromatoporella laminata* (Bargatzky); Turnšek: p. 14, pl. 10 figs 1, 2, pl. 11 figs 1, 2, pl. 14 fig. 1.

1980 *Stromatoporella laminata* (Bargatzky); Mistiaen: p. 199, pl. VIII 8-9, pl. IX 1-2.

Material: F10355, F10356, MRM 5 (18694); F10592, NOB 14 (19745); F10746, MRM 29/64 (19880); F10872, MRM 87 (37258).

Description: Coenosteum tabular, sometimes compound tabular; may have conspicuous inquiline Tabulata. Laminae irregularly undulating, thick, with clear central area in places. Pillars thick, confined to one interlaminar space. Macrostructure fairly irregular. Galleries circular to rectangular in vertical section with rare dissepiments. Ring pillars rare. Astrorhizae prominent, with dissepiments. Microstructure unclear; probably flocculent to transversely fibrous.

Measurements:

Specimen No.		$\bar{x}$	s	min.	max.	n
F10592	L2	8.00	0.82	7	10	10
	P2	7.43	1.13	6	9	7
	t	0.110	0.019	0.071	0.155	12
	d	0.115	0.024	0.081	0.157	12
F10872	L2	7.90	0.88	6	9	10
	P2	6.25	0.71	5	7	8
	t	0.116	0.026	0.084	0.178	12
	d	0.119	0.041	0.066	0.190	13

Remarks: The Canning Basin specimens are very similar to *S. laminata* as figured by Lecompte (1951). The species is here interpreted as possessing prominent astrorhizae and an irregular macrostructure. Most specimens have inquiline tabulates within the coenosteum ("caunopora"). Presumably this should not be a diagnostic characteristic of the species but it is quite possible that coenostea lacking inquiline tabulates would be placed in a different species. The difference between *S. laminata* and *S. socialis* Nicholson seems to be gradational and the two are probably synonyms.

The compound tabular coenostea are quite striking. F10592 (Pl. 22C) is a specimen with *S. laminata* at the base, several latilaminae of *Clathrocoilona spissa* above and part of what is probably *Stachyodes australe* at the top. St. Jean (1971, Fig. 25) has illustrated a similar compound coenosteum made up of a consortium of *Stromatopora*, *Stromatoporella* and *Clathrocoilona*.

Distribution: Pillara Limestone, Sadler Limestone; Frasnian.

Genus **Trupetostroma** Parks

Type species: *Trupetostroma warreni* Parks.

Trupetostroma bassleri Lecompte

Plate 26A-E

1952 *Trupetostroma bassleri* Lecompte: p. 227, pl. 37 figs 3, 3a, 3b.

?1967 *Trupetostroma adriani* Birkhead: p. 63, pl. 11 figs 3a, 3b, 3c, 3d.

Material: F10532, MRM 52 (19692); F10536, NOB 7/28 (19703); F10542, F10543, NOB 7/28 (19706); cf. F10558, NOB 7/8 (19708); ?F10560, NOB 8 (19711); F10607, F10608, F10609, F10610, NOB 30/31 (19771); F10616, NOB 18/32 (19779); ?F10653, NOB 42/43 (19811); F10763, NOB 21 (19900); F10794, F10795, F10797, F10799, F10800 MRM 82 (19936).

Description: Coenosteum usually bulbous (up to 20 cm high), rarely irregularly tabular; latilaminate with latilaminae 4-5 mm thick. Macrostructure a regular network with undulating laminae upturned into numerous mamelons. Mamelons are from 3 to 6 mm in diameter and are spaced at 4 to 8 mm centres. Pillars thicker than laminae. There are 15 to 23 laminae in 5 mm. Galleries square with few dissepiments. Astrorhizae promiment in mamelons, canals up to 0.5 mm in diameter with numerous dissepiments. Microstructure of compact tissue, with prominent dark line in centre of laminae.

Measurements:

Specimen No.		x̄	s	min.	max.	n
F10536	L5	17.20	1.55	15	19	10
	P5	16.90	1.52	15	19	10
	t	0.069	0.018	0.048	0.099	10
	d	0.098	0.014	0.074	0.124	10
F10543	L5	18.30	1.34	16	20	10
	P5	18.50	1.51	16	20	10
	t	0.067	0.007	0.058	0.079	10
	d	0.092	0.021	0.066	0.117	10
F10799	L5	22.20	0.79	21	23	10
	P5	20.90	1.45	20	24	10
	t	0.055	0.008	0.038	0.069	10
	d	0.082	0.017	0.056	0.102	10

Remarks: This species is characterised by having well-developed low mamelons with astrorhizae which rapidly merge with the galleries. The abundance of dissepiments and the number of astrorhizal tubes in any one mamelon are quite variable. For this reason it is probable that *T. adriani* Birkhead (1967) from the Callaway Formation, Missouri, is a synonym of *T. bassleri*. Some specimens have inquiline gastropods (e.g. F10795, Pl. 26C).

Distribution: Pillara Limestone, Sadler Limestone; Frasnian.

Trupetostroma laceratum Lecompte

Plate 27A-D

1952 *Trupetostroma laceratum* Lecompte: p. 228, pl. 38 figs 1, 1a, 1b.

1963 *Trupetostroma laceratum* Lecompte; Yang and Dong: p. 156, pl. 7 figs 6, 7.

1971 *Trupetostroma laceratum* Lecompte; Kazmierczak: p. 113, pl. 30 figs 1a, 1b, 1c, 1d.

1971 *Trupetostroma pertabulatum* Zukalová: p. 79, pl. 26 figs 1-4.

Material: F10567, NOB 36 (19718); ?F10604, NOB 30 (19769); F10732, MRM 61/62 (19870); F10743, MRM 29 (19877); F10767, MRM 65 (19906); F10924, F10925, F10926, MRM 84 (29471).

Description: Coenosteum hemispherical or tabular; strongly latilaminate, with latilaminae 4 to 12 mm in thickness. Laminae undulating, usually no mamelons. Pillars thicker than laminae. There are 16 to 23 laminae in 5 mm and 16 to 22 pillars in 5 mm. Galleries are oval, with many dissepiments. Astrorhizae very conspicuous, large canals (up to 0.85 mm in diameter) with numerous dissepiments. Microstructure of compact tissue, laminae with prominent dark line.

Measurements:

Specimen No.		x̄	s	min.	max.	n
F10743	L5	18.30	1.42	16	20	10
	P5	18.70	1.49	16	21	10
	t	0.056	0.010	0.043	0.069	10
	d	0.084	0.012	0.071	0.107	10

Measurements:

Specimen No.		x̄	s	min.	max.	n
F10925	L5	21.60	1.65	19	23	10
	P5	19.50	1.18	18	22	10
	t	0.046	0.007	0.038	0.058	10
	d	0.084	0.019	0.063	0.124	10

Remarks: The abundant dissepiments and the large astrorhizal canals characterize this species. The Canning Basin specimens have good latilaminae, a feature not well-developed in Lecompte's (1952, p. 228) material. Kazmierczak (1971) placed *T. tenuilamellatum* Lecompte in synonymy with this species. Judging from Lecompte's illustrations, the two are remarkably similar. However, on the basis of Lecompte's description of the microstructure, Stearn (1966a) placed *tenuilamellatum* in *Parallelopora*. There seems to be no essential difference between *T. pertabulatum* Zukalová (1971) and *T. laceratum*. This similarity extends to the presence of inquiline gastropods which can be seen in Zukalová's holotype (1971, pl. 26 fig. 4a upper right) and are common in Canning Basin specimens, e.g. F10925 (Pl. 27A, B).

Distribution: Pillara Limestone; Frasnian.

Trupetostroma mclearni (Stearn)

Plate 28A, B

1962 *Idiostroma mclearni* Stearn: p. 7, pl. 2 figs. 4, 5, pl. 3 figs. 2-4.

1966a *Trupetostroma mclearni* (Stearn); Stearn: p. 106.

1970b *Trupetostroma mclearni* (Stearn); Fischbuch: p. 1078, pl. 147 fig. 8, pl. 148 figs. 1, 2.

Material: F10508, NOB 26/27 (19397); F10512, NOB 26/27 (19398); F10627, NOB 33 (19787).

Description: Coenosteum irregular to stachyodiform, cylindrical branches range from 3.5 to 9.0 mm in diameter. As is usual in stachyodiform coenostea, the pillars and laminae are not clearly differentiated in the axial region. Peripherally the pillars are superposed, thick; laminae thin with a well-marked central row of dark granules. Galleries rounded to radially elongate; very variable in size, sometimes large, sometimes hardly visible. There is a well marked axial canal, crossed by dissepiments, in the branches. Microstructure compact to confertum-like.

Measurements:

Specimen No.		x̄	s	min.	max.	n
F10508	L2	8.75	1.28	7	11	8
	t	0.108	0.025	0.081	0.160	11
	d	0.149	0.018	0.117	0.175	12

Remarks: Although Stearn's (1962) original description referred to stachyodiform coenostea, Fischbuch (1970b), included irregular forms in his concept of the species. While the Canning Basin material is not common, it supports Fischbuch's suggestion that the species includes both dendroid and encrusting coenostea.

Distribution: Pillara Limestone; Givetian and Frasnian.

APPENDIX 1

LIST OF FOSSIL LOCALITIES WITH IDENTIFICATIONS OF STROMATOPOROIDS

Fossil locality number(1)	Sample number	Formation	Stromatoporoids	Remarks
			A. SECTIONS (for positions see Figure 5)	
			Section 1 Emanuel Range, Kudata Gap	
NOB 30	19769	Pillara Limestone	*Actinostroma windjanicum* *Amphipora rudis* *Stachyodes* cf. *crassa* *Trupetostroma laceratum?*	Frasnian; back-reef and bank subfacies
NOB 30/31	19770	Pillara Limestone	*Amphipora rudis* *Clathrocoilona spissa* *Hermatostroma* sp.?	Frasnian; back-reef and bank subfacies
NOB 30/31	19771	Pillara Limestone	*Trupetostroma bassleri*	Frasnian; back-reef and bank subfacies
NOB 31	19638	Sadler Limestone	*Stachyodes costulata*	Frasnian; marginal-slope to basin facies
NOB 31	19639	Sadler Limestone	*Stachyodes costulata*	Frasnian; marginal-slope to basin facies
NOB 31	19776	Sadler Limestone	*Actinostroma papillosum*	Frasnian; marginal-slope to basin facies
NOB 32	3233	Sadler Limestone	*Stachyodes costulata*	Frasnian; marginal-slope to basin facies
NOB 32	19778	Sadler Limestone	*Stachyodes costulata*	Frasnian; marginal-slope to basin facies
NOB 18/32	19779	Sadler Limestone	*Stachyodes costulata* *Stromatopora* cf. *cooperi* *Trupetostroma bassleri*	Frasnian; marginal-slope to basin facies
NOB 18	19781	Sadler Limestone	*Anostylostroma ponderosum* *Stachyodes* sp.	Frasnian; marginal-slope to basin facies
			Section 2 Emanuel Range, Kunian Gap	
NOB 26/27	19394	Pillara Limestone	*Anostylostroma* cf. *ponderosum* *Stachyodes crassa*	Givetian; back-reef and bank subfacies
NOB 26/27	19395	Pillara Limestone	*Actinostroma papillosum* *Stromatopora* cf. *cooperi*	Givetian; back-reef and bank subfacies
NOB 26/27	19396	Pillara Limestone	*Actinostroma papillosum* *Amphipora* sp. *Stachyodes crassa* *Stromatopora* cf. *cooperi*	Givetian; back-reef and bank subfacies
NOB 26/27	19397	Pillara Limestone	*Actinostroma papillosum* *Stromatopora cooperi* *Trupetostroma mclearni*	Givetian; back-reef and bank subfacies
NOB 26/27	19398	Pillara Limestone	*Actinostroma papillosum* var. B *A.* sp. *Trupetostroma mclearni*	Givetian; back-reef and bank subfacies
NOB 7/28	19399	Pillara Limestone	*Amphipora* sp. *Stachyodes crassa*	Givetian/Frasnian; back-reef and bank subfacies
NOB 7/28	19702	Pillara Limestone	*Actinostroma* sp. *Amphipora rudis*	Frasnian; back-reef and bank subfacies
NOB 7/28	19703	Pillara Limestone	*Amphipora rudis* *Stachyodes crassa* *Trupetostroma bassleri*	Frasnian; back-reef and bank subfacies
NOB 7/28	19704	Pillara Limestone	*Amphipora rudis* *Stachyodes crassa*	Frasnian; back-reef and bank subfacies
NOB 7/28	19705	Pillara Limestone	*Amphipora rudis*	Frasnian; back-reef and bank subfacies
NOB 7/28	19706	Pillara Limestone	*Amphipora rudis* *Stachyodes* sp. *Trupetostroma bassleri*	Frasnian; back-reef and bank subfacies
NOB 7/8	19707	Pillara Limestone	*Actinostroma papillosum* *Stromatopora cooperi*	Frasnian; back-reef and bank subfacies
NOB 7/8	19708	Pillara Limestone	*Actinostroma* sp. *Amphipora* sp. *Trupetostroma* cf. *bassleri*	Frasnian; back-reef and bank subfacies
NOB 7/8	19709	Pillara Limestone	*Actinostroma papillosum* var. A *A.* sp. *Amphipora* sp. *Clathrocoilona spissa?* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
NOB 7/8	19710	Pillara Limestone	*Amphipora* sp. *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
NOB 8	19711	Pillara Limestone	*Stachyodes costulata* *Trupetostroma bassleri?*	Frasnian; reef-margin subfacies
			Section 3 Sadler Ridge	
NOB 14	19745	Sadler Limestone	*Amphipora rudis* *Clathrocoilona spissa* ?*Stachyodes australe* *S.* sp. *Stromatoporella laminata*	Frasnian; marginal-slope to basin facies
NOB 14	19748	Sadler Limestone	*Actinostroma papillosum* var. A	Frasnian; marginal-slope to basin facies
NOB 14	19749	Sadler Limestone	*Actinostroma windjanicum*	Frasnian; marginal-slope to basin facies
NOB 14	19750	Sadler Limestone	*Actinostroma papillosum*	Frasnian; marginal-slope to basin facies
NOB 14	19751	Sadler Limestone	*Actinostroma papillosum* *A. windjanicum* *Amphipora* sp. *Stachyodes costulata*	Frasnian; marginal-slope to basin facies

Fossil locality number	Sample number	Formation	Stromatoporoids	Remarks
			Section 4 Sadler Ridge	
NOB 12	19727	Sadler Limestone	*Actinostroma papillosum*	Frasnian; marginal-slope to basin facies
NOB 12	19729	Sadler Limestone	*Actinostroma papillosum* var. A	Frasnian; marginal-slope to basin facies
NOB 12	19730	Sadler Limestone	*Actinostroma papillosum*	Frasnian; marginal-slope to basin facies
NOB 12	19731	Sadler Limestone	*Hermatostroma schlueteri*	Frasnian; marginal-slope to basin facies
NOB 12	19732	Sadler Limestone	*Actinostroma papillosum*	Frasnian; marginal-slope to basin facies
NOB 12	19735	Sadler Limestone	*Amphipora rudis* *Stachyodes costulata*	Frasnian; marginal-slope to basin facies
NOB 12	19736	Sadler Limestone	*Actinostroma windjanicum*	Frasnian; marginal-slope to basin facies
NOB 12	19738	Sadler Limestone	*Actinostroma windjanicum*	Frasnian; marginal-slope to basin facies
NOB 12	19740	Sadler Limestone	*Actinostroma papillosum*	Frasnian; marginal-slope to basin facies
			Section 5 Emanuel Range	
NOB 42	19797	Pillara Limestone	*Actinostroma papillosum* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
NOB 42/43	19798	Pillara Limestone	*Hermatostroma schlueteri* *Stachyodes* sp. ?*Stromatopora cooperi*	Frasnian; back-reef and bank subfacies
NOB 42/43	19800	Pillara Limestone	*Stachyodes costulata* *Stromatopora cooperi*	Frasnian; back-reef and bank subfacies
NOB 42/43	19801	Pillara Limestone	*Anostylostroma ponderosum* *Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
NOB 42/43	19802	Pillara Limestone	*Stromatopora cooperi*	Frasnian; back-reef and bank subfacies
NOB 42/43	19804	Pillara Limestone	*Clathrocoilona spissa*	Frasnian; back-reef and bank subfacies
NOB 42/43	19805	Pillara Limestone	*Actinostroma papillosum* *Amphipora rudis* *Anostylostroma ponderosum*	Frasnian; back-reef and bank subfacies
NOB 42/43	19808	Pillara Limestone	*Hermatostroma* sp.	Frasnian; back-reef and bank subfacies
NOB 42/43	19811	Pillara Limestone	?*Hermatostroma schlueteri* *Trupetostroma bassleri*	Frasnian; back-reef and bank subfacies
NOB 43	19812	Pillara Limestone	*Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
NOB 43/44	19813	Pillara Limestone	*Stachyodes* sp.	Frasnian; back-reef and bank subfacies
NOB 43/44	19814	Pillara Limestone	*Amphipora rudis* *Hermatostroma perseptatum* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
NOB 43/44	19815	Pillara Limestone	*Hermatostroma* sp.	Frasnian; back-reef and bank subfacies
NOB 43/44	19816	Pillara Limestone	*Clathrocoilona spissa* *Hermatostroma perseptatum* *Stromatopora cooperi*	Frasnian; back-reef and bank subfacies
NOB 43/44	19817	Pillara Limestone	*Hermatostroma ambiguum*	Frasnian; back-reef and bank subfacies
NOB 44	19818	Pillara Limestone	*Amphipora rudis* *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
NOB 44/45	19819	Pillara Limestone	*Amphipora rudis*	Frasnian; back-reef and bank subfacies
NOB 44/45	19820	Pillara Limestone	*Hermatostroma perseptatum*	Frasnian; back-reef and bank subfacies
NOB 44/45	19821	Pillara Limestone	*Actinostroma papillosum* *Hermatostroma* sp.	Frasnian; back-reef and bank subfacies
NOB 44/45	19822	Pillara Limestone	*Amphipora* sp. *Clathrocoilona spissa* *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
NOB 44/45	19824	Pillara Limestone	*Actinostroma* sp. *Amphipora rudis* *Clathrocoilona spissa* *Hermatostroma perseptatum* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
NOB 45	19825	Pillara Limestone	*Actinostroma papillosum* *A. windjanicum* *Amphipora rudis* *Clathrocoilona spissa* *Stachyodes costulata* *S.* sp.	Frasnian; back-reef and bank subfacies
			Section 6 Emanuel Range	
NOB 48	19889	Pillara Limestone	*Actinostroma papillosum* *Stachyodes dendroidea*	Frasnian; back-reef and bank subfacies
NOB 21/48	19890	Pillara Limestone	*Actinostroma* sp. *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
NOB 21/48	19892	Pillara Limestone	*Actinostroma papillosum*	Frasnian; back-reef and bank subfacies
NOB 21/48	19894	Pillara Limestone	*Actinostroma papillosum*	Frasnian; back-reef and bank subfacies
NOB 21/48	19896	Pillara Limestone	*Actinostroma papillosum* *Clathrocoilona spissa*	Frasnian; back-reef and bank subfacies
NOB 21/48	19898	Pillara Limestone	*Hermatostroma perseptatum*	Frasnian; back-reef and bank subfacies
NOB 21/48	19899	Pillara Limestone	*Amphipora* sp. *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
NOB 21	19900	Pillara Limestone	*Stachyodes* sp. *Trupetostroma bassleri*	Frasnian; back-reef and bank subfacies
NOB 21	19902	Pillara Limestone	*Anostylostroma ponderosum*	Frasnian; back-reef and bank subfacies

APPENDIX 1—*continued.*

Fossil locality number	Sample number	Formation	Stromatoporoids	Remarks
			Section 7 Emanuel Range	
NOB 49	19924	Pillara Limestone	*Actinostroma* sp.	Frasnian; back-reef and bank subfacies
MRM 72	19929	Pillara Limestone	*Amphipora rudis*	Frasnian; back-reef and bank subfacies
MRM 72/73	19930	Pillara Limestone	*Actinostroma papillosum* *Atelodictyon stelliferum*	Frasnian; back-reef and bank subfacies
MRM 73	19932	Pillara Limestone	*Actinostroma papillosum*	Frasnian; back-reef and bank subfacies
			Section 8 Emanuel Range	
MRM 65	19906	Pillara Limestone	*Amphipora rudis* *Stachyodes costulata* *Trupetostroma laceratum*	Frasnian; back-reef and bank subfacies
MRM 65	19907	Pillara Limestone	*Actinostroma windjanicum*	Frasnian; back-reef and bank subfacies
MRM 66	19910	Pillara Limestone	*Stromatopora* cf. *cooperi*	Frasnian; back-reef and bank subfacies
MRM 66	19911	Pillara Limestone	*Actinostroma papillosum*	Frasnian; back-reef and bank subfacies
			Section 9 Emanuel Range	
NOB 46	19827	Pillara Limestone	*Amphipora rudis* *Hermatostroma schlueteri* *Stachyodes costulata*	Frasnian; reef-margin subfacies
NOB 20/46	19829	Pillara Limestone	*Actinostroma windjanicum* *Clathrocoilona spissa* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
NOB 20	19830	Pillara Limestone	*Actinostroma windjanicum* *Amphipora* sp. *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
NOB 20	19831	Pillara Limestone	*Actinostroma papillosum*	Frasnian; back-reef and bank subfacies
NOB 20/47	19832	Pillara Limestone	*Amphipora* sp.	Frasnian; back-reef and bank subfacies
NOB 20/47	19833	Pillara Limestone	*Actinostroma papillosum* *Amphipora pervesiculata* *A. rudis*	Frasnian; back-reef and bank subfacies
NOB 20/47	19834	Pillara Limestone	*Actinostroma papillosum* *Clathrocoilona spissa*	Frasnian; back-reef and bank subfacies
NOB 20/47	19835	Pillara Limestone	*Pseudoactinodictyon dartingtoniensis*	Frasnian; back-reef and bank subfacies
NOB 20/47	19836	Pillara Limestone	*Actinostroma papillosum* *Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
NOB 20/47	19837	Pillara Limestone	*Amphipora* sp. *Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
NOB 20/47	19839	Pillara Limestone	*Actinostroma papillosum*	Frasnian; back-reef and bank subfacies
NOB 47	19840	Pillara Limestone	*Actinostroma papillosum*	Frasnian; back-reef and bank subfacies
NOB 47	19841	Pillara Limestone	*Actinostroma papillosum* *A. papillosum* var. A *Anostylostroma ponderosum* *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
			Section 10 Laidlaw Range	
MRM 53	19843	Pillara Limestone	*Actinostroma* sp. *Amphipora* sp. *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 53/54	19845	Pillara Limestone	*Amphipora rudis* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 54	19846	Pillara Limestone	*Amphipora* sp. *Hermatostroma* sp. *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 55	19848	Pillara Limestone	*Actinostroma* sp.	Frasnian; back-reef and bank subfacies
MRM 55	19849	Pillara Limestone	*Actinostroma papillosum* var. A *A.* sp.	Frasnian; back-reef and bank subfacies
MRM 56	19850	Pillara Limestone	*Amphipora rudis* *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 56/57	19851	Pillara Limestone	*Actinostroma papillosum*	Frasnian; back-reef and bank subfacies
MRM 56/57	19852	Pillara Limestone	*Amphipora rudis* *A.* sp. *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 57	19854	Pillara Limestone	*Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 57/58	19855	Pillara Limestone	*Amphipora* sp. *Clathrocoilona spissa* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 57/58	19859	Pillara Limestone	*Amphipora* cf. *rudis*	Frasnian; reef-margin subfacies
MRM 58	19861	Sadler Limestone	*Actinostroma* sp.	Frasnian; marginal-slope facies
			Section 11 Southern Lawford Range	
MRM 29	19877	Pillara Limestone	*Stachyodes costulata* *Trupetostroma laceratum*	Frasnian; reef-margin subfacies
MRM 29/64	19879	Pillara Limestone	*Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 29/64	19880	Pillara Limestone	*Amphipora rudis* *A.*sp. *Stachyodes costulata* *Stromatoporella laminata*	Frasnian; back-reef and bank subfacies
MRM 29/64	19881	Pillara Limestone	*Actinostroma windjanicum*	Frasnian; back-reef and bank subfacies
MRM 29/64	19886	Pillara Limestone	*Stachyodes costulata*	Frasnian; back-reef and bank subfacies

