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Early Silurian (Late Llandovery) rugose corals from western North Greenland

by

Ross A. McLean

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GRØNLANDS GEOLOGISKE UNDERSØGELSE
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Early Silurian (Late Llandovery) rugose corals from western North Greenland

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Ross A. McLean

1977

Abstract

Seventeen species of rugose corals are described from strata of Late Llandovery age in western North Greenland. *Grewingkia cuneata* sp. nov., *Strombodes infractus* sp. nov., *Amplexoides poulseni* sp. nov., *Palaeophyllum schuchertense* sp. nov. and *P.* cf. *hubeiense* Ke & Yü 1974 are recorded from the early Late Llandovery Cape Schuchert Formation. The following species are described from the late Late Llandovery Offley Island Formation: *Crassilasma offleyense?* (Etheridge, 1878), *Pseudophaulactis plectilis* sp. nov., *Kenophyllum? congestum* sp. nov., *Craterophyllum vatium* sp. nov., *C. exporrectum* sp. nov., *C. prolatum* sp. nov., *Ptychophyllum tysonense* sp. nov., *Ptychophyllum* sp. A., *Ptychophyllum* sp. B., *Kodonophyllum? pusillum* sp. nov., *Amplexoides poulseni* sp. nov., *Cystilasma? rarum* sp. nov., and *Hedstroemophyllum rhaphis* sp. nov.

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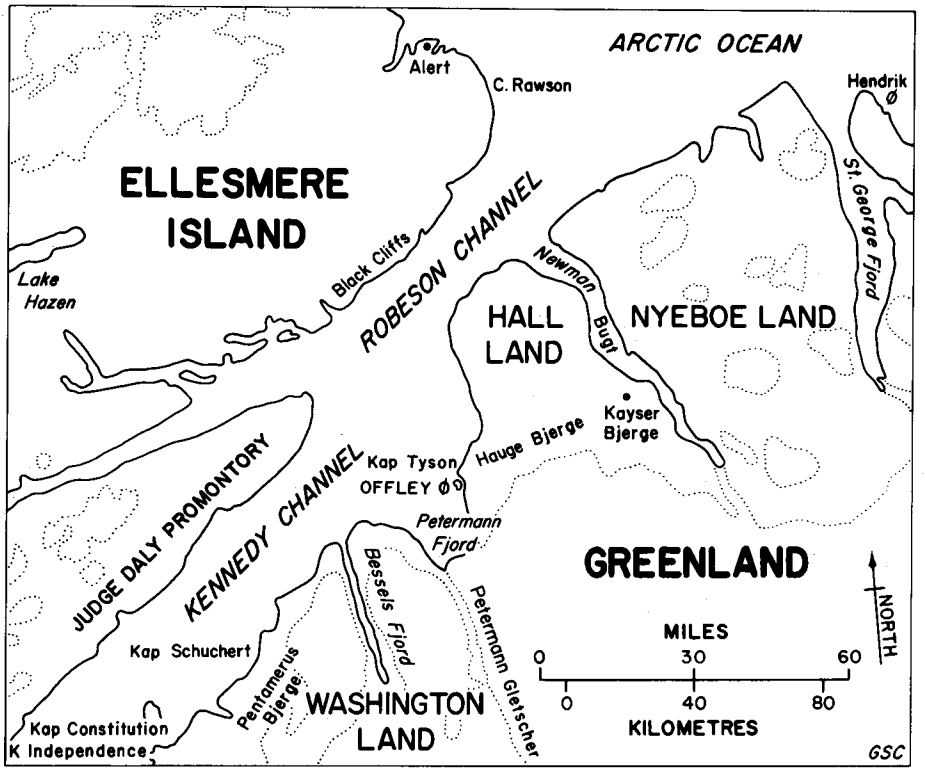

Fig. 1. Locality map, western North Greenland and adjacent Ellesmere Island. (After Norford, 1972, Fig. 2).

INTRODUCTION

Late Llandovery (Silurian) rugose corals are described from Kap Tyson and Offley Ø in southern Hall Land and Kap Schuchert in Washington Land (Fig. 1). The material upon which the study is based was collected in 1966 by B. S. Norford (Geological Survey of Canada) during 'Operation Grant Land'. The operation was a co-operative venture in which a geological party from The Geological Survey of Greenland joined Geological Survey of Canada teams in a programme designed to increase geological correlation between Greenland and Canada, across Nares Strait. B. S. Norford has subsequently donated his collection of rugose corals to The Geological Survey of Greenland. Prior to this collection being studied, very little was known about the rugose coral faunas of northern Greenland. Etheridge (1878) described a single species (*Zaphrentis offleyensis*) from Offley Ø, Troedsson (1928) described a number of late Ordovician species from western North Greenland and Poulsen (1934, 1941) discussed some species from the early Silurian Cape Schuchert and Offley Island Formations. More recently, Scrutton (1975) has described a variety of forms of late Ordovician and Silurian age from Kronprins Christian Land in Eastern North Greenland. The faunas described in this paper are in general strongly recrystallised and largely fragmentary, but a distinctive assemblage may still be recognised.

STRATIGRAPHY AND AGE

The stratigraphic succession from which the described material was obtained, together with the geological framework of the region, have been thoroughly reviewed (Norford, 1972) and little further comment is necessary here. The Cape Schuchert Formation (Koch, 1929), of interbedded limestones, shales and calcarenites with numerous local bioherms and biostromes (Norford, 1972), is overlain by and partly equivalent to the Offley Island Formation (Koch, 1929), composed of biohermal and biostromal limestones, calcarenites, limestone conglomerates and shales (Norford, 1972). Complex facies changes are developed throughout the succession.

Distribution of the rugose coral species identified is shown in Fig. 2 on the stratigraphic sections measured by Norford (1972). Rugose corals are not common in these sequences, stromatoporoids and halysitid and favositid tabulate corals being more abundant. On the basis of the graptolite faunas from these