Fossil locality number	Sample number	Formation	Stromatoporoids	Remarks
MRM 29/64	19882	Pillara Limestone	*Hermatostroma* sp.	Frasnian; back reef and bank subfacies
MRM 29/64	19885	Pillara Limestone	*Actinostroma papillosum* *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 64	19884	Pillara Limestone	*Amphipora pervesiculata* *A. rudis*	Frasnian; reef-margin subfacies
			Section 12 Southern Lawford Range	
MRM 61	19865	Pillara Limestone	*Amphipora pervesiculata* *A. rudis*	Frasnian; back-reef and bank subfacies
MRM 61/62	19866	Pillara Limestone	*Actinostroma windjanicum* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 61/62	19867	Pillara Limestone	*Actinostroma* sp. *Amphipora rudis* *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 61/62	19868	Pillara Limestone	*Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
MRM 61/62	19869	Pillara Limestone	*Amphipora rudis*	Frasnian; back-reef and bank subfacies
MRM 61/62	19870	Pillara Limestone	*Trupetostroma laceratum*	Frasnian; back-reef and bank subfacies
MRM 62	19872	Pillara Limestone	*Actinostroma papillosum* *Amphipora* sp. *Clathrocoilona spissa* *Hermatostroma schlueteri* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 62/63	19873	Pillara Limestone	*Actinostroma* sp. *Amphipora* sp. *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 62/63	19875	Pillara Limestone	*Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
MRM 63	19876	Pillara Limestone	*Actinostroma papillosum* *Hermatostroma* sp.	Frasnian; reef-margin subfacies
			Section 13 Southern Lawford Range	
MRM 70	19919	Pillara Limestone	*Amphipora rudis* *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 70/71	19921	Pillara Limestone	*Amphipora rudis* *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 71	19922	Pillara Limestone	*Actinostroma windjanicum* *A.* cf. *windjanicum* *Amphipora rudis* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
			Section 14 Southern Lawford Range	
MRM 4	18693	Sadler Limestone	*Amphipora pervesiculata* *A. rudis* *Hermatostroma* sp. *Stachyodes sp.*	Frasnian; marginal-slope facies
MRM 5	18694	Sadler Limestone	*Amphipora* sp. *Clathrocoilona spissa* *Stachyodes* sp. *Stromatoporella laminata*	Frasnian; marginal-slope facies
MRM 31	18696	Pillara Limestone	*Amphipora rudis* *A.* sp. *Pseudoactinodictyon dartingtoniensis* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 31	18698	Pillara Limestone	*Actinostroma papillosum* *A. windjanicum* *Amphipora* sp. *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 32	18700	Pillara Limestone	*Amphipora rudis* *A.* sp.	Frasnian; back-reef and bank subfacies
			Section 15 Wray Hills	
MRM 67	19912	Virgin Hills Formation	*Stachyodes* sp.	Frasnian; marginal-slope facies
MRM 68	19913	Pillara Limestone	*Actinostroma papillosum* *Clathrocoilona spissa* *Stachyodes costulata*	Frasnian; reef-margin subfacies
MRM 68/69	19914	Pillara Limestone	*Actinostroma papillosum* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 68/69	19915	Pillara Limestone	*Amphipora* sp. *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 69	19916	Pillara Limestone	*Amphipora rudis* *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
		B. SPOT SAMPLES (for positions see Figures 4 and 5)		
LNR 6	21661	Pillara Limestone	*Actinostroma papillosum* *Stachyodes costulata*	Frasnian; patch-reef subfacies
LNR 7	21663	Pillara Limestone	*Actinostroma windjanicum* *A.* cf. *windjanicum* *Hermatostroma* cf. *ambiguum* *Stachyodes crassa* *Stromatopora minutitextum*	Frasnian; reef-flat subfacies

APPENDIX 1—*continued.*

Fossil locality number	Sample number	Formation	Stromatoporoids	Remarks
	37058	Pillara Limestone	*Actinostroma windjanicum*	Frasnian; reef-flat subfacies
	37059	Pillara Limestone	*Hermatostroma ambiguum*	Frasnian; reef-flat subfacies
	37060	Pillara Limestone	*Hermatostroma ambiguum*	Frasnian; reef-flat subfacies
LNR 8	37052	Napier Formation	*Amphipora* sp. *Hermatostroma* sp. *Stachyodes* sp.	Frasnian; marginal-slope facies
LNR 9	37264	Pillara Limestone	*Actinostroma* cf. *windjanicum*	Frasnian; back-reef and bank surfacies
	37278	Pillara Limestone	*Atelodictyon stelliferum*	Frasnian; back-reef and bank subfacies
LNR 10	37265	Windjana Limestone	*Clathrocoilona saginata*	Famennian; reef-margin subfacies
	37277	Windjana Limestone	*Stromatopora lennardensis*	Famennian; reef-margin subfacies
LNR 11	37267	Windjana Limestone	*Clathrocoilona saginata*	Famennian; reef-margin subfacies
	37268	Windjana Limestone	*Clathrocoilona saginata*	Famennian; reef-margin subfacies
LNR 12	37274	Pillara Limestone	*Actinostroma* cf. *papillosum* *A. windjanicum* *A.* sp. ?*Clathrocoilona spissa* ?*Hermatostroma* sp. *Stachyodes costulata*	Frasnian; platform facies
MRM 2	18660	Pillara Limestone	*Actinostroma papillosum* *Stachyodes costulata*	Frasnian; reef-margin subfacies
MRM 3	18666	Pillara Limestone	*Clathrocoilona spissa* *Stachyodes costulata*	Frasnian; reef-margin subfacies
	18667	Pillara Limestone	*Actinostroma windjanicum* *A.* sp. *Stachyodes costulata*	Frasnian; reef-margin subfacies
MRM 6	19308	Pillara Limestone	*Stachyodes costulata*	Frasnian; reef-margin subfacies
MRM 8	19311	Pillara Limestone	*Clathrocoilona spissa* *Stachyodes costulata*	Frasnian; reef-margin subfacies
	19312	Pillara Limestone	?.*Clathrocoilona spissa* *Hermatostroma ambiguum*	Frasnian; reef-margin subfacies
MRM 9	19314	Pillara Limestone	*Amphipora* sp. *Clathrocoilona spissa* *Hermatostroma schlueteri* *Stachyodes costulata*	Frasnian; reef-margin subfacies
	19315	Pillara Limestone	*Hermatostroma ambiguum*	Frasnian; reef-margin subfacies
	19316	Pillara Limestone	*Actinostroma windjanicum*	Frasnian; reef-margin subfacies
MRM 11	19321	Pillara Limestone	*Clathrocoilona spissa*	Frasnian; reef-margin subfacies
MRM 12	19322	Pillara Limestone	*Actinostroma papillosum* *A. windjanicum* *Clathrocoilona spissa*	Frasnian; reef-margin subfacies
MRM 13	19323	Pillara Limestone	*Amphipora rudis* *Clathrocoilona spissa* *Hermatostroma ambiguum* *Stachyodes costulata*	Frasnian; reef-margin subfacies
	19324	Pillara Limestone	*Actinostroma papillosum* *A.* sp. *Clathrocoilona spissa* *Hermatostroma ambiguum*	Frasnian; reef-margin subfacies
MRM 15	19327	Pillara Limestone	?*Anostylostroma ponderosum*	Frasnian; reef-flat and back-reef subfacies
	19328	Pillara Limestone	*Clathrocoilona spissa* *Hermatostroma schlueteri*	Frasnian; reef-flat and back-reef subfacies
	19335	Pillara Limestone	*Hermatostroma ambiguum*	Frasnian; reef-flat and back-reef subfacies
MRM 16	19331	Pillara Limestone	*Actinostroma* sp. *Clathrocoilona spissa*	Frasnian; reef-margin subfacies
	19340	Pillara Limestone	?*Hermatostroma ambiguum*	Frasnian; reef-margin subfacies
MRM 17	19333	Pillara Limestone	*Amphipora rudis* ?*Clathrocoilona spissa* *Hermatostroma* sp. *Stachyodes costulata*	Frasnian; reef-margin subfacies
MRM 19	19338	Pillara Limestone	*Clathrocoilona spissa* ?*Hermatostroma ambiguum*	Frasnian; reef-flat and back-reef subfacies
	19339	Pillara Limestone	*Actinostroma papillosum* *Hermatostroma ambiguum*	Frasnian; reef-flat and back-reef subfacies
	19344	Pillara Limestone	*Clathrocoilona spissa*	Frasnian; reef-flat and back-reef subfacies
MRM 20	19346	Pillara Limestone	*Amphipora* sp. *Stachyodes costulata*	Frasnian; reef-margin subfacies
MRM 21	19347	Sadler Limestone	*Stachyodes australe* *Stromatopora cooperi*	Frasnian; marginal-slope facies
MRM 23	19349	Sadler Limestone	?*Clathrocoilona spissa* *Stachyodes* sp.	Frasnian; marginal-slope facies
	19350	Sadler Limestone	*Amphipora rudis* *Atelodictyon* cf. *stelliferum* *Clathrocoilona spissa* *Hermatostroma schlueteri* *Stachyodes costulata*	Frasnian; marginal-slopes facies
MRM 26	19615	Virgin Hills Formation	*Stachyodes australe* *Hermatostroma ambiguum*	Frasnian; marginal-slope facies
MRM 33	18645	Pillara Limestone	*Clathrocoilona spissa*	Frasnian; reef-margin subfacies
	18665	Pillara Limestone	*Actinostroma* cf. *windjanicum* *Clathrocoilona spissa* *Stachyodes costulata*	Frasnian; reef-margin subfacies

APPENDIX 1—*continued.*

Fossil locality number	Sample number	Formation	Stromatoporoids	Remarks
MRM 34	19959	Pillara Limestone	*Actinostroma windjanicum* *A.* sp. *Clathrocoilona spissa* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
	21585	Pillara Limestone	*Clathrocoilona spissa* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 35	19960	Pillara Limestone	*Actinostroma papillosum* var. A *Amphipora* sp. *Stachyodes costulata*	Frasnian; reef-margin subfacies
	19961	Pillara Limestone	*Actinostroma papillosum*	Frasnian; reef-margin subfacies
MRM 36	19302	Pillara Limestone	*Actinostroma* cf. *papillosum* *A. papillosum* var. A *A. windjanicum* *Amphipora pervesiculata* *A. rudis* *Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
MRM 37	19355	Pillara Limestone	*Actinostroma windjanicum* *A.* cf. *windjanicum* *Stachyodes costulata*	Frasnian; reef-margin subfacies
MRM 38	19372	Pillara Limestone	*Actinostroma* sp. *Stachyodes* sp.	Frasnian; reef-margin subfacies
MRM 39	19376	Virgin Hills Formation	*Actinostroma* sp.	Frasnian; marginal-slope facies
MRM40	19383	Pillara Limestone	*Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
MRM 41	19384	Pillara Limestone	*Actinostroma papillosum* var. A *A.* sp. *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 42	19386	Pillara Limestone	*Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
MRM 43	19388	Sadler Limestone	*Actinostroma windjanicum*	Frasnian; marginal-slope facies
MRM 44	19616	Pillara Limestone	*Actinostroma* sp. *Stachyodes australe*	Frasnian; reef-margin subfacies
MRM 45	19617	Pillara Limestone	*Actinostroma windjanicum* *A.* sp.	Frasnian; reef-margin subfacies
MRM 46	19618	Pillara Limestone	*Stachyodes australe*	Frasnian; reef-margin subfacies
MRM 47	19621	Pillara Limestone	*Stachyodes australe*	Frasnian; reef-margin subfacies
MRM 48	19661	Pillara Limestone	*Stachyodes costulata*	Frasnian; reef-margin subfacies
MRM 49	19671	Sadler Limestone	*Actinostroma papillosum* var. A	Frasnian; marginal-slope to basin facies
MRM 50	19673	Pillara Limestone	*Amphipora* cf. *pervesiculata*	Frasnian; back-reef and bank subfacies
MRM 51	19690	Pillara Limestone	*Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
MRM 52	19691	Pillara Limestone	*Actinostroma windjanicum* *Amphipora rudis* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
	19692	Pillara Limestone	*Trupetostroma bassleri*	Frasnian; back-reef and bank subfacies
MRM 59	19862	Pillara Limestone	*Actinostroma papillosum*	Frasnian; reef-margin subfacies
MRM 60	19863	Sadler Limestone	*Actinostroma papillosum*	Frasnian; marginal-slope to basin facies
	21577	Sadler Limestone	*Actinostroma windjanicum*	Frasnian; marginal-slope to basin facies
MRM 74	19957	Pillara Limestone	*Hermatostroma roemeri*	Frasnian; reef-margin subfacies
	19958	Pillara Limestone	*Actinostroma* cf. *windjanicum* *A.* sp.	Frasnian; reef-margin subfacies
	21584	Pillara Limestone	*Hermatostroma roemeri*	Frasnian; reef-margin subfacies
MRM 75	21580	Pillara Limestone	*Actinostroma windjanicum* *Amphipora rudis* *Atelodictyon stelliferum* *Stachyodes* sp.	Frasnian; back-reef and bank subfacies
MRM 76	21582	Pillara Limestone	*Hermatostroma ambiguum*	Frasnian; reef-margin subfacies
MRM 77	21583	Pillara Limestone	*Stachyodes costulata*	Frasnian; reef-margin subfacies
MRM 78	3496	Pillara Limestone	*Actinostroma papillosum*	Frasnian; reef-margin subfacies (allochthonous block)
	37245	Pillara Limestone	*Actinostroma papillosum* ?*Hermatostroma roemeri* *H.* sp.	Frasnian; reef-margin subfacies (allochthonous block)
MRM 79	3497	Pillara Limestone	*Actinostroma papillosum* *Clathrocoilona spissa* *Hermatrostroma roemeri* *H. schlueteri*	Frasnian; reef-margin subfacies (allochthonous block)
	37262	Pillara Limestone	*Actinostroma papillosum* ?*Hermatostroma roemeri*	Frasnian; reef-margin subfacies (allochthonous block)
MRM 80	11671	Pillara Limestone	*Actinostroma papillosum* var. B	Frasnian; reef-flat subfacies
MRM81	37259	Pillara Limestone	*Amphipora rudis*	Frasnian; back-reef and bank subfacies
MRM 82	19936	Pillara Limestone	*Hermatostroma perseptatum* *Stachyodes crassa*? *Trupetostroma bassleri*	Frasnian; platform facies
MRM 83	19937	Pillara Limestone	*Anostylostroma ponderosum*	Frasnian; platform facies
MRM 84	29471	Pillara Limestone	*Actinostroma papillosum* *Trupetostroma laceratum*	Frasnian; back-reef and bank subfacies
	37247	Pillara Limestone	*Hermatostroma schlueteri* *Stachyodes dendroidea*	Frasnian; back-reef and bank subfacies
MRM 85	37252	Nullara Limestone	?*Clathrocoilona saginata*	Famennian; back-reef and bank subfacies
MRM 86	37254	Pillara Limestone	*Stachyodes costulata*	Frasnian; back-reef and bank subfacies
MRM 87	37258	Pillara Limestone	*Stromatoporella laminata*	Frasnian; back-reef and bank subfacies
MRM 88	18691	Pillara Limestone	*Actinostroma papillosum* var. A	Frasnian; back-reef and bank subfacies

APPENDIX 1—*continued.*

Fossil locality number	Sample number	Formation	Stromatoporoids	Remarks
NOB 9	19719	Sadler Limestone	*Actinostroma papillosum* *Anostylostroma ponderosum* *Clathrocoilona spissa* ?*Hermatostroma* sp. *Stromatopora cooperi*	Frasnian; marginal-slope to basin facies
	19720	Sadler Limestone	*Anostylostroma ponderosum* *Hermatostroma ambiguum*	Frasnian; marginal-slope to basin facies
	19721	Sadler Limestone	*Anostylostroma ponderosum* *Stachyodes* sp.	Frasnian; marginal-slope to basin facies
NOB 11	19725	Sadler Limestone	?*Dendrostroma oculatum* *Hermatostroma perseptatum*	Frasnian; marginal-slope to basin facies
	29451	Sadler Limestone	*Dendrostroma oculatum*	Frasnian; marginal slope to basin facies
NOB 22	19351	Pillara Limestone	*Clathrocoilona spissa* *Hermatostroma schlueteri* *Stachyodes costulata*	Frasnian; patch-reef subfacies
	30454	Pillara Limestone	*Clathrocoilona spissa*	Frasnian; patch-reef subfacies
	37068	Pillara Limestone	?*Hermatostroma schlueteri*	Frasnian; patch-reef subfacies
	37261	Pillara Limestone	*Clathrocoilona spissa*	Frasnian; patch-reef subfacies
NOB 23	19352	Sadler Limestone	*Amphipora rudis* *Hermatostroma schlueteri*	Frasnian; marginal-slope facies
NOB 24	19354	Pillara Limestone	*Hermatostroma schlueteri*	Frasnian; back-reef and bank subfacies
NOB 25	29455	Pillara Limestone	*Amphipora rudis* *Anostylostroma* cf. *ponderosum* *Stachyodes crassa*	Givetian; back-reef and bank subfacies
NOB 29	19632	Pillara Limestone	*Stachyodes costulata*	Frasnian; reef-margin subfacies
NOB 33	19664	Pillara Limestone	*Stachyodes costulata*	Frasnian; back-reef and bank subfacies
	19785	Pillara Limestone	*Stachyodes costulata*	Frasnian; back-reef and bank subfacies
	19786	Pillara Limestone	*Hermatostroma schlueteri* *Stachyodes costulata*	Frasnian; back-reef and bank subfacies
	19787	Pillara Limestone	*Actinostroma* cf. *papillosum* *Hermatostroma schlueteri* *Trupetostroma mclearni*	Frasnian; back-reef and bank subfacies
NOB 34	19714	Pillara Limestone	*Stachyodes costulata*	Frasnian; reef-margin subfacies
NOB 35	19715	Pillara Limestone	*Dendrostroma oculatum*	Frasnian; reef-margin subfacies (allochthonous block)
	19716	Sadler Limestone	*Anostylostroma ponderosum* *Hermatostroma schlueteri* *Stachyodes crassa*	Frasnian; marginal-slope to basin facies
NOB 36	19717	Pillara Limestone	*Actinostroma papillosum* *Stachyodes costulata* *Stromatopora cooperi*	Frasnian; back-reef and bank subfacies
	19718	Pillara Limestone	*Hermatostroma schlueteri* *Trupetostroma laceratum*	Frasnian; back-reef and bank subfacies
NOB 37	19766	Sadler Limestone	*Actinostroma papillosum* *Stachyodes* sp.	Frasnian; marginal-slope to basin facies
NOB 38	19782	Pillara Limestone	*Clathrocoilona spissa* *Stachyodes costulata* *Stromatopora cooperi*	Frasnian; reef-margin subfacies
	19783	Pillara Limestone	*Anostylostroma ponderosum*	Frasnian; reef-margin subfacies
NOB 39	19789	Pillara Limestone	*Anostylostroma ponderosum* *Hermatostroma ambiguum*	Frasnian; reef-margin subfacies
NOB 40	19790	Pillara Limestone	*Actinostroma windjanicum* *Stromatopora* cf. *cooperi*	Frasnian; reef-margin subfacies
	19791	Pillara Limestone	*Hermatostroma perseptatum*	Frasnian; reef-margin subfacies
NOB 41	19793	Pillara Limestone	*Hermatostroma schlueteri*	Frasnian; reef-margin subfacies
	19794	Pillara Limestone	*Hermatostroma perseptatum*	Frasnian; reef-margin subfacies
NOB 50	21631	Pillara Limestone	*Actinostroma papillosum* *A.* sp. *Amphipora rudis* *Clathrocoilona spissa*	Frasnian; back-reef and bank subfacies
NOB 51	29454	Pillara Limestone	*Actinostroma papillosum* *Amphipora rudis*	Givetian; back-reef and bank subfacies
NOB 52	37256	Pillara Limestone	*Hermatostroma schlueteri*	Frasnian; patch-reef subfacies
NOB 53	37257	Sadler Limestone	*Actinostroma papillosum* *Amphipora rudis* *Stachyodes costulata*	Frasnian; marginal-slope facies
NOB 55	K312	Sadler Limestone	*Pseudoactinodictyon dartingtoniensis*	Frasnian; marginal-slope facies
NOB 56	K459	Pillara Limestone	*Dendrostroma oculatum*	Frasnian; back-reef and bank subfacies
NOB 57	3364	Pillara Limestone	*Amphipora rudis* *Hermatostroma schlueteri* *Stachyodes* sp.	Givetian; back-reef and bank subfacies
	29473	Pillara Limestone	*Amphipora rudis*	Givetian; back-reef and bank subfacies
NOB 58	37244	Pillara Limestone	*Amphipora rudis* *Hermatostroma* cf. *roemeri*	Frasnian; back-reef and bank subfacies
NOB 59	29479	Pillara Limestone	*Actinostroma windjanicum*	Frasnian; back-reef subfacies

(1) LNR = Lennard River 1:250 000 map sheet
MRM = Mount Ramsay 1:250 000 map sheet
NOB = Noonkanbah 1:250 000 map sheet.

APPENDIX 2

GALLERY INDEX AND THE DISCRIMINATION OF *ACTINOSTROMA* SPECIES

Klovan (1966) introduced the concept of gallery index (GI) as a measure of gallery shape (as seen in vertical section) in *Actinostroma*. GI was defined as the ratio of gallery height to gallery width. A vertically-elongated gallery has GI greater than 1, a horizontally-elongated gallery has an index less than 1 and a square gallery has GI = 1. GI may be calculated from the following formula:

$$GI = [(N-L.t)(p-1)]/[(L-1)(N-P.d)]$$

where L = number of laminae in N mm
P = number of pillars in N mm
t = lamina thickness
d = pillar diameter

It should be noted that Klovan's formula (1966, p. 17) gives the reciprocal of GI.

Mallett (1971) used GI to differentiate specimens of *Actinostroma papillosum* and *A. clathratum* from the Broken River Formation, Queensland. He drew GI curves on scatter diagrams of P plotted against L and number of pillars in 1 mm plotted against L. Mallett (p. 238) considered that "... The differing gallery index for corresponding numbers of pillars and laminae separates the two species over most of the range of variation ...." Again it should be pointed out that, through using Klovan's formula, Mallett's GI is the reciprocal of GI as originally defined. Mallett realised this when he stated (p. 238) "... higher gallery indices (i.e. more horizontally elongated galleries)."

In the following discussion only the relationship between GI, L and P will be considered; the number of pillars in a particular area has not been used in this study for several reasons: (a) the parameter is not easy to measure, (b) it cannot be measured on the same thin section as P and L and this may introduce errors when plotting it against these variables, especially in view of the known variability within *Actinostroma* coenostea (Cockbain, 1979) and (c) at least in theory it should be possible to calculate it from P and it is consequently redundant.

Mallett's (1971) Figures 1 and 3 are essentially hand-contoured plots of GI against L and P. This suggests that a trend-surface analysis of GI as a function of L and P may be a useful way of examining the data. First-degree trend surfaces were calculated for Mallett's specimens (from data kindly supplied by him), for Lecompte's *A. clathratum* (data given by Lecompte, 1951, p. 80-83) and for the Canning Basin specimens. In making the calculations it was thought appropriate to use log GI (denoted by GI*) rather than GI because: (a) a GI of zero is meaningless in *Actinostroma* but the zero line on a trend surface is a useful line for visualising the surface and with a log transformation corresponds to a GI of 1; (b) the log transformation means that contours for reciprocal values of GI, e.g. GI=2 and GI=0.5 (which have similarly shaped galleries albeit with different directions of elongation) are equally spaced about GI=1.

GI* as a function of L and P was determined for the four groups of specimens. The equations for the trend surfaces are given below and the surfaces are drawn in Figure 19.

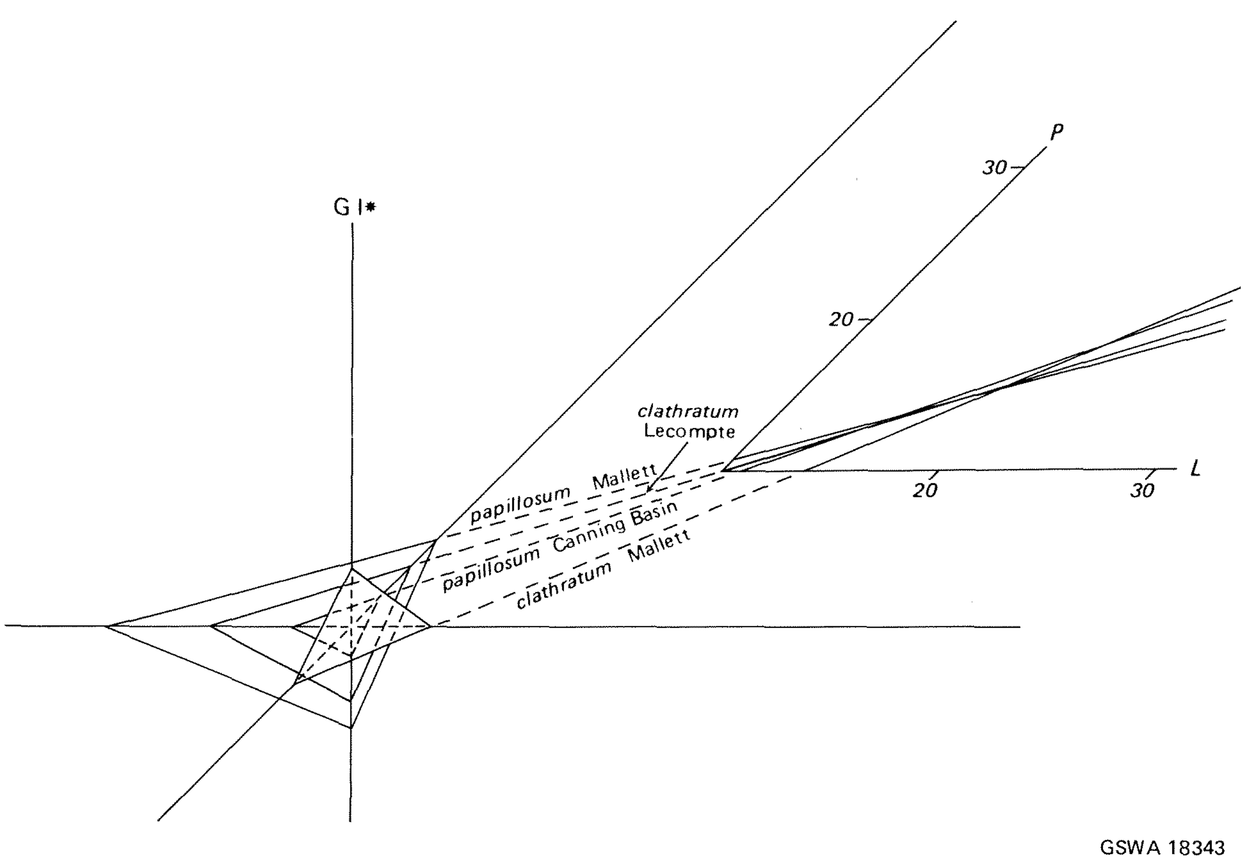


Figure 19. First-degree trend surfaces (log gallery index (GI*) as a function of number of laminae in 5 mm (L) and number of pillars in 5 mm (P)) for four samples of *Actinostroma papillosum.* Values along GI*-axis are exaggerated x10 for emphasis. For simplicity the planes are only shown where they intercept the three axes. Trend lines on the LP-plane are for GI* = 0 (i.e. GI = 1). The region in the LP-plane with numbered axes is where the measured specimens plot and corresponds to the area shown in Figure 7.

A. papillosum of Mallett (1971); n = 22,
correlation coefficient (r) = 0.84
$GI^* = -0.4698 - 0.0414L + 0.0813P$

A. clathratum of Mallett (1971); n = 23, r = 0.93
$GI^* = 0.2722 - 0.0722L + 0.0719P$

A. clathratum of Lecompte (1951); n = 13, r = 0.87
$GI^* = -0.3513 - 0.0512L + 0.0878P$

A. papillosum from Canning Basin; n = 24, r = 0.75
$GI^* = -0.1384 - 0.0506L + 0.0674P$

As can be seen the surfaces intersect in the sample space and have similar orientations. The four populations may be compared by determining the angular separation between the normals to the trend surfaces. This is done in Figure 20. While the *papillosum* Mallett and *clathratum* Mallett populations have the greatest separation (1.9°) the other two groups of specimens are intermediate in position. This seems to be more consistent with the samples representing one variable species, rather than there being several species present. From this I conclude that all four groups of specimens belong to one species which I identify as *Actinostroma papillosum*.

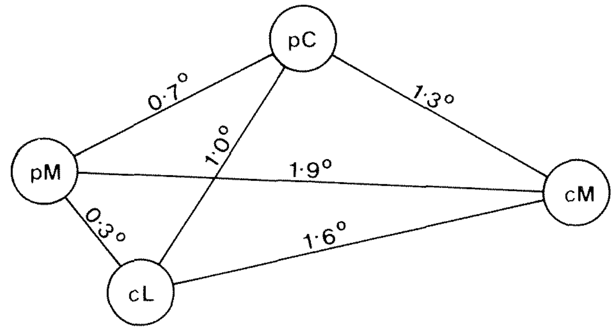


Figure 20. Angular separation of normals to first-degree trend surfaces for the four samples of *Actinostroma papillosum* shown in Figure 19. pM = *A. papillosum* of Mallett (1971); cM = *A. clathratum* of Mallett (1971); cL = *A. clathratum* of Lecompte (1951); pC = *A. papillosum* specimens from the Canning Basin.

APPENDIX 3

LATITUDE AND LONGITUDE OF FOSSIL LOCALITIES

Fossil Locality No.	Latitude S	Longitude E	Section No.	Location
LNR 6	17°41′00″	125°04′00″	—	Oscar Range, Elimberrie No. 1 bioherm
LNR 7	17°24′34″	124°57′25″	—	Napier Range, Windjana Gorge
LNR 8	17°24′32″	124°57′49″	—	Napier Range, Windjana Gorge
LNR 9	17°24′18″	124°57′19″	—	Napier Range, Windjana Gorge
LNR 10	17°24′27″	124°56′30″	—	Napier Range, Windjana Gorge
LNR 11	17°38′25″	124°56′33″	—	Oscar Range, Nullara Spring
LNR 12	16°57′57″	124°28′35″	—	Napier Range, Limestone Spring
LNR 13	17°24′33″	124°58′03″	—	Napier Range, Windjana Gorge
MRM 2	18°44′06″	126°04′38″	—	S. Lawford Range, McWhae Ridge
MRM 3	18°43′54″	126°04′39″	—	S. Lawford Range, McWhae Ridge
MRM 4	18°42′39″	126°03′15″	14	S. Lawford Range, McWhae Ridge
MRM 5	18°42′39″	126°03′16″	14	S. Lawford Range, McWhae Ridge
MRM 6	18°41′23″	126°02′02″	—	Glenister Knolls
MRM 8	18°41′22″	126°02′02″	—	Glenister Knolls
MRM 9	18°41′17″	126°02′01″	—	Glenister Knolls
MRM 11	18°41′30″	126°02′03″	—	Glenister Knolls
MRM 12	18°41′32″	126°02′03″	—	Glenister Knolls
MRM 13	18°41′35″	126°02′04″	—	Glenister Knolls
MRM 15	18°40′25″	126°00′44″	—	Lloyd Hill
MRM 16	18°40′24″	126°00′44″	—	Lloyd Hill
MRM 17	18°40′26″	126°00′37″	—	Lloyd Hill
MRM 19	18°40′26″	126°00′37″	—	Lloyd Hill
MRM 20	18°40′30″	126°00′36″	—	Lloyd Hill
MRM 21	18°40′27″	126°00′34″	—	Lloyd Hill
MRM 23	18°40′28″	126°00′35″	—	Lloyd Hill
MRM 26	18°37′01″	126°05′12″	—	Lawford Range, Galeru Gorge
MRM 29	18°39′19″	126°04′25″	11	S. Lawford Range
MRM 31	18°42′39″	126°03′22″	14	S. Lawford Range
MRM 32	18°42′36″	126°03′26″	14	S. Lawford Range
MRM 33	18°43′58″	126°04′39″	—	S. Lawford Range, McWhae Ridge
MRM 34	18°37′34″	126°10′14″	—	Wray Hills
MRM 35	18°37′33″	126°10′08″	—	Wray Hills
MRM 36	18°42′57″	126°04′28″	—	S. Lawford Range
MRM 37	18°38′25″	126°04′39″	—	Lawford Range, Waggon Pass
MRM 38	18°35′43″	126°06′51″	—	N. Lawford Range
MRM 39	18°35′19″	126°07′43″	—	N. Lawford Range
MRM 40	18°41′58″	126°04′23″	—	S. Lawford Range
MRM 41	18°41′53″	126°04′28″	—	S. Lawford Range
MRM 42	18°40′45″	126°05′21″	—	Teichert Hills
MRM 43	18°40′26″	126°05′29″	—	Teichert Hills
MRM 44	18°36′58″	126°05′08″	—	Lawford Range, Galeru Gorge
MRM 45	18°36′55″	126°05′07″	—	Lawford Range, Galeru Gorge
MRM 46	18°36′51″	126°05′03″	—	Lawford Range, Galeru Gorge
MRM 47	18°36′48″	126°05′06″	—	Lawford Range, Galeru Gorge
MRM 48	18°37′57″	126°01′05″	—	Laidlaw Range
MRM 49	18°37′46″	126°02′30″	—	Laidlaw Range
MRM 50	18°37′43″	126°02′54″	—	Laidlaw Range
MRM 51	18°40′31″	126°06′11″	—	Teichert Hills
MRM 52	18°40′12″	126°06′01″	—	Teichert Hills
MRM 53	18°38′57″	126°01′06″	10	Laidlaw Range
MRM 54	18°39′01″	126°01′18″	10	Laidlaw Range
MRM 55	18°39′11″	126°01′27″	10	Laidlaw Range
MRM 56	18°39′00″	126°01′31″	10	Laidlaw Range
MRM 57	18°39′11″	126°01′51″	10	Laidlaw Range
MRM 58	18°39′23″	126°02′18″	10	Laidlaw Range
MRM 59	18°37′41″	126°02′21″	—	Laidlaw Range
MRM 60	18°38′02″	126°02′30″	—	Laidlaw Range
MRM 61	18°39′50″	126°03′35″	12	S. Lawford Range
MRM 62	18°40′00″	126°04′04″	12	S. Lawford Range
MRM 63	18°40′05″	126°04′28″	12	S. Lawford Range
MRM 64	18°39′08″	126°04′04″	11	S. Lawford Range
MRM 65	18°42′28″	126°01′07″	8	Emanuel Range
MRM 66	18°42′28″	126°00′02″	8	Emanuel Range
MRM 67	18°38′30″	126°10′21″	15	Wray Hills
MRM 68	18°38′21″	126°10′25″	15	Wray Hills
MRM 69	18°38′20″	126°10′44″	15	Wray Hills
MRM 70	18°41′20″	126°03′29″	13	S. Lawford Range
MRM 71	18°41′24″	126°04′12″	13	S. Lawford Range
MRM 72	18°43′12″	126°00′06″	7	Emanuel Range
MRM 73	18°43′09″	126°00′26″	7	Emanuel Range
MRM 74	18°37′28″	126°09′44″	—	N. Lawford Range
MRM 75	18°36′57″	126°09′02″	—	N. Lawford Range

LATITUDE & LONGITUDE OF FOSSIL LOCALITIES—*continued*

Fossil Locality No.	Latitude S	Longitude E	Section No.	Location
MRM 76	18°37′01″	126°08′31″	—	N. Lawford Range
MRM 77	18°37′00″	126°09′45″	—	N. Lawford Range
MRM 78	18°38′00″	126°06′10″	—	McPhee Knoll
MRM 79	18°37′59″	126°06′53″	—	McIntyre Knolls
MRM 80	18°36′54″	126°07′23″	—	N. Lawford Range
MRM 81	18°39′56″	126°01′34″	—	Laidlaw Range
MRM 82	18°15′00″	126°04′09″	—	Hull Range
MRM 83	18°20′06″	126°07′47″	—	Hull Range, opposite Mt. Krauss
MRM 84	18°21′02″	126°02′29″	—	Minnie Pool
MRM 85	18°11′48″	126°08′12″	—	Horseshoe Range
MRM 86	18°08′59″	126°13′35″	—	Horseshoe Range
MRM 87	18°38′02″	126°00′41″	—	Laidlaw Range
MRM 88	18°42′30″	126°04′35″	—	S. Lawford Range
NOB 7	18°37′22″	125°55′21″	2	Emanuel Range, near Kunian Gap
NOB 8	18°37′16″	125°55′31″	2	Emanuel Range, near Kunian Gap
NOB 9	18°37′36″	125°56′07″	—	Emanuel Range, near Kunian Gap
NOB 11	18°37′28″	125°56′20″	—	Sadler Ridge
NOB 12	18°37′43″ to 18°37′16″	125°56′44″ to 125°57′00″	4	Sadler Ridge
NOB 14	18°37′19″ to 18°37′13″	125°56′31″ to 125°56′57″	3	Sadler Ridge
NOB 18	18°36′24″	125°55′01″	1	Emanuel Range, Kudata Gap
NOB 20	18°37′53″	125°59′51″	9	Emanuel Range, Kudata Gap
NOB 21	18°43′14″	125°59′11″	6	Emanuel Range
NOB 22	18°39′27″	125°59′53″	—	Wade Knoll
NOB 23	18°39′38″	125°59′05″	—	Emanuel Range
NOB 24	18°39′43″	125°59′02″	—	Emanuel Range
NOB 25	18°37′27″	125°54′48″	—	Emanuel Range Kunian Gap
NOB 26	18°37′21″	125°54′56″	2	Emanuel Range Kunian Gap
NOB 27	18°37′24″	125°54′59″	2	Emanuel Range Kunian Gap
NOB 28	18°37′30″	125°55′08″	2	Emanuel Range Kunian Gap
NOB 29	18°37′39″	125°56′23″	—	Emanuel Range
NOB 30	18°36′15″	125°54′41″	1	Emanuel Range Kudata Gap
NOB 31	18°36′16″	125°54′45″	1	Emanuel Range Kudata Gap
NOB 32	18°36′15″	125°54′51″	1	Emanuel Range Kudata Gap
NOB 33	18°37′55″	125°56′38″	—	Emanuel Range
NOB 34	18°37′24″	125°55′44″	—	Emanuel Range
NOB 35	18°37′19″	125°55′45″	—	Emanuel Range
NOB 36	18°37′36″	125°56′09″	—	Emanel Range
NOB 37	18°36′43″	125°56′35″	—	Sadler Ridge
NOB 38	18°37′47″	125°56′37″	—	Emanuel Range
NOB 39	18°37′44″	125°56′48″	—	Emanuel Range
NOB 40	18°37′48″	125°57′02″	—	Emanuel Range
NOB 41	18°37′47″	125°57′33″	—	Emanuel Range
NOB 42	18°38′09″	125°56′40″	5	Emanuel Range
NOB 43	18°38′10″	125°57′18″	5	Emanuel Range
NOB 44	18°38′02″	125°57′45″	5	Emanuel Range
NOB 45	18°37′45″	125°58′04″	5	Emanuel Range
NOB 46	18°37′56″	125°59′51″	9	Emanuel Range
NOB 47	18°37′24″	125°59′55″	9	Emanuel Range
NOB 48	18°43′25″	125°58′27″	6	Emanuel Range
NOB 49	18°43′37″	125°59′35″	7	Emanuel Range
NOB 50	18°43′34″	125°59′13″	—	Emanuel Range
NOB 51	18°37′39″	125°55′11″	—	Emanuel Range Kunian Gap
NOB 52	18°40′02″	125°59′23″	—	Emanuel Range
NOB 53	18°40′05″	125°59′16″	—	Emanuel Range
NOB 55	18°23′46″	125°51′56″	—	Pillara Range (BMR K312)
NOB 56	18°24′00″	125°50′03″	—	Pillara Range Menyous Gap (BMR K459)
NOB 57	18°28′11″	125°54′27″	—	Home Range, near Mt. Home Spring
NOB 58	18°24′53″	125°45′03″	—	Outcamp Hill
NOB 59	18°01′57″	125°44′35″	—	Geikie Gorge

REFERENCES

Abbott, B. M., 1973, Terminology of stromatoporoid shapes: Jour. Paleontology, v. 47, p. 805-806.

Bargatzky, A., 1881a, Die Stromatoporen des rheinischen Devons: Verhandl. Naturhist. Ver. Preuss, Rheinld. Westf., v. 38 p. 233-304 (not seen).

—— 1881b, *Stachyodes*, eine neue Stromatoporoidae: Zeit. Deutsch. Geol. Ges., v. 33, p. 688-691.

Bathurst, R. G. C., 1971, Carbonate sediments and their diagenesis: New York, Elsevier, 658 p.

Benson, W. N., 1922, Materials for the study of the Devonian palaeontology of Australia: New South Wales Geol. Survey Rec., v. 10, p. 83-204.

Benton, M. J., 1979, H. A. Nicholson (1844-1899), invertebrate palaeontologist: Bibliography and catalogue of his type and figured material: Royal Scottish Mus. Information Ser., Geology 7, 94 p.

Birkhead, P. K., 1967, Stromatoporoidea of Missouri: Bull. Am. Paleontology, v. 52. no. 234, 110 p.

Burchette, T. P., and Riding, R., 1977, Attached vermiform gastropods in Carboniferous marginal marine stromatolites and biostromes: Lethaia, v. 10, p. 17-28.

Calvin, S., 1888, On a new genus and new species of tubicolor Annelida: Am. Geologist, v. 1, p. 24-28.

Carter, H. J., 1880, On *Stromatopora dartingtoniensis*, n. sp. with the tabulation in the larger branches of the astrorhiza: Ann. Mag. Nat. Hist., ser. 5, v. 6, p. 339-347.

Chapman, F., 1924, The Wade collection of fossils: Commonwealth of Australia, Parliamentary Paper, Melbourne.

Cockbain, A. E., 1970, Notes on the cheilostomatous bryozoa from the Eucla Group Western Australia: West. Australia Geol. Survey Bull. 122, Appendix 2, p. 192-199.

——1976, *Stromatoporella kimberleyensis* Etheridge Jr. 1918 is a piece of bone: West. Australia Geol. Survey Ann. Rept 1975, p. 133-135.

——1979, Intracoenosteal variation in a specimen of *Actinostroma*: West. Australia Geol. Survey Ann. Rept 1978, p. 87-89.

Dales, R. P, 1957, Interrelations of organisms. A. Commensalism, *in* Hedgpeth, J. W. (ed.), Treatise on marine ecology and paleoecology, vol. 1: Geol. Soc. America Mem. 67, p. 391-412.

Etheridge, R., Jr., 1918, Observations on Carboniferous and other fossils, *in* Basedow, H., Narrative of an expedition of exploration in northwestern Australia: Royal Geographical Soc. Australasia, South Australia Branch, Trans., v. 18, p. 250-262.

Fagerstrom, J. A., 1962, Middle Devonian stromatoporoids from southeastern Michigan: Jour. Paleontology, v. 36, p. 424-430.

——1977, The stromatoporoid genus *Stictostroma* Parks, 1936; its type species, type specimens and type locality: Jour. Paleontology, v. 51, p. 416-419.

Fischbuch, N. R., 1969, Devonian stromatoporoids from central Alberta, Canada: Canadian Jour. Earth Sci., v. 6, p. 167-185.

——1970a, *Amphipora* and *Euryamphipora* (Stromatoporoidea) from the Devonian of western Canada: Palaeontology, v. 13, p. 64-75.

——1970b, Devonian reef-building stromatoporoids from western Canada: Jour. Paleontology, v. 44, p. 1071-1084.

Fletcher, H. O., 1971, Catalogue of type specimens in The Australian Museum: Australian Mus. Mem. 13, 167 p.

Flügel, E., 1958, *Pseudoactinodictyon* n. gen. und *Actinodictyon* Parks (Stromatoporoidea): Senckenbergiana leth., v. 39, p. 135-151.

——1959, Die Gattung *Actinostroma* Nicholson und ihre Arten (Stromatoporoidea) Ann. Naturhist, Mus. Wien, v. 63, p. 90-273.

——1974, Stromatoporen aus dem Schwelmer Kalk (Givet) des Sauerlandes (Stromatoporen aus dem deutschen Paläozoikum 1): Paläont. Zeit., v. 48, p. 149-187.

Flügel, E., and Flügel-Kahler, E., 1968, Stromatoporoidea (Hydrozoa palaeozoica): Fossilium Catalogus, 1, Animalia, pars 115, 116, W. Junk, 's-Gravenhage, 681 p.

Galloway, J. J., 1957, Structure and classification of the Stromatoporoidea: Bull. Am. Paleontology, v. 37, no. 164, p. 345-480.

Galloway, J. J., and Ehlers, G. M., 1960, Some Middle Devonian stromatoporoids from Michigan and southwestern Ontario: Contr. Mus. Paleontology Univ. Michigan, v. 15, p. 39-120.

Galloway, J. J., and St. Jean, J., Jr., 1957, Middle Devonian Stromatoporoidea of Indiana, Kentucky, and Ohio: Bull. Am. Paleontology, v. 37, no. 162, p. 29-308.

Gogolczyk, W., 1956, Rodzaj *Amphipora* w Dewonie Polski (*Amphipora* dans le Devonien de Pologne): Acta Palaeontologica Polonica, v. 1, p. 211-240 (in Polish, with French and Russian summaries).

——1959, Rodzaj *Stachyodes* (Stromatoporoidea) w Dewonie Polski (On the stromatoporoid genus *Stachyodes* in the Devonian of Poland): Acta Palaeontologica Polonica, v. 4, p. 353-387 (in Polish, with English and Russian summaries).

Gürich, G., 1896, Das Palaeozoikum des Polnischen Mittelgebirges: Verh. Russ. Kais. Miner, Ges. St. Petersburg, (2), v. 32, 539 p. (not seen).

Hardman, E. T., 1885, Report on the geology of the Kimberiey District, Western Australia: Perth, Govt Printer, 38 p.

Hartman, W. D., and Goreau, T. F., 1970, Jamaican coralline sponges: Their morphology, ecology and fossil relatives: Zool. Soc. London Symposium 25, p. 205-243.

Hosking, L. C. V., 1933, Distribution of Devonian rocks in the Kimberley Division and description of a recent collection of Devonian fossils from the Kimberley Division: Royal Soc. West. Australia Jour., v. 19, p. 67-77.

Howell, B. F., 1962, Worms, *in* Moore, R. C. (ed.), Treatise on Invertebrate Paleontology Part W: Geol. Soc. America and Univ. Kansas Press, p. W144-W177.

International Commission on Zoological Nomenclature, 1964, International Code of Zoological Nomenclature: London, Internat. Trust Zool. Nomenclature, 176 p.

Jack, R. L., 1906, The prospects of obtaining artesian water in the Kimberley District: West Australia Geol. Survey Bull. 25, p. 1-46.

Kazmierczak, J., 1971, Morphogenesis and systematics of the Devonian Stromatoporoidea from the Holy Cross Mountains, Poland: Palaeontologica Polonica, no. 26, 150 p.

——1976, Cyanophycean nature of stromatoporoids: Nature, v. 264, p. 49-51.

——1981, Evidences for Cyanophyte origin of stromatoporoids, *in* Monty, C. (ed.), Phanerozoic stromatolites: Berlin, Springer-Verlag, p. 230-241.

Kershaw, S., and Riding, R., 1978, Parameterization of stromatoporoid shape: Lethaia, v. 11, p. 233-242.

Khalfina, V. K., and Yavorsky, V. I., 1973, Classification of the stromatoporoids: Palaeont. Jour. No. 2, p. 141-153 (English translation of Klassifikatsiya stromatoporoidey: Paleont. Zhur. no. 2, p. 19-34).

Klovan, J. E., 1966, Upper Devonian stromatoporoids from the Redwater reef complex, Alberta: Canada Geol. Survey Bull. 133, p. 1-33.

Kobluk, D. R., 1975, Stromatoporoid paleoecology of the southwest margin of the Miette carbonate complex, Jasper Park, Alberta: Canadian Petroleum Geology Bull., v. 23, p. 224-277.

——1978, Reef stromatoporoid morphologies as dynamic populations; application of field data to a model and the reconstruction of an Upper Devonian reef: Canadian Petroleum Geology Bull., v. 26, p. 218-236.

Lecompte, M., 1951, Les Stromatoporoides du Dévonien moyen et supérieur du Bassin de Dinant. Prémière Partie: Inst. Royal Sci. Natur. Belgique Mem. 116, p. 1-215.

Lecompte, M., 1952, Les Stromatopoides du Dévonien moyen et supérieur du Bassin de Dinant. Deuxieme Partie: Inst. Royal Sci. Natur. Belgique Mém. 117, p. 216-369.

——1956, Stromatoporoidea, *in* Moore, R. C. (ed.), Treatise on Invertebrate Paleontology Part F: Geol. Soc. America and Univ. Kansas Press, p. F107-F144.

Le Maitre, D., 1933, Descriptions des stromatoporoides de l'Assise d'Etroeungt: Mém. Soc. Geol. France, new ser. v. 9, no. 20, p. 5-31.

——1934, Etudes sur la faune des Calcaire Dévoniens du Bassin d'Ancenies, Calcaire de Chaudefond et Calcaire de Chalonnes (Maine-et-Loire): Mém. Soc. Geol. Nord., v. 12, p. 5-267.

M'Coy, F., 1850, Descriptions of three new Devonian zoophytes: Ann. Mag. Nat. Hist., ser. 2, v. 6, p. 377-378.

——1851, Descriptions of the British Palaeozoic fossils in the Geological Museum of the University of Cambridge: Cambridge, 406 p.

Machielse, S., 1972, Devonian algae and their contribution to the western Canadian sedimentary basin: Canadian Petroleum Geology Bull., v. 20, p. 187-237.

Maitland, A. G., 1919, A summary of the geology of Western Australia, *in* The Mining Handbook of Western Australia: West. Australia Geol. Survey Mem. 1, ch. 1.

——1924, The geology of Western Australia: West. Australia Geol. Survey Bull. 89, p. 9-89.

Majewske, O. P., 1969, Recognition of invertebrate fossil fragments in rocks and thin sections: Leiden, E. J. Brill, 101 p.

Mallett, C. W., 1971, The stromatoporoid genera *Actinostroma* Nicholson, and *Nexililamina* gen. nov. from the Devonian Broken River Formation, north Queensland: Royal Soc. Victoria Proc., v. 84, p. 235-244.

McLaren, D., 1970, Presidential address: Time, life and boundaries: Jour. Paleontology, v. 44, p. 801-815.

Mistiaen, B., 1980, Stromatopores du Givetien de Ferques (Boulonnais, France): Bull. Mus. Nat. Hist. Paris, ser. 2, sect. C., no. 3, p. 167-257.

Monty, C., 1981, Introduction, *in* Monty, C. (ed.), Phanerozoic stromatolites: Berlin, Springer-Verlag, p. v-viii.

Mori, K., 1970, Stromatoporoids from the Silurian of Gotland, Part 2: Stockholm Contr. Geology, v. 22, p. 1-152.