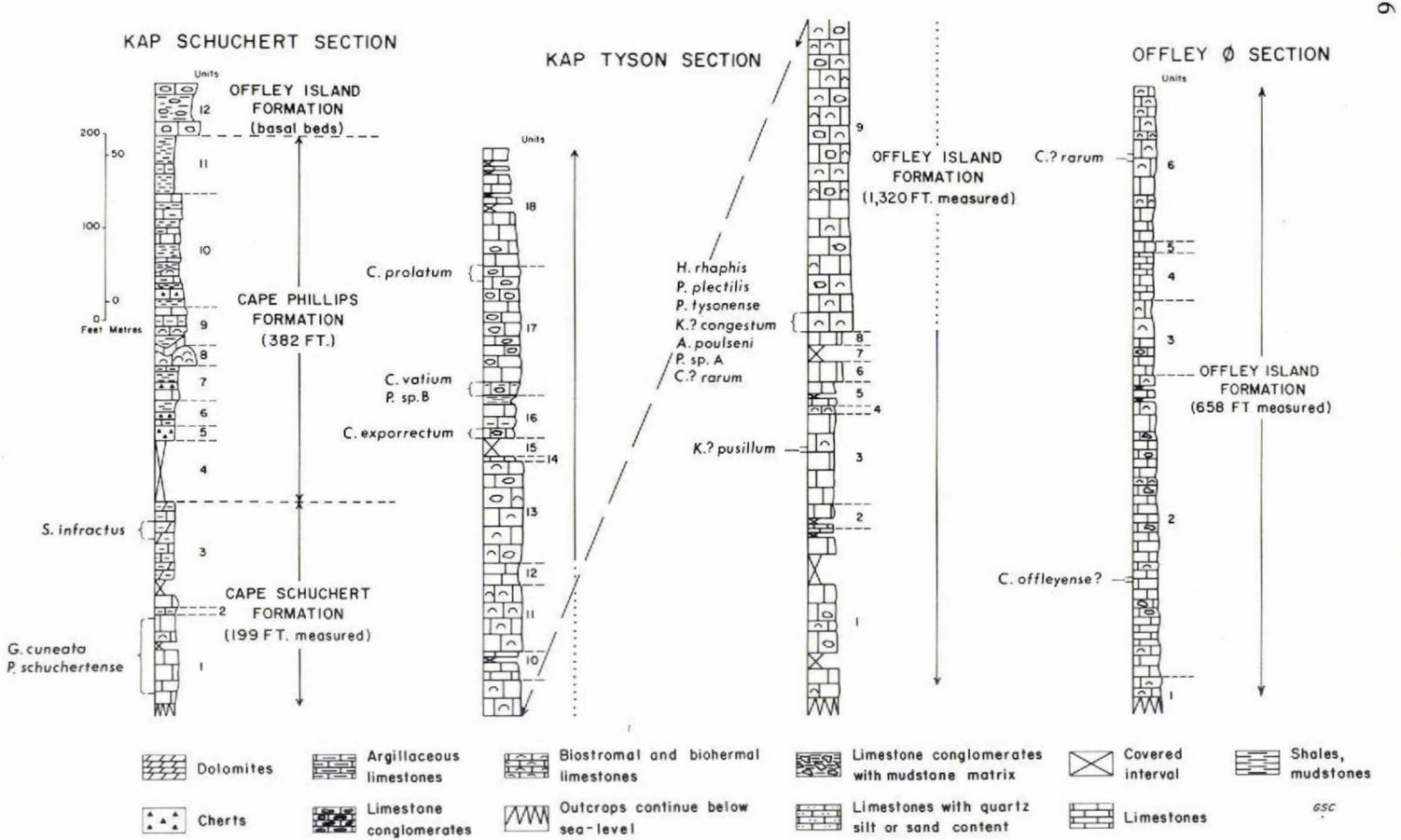

Fig. 2. Distribution of rugose coral species in measured stratigraphic sections at Kap Schuchert, Kap Tyson and Offley Ø. (Based on Norford, 1972, Fig. 5).

measured sections, identified by Jackson *in* Norford (1972), the Cape Schuchert Formation was shown to be essentially of early Late Llandovery (*turriculatus* zone) age, while the Offley Island Formation is of *turriculatus* and *spiralis* zones age, or latest Llandovery (see Norford, 1972, p. 9, Fig. 3). The age suggested by the rugose coral faunas is in accord with such an assignment.

THE RUGOSE CORALS FROM WESTERN NORTH GREENLAND

Through the kindness of Søren Floris of the Geologisk Museum, Copenhagen, the writer had the opportunity to examine the small rugose coral fauna described by Poulsen (1941) from the Offley Island Formation, and some comments on it are pertinent here. These corals are extremely fragmentary specimens, some of which have not been sectioned, and only one species (*Cystiphyllum spinulosum*, Offley Ø) was obtained from a locality considered in this paper. Poulsen's *Amplexus propinquus* is generically indeterminate on the basis of the available mater-

Table 1. Distribution of rugose corals in the Cape Schuchert and Offley Island Formations

Species	Cape Schuchert Formation		Offley Island Formation	
	Kap Schuchert	Kap Tyson west	Offley Ø	Kap Tyson
Grewingkia cuneata	×			
Strombodes infractus	×			
Palaeophyllum schuchertense	×			
Palaeophyllum cf. *P. hubeiense*	×			
Amplexoides poulseni		×		×
Crassilasma offleyense?			×	
Pseudophaulactis plectilis				×
Kenophyllum? congestum				×
Craterophyllum vatium				×
Craterophyllum exporrectum				×
Craterophyllum prolatum				×
Ptychophyllum tysonense				×
Ptychophyllum sp. A				×
Ptychophyllum sp. B.				×
Kodonophyllum? pusillum				×
Cystilasma? rarum			×	×
Hedstroemophyllum rhaphis				×

ial, while his *Amplexus polaris* shows faint development of septal spines on the corallite walls and may belong to *Tryplasma* Lonsdale. *Cystiphyllum tubiforme* Poulsen has well developed septal spines on the corallite walls and although only solitary fragments are present in the collection, it is almost certainly a representative of *Microplasma* Dybowski. The longitudinal section of a paratype (Poulsen, 1941, Pl. 1, fig. 8) is reillustrated herein (Plate 11, fig. 9). *Palaeophyllum troedssoni* Poulsen is a well-preserved *Palaeophyllum,* but while the forms he referred to *Cystiphyllum spinulosum* are probably cystiphyllids, they are indeterminate without thin section analysis.

It is interesting to note that none of these species has been confirmed in the collections presently under consideration, although, as previously noted, they are largely from different localities. However, B. S. Norford (personal communication, 1976) has suggested that most of Poulsen's specimens are of uncertain stratigraphic horizon and some may not have been found *in situ.*

The rugose coral species studied here are generally strongly restricted stratigraphically, with only one species (*Amplexoides poulseni* sp. nov.) being represented in both the Cape Schuchert and Offley Island Formations. The stratigraphic and geographic distribution of the described species is listed in Table 1. The most diverse fauna was obtained from the Offley Island Formation at Kap Tyson.

The fauna contains some characteristic Late Llandovery genera (*Crassilasma, Pseudophaulactis*), but the other forms are generally long ranging. Notably absent are the common Llandovery genera *Calostylis, Phaulactis, Arachnophyllum* and *Streptelasma.* A possible *Cystiphyllum* is represented by '*Cystiphyllum spinulosum* Foerste' of Poulsen (1941) at Offley Ø, but this species is not duplicated in the present collections. At the species level the described fauna is almost totally new.

SYSTEMATIC PALAEONTOLOGY

Morphological terminology used is basically that of Hill (1956). The term 'presepiment' of Schouppé & Stacul (1966) is preferred for 'lonsdaleoid dissepiments' (see also discussion of McLean, 1976b).

The following abbreviations are used for repositories of specimens to which reference is made:

MGUH	Geologisk Museum, Copenhagen
MMH	Mineralogisk Museum, Copenhagen (renamed Geologisk Museum in 1976)
GGU	Grønlands Geologiske Undersøgelse, Copenhagen
GSC	Geological Survey of Canada, Ottawa
USNM	United States National Museum, Washington, D.C.
BM	British Museum (Natural History), London
SMF Wdkd	Forschungs-Institut Senckenberg, Wedekind Collection, Frankfurt.