Nicholson, H. A., 1873, On some new species of *Stromatopora*: Ann. Mag. Nat. Hist., ser. 4, v. 12, p. 89-95.

——1875, Descriptions of Amorphozoa from the Silurian and Devonian formations: Ohio Geol. Survey Rept, v. 2, p. 245-256.

——1886a, On some new or imperfectly known species of stromatoporoids: Ann. Mag. Nat. Hist., ser. 5, v. 17, p. 225-239.

——1886b, 1889, 1891, 1892, A monograph of the British stromatoporoids: Palaeontographical Soc. London, 234 p.

——1890, Notes on the palaeontology of Western Australia, Stromatoporoidea: Geol. Mag., new ser. dec. 3, v. 7, p. 193.

Nicholson, H. A., and Murie, J., 1878, The minute structure of the skeleton of *Stromatopora* and its allies: Jour. Linnean Soc., Zoology, v. 14, p. 187-246.

Parks, W. A., 1936, Devonian stromatoporoids of North America Part I: Univ. Toronto Studies, Geol. Ser. no. 39, p. 1-125.

Petryk, A. A., 1967, Some Silurian stromatoporoids from northwestern Baffin Island, District of Franklin: Canada Geol. Survey Paper 67-7, 51 p.

Playford, P. E., 1976, Devonian reef complexes of the Canning Basin, Western Australia: Internat. Geol. Congr. 25th, Sydney 1976, Excursion Guide no. 38A, 39 p.

——1979, Stromatolite research in Western Australia: Royal Soc. West. Australia Jour., v. 62, p. 13-20.

——1980, Devonian 'Great Barrier Reef' of the Canning Basin, Western Australia: Am. Assoc. Petroleum Geologists Bull., v. 64, p. 814-840.

Playford, P. E., and Cockbain, A. E., 1976, Revised stratigraphic and facies nomenclature in Devonian reef complexes of the Canning Basin: West. Australia Geol. Survey Ann. Rept 1975, p. 52-56.

Playford, P. E. and Lowry, D. C., 1966, Devonian reef complexes of the Canning Basin, Western Australia: West. Australia Geol. Survey Bull. 118, 150 p.

Riding, R., 1974, The Devonian genus *Keega* (Algae) reinterpreted as a stromatoporoid basal layer: Palaeontology, v. 17, p. 565-577.

Riding, R., and Kershaw, S., 1977, Nature of stromatoporoids: Nature, v. 268, p. 178.

Ripper, E. A., 1937a, A note on the occurrence of *Amphipora ramosa* (Phillips) in Western Australia: Royal Soc. West. Australia Jour. v. 23, p. 37-41.

——1937b, Stromatoporoids of the Lilydale Limestone Part II. *Syringostroma, Stromatopora* and other genera: Royal Soc. Victoria Proc., new ser., v. 49, p. 178-200.

——1938, Notes on the Middle Palaeozoic stromatoporoid faunas of Victoria: Royal Soc. Victoria Proc., new ser., v. 50, p. 221-243.

Rukhin, L. B., 1938, Nizhnepaleozoiske korally i stromatoporoidei verkhnei chasti basseina r. Kolymy: Materialy po izcheniyu Kolymsko-Indigirskogo kraya, (2) Geologiya i Geomorfologiya, v. 10, 119 p (not seen).

Schmidt, F., 1858, Untersuchungen über die Silurische Formation von Esthland, Nord-Livland und Oesel: Archiv für die Naturkunde Liv-, Est- und Kurlands, ser. 1, v. 2, p. 1-248 (not seen).

Schulz, E., 1883, Die Eifelkalkmulde von Hillesheim, Nebst einem paläontologischem Anhang: Jb. Preuss. Geol. Landesanstalt für 1882, 94 p. (not seen).

Shimer, H. W., and Shrock, R. R., 1944, Index fossils of North America: New York, John Wiley & Sons Inc. (6th printing 1959), 837 p.

Sleumer, B. H. G., 1969, Devonian stromatoporoids of the Cantabrian Mountains (Spain): Leidse Geol. Mededelingen, v. 44, p. 1-136.

St. Jean, J., Jr., 1971, Paleobiologic considerations of reef stromatoporoids, *in* Yochelson, E. L., (ed.), Proceedings of the North American Paleontological Convention: Lawrence, Kansas, Allen Press Inc., v. 2, p. 1389-1429.

——1977, *Stromatoporella* Nicholson, 1886 (Fossil Order Stromatoporoidea): problem of the type specimen of the type species, *Stromatoporella granulata* (Nicholson), 1873, Z.N. (S.) 2177: Zool. Nomenclature Bull., v. 33, p. 233-240.

Stearn, C. W., 1961, Devonian stromatoporoids from the Canadian Rocky Mountains: Jour. Paleontology, v. 35, p. 932-948.

——1962, Stromatoporoid fauna of the Waterways Formation (Devonian) of northeastern Alberta: Canada Geol. Survey Bull. 92, p. 1-23.

——1963, Some stromatoporoids from the Beaverhill Lake Formation (Devonian) of the Swan Hills area, Alberta: Jour. Paleontology, v. 37, p. 651-668.

——1966a, The microstructure of stromatoporoids: Palaeontology, v. 9, p. 74-124.

——1966b, Upper Devonian stromatoporoids from southern Northwest Territories and northern Alberta: Canada Geol. Survey Bull. 133, p. 35-68.

——1972, The relationship of the stromatoporoids to the sclerosponges: Lethaia, v. 5, p. 369-388.

——1975a, Stromatoporoid assemblages, Ancient Wall reef complex (Devonian), Alberta: Canadian Jour. Earth Sci., v. 12, p. 1631-1667.

——1975b, The stromatoporoid animal: Lethaia, v. 8, p. 89-100.

——1980, Classification of the Paleozoic stromatoporoids: Jour. Paleontology, v. 54, p. 881-902.

Stearn, C. W., and Mehrotra, P.N., 1970, Lower and Middle Devonian stromatoporoids from northwestern Canada: Canada Geol. Survey Paper 70-13, 42 p.

Teichert, C., 1943, The Devonian of Western Australia, a preliminary review: Am. Jour. Sci., v. 241, p. 69-94, 167-184.

Teichert, C., 1949, Stratigraphy and palaeontology of Devonian portion of Kimberley Division, Western Australia: Australia, Bureau of Mineral Resources Rept 2, 55 p.

Turnšek, D., 1970, The Devonian stromatoporoid fauna from the Karavanke Mountains: Slovenske Akad. Znanosti in Umetnosti, Razred za Prirodoslovne in Medicinske Vede, Razpravy, v. 13, no. 5, p. 167-192.

Wade, A., 1924, Petroleum prospects, Kimberley District of Western Australia and Northern Territory: Commonwealth of Australia, Parliamentary Paper, Melbourne.

Woodward, H., 1890, Notes on the palaeontology of Western Australia, Introductory: Geol. Mag., new ser., dec. 3, v. 7, p. 97.

Wray, J. L., 1967, Upper Devonian calcareous algae from the Canning Basin, Western Australia: Colorado School Mines Prof. Contr. no. 3, 76 p.

Wray, J. L., and Playford, P. E., 1970, Some occurrences of Devonian reef-building algae in Alberta: Canadian Petroleum Geology Bull., v. 18, p. 544-555.

Yang, K. C., and Dong, D. Y., 1963, Stromatoporoids from the Jiwozhai Member, upper part of the Middle Devonian of Dushan District, Gueizhou (Kueichow): Acta Palaeontologica Sinica, v. 11, p. 147-178.

Yavorsky, V. I., 1955, Stromatoporoidea Sovetskogo Soyuza 1: Trudy vses. nauchno-issled. geol. inst. (VSEGEI) new ser. v. 8, p. 1-173.

——1957, Stromatoporoidea Sovetskogo Soyuza 2: Trudy vses. nauchno-issled. geol. inst. (VSEGEI) new ser. v. 18, p. 1-168.

——1961, Stromatoporoidea Sovetskogo Soyuza 3: Trudy vses. nauchno-issled. geol. inst. (VSEGEI) new ser. v. 44, p. 1-144.

Yochelson, E. L., 1971, A new Late Devonian gastropod and its bearing on problems of coiling and septation: Smithsonian Contr. Paleobiology, no. 3, p. 231-241.

Zukalová, V., 1971, Stromatoporoidea from the Middle and Upper Devonian of the Moravian Karst: Ceskoslovenske Akademie Ved, Rozpravy Ustredniho Ustavu Geologickeho no. 37, p. 1-143.

PLATES

PLATE 1

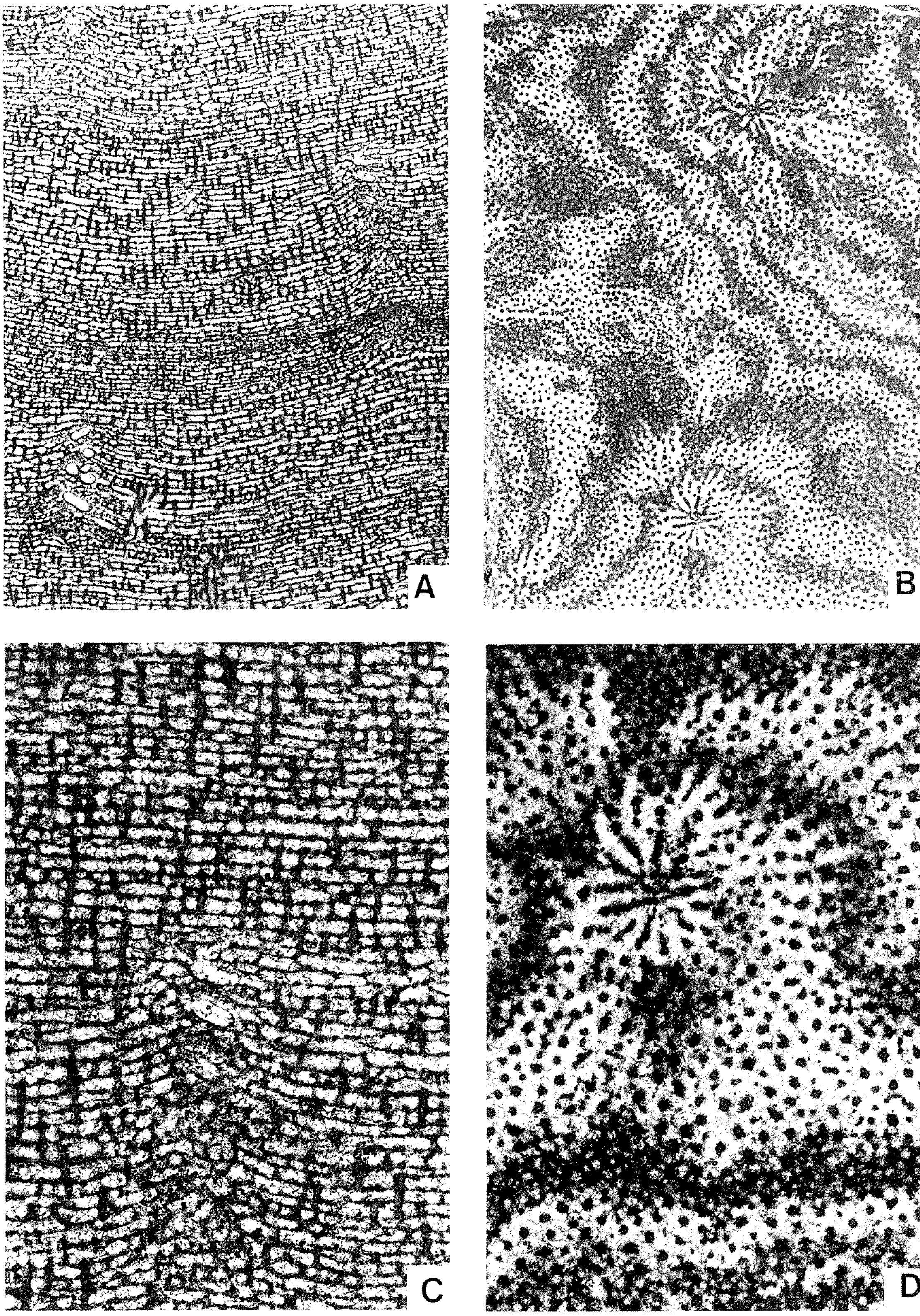
A-D *Actinostroma papillosum* (Bargatzky)

A. GSWA F10685, Pillara Limestone, NOB 20; vertical section, x 4.

B. GSWA F10685, Pillara Limestone, NOB 20; tangential section, x 4.

C. GSWA F10685, Pillara Limestone, NOB 20; vertical section, x 10.

D. GSWA F10685, Pillara Limestone, NOB 20; tangential section, x 10.



GSWA 20208

PLATE 2

A-C *Actinostroma papillosum* (Bargatzky)

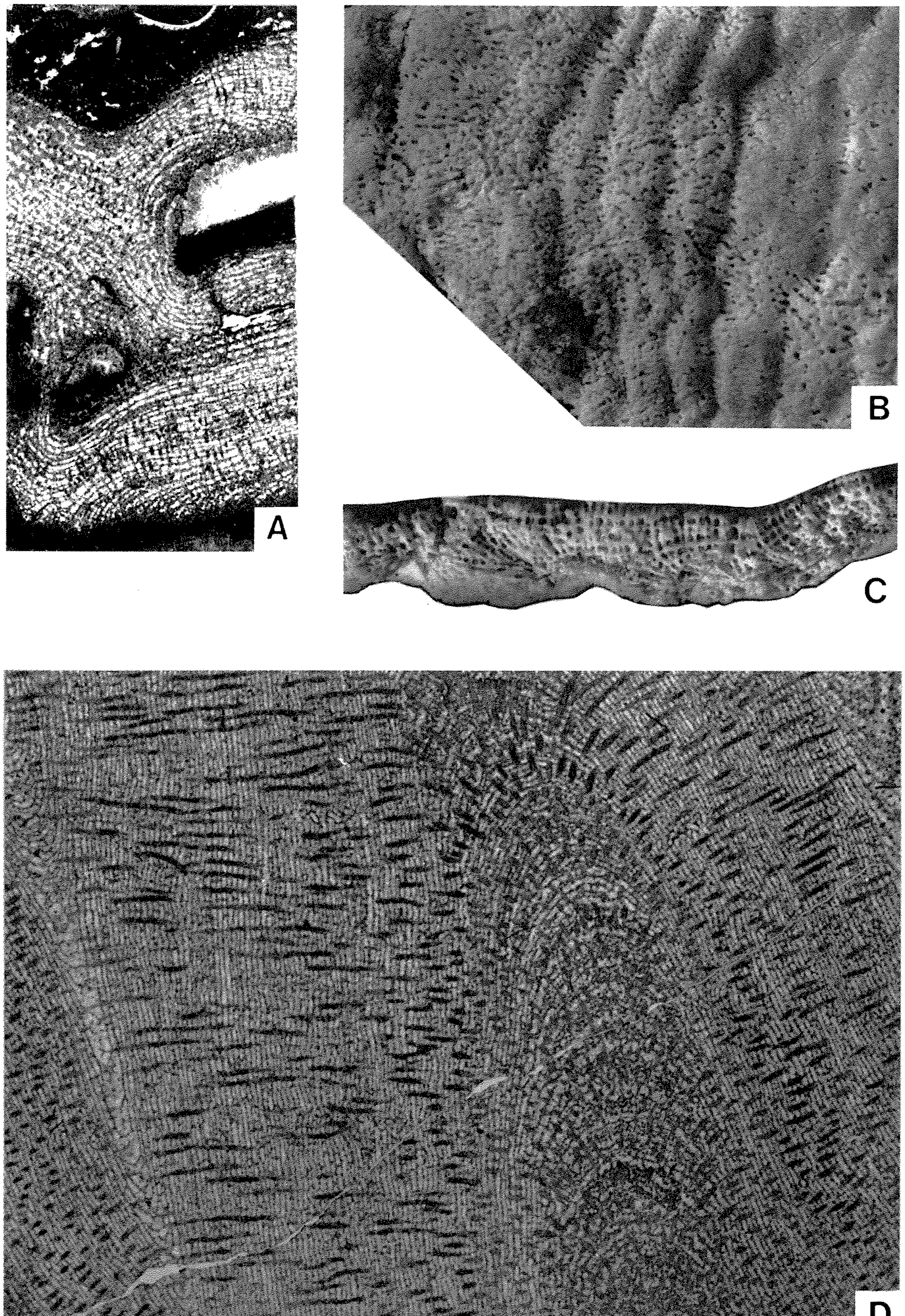
A. GSWA F10817, Pillara Limestone, MRM 78; vertical section, x 4.

B. GSWA F10869, Sadler Limestone, NOB 53; lower surface of silicified coenosteum, x 4.

C. GSWA F10869, Sadler Limestone, NOB 53; vertical section, x 4.

D *Actinostroma windjanicum* n. sp.

D. GSWA F10496, Sadler Limestone, MRM 43; vertical section, x 4.



GSWA 20209

PLATE 3

A, C *Actinostroma papillosum* var. A

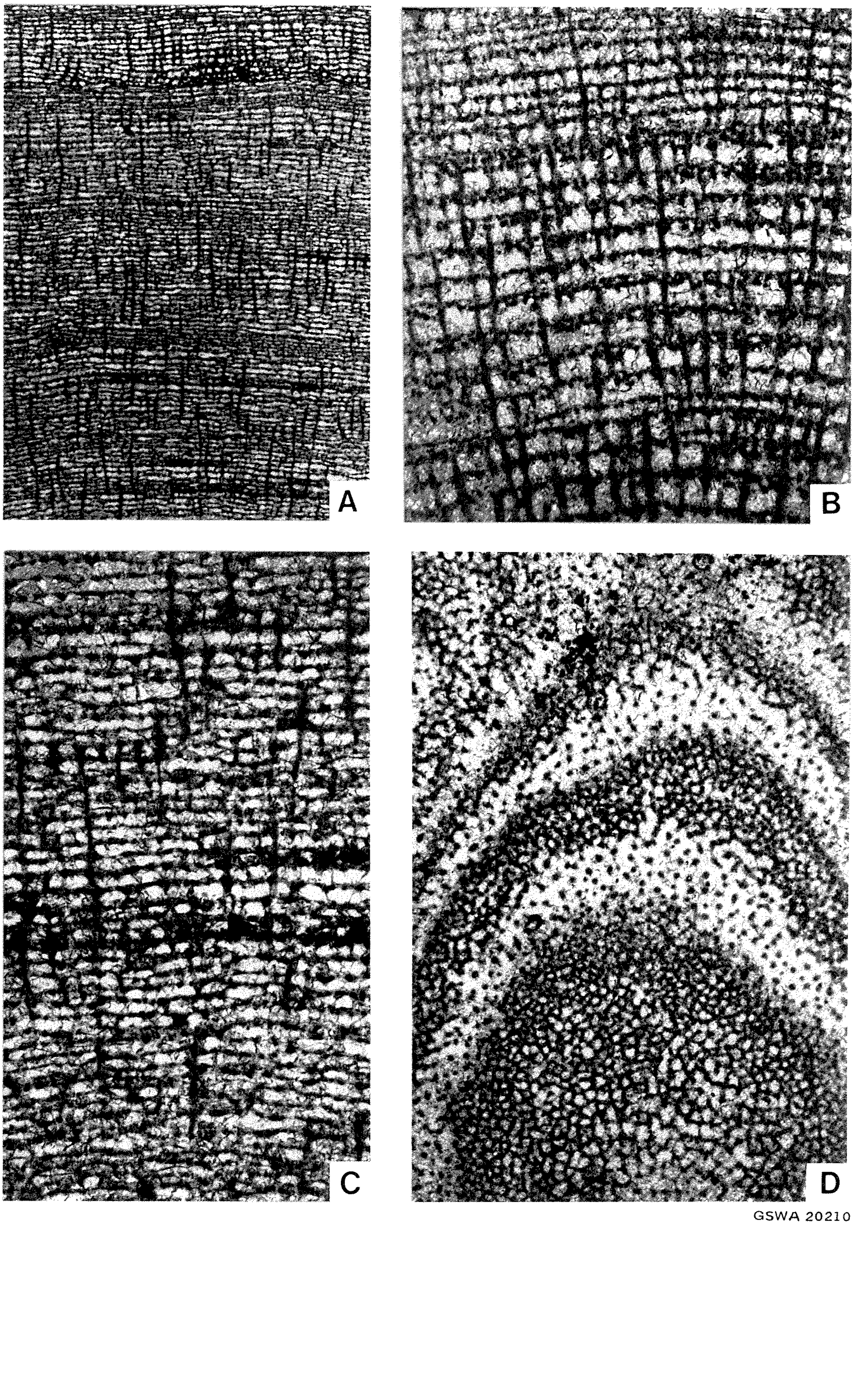
A. GSWA F10490, Pillara Limestone, MRM 41; vertical section, x 4.

C. GSWA F10490, Pillara Limestone, MRM 41; vertical section, x 10.

B, D *Actinostroma papillosum* var. B

B. GSWA F10802, Pillara Limestone, MRM 80; vertical section, x 10.

D. GSWA F10802, Pillara Limestone, MRM 80; tangential section, x 10.



GSWA 20210

PLATE 4

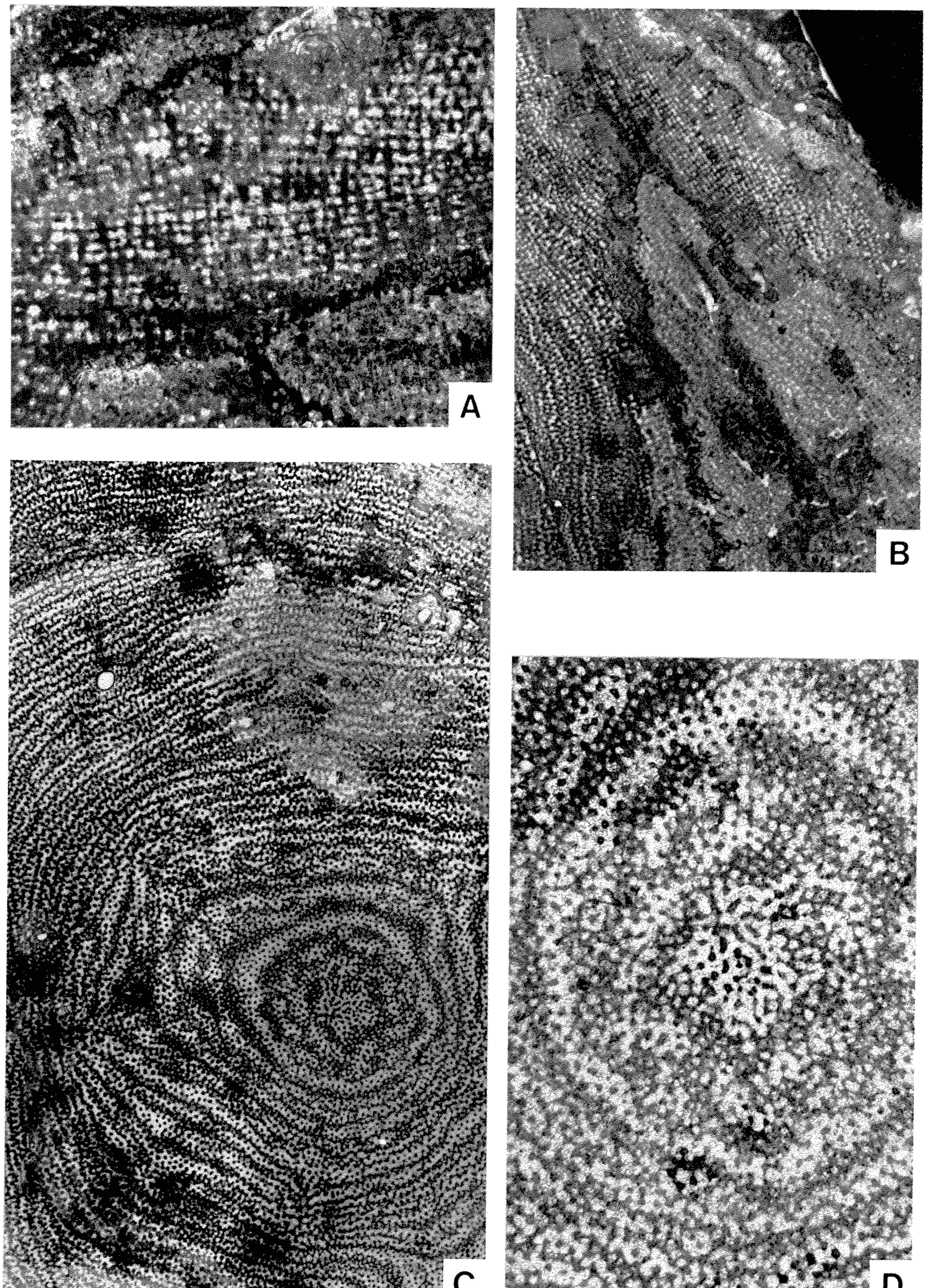
A-D *Actinostroma subclathratum* Etheridge Jr.