Further details of locality and horizon of the described specimens may be found in the stratigraphic descriptions of Norford (1972) and in the Appendix herein.

Family STREPTELASMATIDAE Nicholson *in* Nicholson & Lydekker, 1889
Genus *Crassilasma* Ivanovskiy, 1962

Crassilasma Ivanovskiy, 1962b, p. 126

Type species. *Crassilasma simplex* Ivanovskiy, 1962b

Diagnosis. Corallum solitary, with septa heavily dilated throughout ontogeny. Interseptal loculi are variably developed in ephebic stage, where complete and incomplete, arched tabulae may be developed. Major septa generally extend near to corallite axis throughout ontogeny, although they may be slightly reduced in length in ephebic stage. Axial structure generally is not developed.

Discussion. *Crassilasma* shows close similarities to both *Borelasma* Neuman, 1969 and *Ullernelasma* Neuman, 1975. *Borelasma* (type species *B. crassitangens* Neuman, 1969, *Dalmanitina* Beds, late Ashgill, Sweden) differs in having the major septa strongly reduced in length in the ephebic stage (Neuman, 1969, Fig. 57E). *Ullernelasma* (type species *U. svartoeyensis* Neuman, 1975, Horizon 5b, late Ashgill, Ringerike, Norway) also has its major septa more reduced than *Crassilasma* in the ephebic stage, although the septa are also thinner at this growth level (Neuman, 1975, Fig. 10). In addition *Ullernelasma* has very weakly developed, incomplete tabulae.

The following species are probably representatives of *Crassilasma*. *Streptelasma devonica* Chernyshev, 1885, revised by Ivanovskiy & Shurygina (1975); Shemakhin Beds, Late Llandovery, western slopes of Central Urals. *Streptelasma crassiseptatum* Smith, 1930; Late Llandovery, Montgomeryshire, Wales; this includes the possible synonym *Streptelasma viluiense* Nikolaeva, 1955. *Streptelasma? completum* Nikolaeva, 1955; Middle Llandovery, Siberian Platform. *Streptelasma? electum* Nikolaeva, 1955; Middle Llandovery, Siberian Platform, which was regarded as a synonym of *Zaphrentis obesa* Lindström, 1882 by Ivanovskiy (1963), but the latter has not been illustrated in thin section. *Streptelasma enisseicum* Ivanovskiy, 1961; Late Ordovician, Siberian Platform. *Crassilasma simplex* Ivanovskiy, 1962b, type species; Late Llandovery, Siberian Platform. *Crassilasma crassiseptatum* (Smith) *sensu* Ivanovskiy, 1963 (*non* Smith, 1930); Late Llandovery, Siberian Platform. *Axolasma perplexum* Ivanovskiy, 1963; Late Llandovery, Siberian Platform.

The following species are insufficiently known, but may also belong to *Crassilasma*. *Zaphrentis offleyensis* Etheridge, 1878; Offley Island Formation, Late Llandovery, western North Greenland. *Streptelasma orientalis* Kaljo, 1958; Vazalemma Horizon, Middle Caradoc, Estonia. *Tungussophyllum densum* Ivanovskiy, 1965; Late Llandovery, Siberian Platform. *Pseudophaulactis crassiseptatus* Ivanovskiy, 1965; Late Llandovery, Siberian Platform. *Crassilasma raritabulatum* Ke & Yü, 1974; Llandovery, Szechwan, China. *Crassilasma brachyelasmaoides* Ivanovskiy, 1965, from the Late Llandovery of the Siberian Platform, has asymmetrically developed septal dilation (Ivanovskiy, 1965, Pl. 3, fig. 2a) and short septa. It was subsequently referred by Ivanovskiy (1970) to *Onychophyllum* Smith, an inadequately known genus. *Onychophyllum* is discussed below in relation to *Pseudophaulactis*.

Crassilasma is a widely distributed genus in strata of late Ordovician to early Silurian (Llandovery) age, being most common in the Late Llandovery (Siberian Platform, Urals, Mountainous Altai, Arctic USSR, Britain, China, western North Greenland).

Crassilasma offleyense? (Etheridge, 1878)

Plate 1, figs 1–7, 9, 11, 13

?Zaphrentis offleyensis Etheridge, 1878, p. 588, Pl. 26, figs 2, 2a

Material. MGUH 13897–13903 from GGU 211701–211707. Offley Island Formation, Offley Ø, GSC locality 73952.

Diagnosis. *Crassilasma* characterised by septa of very variable length in ephebic stage, some septa being largely confined to broad peripheral stereozone, others extending irregularly to corallite axis.

Description. Corallum solitary, trochoid, with diameter ranging up to 33 mm in available specimens, with average 27 to 29 mm. Corallum height is unknown due to fragmentary nature of material.

In neanic stage septa are strongly dilated, interseptal loculi being only rarely developed. In ephebic stage septa remain dilated, but taper gradually towards corallite axis. Peripherally, septa are in lateral contact and reinforced with sclerenchyme so that a stereozone, of width 4 to 6 mm is developed. Septa extend irregularly from stereozone, in some cases (e.g. GGU 211701, Plate 1, figs 1–3) extending largely to corallite axis with weakly developed interseptal loculi; in others (e.g. GGU 211702, Plate 1, fig. 7) some septa reach axis, while others do not leave stereozone; in still other specimens (e.g. GGU 211707, Plate 1, fig. 11) no septa reach corallite axis. Septal number ranges from 43–52 with minor septa very short or more generally not developed.

Tabulae are only developed in ephebic stage; they are very irregular in shape, being generally flat or weakly arched, with axial depression, and mostly complete. Tabular spacing varies from 1 to 3 mm.

Remarks. The writer has examined the type specimen of *Zaphrentis offleyensis* (B.M. 90074) and in external characters it is comparable to the material described above. It has been ground and polished in transverse section both proximally and distally, the distal surface being above the level of the base of the calice (Etheridge, 1878, Pl. 26, fig. 2a). Unfortunately permission to prepare thin sections from this specimen could not be obtained and hence its taxonomic status cannot be determined with certainty. However, of the material from Offley Ø at the writer's disposal, the form described above is the only one with any similarities to Etheridge's specimen and in features that can be observed (septal number, character of septa in the calice, growth form) shows no differences. It is

thus most probable that this material is conspecific with '*Z.*' *offleyensis,* but confirmation must await thin section analysis of the holotype.

Some specimens with shorter septa in the ephebic stage described above approach *Borelasma* Neuman in their ephebic morphology. However, none of the material has ephebic septa as short as in *B. crassitangens* (see Neuman, 1969, Figs 57–59) and the overall variation in the Greenland material suggests that it cannot be subdivided specifically.

The irregularity in septal length clearly distinguishes *C. offleyense?* from other described species.

Genus *Grewingkia* Dybowski, 1873

Grewingkia Dybowski, 1873a, p. 394
Kiaerophyllum Wedekind, 1927, p. 17
Rectigrewingkia Kaljo, 1961, p. 62

Type species. *Clisiophyllum buceros* Eichwald, 1856

Diagnosis. (Based on Neuman, 1969, p. 33, McLean, 1974c, p. 43). Corallum solitary with septa moderately or heavily dilated early in ontogeny, major septa long, forming narrow axial structure. Later in ontogeny, major septa are relatively short and thin and axial structure is broad, composed of numerous, irregularly intertwined septal lobes and lamellae. Tabulae are complete and incomplete, with or without complementary plates.

Discussion. *Grewingkia* has been reviewed in some detail by Neuman (1969) and McLean (1974c) and little further comment is necessary here. It is a common late Ordovician genus, but has been rarely recorded from the Silurian (Flügel & Saleh, 1970; McLean, 1974c). However, unsectioned silicified forms from the Late Llandovery – Wenlock of Michigan and adjacent Manitoulin Island, Ontario, referred to '*Kionelasma*' *spongaxis* (Rominger) (e.g. Ehlers, 1973, Pl. 4, fig. 2; Bolton, 1966, Pl. 5, fig. 4) may be representatives of *Grewingkia*.

Grewingkia cuneata sp. nov.

Plate 1, figs 8, 10, 12

Material. Holotype MGUH 13908 from GGU 211712. Cape Schuchert Formation, Kap Schuchert, GSC locality 73959.

Diagnosis. *Grewingkia* characterised in the ephebic stage by straight, wedge-shaped septa and a narrow, compact axial structure.

Description. Corallum is solitary, with growth habit and calice unknown. Corallite diameter reaches 13 mm, but height was not determined due to incomplete material.

In neanic stage septa are moderately dilated, slightly bent near axial structure, which is broad and composed of coarse, twisted septal lamellae and lobes (Plate 1, fig. 12). In ephebic stage septa are straight, strongly dilated peripherally, gradually tapering towards axial structure so as to give a wedge-shaped appearance in transverse section. Minor septa are thinner but almost as long as major septa. Total septal number reaches 74 in only available specimen. A narrow peripheral stereozone is formed by the dilated septal bases, but although strongly dilated peripherally the septa are not in lateral contact for most of their length. Axial structure is narrow, reaching a diameter of 4.5 mm, composed of tightly packed, twisted septal lobes and lamellae (Plate 1, fig. 10).

Tabulae are largely complete, moderately arched and have an average spacing of 1 mm.

Remarks. Although only one specimen was available for study and thus the variability of the species could not be ascertained, its distinctive, straight, wedge-shaped septa and narrow, compact axial structure clearly distinguish it from all other described forms and warrant erection of a new species.

Genus *Pseudophaulactis* Zaprudskaya, 1963

Pseudophaulactis Zaprudskaya *in* Ivanovskiy, 1963, p. 32

Type species. *Pseudophaulactis lykophylloides* Zaprudskaya & Ivanovskiy *in* Ivanovskiy, 1963

Diagnosis. Corallum solitary. Septa moderately or heavily dilated in neanic stage, but with dilation confined to cardinal quadrants in ephebic stage. Major septa of variable length, generally extending near to corallite axis where there may be development of septal lobes and lamellae, forming an incipient *Grewingkia*-like axial structure. Tabulae are generally arched, complete and incomplete.

Discussion. The interpretation of *Pseudophaulactis* suggested here is expanded somewhat from that of Zaprudskaya (*in* Ivanovskiy, 1963), who considered the genus to lack an axial structure. The septa of the type species are withdrawn from the corallite axis, although a few discrete septal lamellae are present in this region (Ivanovskiy, 1963, Pl. 6, fig. 2a). However, Ivanovskiy (1965) included in *Pseudophaulactis* a number of species which have long major septa in the ephebic stage, sometimes forming an incipient axial structure of loose septal lobes and lamellae (e.g. *P. lasius* Ivanovskiy, 1965, Pl. 5, fig. 3). This latter interpretation of *Pseudophaulactis* is adopted here.

The genus *Onychophyllum* Smith, 1930 (type species *O. pringlei* Smith, 1930, Purple Shale, Late Llandovery, Shropshire) shows close similarities to *Pseudophaulactis*. It develops comparable septal dilation to that of *Pseudophaulactis* although in *Onychophyllum* the septa in the cardinal quadrants lose their dilation in the ephebic stage, as opposed to those in the counter quadrants in

Pseudophaulactis. *Onychophyllum* has been regarded generally as a halliid, being related to *Phaulactis* Ryder, but further study of the type species seems necessary to confirm this. *Pseudophaulactis* also generally has longer and more slender septa in the ephebic stage and better developed tabulae than *Onychophyllum*. The common development of axial septal lobes and lamellae in *Pseudophaulactis* indicates its streptelasmatid affinities.

Bowenelasma Scrutton, 1973 (type species *B. typa* Scrutton, 1973, Caño Grande Formation, Eifelian, Venezuela) is very similar to *Pseudophaulactis,* as noted by Scrutton (1973, p. 243), particularly those forms of the latter with an incipient axial structure. However, *Pseudophaulactis* is not known from strata younger than ?Early Wenlock (Lavrusevich, 1971, p. 51) and thus it is likely that *Bowenelasma* is a homeomorph of *Pseudophaulactis*.

Some Ordovician streptelasmatids, e.g. *Grewingkia buceros* (Eichwald) *sensu* Neuman, 1969 and *G. contexta* Neuman, 1969, show marked septal dilation in the cardinal quadrants in the late neanic stage (Neuman, 1969, Figs 30,36). However, in the ephebic stage such forms tend to have more evenly dilated septa, unlike *Pseudophaulactis,* which retains the cardinal dilation throughout ontogeny. *Grewingkia europaea hosholmensis* Kaljo, 1961, however, apparently has cardinal dilation of the septa throughout its ontogeny (Kaljo, 1961, Pl. 3, Figs 1–15) and is here referred to *Pseudophaulactis*.

The following species are included in *Pseudophaulactis:*
Dinophyllum breviseptatum Ivanovskiy, 1960; Late Llandovery, Siberian Platform. *Grewingkia europaea hosholmensis* Kaljo, 1961; Pirgu Horizon, early Ashgill, Estonia. *Pseudophaulactis lykophylloides* Zaprudskaya & Ivanovskiy *in* Ivanovskiy, 1963; Late Llandovery, Siberian Platform. *Pseudophaulactis lasius* Ivanovskiy, 1965; Late Llandovery, Siberian Platform. *Pseudophaulactis tenuiseptatus* Ivanovskiy, 1965; Late Llandovery, Siberian Platform. *Pseudophaulactis plectilis* sp. nov.; Offley Island Formation, Late Llandovery, western North Greenland. In addition, *Dinophyllum flagellatum* Scheffen, 1933, from Horizon 7b (Late Llandovery) of the Oslo region, Norway, may be a representative of *Pseudophaulactis,* but requires further study. *Pseudophaulactis crassiseptatus* Ivanovskiy, 1965, from the Late Llandovery of the Siberian Platform, apparently retains strong dilation of septa in all quadrants throughout ontogeny (Ivanovskiy, 1965, Pl. 7, figs 1a, b) and is likely to belong to *Crassilasma*.