A. AM791a, lectotype, Pillara Limestone, Minnie Pool; vertical section, x 10.

B. AM791a, lectotype, Pillara Limestone, Minnie Pool; vertical section, x 4.

C. AM791, lectotype, Pillara Limestone, Minnie Pool; tangential section, x 4.

D. AM791, lectotype, Pillara Limestone, Minnie Pool; tangential section, x 10.



GSWA 20211

PLATE 5

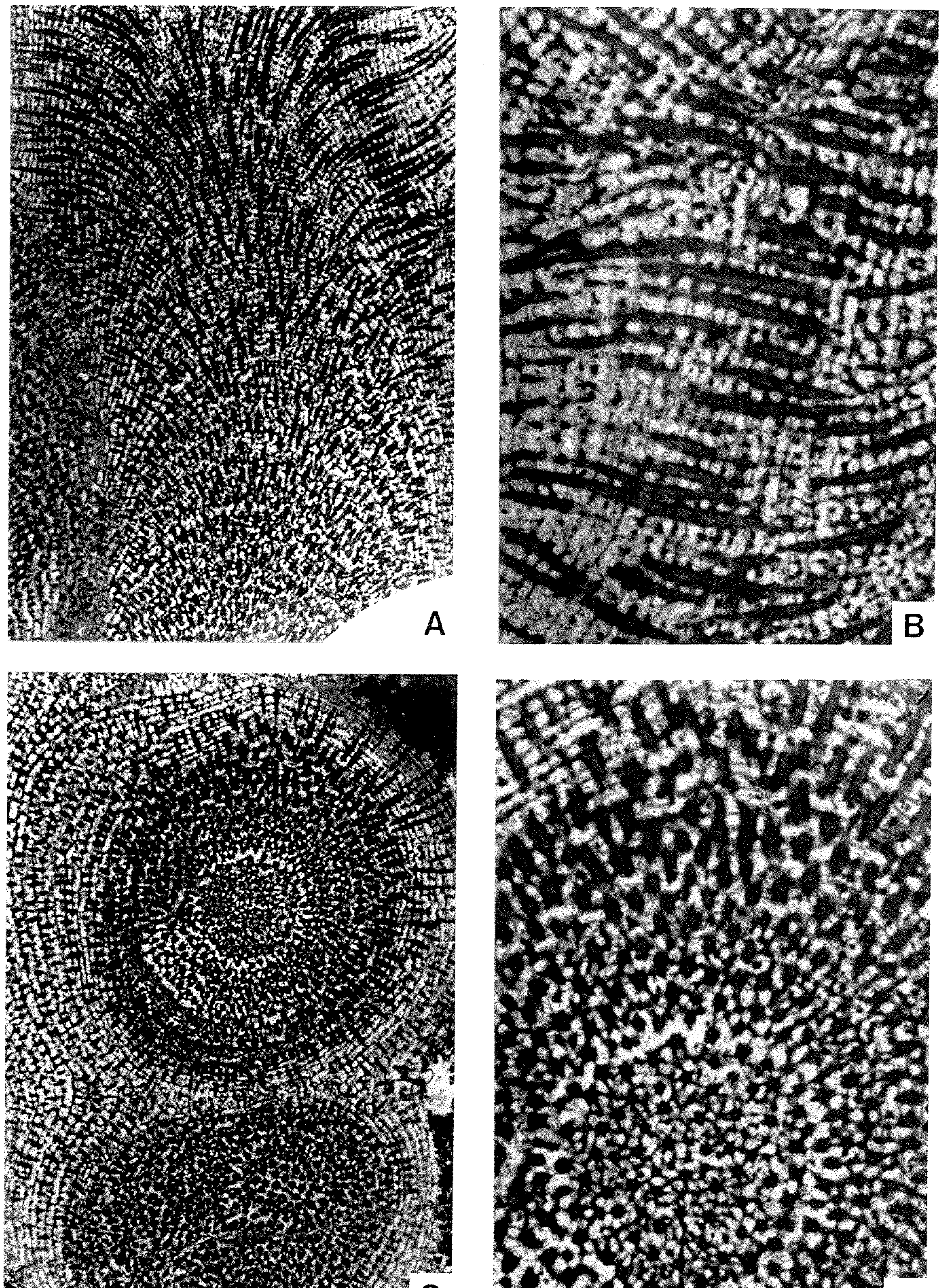
A-D *Actinostroma windjanicum* n. sp.

A. GSWA F10839, holotype, Pillara Limestone, LNR 7; vertical section, x 4.

B. GSWA F10839, holotype, Pillara Limestone, LNR 7; vertical section, x 10.

C. GSWA F10839, holotype, Pillara Limestone, LNR 7; tangential section, x 4.

D. GSWA F10839, holotype, Pillara Limestone, LNR 7; tangential section, x 10.



GSWA 20212

PLATE 6

A-E *Amphipora rudis* Lecompte

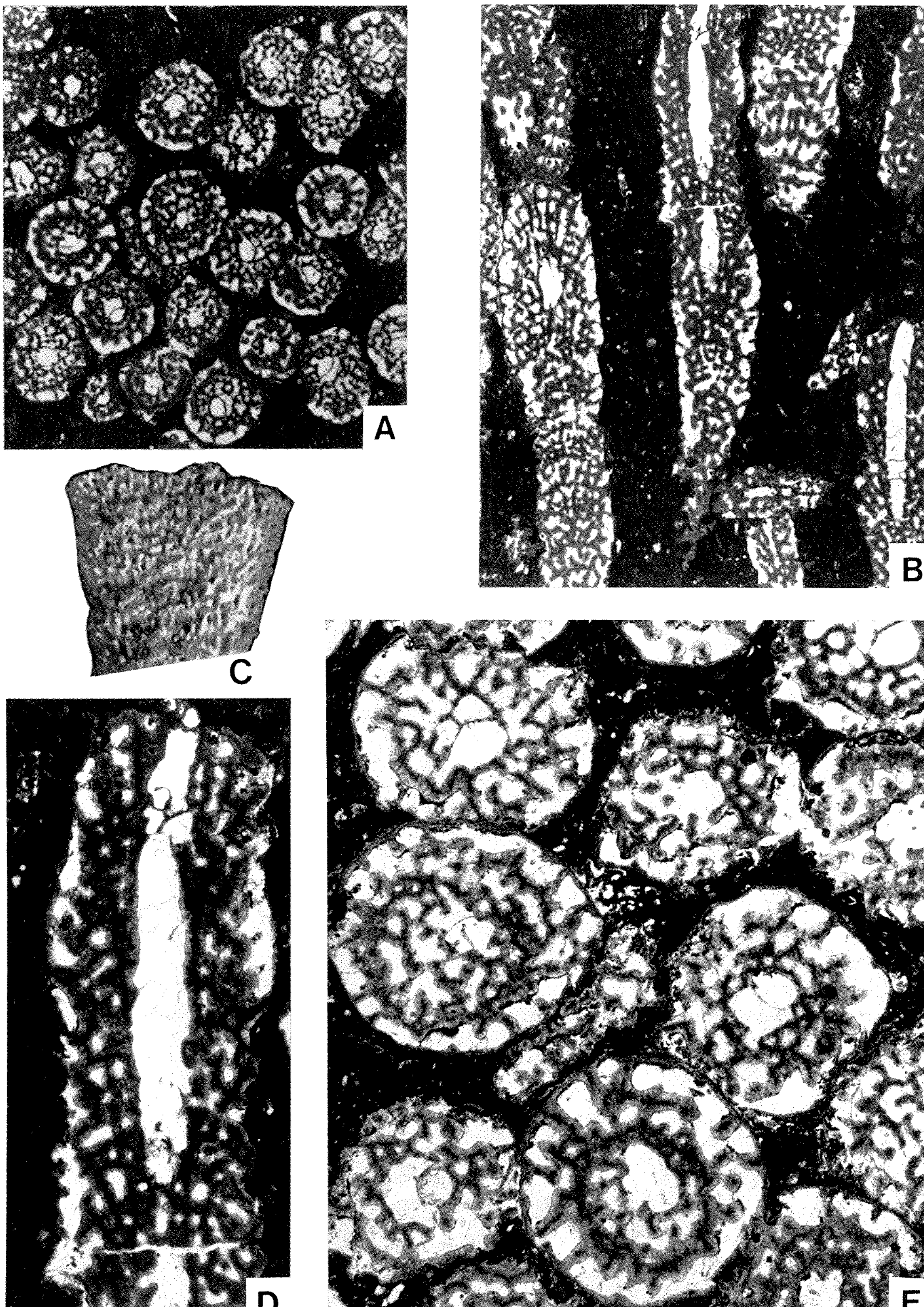
A. GSWA F10533, Pillara Limestone, NOB 7/28; transverse section, x 4.

B. GSWA F10533, Pillara Limestone, NOB 7/28; longitudinal section, x 4.

C. GSWA F10867, Sadler Limestone, NOB 53; external view of laterally-flattened coenosteum, x 4.

D. GSWA F10533, Pillara Limestone, NOB 7/28; longitudinal section, x 10.

E. GSWA F10533, Pillara Limestone, NOB 7/28, transverse section, x 10.



GSWA 20213

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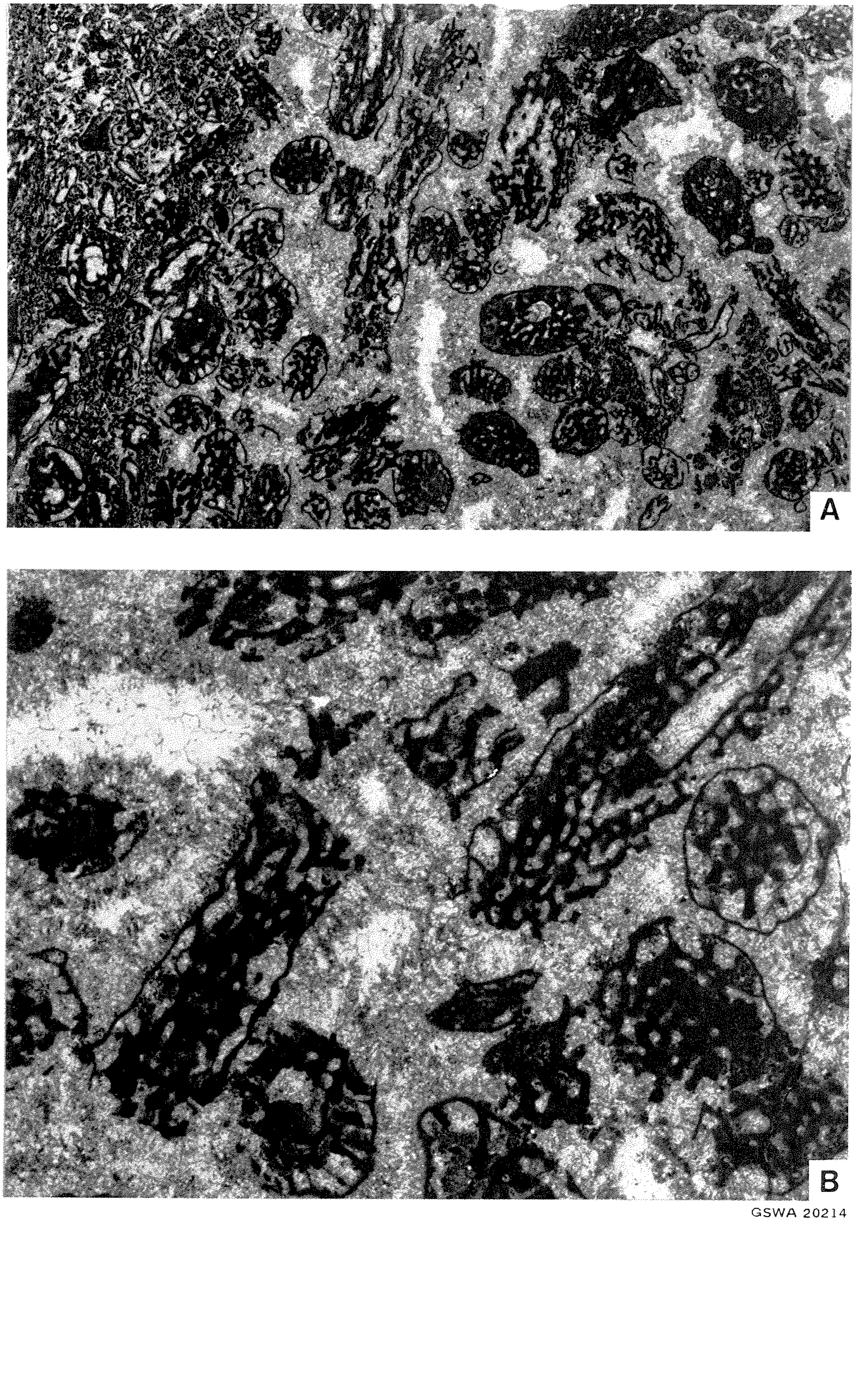
PLATE 7

A-B *Amphipora pervesiculata* Lecompte

A. GSWA F10750, Pillara Limestone, MRM 64; longitudinal and transverse sections, x 4.

B. GSWA F10750, Pillara Limestone, MRM 64; longitudinal and transverse sections, x 10.



GSWA 20214

PLATE 8

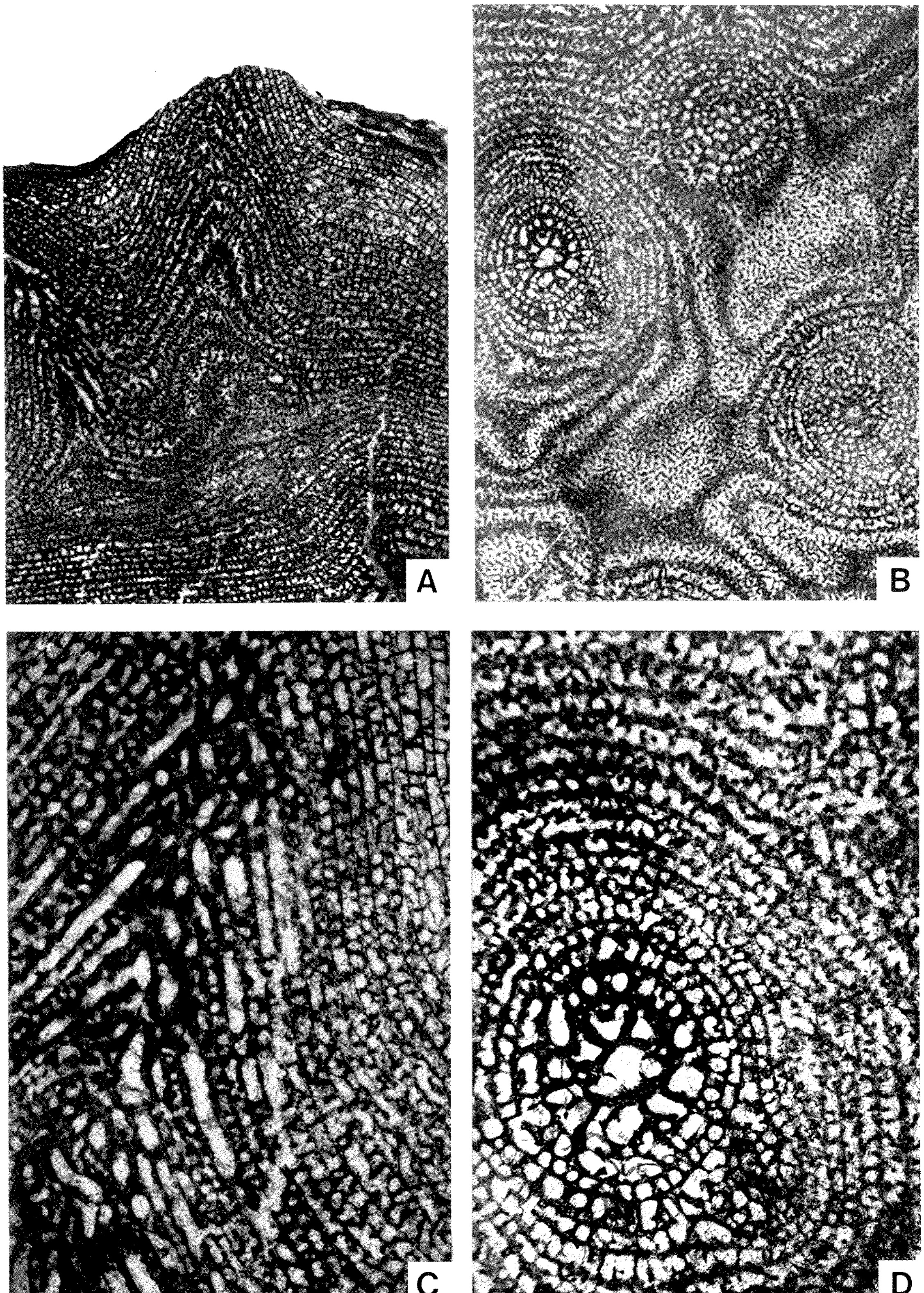
A-D *Anostylostroma ponderosum* (Nicholson)

A. GSWA F10801, Pillara Limestone, MRM 83; vertical section, x 4.

B. GSWA F10801, Pillara Limestone, MRM 83; tangential section, x 4.

C. GSWA F10801, Pillara Limestone, MRM 83; vertical section, x 10.

D. GSWA F10801, Pillara Limestone, MRM 83; tangential section, x 10.



GSWA 20215

PLATE 9

A-D *Atelodictyon stelliferum* Stearn

A. GSWA F10829, Pillara Limestone, MRM 72/73; vertical section, x 4.

B. GSWA F10829, Pillara Limestone, MRM 72/73; tangential section, x 4.

C. GSWA F10829, Pillara Limestone, MRM 72/73; vertical section, x 10.

D. GSWA F10829, Pillara Limestone, MRM 72/73; tangential section, x 10.

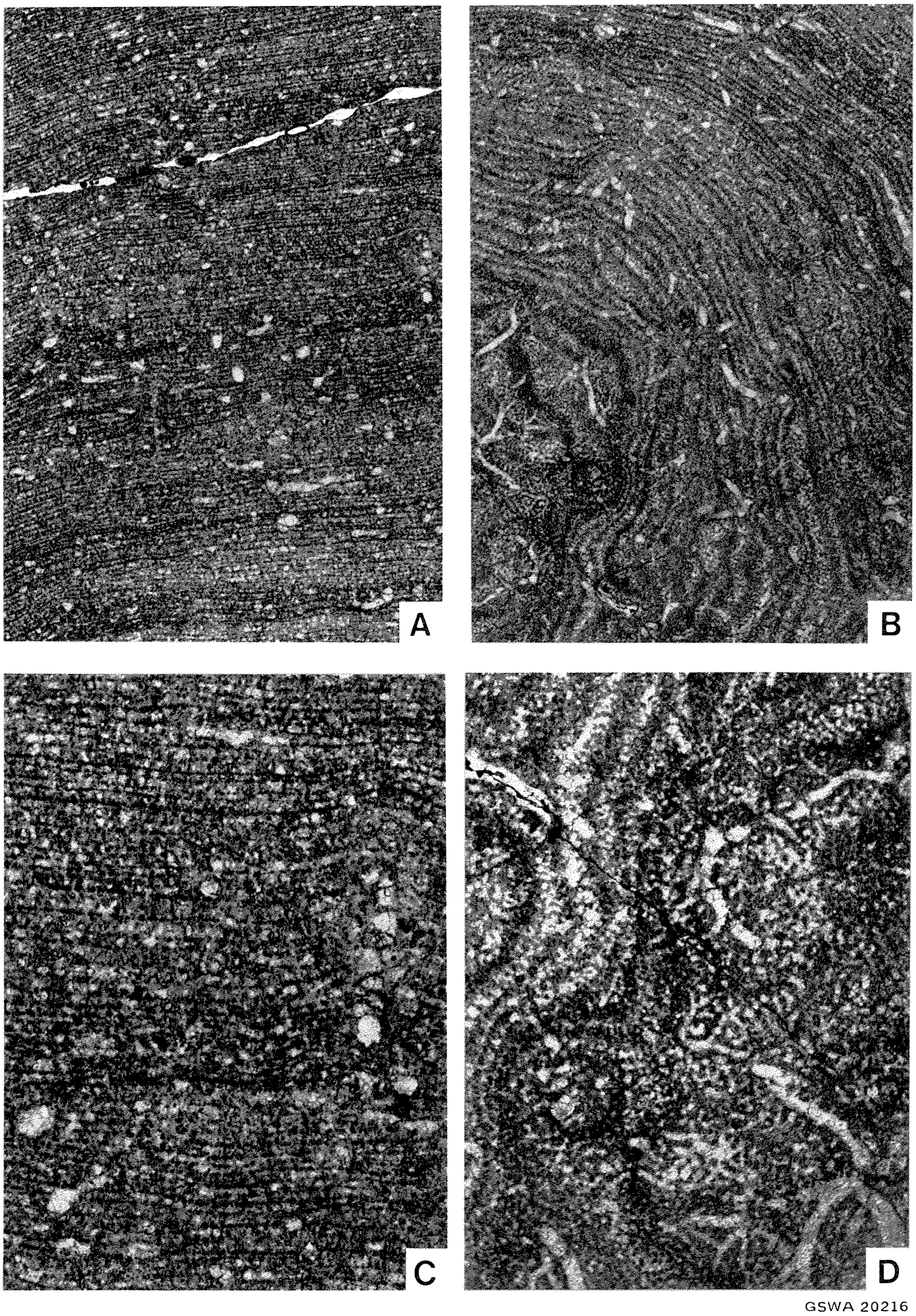

A
B
C
D
GSWA 20216

PLATE 10

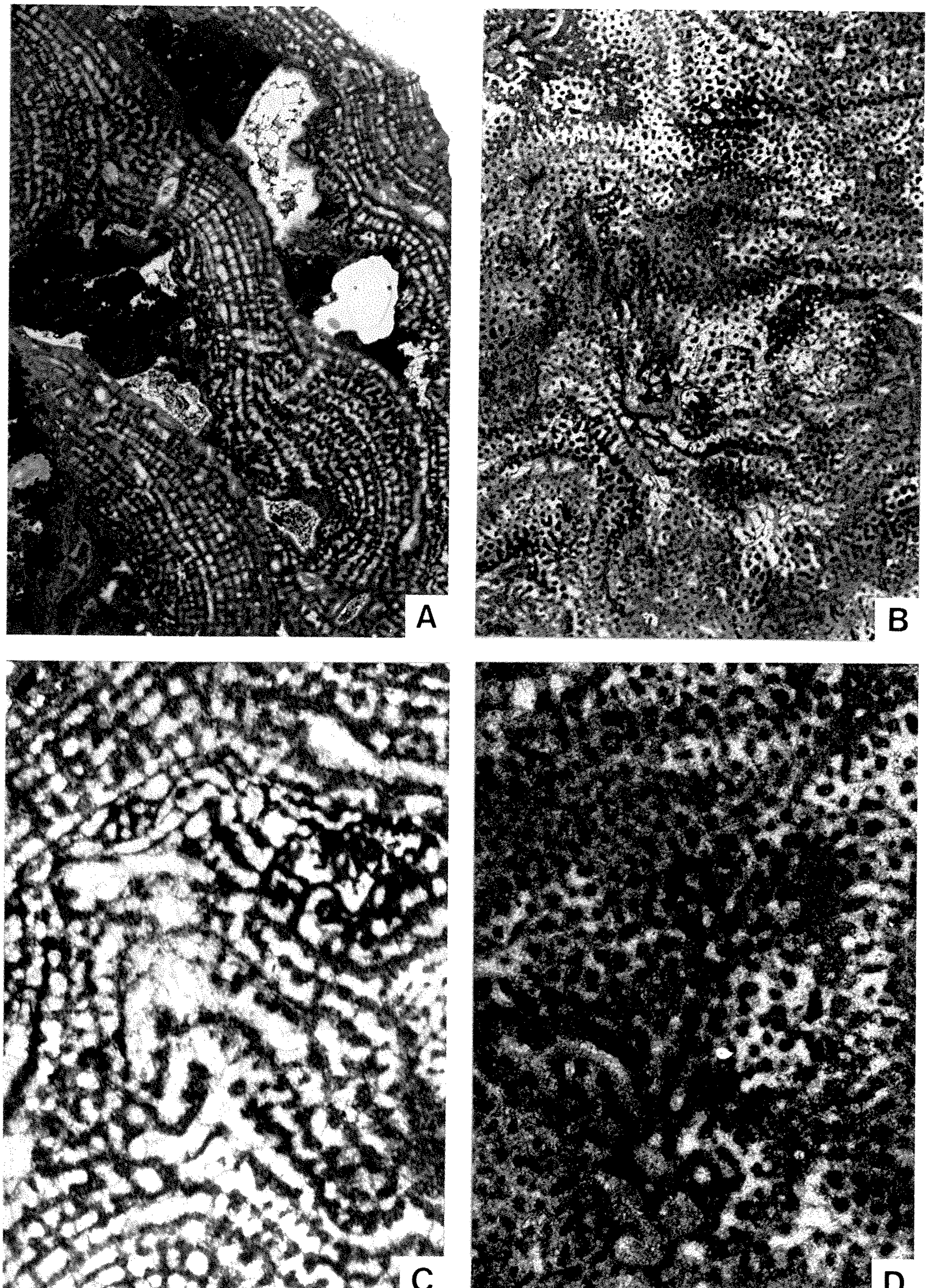
A-D *Clathrocoilona saginata* (Lecompte)

A. GSWA F10890, Windjana Limestone, LNR 11; vertical section, x 4.

B. GSWA F10886, Windjana Limestone, LNR 11; tangential section, x 4.

C. GSWA F10890, Windjana Limestone, LNR 11; vertical section, x 10.

D. GSWA F10886, Windjana Limestone, LNR 11; tangential section, x 10.



GSWA 20217

PLATE 11

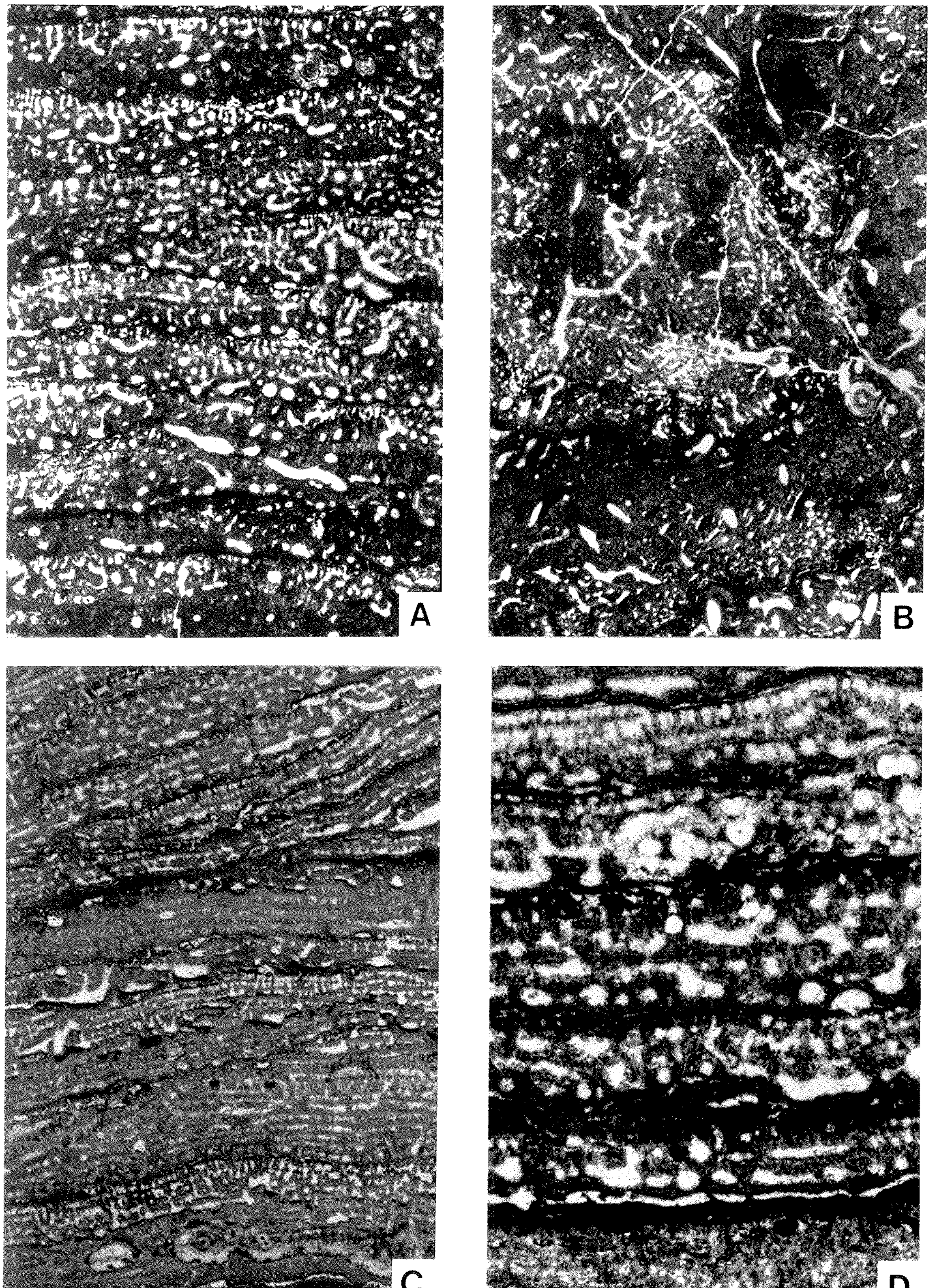
A-D *Clathrocoilona spissa* (Lecompte)

A. GSWA F10647, Pillara Limestone, NOB 42/43; vertical section, x 4.

B. GSWA F10647, Pillara Limestone, NOB 42/43; tangential section, x 4.

C. GSWA F10621, Pillara Limestone, NOB 38; vertical section, x 4.

D. GSWA F10621, Pillara Limestone, NOB 38; vertical section, x 10.



GSWA 20218

PLATE 12

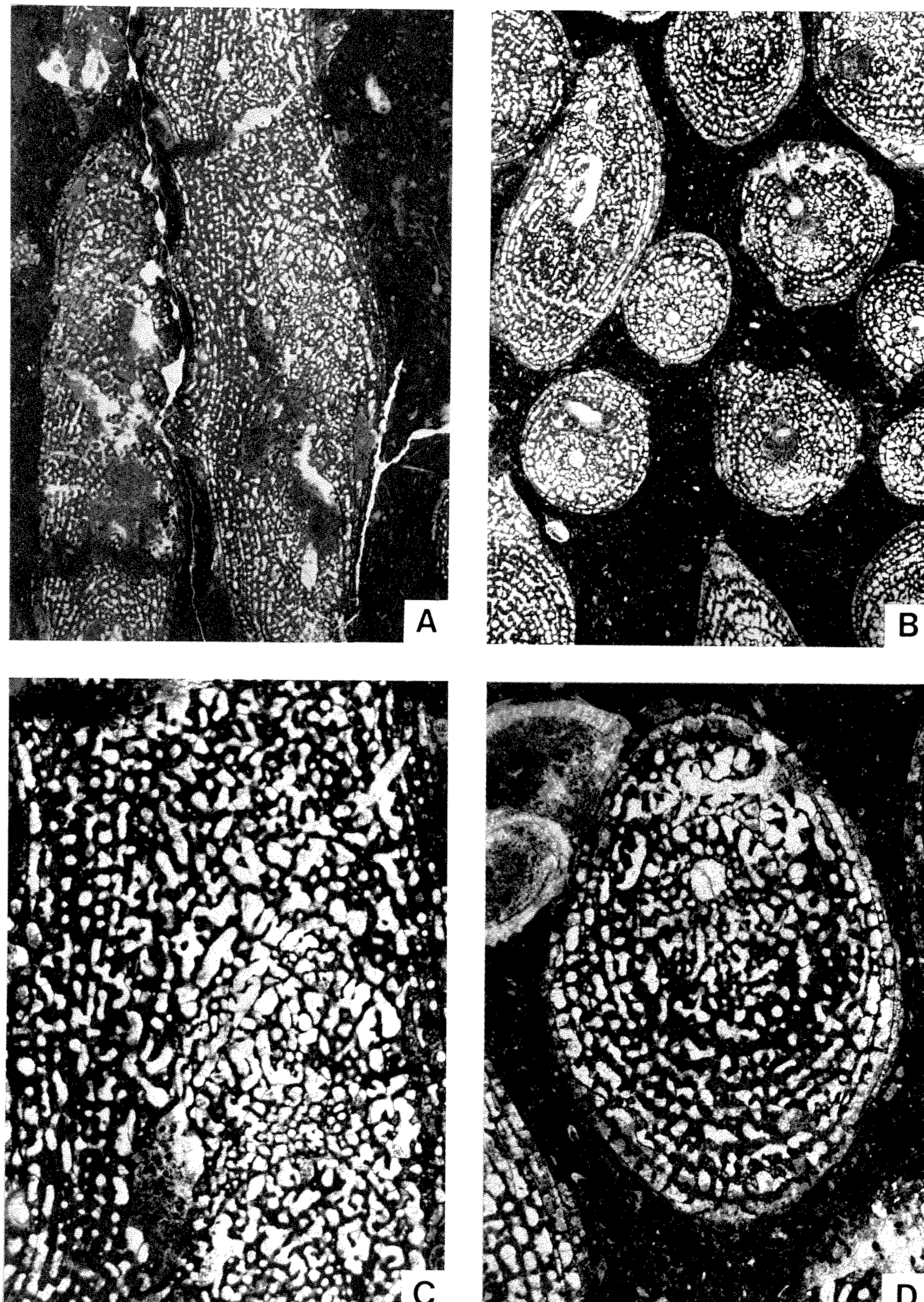
A-D *Dendrostroma oculatum* (Nicholson)

A. CPC21177, Pillara Limestone, NOB 56; longitudinal section, x 4.

B. CPC21177, Pillara Limestone, NOB 56; transverse section , x 4.

C. CPC21177, Pillara Limestone, NOB 56; longitudinal section, x 10.

D. CPC21177, Pillara Limestone, NOB 56; transverse section, x 10.



GSWA 20219

PLATE 13

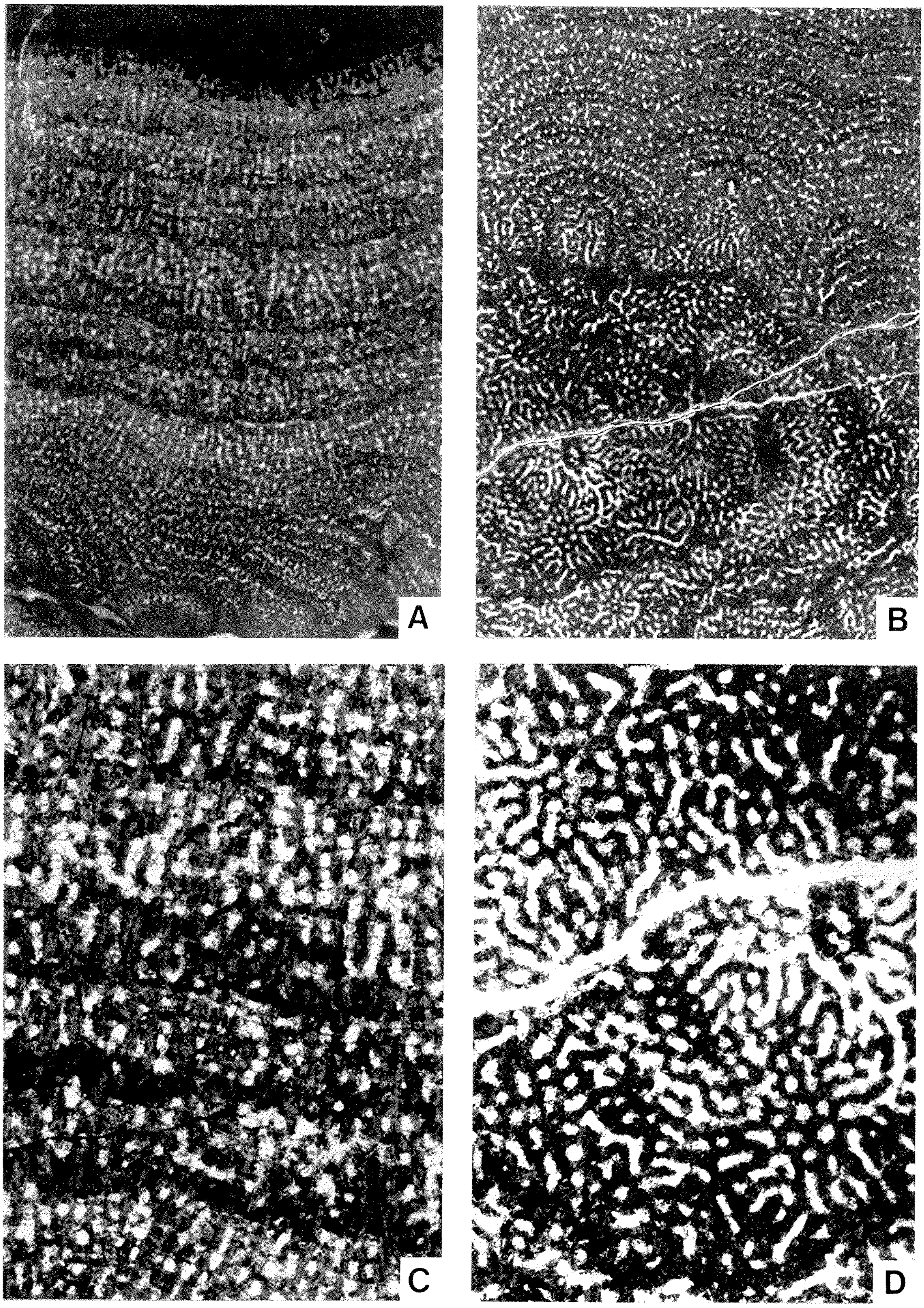
A-D *Hermatostroma ambiguum* n. sp.

A. GSWA F10916, holotype, Pillara Limestone, LNR 7; vertical section, x 4.

B. GSWA F10916, holotype, Pillara Limestone, LNR 7; tangential section, x 4.

C. GSWA F10916, holotype, Pillara Limestone, LNR 7; vertical section, x 10.

D. GSWA F10916, holotype, Pillara Limestone, LNR 7; tangential section, x 10.



GSWA 20220

PLATE 14

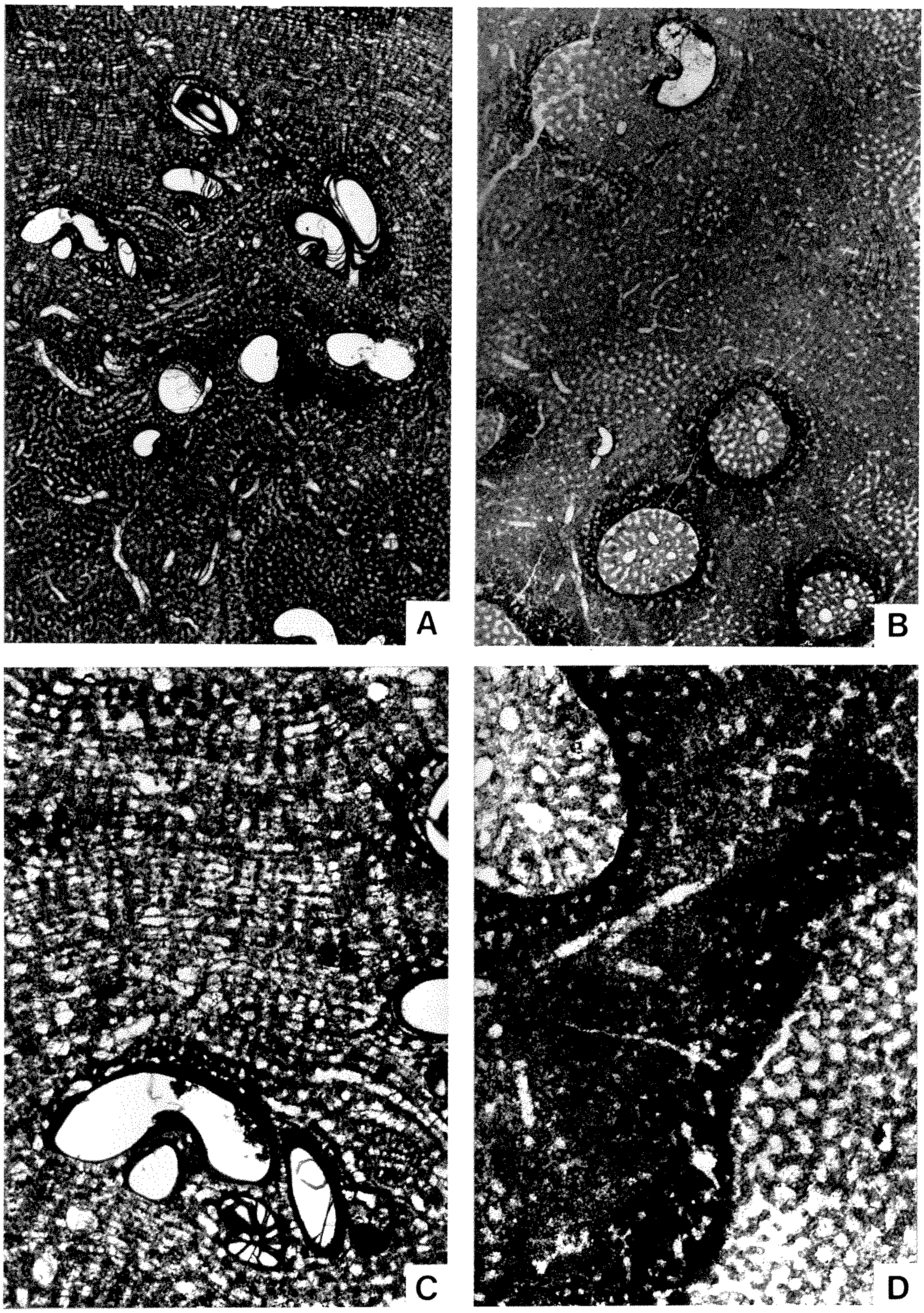
A-D *Hermatostroma perseptatum* Lecompte

A. GSWA F10792, Pillara Limestone, MRM 82; vertical section, x 4.

B. GSWA F10761, Pillara Limestone, NOB 21/48; tangential section, x 4.

C. GSWA F10792, Pillara Limestone, MRM 82; vertical section, x 10.

D. GSWA F10761, Pillara Limestone, NOB 21/48; tangential section, x 10.



GSWA 20221

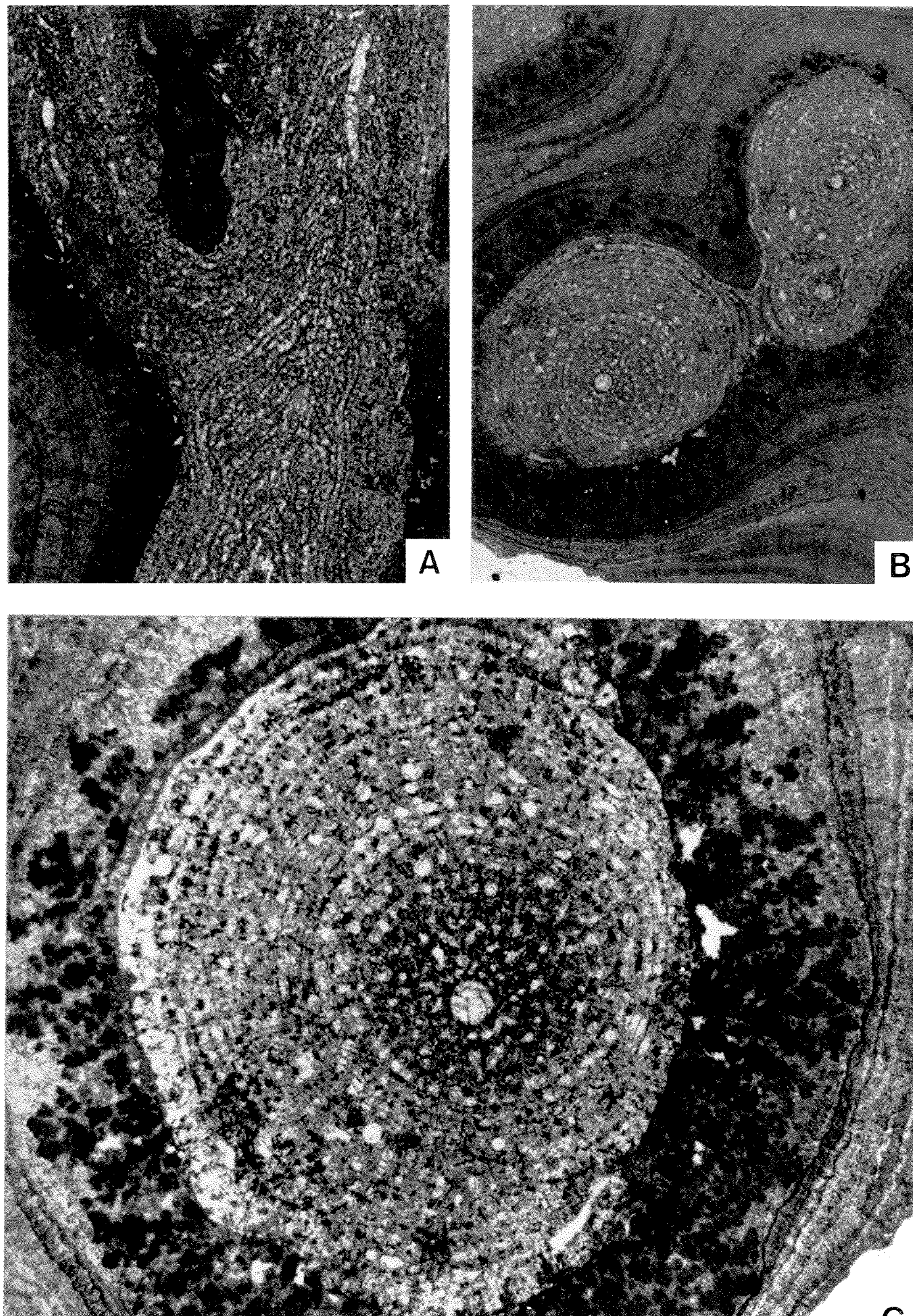
PLATE 15

A-C *Hermatostroma roemeri* (Nicholson)

A. GSWA F10833, Pillara Limestone, MRM 74; longitudinal section, x 4.

B. GSWA F10833, Pillara Limestone, MRM 74; transverse section, x 4.

C. GSWA F10833, Pillara Limestone, MRM 74; transverse section, x 10.



GSWA 20222

PLATE 16

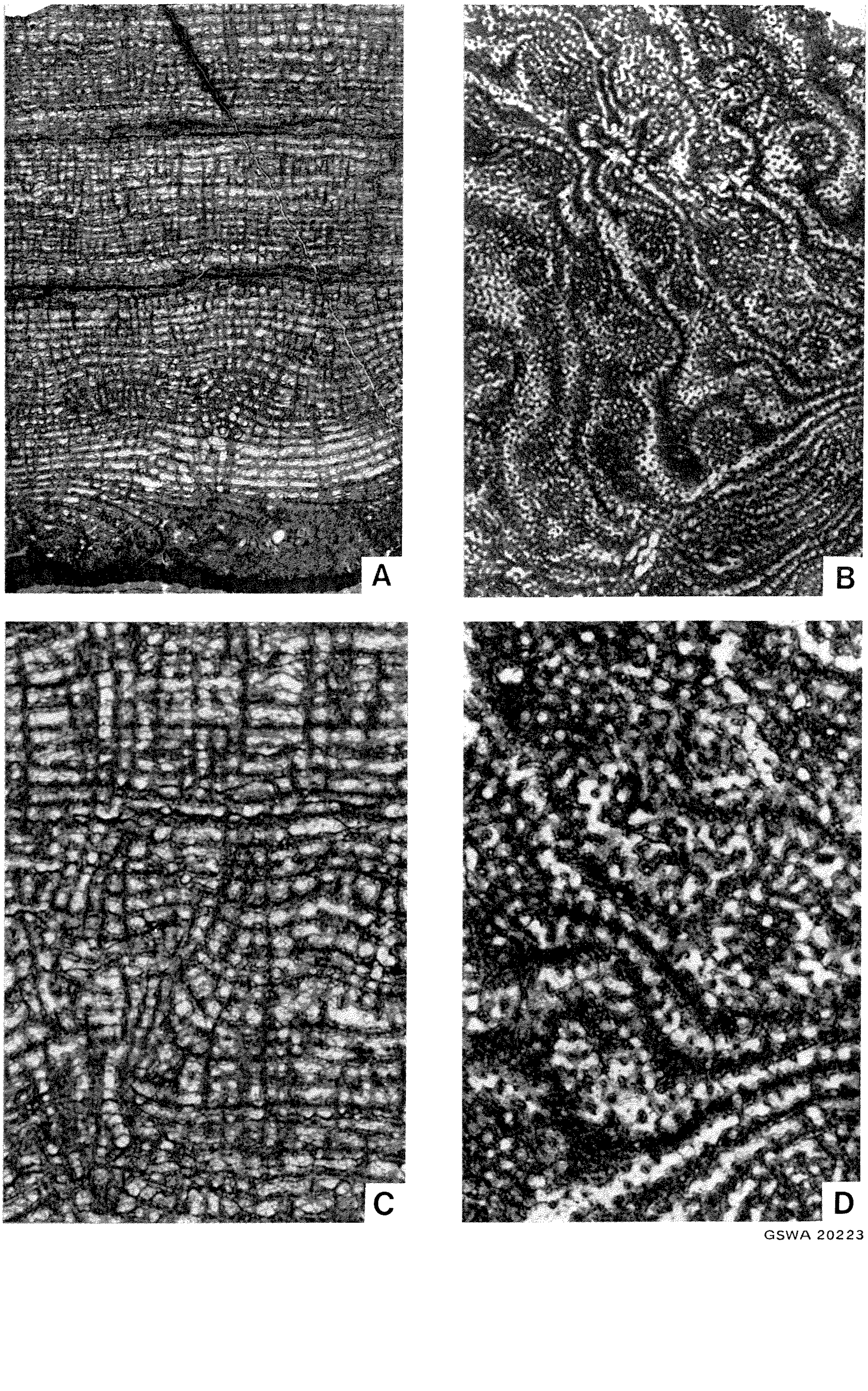
A-D *Hermatostroma schlueteri* Nicholson