Pseudophaulactis is known from strata of early Ashgill to ?early Wenlock age and was most abundant in the Late Llandovery (Siberian Platform, Tadzhikistan, Mountainous Altai, western North Greenland and ?Norway).

Pseudophaulactis plectilis sp. nov.

Plate 2, figs 1–9

Material. Holotype MGUH 13904 from GGU 211708. Offley Island Formation, Kap Tyson, GSC locality 73927. Paratypes MGUH 13905–13907 from GGU 211709–211711, same horizon and locality.

Diagnosis. *Pseudophaulactis* having long septa in the ephebic stage, reaching corallite axis where septal lobes and lamellae form a very loose, incipient axial

structure. Ephebic septal dilation in cardinal quadrants is strong. Peripheral stereozone is generally well developed.

Description. Corallum solitary, trochoid, with a convex cardinal side. Calice is not preserved in available material. Corallite diameter reaches 39 mm with a height of at least 70 mm.

In neanic stage, septa are heavily dilated, leaving few interseptal loculi (Plate 2, fig. 5). In ephebic stage, which occupies majority of corallite, septa remain heavily dilated in cardinal quadrants, leaving narrow interseptal loculi. A stereozone comprising the expanded septal bases, with width 1 to 2 mm, is retained in other quadrants. Septa become abruptly thinner inside stereozone and become irregularly bent and twisted as they approach axial region, where numerous lamellae and lobes form a loose, weakly developed axial structure of *Grewingkia*-type (Plate 2, figs 1, 7). Septal number reaches approximately 63 in available material, with minor septa generally not distinguished from major septa.

Tabulae are numerous, mostly complete, with an average spacing of 0.5 to 1.5 mm. They are steeply inclined upward to axis on counter side, more gently sloped on cardinal side where they are strongly disrupted by the dilated septa.

Remarks. It is possible that with further study, forms like *Pseudophaulactis lasius* Ivanovskiy and *P. plectilis* sp. nov., having incipient development of a *Grewingkia*-type axial structure, could be separated from *Pseudophaulactis,* the type species of which has somewhat shorter septa. However, on the basis of the variability in illustrated material and in the Greenland form, such a subdivision does not seem warranted at this stage. *P. plectilis* differs from *P. lasius* largely in lacking the long counter septum and more marked bilateral symmetry of that species (Ivanovskiy, 1965, Pl. 5, figs 2a–v, 3). *P. lykophylloides* Zaprudskaya & Ivanovskiy *sensu* Lavrusevich, 1971 (Late Llandovery, Tadzhikistan) and *sensu* Ivanovskiy & Kulkov, 1974 (Late Llandovery, Mountainous Altai), is closely similar to *P. plectilis,* but has generally weaker ephebic cardinal septal dilation and a narrower stereozone. The Tadzhik and Altai material is probably not conspecific with *P. lykophylloides* Zaprudskaya & Ivanovskiy, 1963. *P. breviseptatus*(Ivanovskiy, 1960), from the Late Llandovery of the Siberian Platform, has generally thicker septa and greater development of interseptal loculi in cardinal quadrants in the ephebic stage (Ivanovskiy, 1960, Pl. 9, fig. 1a).

Genus *Kenophyllum* Dybowski, 1873

Kenophyllum Dybowski, 1873a, p. 358

Type species. *Kenophyllum subcylindricum* Dybowski, 1873a

Diagnosis. Solitary corallum with septa extensively dilated throughout growth so that interseptal loculi are weakly developed or absent. Septa fuse axially with

tightly packed lobes and lamellae to form a narrow, dense axial structure. Tabulae are rare or lacking.

Discussion. The genus *Kenophyllum* is known largely from revision and illustrations of sections of the type species by Kaljo (1958a, Pl. 2, figs 5–7; 1961, Pl. 4, figs 1–9). It is closely similar to *Crassilasma* Ivanovskiy, reviewed above, which differs in lacking an axial structure and in generally having better tabular development. *Leolasma* Kaljo, 1956 (type species *L. reimani* Kaljo, 1956, Vazalemma Horizon, Middle Caradoc, Estonia) is also very closely related to *Kenophyllum,* as noted by Scrutton (1971, p. 211) and Neuman (1975, p. 338–340). *Leolasma,* however, may be distinguished by having thinner septa in the ephebic stage and better tabular development. *Kenophyllum* differs from *Grewingkia* Dybowski (see above) in having a generally weaker, denser axial structure, more strongly dilated septa and rare or absent tabulae.

The following species are the only adequately described forms that may be assigned to *Kenophyllum: Kenophyllum subcylindricum* Dybowski, 1873a type species; Vormsi Horizon, Late Caradoc – Early Ashgill, Estonia. Revised by Kaljo, (1958a, 1961). *Kenophyllum canaliferum* Reiman *in* Kaljo, 1958; Nabala Horizon, Late Caradoc, Estonia. *Kenophyllum? congestum* sp. nov.; Offley Island Formation, Late Llandovery, western North Greenland.

Kenophyllum? congestum sp. nov.

Plate 3, figs 1–5

Material. Holotype MGUH 13909 from GGU 211713. Offley Island Formation, Kap Tyson, GSC locality 73927. Paratype MGUH 13910 from GGU 211714, same horizon and locality.

Diagnosis. Possible *Kenophyllum* characterised by a broad, dense axial structure and sparse tabulae.

Description. Corallum solitary, of uncertain growth habit due to fragmentary nature of material. Corallite diameter reaches 38 mm.

Septa are dilated and densely packed throughout growth, with interseptal loculi only weakly developed in late ephebic stage, where short traces of tabulae may be detected (Plate 3, fig. 2). Septal number reaches approximately 58, although number is difficult to determine owing to recrystallization of septa. Minor septa cannot be clearly differentiated. Axial region of corallite is occupied by broad, dense axial structure of tightly packed septal lobes and lamellae with probable additional sclerenchyme, although recrystallization renders it difficult to distinguish sclerenchyme. A weak fossula is shown by the holotype.

Remarks. The Greenland form develops a broader axial structure than is shown by the type species, *K. subcylindricum* Dybowski, together with a weaker fossula (holotype of *K.? congestum,* Plate 3, fig. 1) and better tabulae. It is also considerably younger than the previous youngest record of the genus (Pirgu Horizon,

Early Ashgill, Estonia – Kaljo, 1958a), and hence is only doubtfully referred to *Kenophyllum*.

Family CYATHOPHYLLIDAE Dana, 1846
Subfamily ARACHNOPHYLLINAE Dybowski, 1873
Genus *Craterophyllum* Foerste, 1909a

Craterophyllum Foerste, 1909a, p. 101
Naos Lang, 1926, p. 428

Type species. *Chonophyllum (Craterophyllum) vulcanius* Foerste, 1909a

Diagnosis. Corallum solitary, cylindrical to patelloid, with a strongly reflexed dissepimentarium. Septa tend to break down irregularly into radial rows of isolated trabeculae or clusters of trabeculae based on dissepimental crests. Septa extend axially to margin of tabularium and may in some cases extend to varying degrees into tabularium. Tabulae are generally slightly arched, complete and incomplete in forms with short septa, but when septa extend into tabularium, tabulae become strongly incomplete and form more strongly arched series. Dissepiments are small, generally globose, forming very broad dissepimentarium.