A. GSWA F10864, Pillara Limestone, NOB 52; vertical section, x 4.

B. GSWA F10493, Pillara Limestone, MRM 42; tangential section, x 4.

C. GSWA F10493, Pillara Limestone, MRM 42; vertical section, x 10.

D. GSWA F10493, Pillara Limestone, MRM 42; tangential section, x 10.



GSWA 20223

PLATE 17

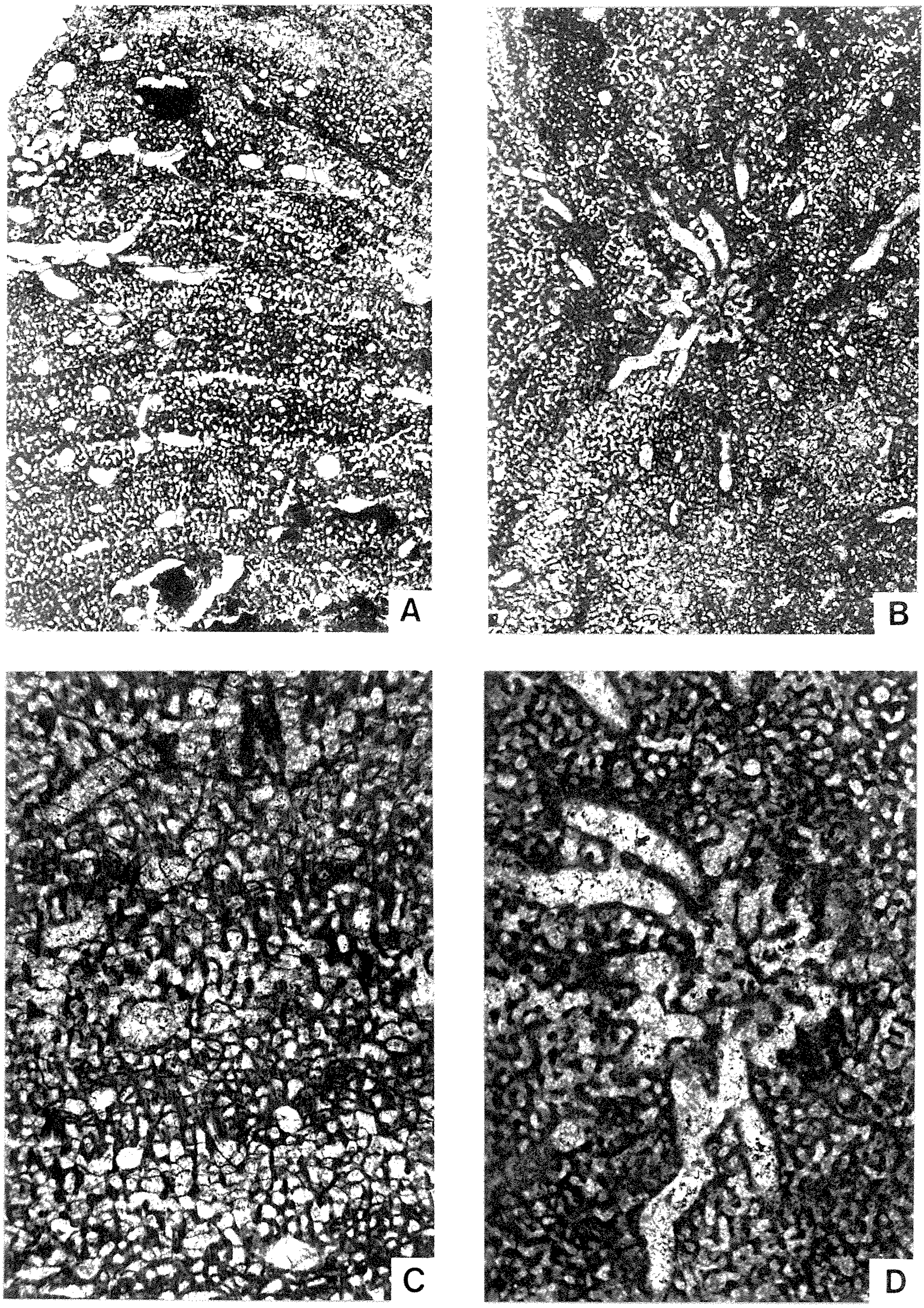
A-D *Pseudoactinodictyon dartingtoniensis* (Carter)

A. GSWA F10361, Pillara Limestone, MRM 31; vertical section, x 4.

B. CPC21178, Sadler Limestone, NOB 55; tangential section, x 4.

C. CPC21178, Sadler Limestone, NOB 55; vertical section, x 10.

D. CPC21178, Sadler Limestone, NOB 55; tangential section, x 10.



GSWA 20224

PLATE 18

A-E *Stachyodes australe* (Wray)

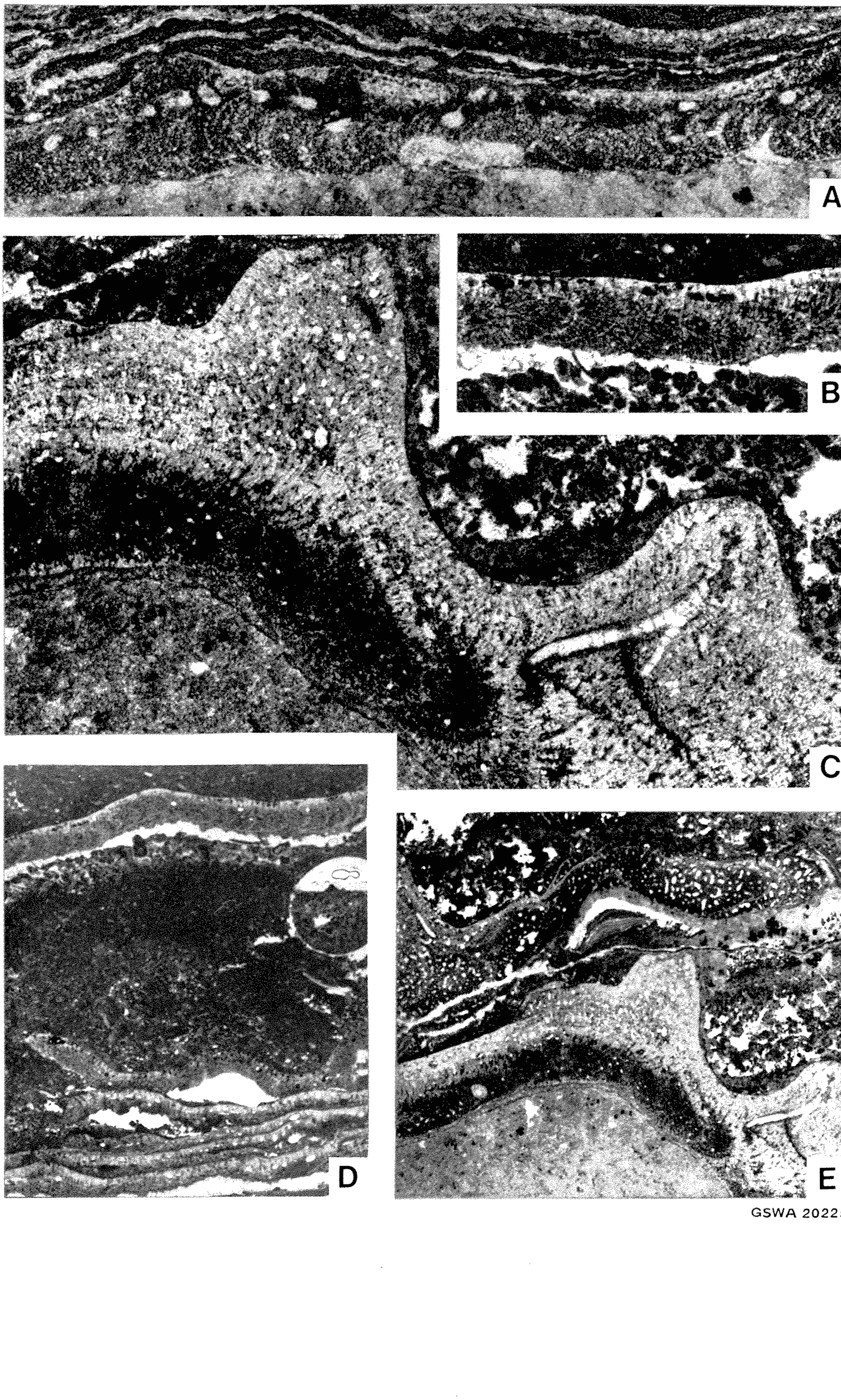
A. GSWA F6160, holotype, Pillara Limestone, LNR 13; vertical section, x 10.

B. GSWA F10516, Pillara Limestone, MRM 46; vertical section, x 10.

C. GSWA F10521, Pillara Limestone, MRM 47; vertical section, x 10.

D. GSWA F10516, Pillara Limestone, MRM 46; vertical section, x 4.

E. GSWA F10521, Pillara Limestone, MRM 47; vertical section, x 4.



GSWA 20225

PLATE 19

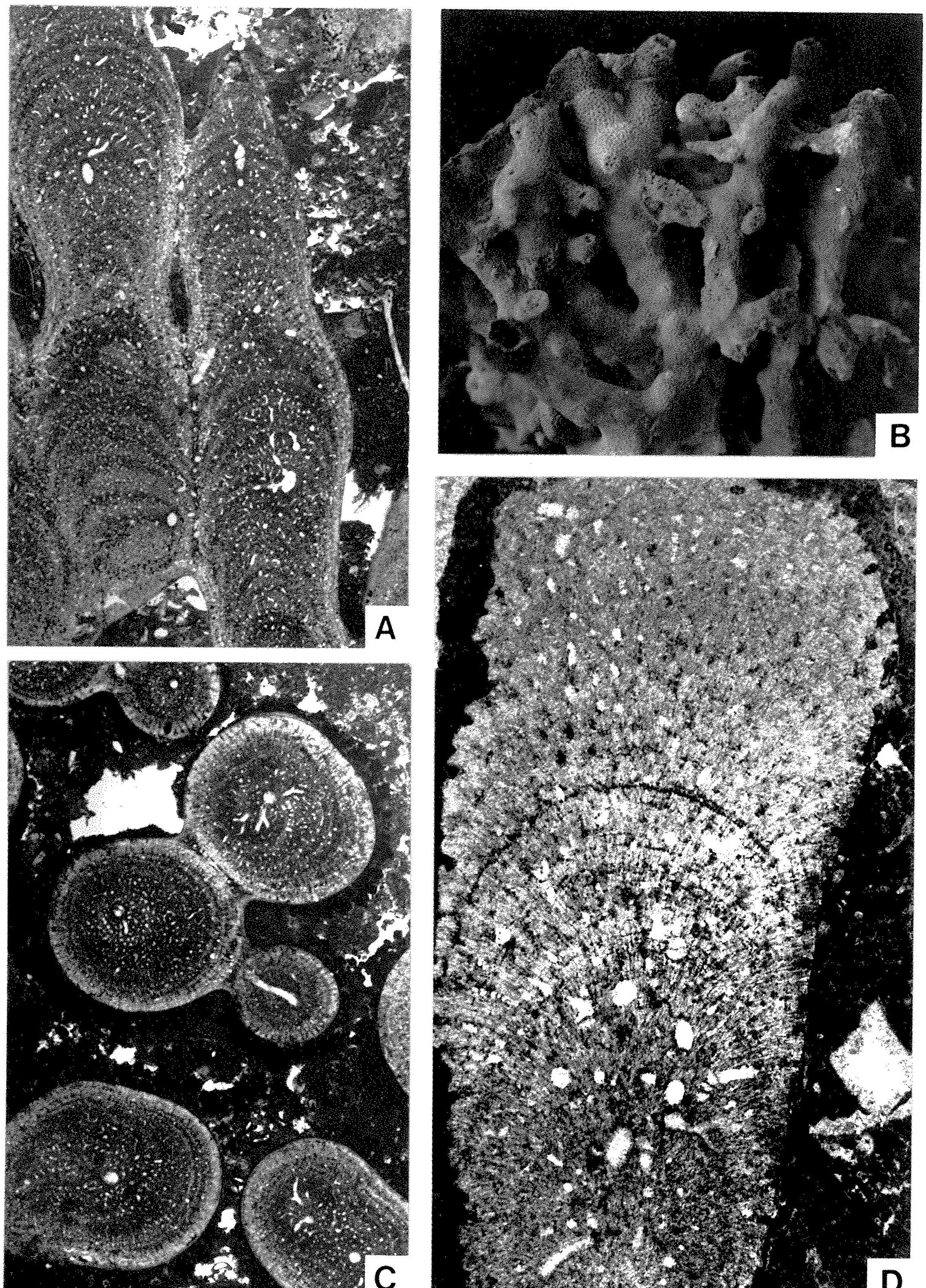
A-D *Stachyodes costulata* Lecompte

A. GSWA F10625, Pillara Limestone, NOB 33; longitudinal section, x 4.

B. GSWA F7885, Sadler Limestone, NOB 32; general view of silicified coenosteum, x 2.

C. GSWA F10625, Pillara Limestone, NOB 33; transverse section, x 4.

D. GSWA F10552, Pillara Limestone, NOB 34; longitudinal section, x 10.



GSWA 20226

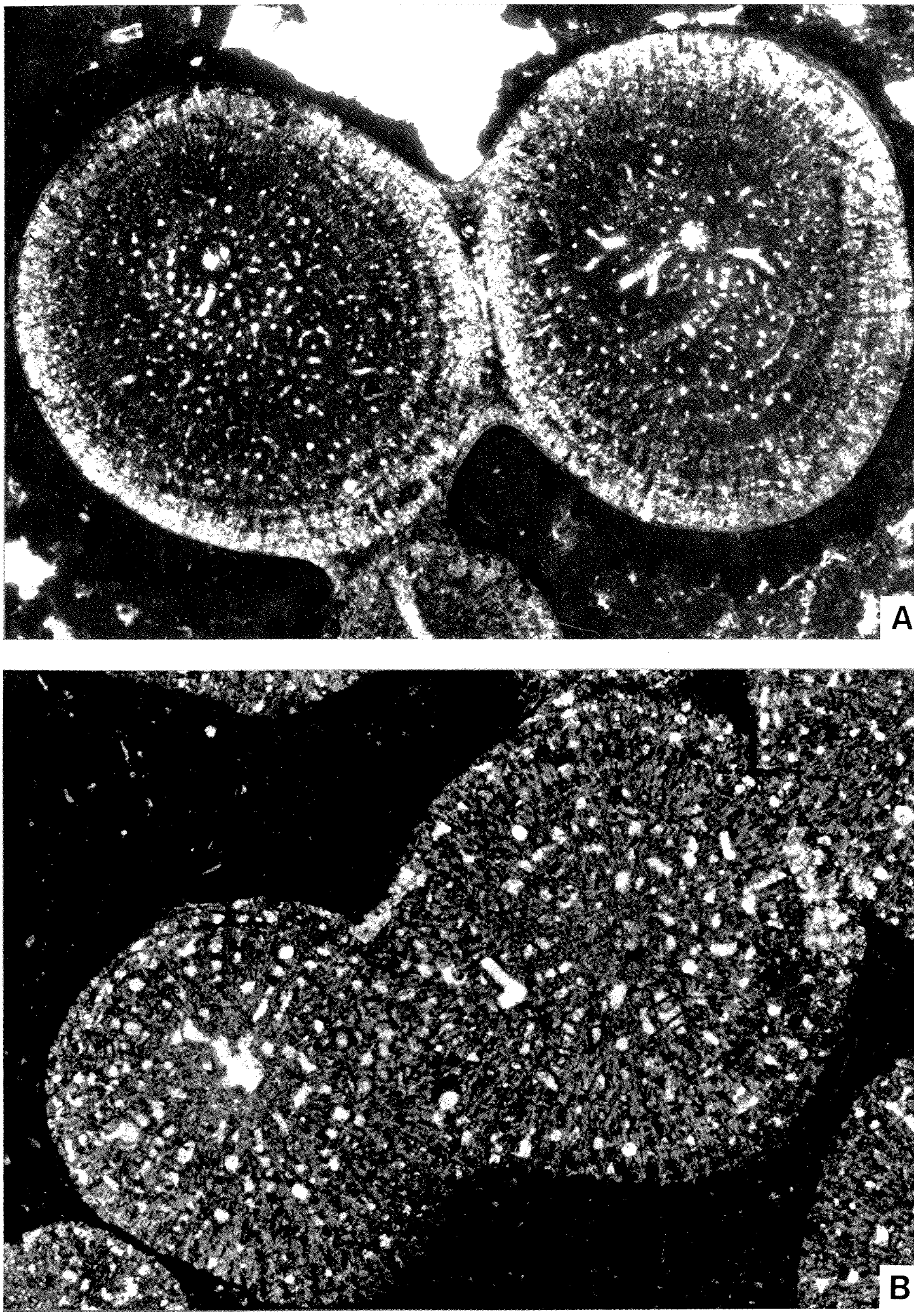
PLATE 20

A *Stachyodes costulata* Lecompte

A. GSWA F10625, Pillara Limestone, NOB 33; transverse section, x 10.

B *Stachyodes crassa* (Lecompte)

B. GSWA F10856, Pillara Limestone, NOB 25; transverse section, x 10.



GSWA 20227

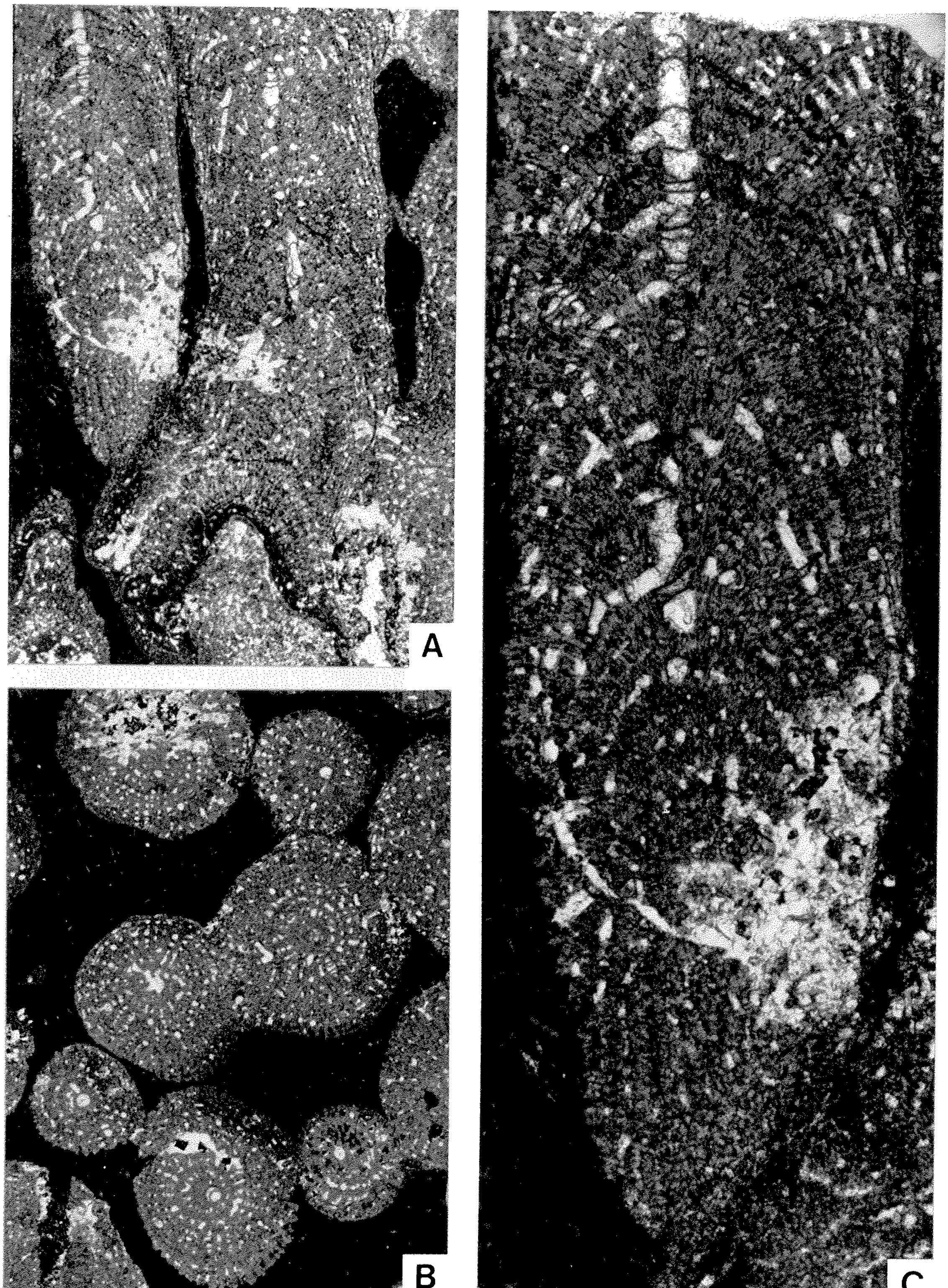
PLATE 21

A-C *Stachyodes crassa* (Lecompte)

A. GSWA F10856, Pillara Limestone, NOB 25; longitudinal section, x 4.

B. GSWA F10856, Pillara Limestone, NOB 25; transverse section, x 4.

C. GSWA F10856, Pillara Limestone, NOB 25; longitudinal section, x 10.



GSWA 20228

PLATE 22

A, B *Stachyodes dendroidea* Etheridge Jr.

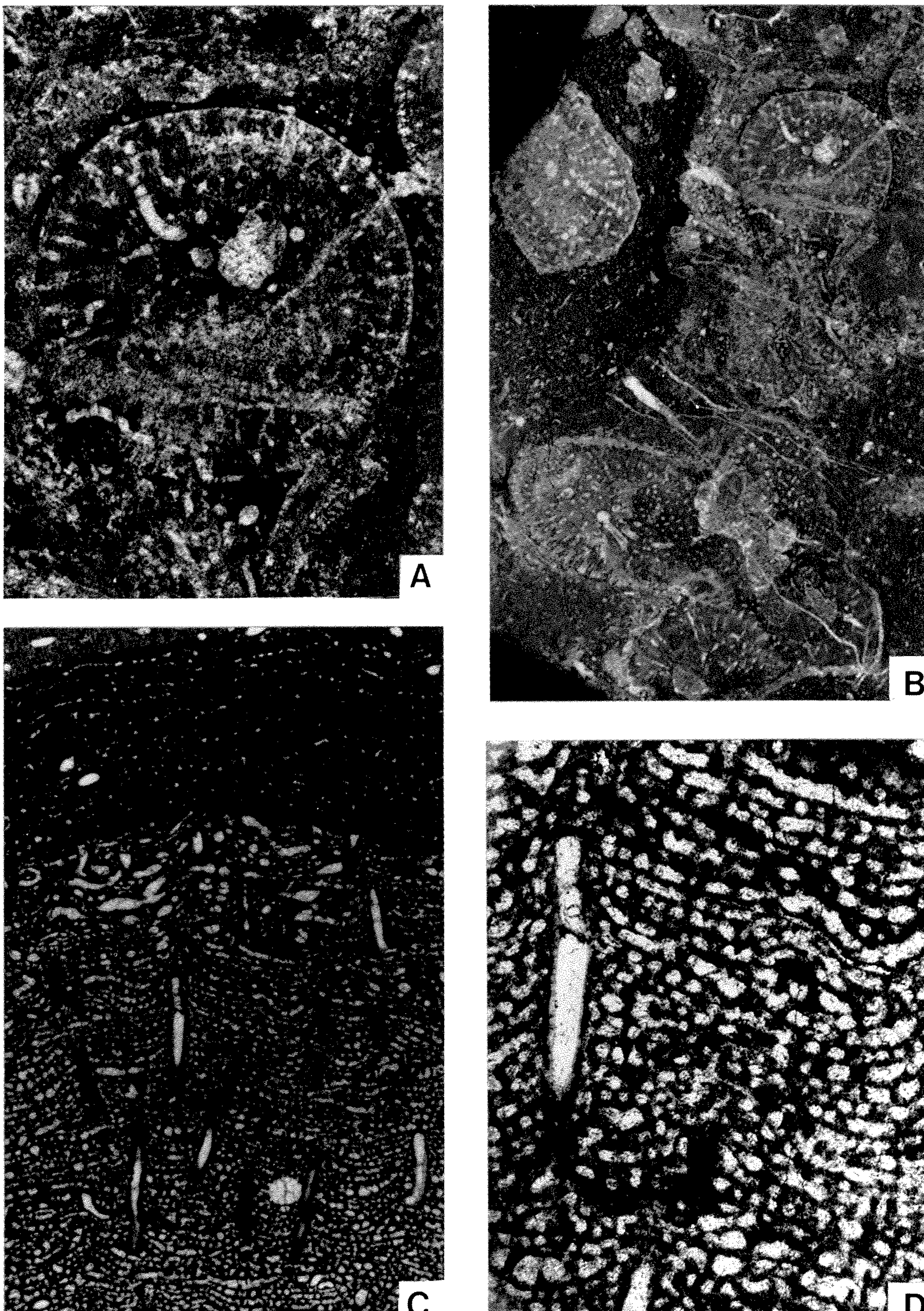
A. AM991a, holotype, Pillara Limestone, Minnie Pool; transverse section, x 10.

B. AM991a, holotype, Pillara Limestone, Minnie Pool; transverse section, x 4.

C, D *Stromatoporella laminata* (Bargatzky)

C. GSWA F10592, Sadler Limestone, NOB 14; vertical section, x 4.

D. GSWA F10592, Sadler Limestone, NOB 14; vertical section, x 10.



GSWA 20229

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PLATE 23

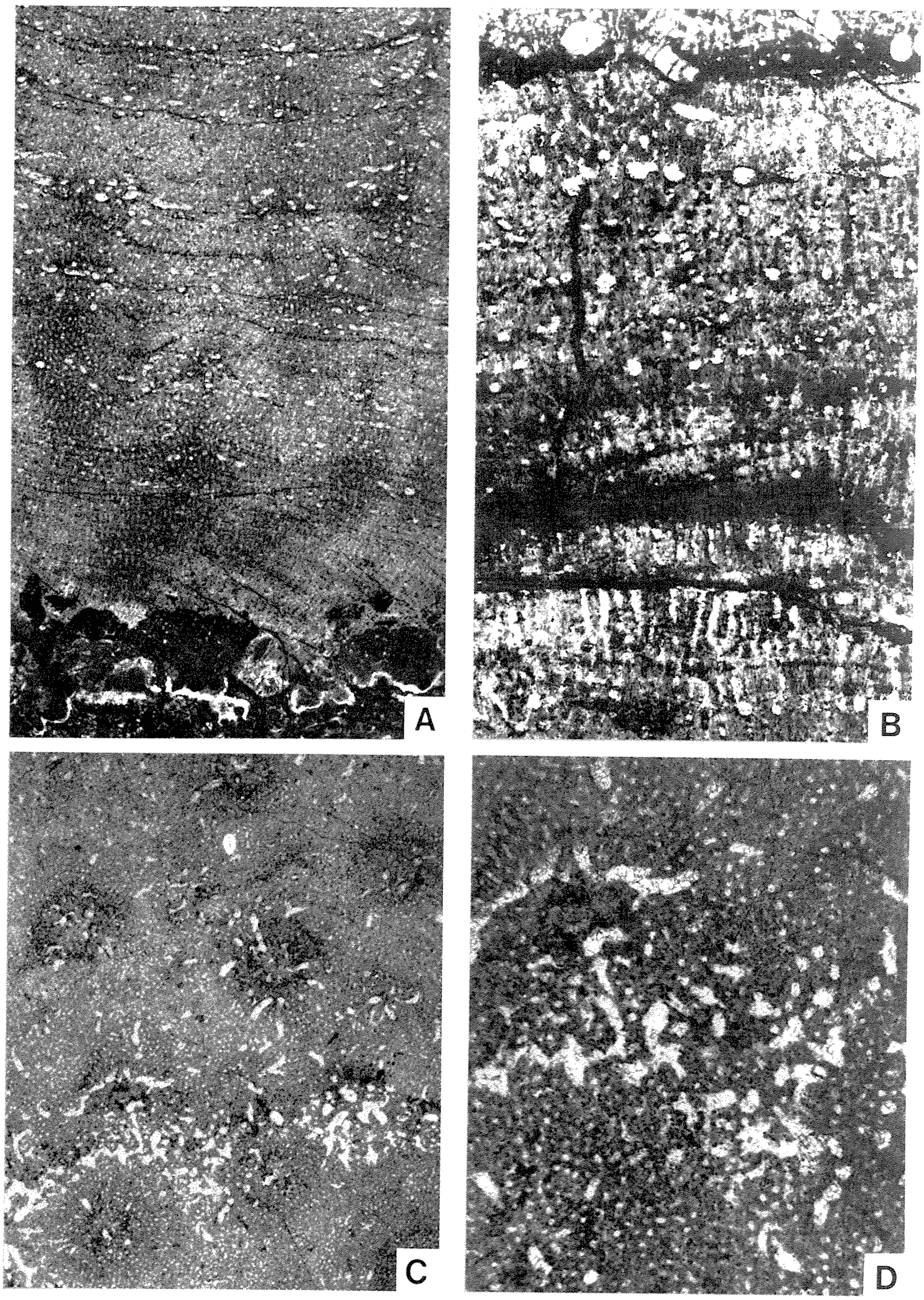
A-D *Stromatopora cooperi* Lecompte

A. GSWA F10643, Pillara Limestone, NOB 42/43; vertical section, x 4.

B. GSWA F10571, Sadler Limestone, NOB 9; vertical section, x 10.

C. GSWA F10643, Pillara Limestone, NOB 42/43; tangential section, x 4.

D. GSWA F10643, Pillara Limestone, NOB 42/43; tangential section, x 10.



GSWA 20230

PLATE 24

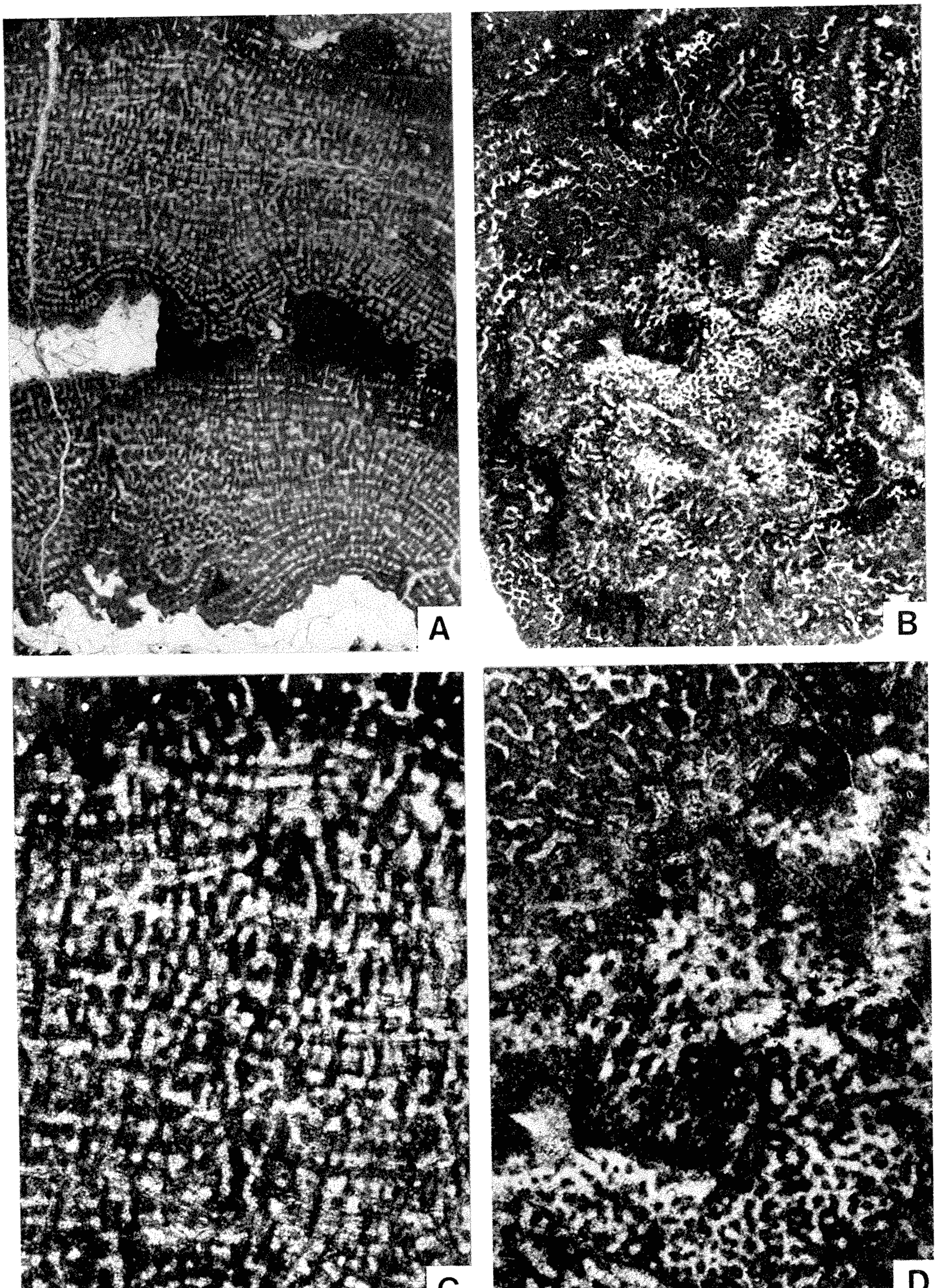
A-D *Stromatopora lennardensis* n.sp.

A. GSWA F10906, holotype, Windjana Limestone, LNR 10; vertical section, x 4.

B. GSWA F10906, holotype, Windjana Limestone, LNR 10; tangential section, x 4.

C. GSWA F10906, holotype, Windjana Limestone, LNR 10; vertical section, x 10.

D. GSWA F10906, holotype, Windjana Limestone, LNR 10; tangential section, x 10.



GSWA 20231

PLATE 25

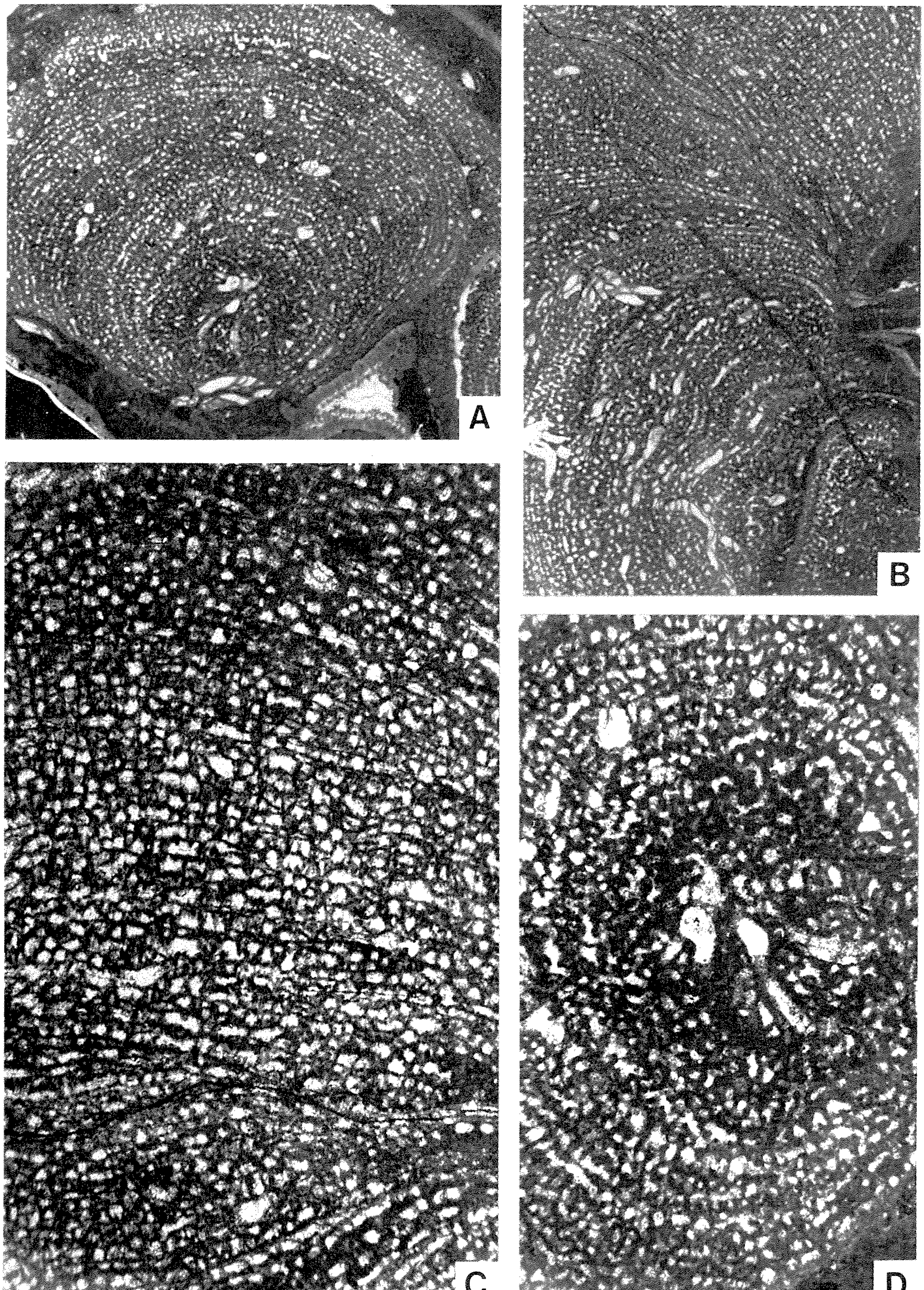
A-D *Stromatopora minutitextum* (Lecompte)

A. GSWA F10845, Pillara Limestone, LNR 7; tangential section, x 4.

B. GSWA F10845, Pillara Limestone, LNR 7; vertical section, x 4.

C. GSWA F10845, Pillara Limestone, LNR 7; vertical section, x 10.

D. GSWA F10845, Pillara Limestone, LNR 7; tangential section, x 10.



GSWA 20232

PLATE 26

A-E *Trupetostroma bassleri* (Lecompte)

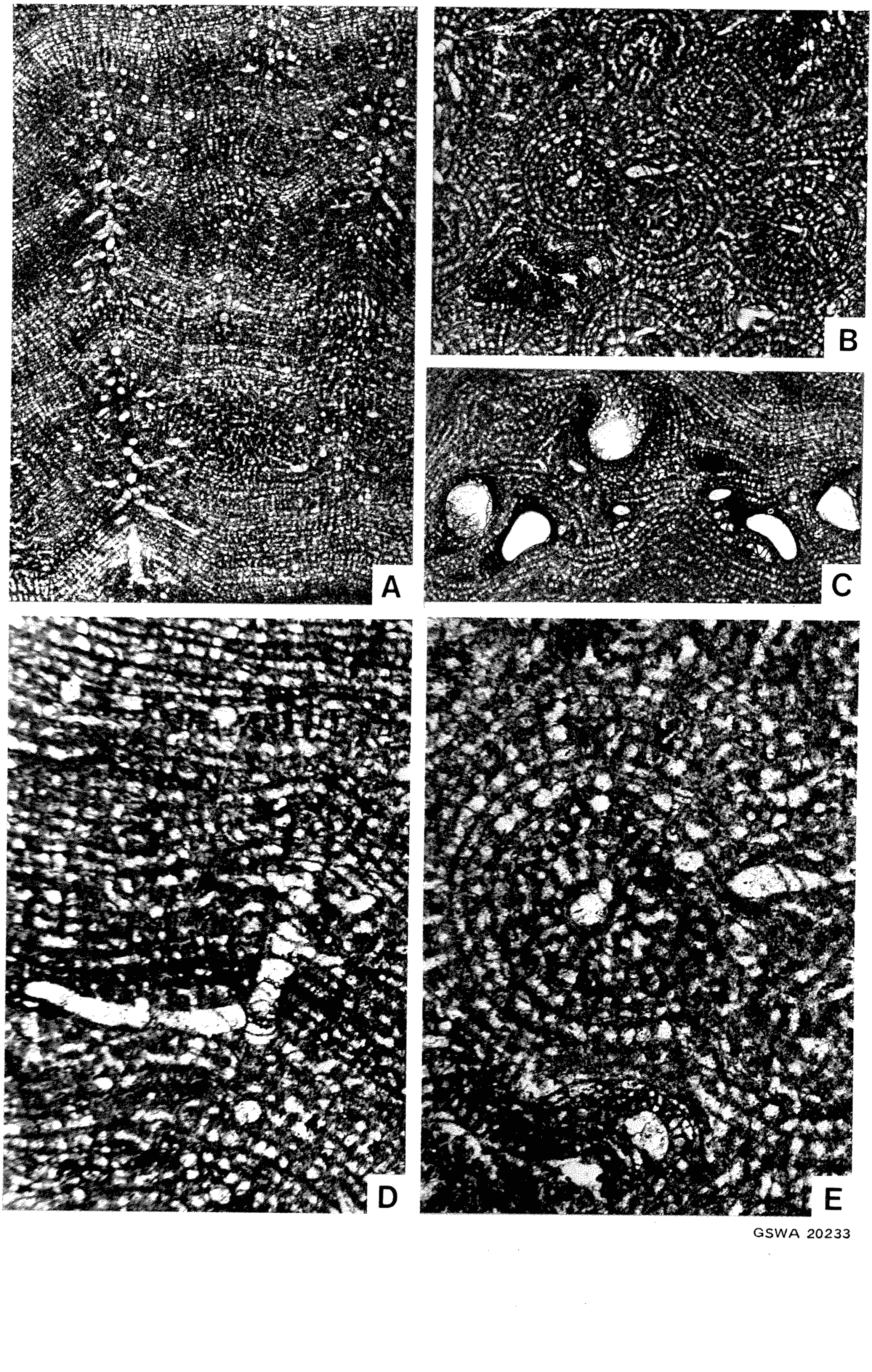
A. GSWA F10799, Pillara Limestone, MRM 82; vertical section, x 4.

B. GSWA F10543, Pillara Limestone, NOB 7/28; tangential section, x 4.

C. GSWA F10795, Pillara Limestone, MRM 82; vertical section, x 4.

D. GSWA F10543, Pillara Limestone, NOB 7/28; vertical section, x 10.

E. GSWA F10543, Pillara Limestone, NOB 7/28; tangential section, x 10.



GSWA 20233

PLATE 27

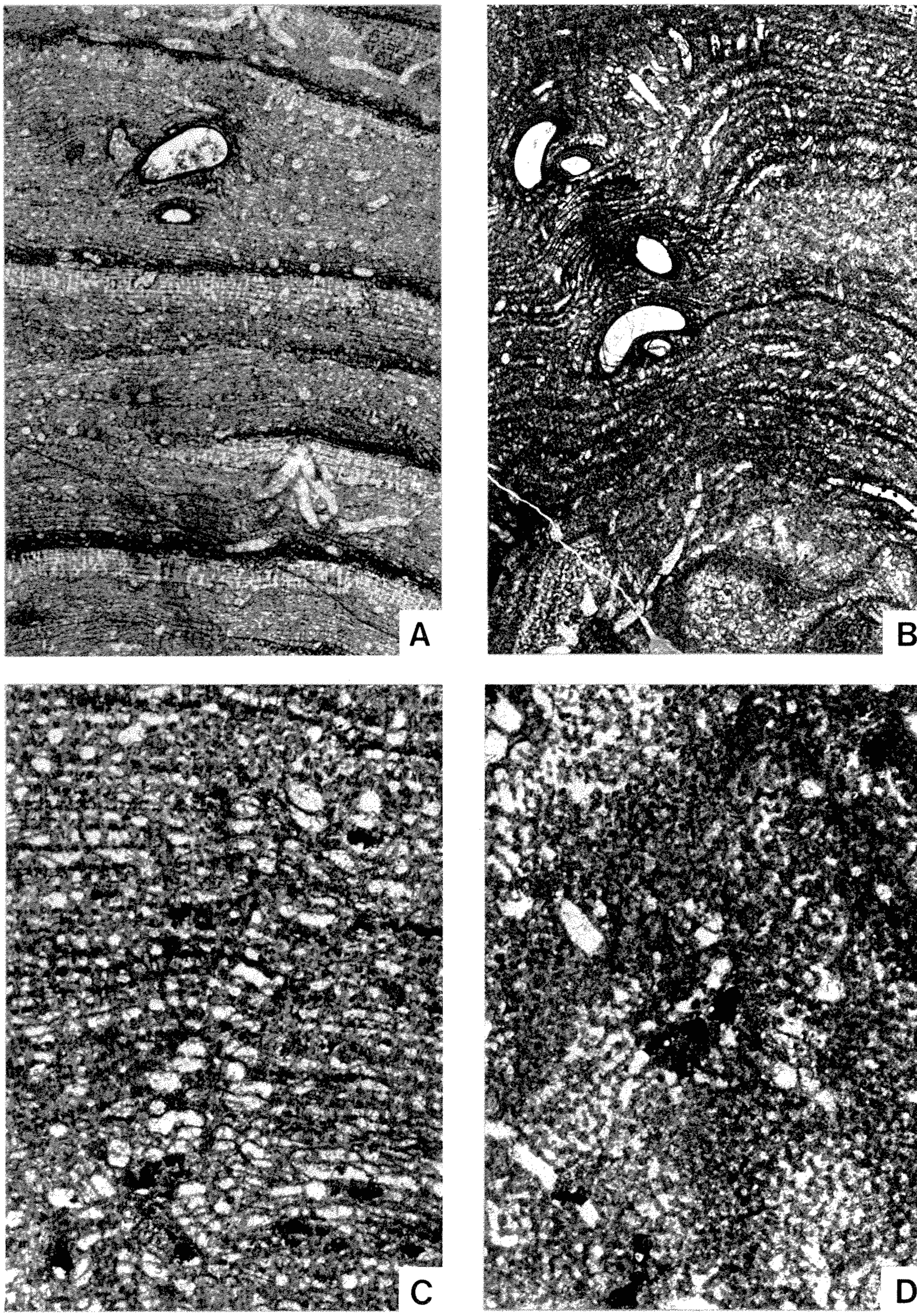
A-D *Trupetostroma laceratum* (Lecompte)

A. GSWA F10925, Pillara Limestone, MRM 84; vertical section, x 4.

B. GSWA F10925, Pillara Limestone, MRM 84; tangential section, x 4.

C. GSWA F10743, Pillara Limestone, MRM 29; vertical section, x 10.

D. GSWA F10743, Pillara Limestone, MRM 29; tangential section, x 10.



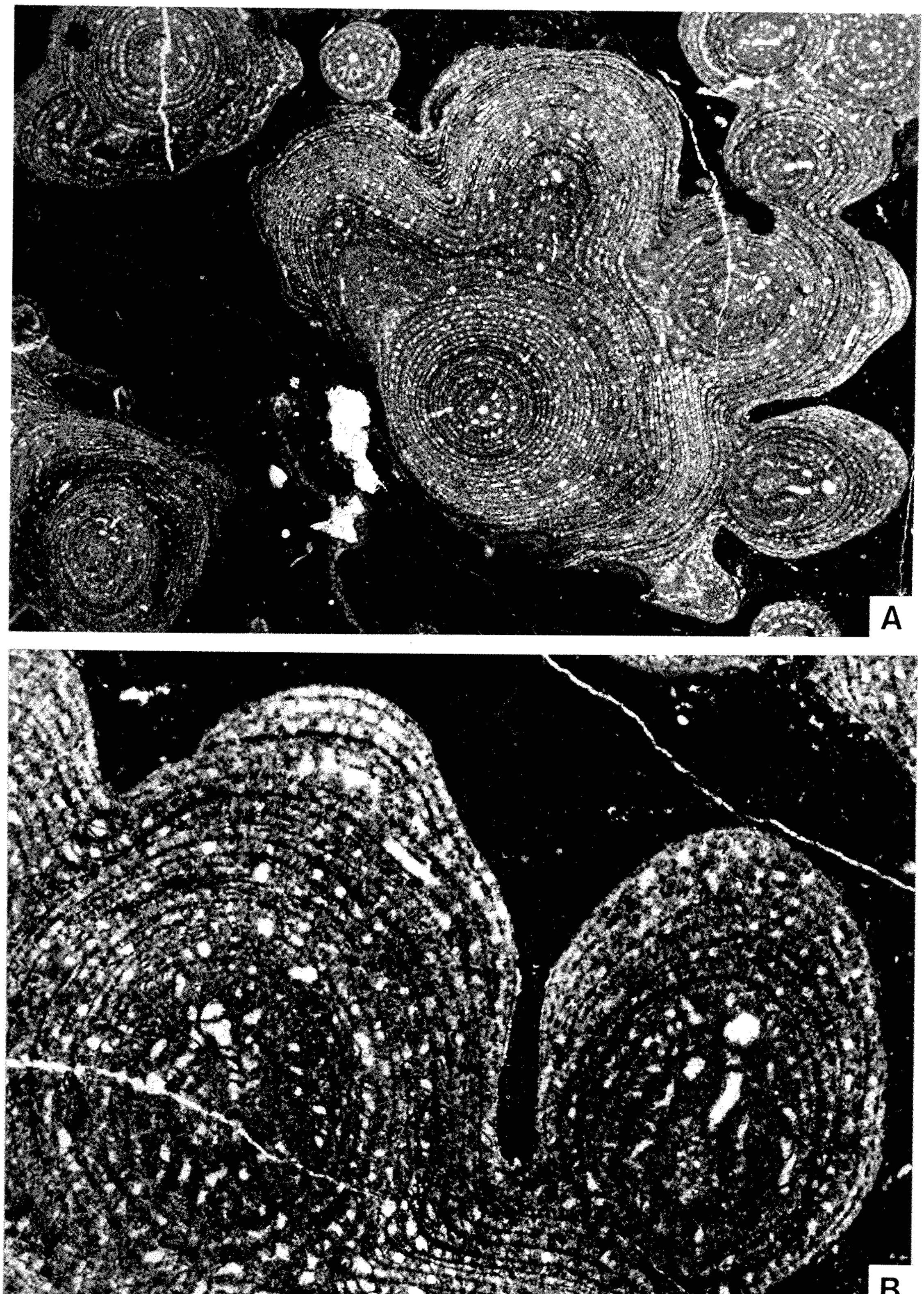
GSWA 20234

PLATE 28

A, B *Trupetostroma mclearni* (Stearn)

A. GSWA F10508, Pillara Limestone, NOB 26/27; transverse section, x 4.

B. GSWA F10508, Pillara Limestone, NOB 26/27; transverse section, x 10.



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SYSTEMATIC INDEX

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