Discussion. The interpretation of *Craterophyllum* adopted here differs somewhat from that of previous authors (e.g. Smith, 1945, diagnosis of *Naos* Lang, p. 36; Hill, 1956, p. F275), who suggested that the major and minor septa were of equal length, terminating at the tabularium boundary. While such is the case in the type species, *C. vulcanius* Foerste, 1909 and also *C. pagoda* (Salter, 1873), other species differ in having the major septa extending to varying degrees into the tabularium, e.g. *C. nymphale* (Billings, 1862), *C. brownsportense* (Amsden, 1949) and *C. prolatum* sp. nov. These latter, long-septate species tend also to have more incomplete and arched tabulae than those forms with short septa, a feature commonly observed among the Rugosa. It does not seem advisable to separate such species from *Craterophyllum*, since the septal length appears to be such a variable character, even varying considerably within the one corallite (*C. exporrectum* sp. nov., Plate 5, figs 1,3).

Previous workers (e.g. Lang, 1926; Smith, 1945; Hill, 1956) have considered that the septal structure of *Craterophyllum* (including *Naos*) breaks up "into a series of separate, transverse, slightly convex plates traversed by radiating spinelike trabeculae" (Smith, 1945, p. 36). This theory has been based on the structure of *C. pagoda* (Salter), the type species of *Naos* Lang. However, examination of this and other species suggests that the 'transverse plates' are in fact simply dissepiments, their unusual appearance in transverse section being due only to the reflexed shape of the dissepimentarium. The septa comprise only the rows of partly contiguous trabeculae, which are frequently interrupted by the dissepiments. The structure is clearly shown in the transverse section of *C. vul-*

canius Foerste (Plate 3, fig. 6). *C. pagoda* differs in having the single dissepimental plate traversing a septum at a particular growth stage in the peripheral regions of *C. vulcanius* replaced by a layer of very small dissepimental plates, but the basic structural pattern is the same (compare Plate 3, fig. 6 and Smith, 1945, Pl. 29, fig. 4).

The following species are referred to *Craterophyllum: Cyathophyllum nymphale* Billings, 1862; ?La Vieille Formation, latest Llandovery–Wenlock, Chaleur Bay, Quebec. This species was revised by Lambe (1901) and the holotype is illustrated herein, Plate 6, figs 1, 2. *Ptychophyllum pagoda* Salter, 1873, type species of *Naos* Lang, Silurian, '?Disaster Bay, Arctic America' (Lang, 1926). The precise horizon and locality of this species, revised by Lang (1926) and Smith (1945), are unknown. *Craterophyllum vulcanius* Foerste, 1909a, type species, Brownsport Formation, Ludlow, Tennessee; holotype illustrated herein, Plate 3, figs 6, 7; Plate 4, fig. 3. *Naos brownsportensis* Amsden, 1949; Brownsport Formation, Ludlow, Tennessee. *Craterophyllum vatium* sp. nov., *C. exporrectum* sp. nov. and *C. prolatum* sp. nov.; Offley Island Formation, Late Llandovery, western North Greenland.

Smith (1945, p. 36) suggested *C. pagoda* may be synonymous with *C. nymphale* (Billings). However, illustrations of sections of the latter clearly show that the dissepimental structure of *C. nymphale* is simpler than that of *pagoda* and the septa longer (Plate 6, figs 1,2). Smith also proposed that *C. vulcanius* may be synonymous with *Ptychophyllum canadense* Billings, 1962. The writer has sectioned the latter species from the ?early Wenlock Chicotte Formation of Anticosti Island, Quebec, and it lacks dissepiments, the marginarium being composed of tightly packed, coarse trabeculae. It is referred to *Schlotheimophyllum* Smith.

Naos sewellensis Amsden, 1949, from the Brownsport Formation of Tennessee, has an internal structure typical of the genus *Stereoxylodes* Wang (Amsden, 1949, Pl. 32, figs 4–6) and is included here in that genus.

Stumm (1965, p. 32–33) referred a number of Silurian and Devonian species described by early North American workers to the genus *Craterophyllum*. However, all of these forms require adequate thin section analysis before they can be assigned generically.

The form described as *Naos* sp. by Strelnikov (1965), from the Wenlock of Golets Island in the Soviet Arctic, appears to have comparable septal and dissepimental structure to *Craterophyllum*. However, a reflexed dissepimentarium is apparently lacking, so the species should probably be separated from that genus. Similarly, the form from the late Wenlock of the Chernyshev Ridge, Arctic USSR, referred by Strelnikov (1971) to *Naos pagoda,* lacks a reflexed dissepimentarium, although it is otherwise close to *Craterophyllum*. The genus *Medinophyllum* Sytova *in* Sytova & Ulitina, 1966 (type species *M. crispum* Sytova *in* Sytova & Ulitina, 1966, Akkan Horizon, Ludlow, Kazakhstan) would seem to differ from *Craterophyllum* largely in lacking a reflexed dissepimentarium, although the illustrations are not clear. Hence, the two forms described as *Naos* by Strelnikov may be representatives of *Medinophyllum*.

Laub (1975) listed *Chonophyllum solitarium* Foerste, 1906, from the Brassfield

Formation (Middle Llandovery) of Kentucky, as a possible representative of *Craterophyllum*. However, this identification is based only on Foerste's original figure and description, as the type material and any further specimens were not available for study (R. S. Laub, personal communication, 1976). The generic assignment of this species must remain uncertain for the present, but if its inclusion in *Craterophyllum* can be justified then it would represent the earliest record of the genus.

At present *Craterophyllum* seems to be restricted to strata of ?Middle Llandovery to Ludlow age in the western North Greenland – North American region.

Craterophyllum vatium sp. nov.
Plate 4, figs 1, 2, 6

Material. Holotype MGUH 13911 from GGU 211715. Offley Island Formation, Kap Tyson, GSC locality 73939. Paratypes MGUH 13912–13913 from GGU 211716–211717, same horizon and locality.

Diagnosis. *Craterophyllum* characterized by a strongly reflexed dissepimentarium, narrow tabularium, major septa extending slightly into tabularium and well-spaced, slightly arched, complete and incomplete tabulae.

Description. All the material available for study is highly fragmentary and full details of dimensions and growth form cannot be determined. Corallum is solitary, with a strongly reflexed dissepimentarium and deep, narrow calical pit. A maximum corallite diameter of 40 mm was observed, but the epitheca is generally not preserved and a diameter of at least 50 mm was likely. Height is unknown.

Septal number reaches 66, with major septa extending slightly into tabularium, although the apparent length is irregular due to interruption of the septa by tabulae. Minor septa are slightly shorter, extending axially to tabularium boundary. Septa are slightly wavy, very thin and tend to break down to isolated trabeculae or short rows of trabeculae, particularly in peripheral, reflexed portion of dissepimentarium. Trabeculae are very slender, with microstructure obscured by recrystallization. Septa are slightly dilated near tabularium boundary.

Tabularium is narrow, averaging 6.5 mm in width, composed of slightly arched, complete and incomplete tabulae, which have a common spacing of 0.4 to 1.3 mm. Dissepiments are very small, strongly globose, becoming more elongate near periphery. Dissepimental layers are steeply inclined towards axis near tabularium boundary, but become abruptly flatter and for most of dissepimentarium they are reflexed, being inclined towards corallite periphery.

Remarks. *C. vatium* shows close similarities to the type species, *C. vulcanius* Foerste, 1909 from the Ludlow Brownsport Formation of Tennessee (see illustrations of holotype of the latter herein, Plate 3, figs 6, 7; Plate 4, fig. 3). *C. vulcanius*, however, has rather more elongate dissepiments, more radially discontinuous septa, which are largely confined to the dissepimentarium, and more concave tabulae.

Craterophyllum exporrectum sp. nov.
Plate 5, figs 1–3

Material. Holotype MGUH 13914 from GGU 211718. Offley Island Formation, Kap Tyson, GSC locality 73936.

Diagnosis. *Craterophyllum* characterized by a very broad, only weakly reflexed dissepimentarium, major septa extending to varying degrees into tabularium and strongly arched series of very closely spaced, incomplete tabulae.

Description. Material is highly fragmentary, but calice is only weakly reflexed, although dissepimentarium is very wide. Corallite diameter reaches 55 mm, although specimen is abraded. Corallite height and growth form are not known.

Septal number is approximately 70, major septa extending irregularly into tabularium and, while interrupted by tabulae, may reach almost to corallite axis. Minor septa are confined to dissepimentarium and are strongly discontinuous, especially peripherally. Septa are very slender and slightly wavy, with slight dilation near tabularium boundary.

Tabularium is very narrow, with average diameter 11 mm, comprising a strongly arched series of incomplete tabulae with average spacing of 0.3–0.4 mm. Tabularium has broadly flattened axial region, giving it the appearance characteristic of *Entelophyllum*. Dissepiments are very small, globose to slightly elongate, in moderately inclined layers near tabularium, but forming broad, flattened or weakly reflexed series in remainder of dissepimentarium.

Remarks. Although only one specimen was available for study, it shows sufficiently distinctive characteristics to warrant erection of a new species. It differs from *C. vatium* sp. nov., which occurs at a slightly higher stratigraphic level than *C. exporrectun* (see Fig. 2), in having a more weakly reflexed dissepimentarium, generally longer major septa and more arched, closely spaced tabulae.

C. nymphale (Billings, 1862), possibly from the La Vieille Formation (Late Llandovery – Wenlock) of Chaleur Bay, Quebec, shows perhaps closest similarities to *C. exporrectum*, differing largely in having stronger dilation of the septa at the tabularium boundary, generally somewhat shorter major septa, a more strongly reflexed dissepimentarium and arched tabular layers that lack the axial flattening of *C. exporrectum* (Plate 6, figs 1, 2).

Craterophyllum prolatum sp. nov.
Plate 4, figs 4, 5, 7, 8; Fig. 3

Material. Holotype MGUH 13915 from GGU 211719. Offley Island Formation, Kap Tyson, GSC locality 73940. Paratype MGUH 13916 from GGU 211720, same horizon and locality.

Diagnosis. *Craterophyllum* having a narrow, but strongly reflexed dissepimentarium, strongly arched series of tabellae, small dissepiments and long major

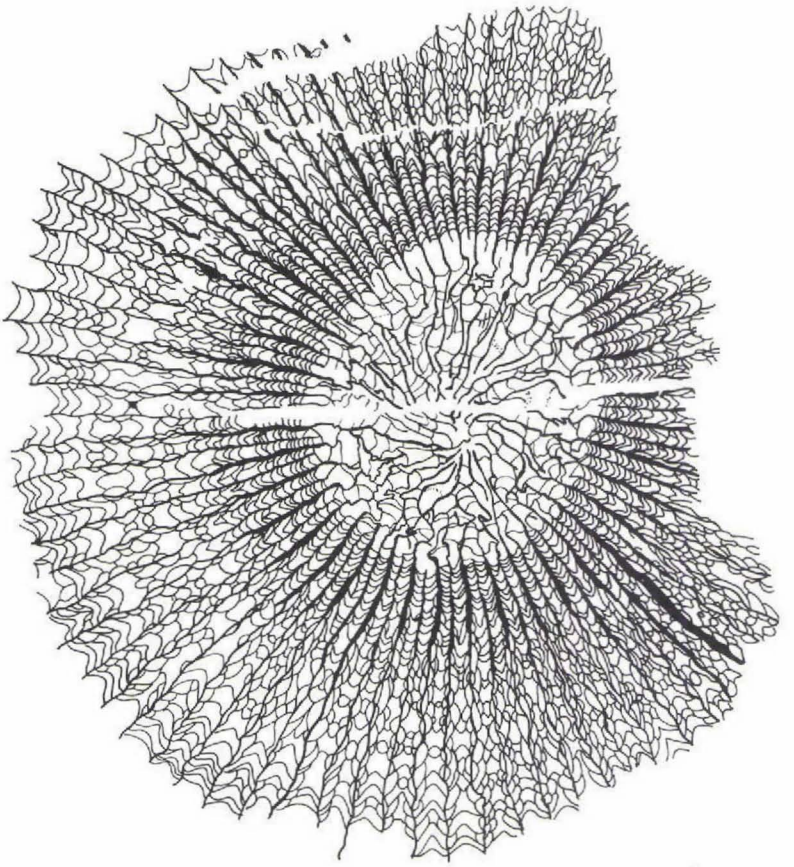

Fig. 3. *Craterophyllum prolatum* sp. nov. Offley Island Formation, Kap Tyson. MGUH 13915 from GGU 211719, holotype, ×3. See also Plate 4, fig. 7.

septa, extending almost to corallite axis, with numerous twisted lobes in tabularium.

Description. Material is extremely fragmentary and in neither specimen is the epitheca preserved. It would seem likely that this species, however, is more cylindrical than the two species described above. Diameter of preserved portions of corallite reaches 40 mm.

Septa range in number to 84, major septa extending into tabularium where they are considerably twisted and form lobes and occasional lamellae (Fig. 3). Minor septa generally extend to tabularial boundary, although a few extend into tabularium for a short distance. Septa show moderate dilation in inner parts of dissepimentarium, but are very thin in tabularium and outer, reflexed portion of dissepimentarium. Minor septa are notably thinner than major septa.

Tabularium is broad, with maximum observed diameter of 14 mm, composed of

a strongly arched series of small, elongate tabellae and incomplete tabulae. Dissepimentarium is relatively narrow, comprising very small, highly globose dissepiments that form steeply inclined layers near tabularium, the layers then becoming strongly reflexed peripherally.

Remarks. With its particularly long septa and their axial complexity, it could be argued that the form described above warrants erection of a new genus. However, on the basis of the variability shown by other closely related species, it would seem better to include *prolatum* in *Craterophyllum,* noting that it represents an extreme variant of the typical morphological range of the genus.

C. brownsportense (Amsden, 1949), from the Ludlow Brownsport Formation of Tennessee, shares with *C. prolatum* a narrower dissepimentarium than is typical for *Craterophyllum.* However, *C. brownsportense* has its major septa more irregularly broken up in the tabularium, greater variety in dissepimental size and shape, and has a less arched tabularium (Amsden, 1949, Pl. 31, figs 2, 3).

Genus *Ptychophyllum* Edwards & Haime, 1850

Ptychophyllum Edwards & Haime, 1850, p. lxix
Implicophyllum Sytova *in* Sytova & Ulitina, 1966, p. 239

Type species. *Ptychophyllum stokesi* Edwards & Haime, 1850

Diagnosis. Solitary corallum with major septa extending to corallite axis, becoming twisted to varying degree, typically forming axial vortex. Dissepiments are small, globose to elongate and tabularium is composed of arched series of tabellae and incomplete tabulae.

Discussion. The type species of *Ptychophyllum, P. stokesi* Edwards & Haime, is very inadequately known. Its horizon was listed by Bassler (1950) as being the 'Lockport Dolomite' of Drummond Island, Michigan and this view was followed by McLean (1975b, p. 57). However, in his faunal lists, Ehlers (1973) does not record *P. stokesi* from the Lockport equivalents (Engadine Dolomite) of Michigan, but figures it from the underlying Cordell Dolomite (Pl. 6, figs 5, 6) and lists it from the still lower Burnt Bluff Limestone. The preservation of the type specimen (Bigsby, 1824, Pl. 29, fig. 1, right side) and paratype (Smith, 1945, Pl. 35, fig. 2a) is comparable to that of the specimen figured by Ehlers and suggests that the type horizon may be the Cordell Dolomite. The stratigraphic range of the species is likely to be late Llandovery to early Wenlock. Internal structures of *P. stokesi* are known only from transverse and longitudinal sections first figured diagrammatically by Hill (1935, Text-fig. 21 A, B) and a transverse section illustrated by Smith (1945, Pl. 35, fig. 2b). The extent to which the axial vortex is developed seems quite variable and is particularly so in material from adjacent Manitoulin Island in strata of comparable or slightly older age examined by the

writer. It is evident that a large assemblage of *P. stokesi* from Drummond Island and adjacent northern Michigan and southern Ontario must be studied before its variability may be ascertained. It seems quite possible that the axial vortex may be of little generic significance.

The genus *Cyathactis* Soshkina, 1955 (type species *C. typus* Soshkina, 1955, Late Llandovery, Siberian Platform) differs from *Ptychophyllum* only in lacking an axial septal vortex (see McLean, 1975b, p. 60). If it is found that the axial vortex of *Ptychophyllum* does not have generic significance, then *Cyathactis*, with its probable synonyms *Miculiella* Ivanovskiy, 1963 and *Contortophyllum* Strelnikov, 1968, should be included in *Ptychophyllum*. At present *Cyathactis* may be interpreted as a solitary equivalent of the fasciculate *Entelophyllum* Wedekind, 1927.

Micula Sytova, 1952 (type species *M. antiqua* Sytova, 1952, Demid Beds, Pridolian, western slopes of central Urals –*fide* Ivanovskiy & Shurygina, 1975), and its synonym *Expressophyllum* Strelnikov, 1968, also shows close similarities to *Ptychophyllum*. It may be distinguished by having considerably dilated septa peripherally, composed of coarse trabeculae, together with occasional development of presepiments.

Implicophyllum Sytova, 1966 (type species *I. vesiculosum* Sytova *in* Sytova & Ulitina, 1966, Aynasu Horizon, Pridolian – ?early Lochkovian, central Kazakhstan) was considered to differ from *Ptychophyllum* in lacking lateral dissepiments lining the septa. However, the presence of lateral dissepiments in *Ptychophyllum* and in other genera is a highly variable character, even within the one corallite (see McLean, 1976b), and cannot be regarded as having generic significance. Consequently, *Implicophyllum* is placed in synonymy with *Ptychophyllum*.

The following species are here referred to *Ptychophyllum: Ptychophyllum stokesi* Edwards & Haime, 1850, type species; Silurian, Drummond Island, Michigan; revised by Smith (1945). *Ptychophyllum sibiricum* Ivanovskiy, 1963; Late Llandovery, Siberian Platform. *Ptychophyllum tenuiseptatum* Ivanovskiy, 1963; Late Llandovery, Siberian Platform. *Implicophyllum vesiculosum* Sytova *in* Sytova & Ulitina, 1966; Aynasu Horizon, Pridolian – ?early Lochkovian, central Kazakhstan. *Ptychophyllum araneosum* Strelnikov, 1972; Wenlock, Subpolar Urals. *Ptychophyllum auctum* McLean, 1975b: Quarry Creek Limestone, Late Llandovery, New South Wales. *Ptychophyllum tysonense* sp. nov.; Offley Island Formation, Late Llandovery, western North Greenland.

Ptychophyllum giganteum Sun *in* Wang *et al.*, 1957, from the Frasnian of Hunan, China, has been subsequently referred to *Mictophyllum* Lang & Smith, 1939 by Pedder (1965). *Ptychophyllum? kindlei* Smith, 1945 and *P.? whittakeri* Smith, 1945 from the Late Frasnian upper Red Knife and Kakisa Formations of the Mackenzie River region, north-western Canada, are representatives of *Mictophyllum* or a closely allied new genus (A. E. H. Pedder, personal communication, 1976).

Ptychophyllum? cliftonense Amsden, 1949, from the Ludlow Brownsport Formation of Tennessee, shows development of large presepiments and some sclerenchymal coating of the dissepiments and presepiments (Amsden, 1949, Pl. 30, fig. 4). It may belong to *Pilophyllum* Wedekind, 1927.

Ptychophyllum orthoseptatum Ivanovskiy *in* Ivanovskiy & Kulkov, 1974, from the Chagyr and Kuimov Horizons (Wenlock–Ludlow) of the Mountainous Altai, lacks any development of an axial

vortex (Ivanovskiy & Kulkov, 1974, Pl. 6, fig. 1) and is a representative of *Cyathactis* as currently defined.

As it is presently understood, *Ptychophyllum* is a common genus in strata of Middle Llandovery to Pridolian age.

Ptychophyllum tysonense sp. nov.
Plate 6, figs 3, 4, 6: Plate 7, figs 2–4; Fig. 4

Material. Holotype MGUH 13917 from GGU 211721. Offley Island Formation, Kap Tyson, GSC locality 73927. Paratypes MGUH 13918–13919 from GGU 211722–211723, same horizon and locality.

Diagnosis. *Ptychophyllum* with a weak axial vortex, thick septa and a narrow tabularium.

Description. Corallum solitary, probably cylindrical, although material is fragmentary. Corallite diameter reaches 20 mm, although epitheca is not preserved.

Septa are long, moderately dilated throughout, major septa forming an irregular axial vortex of variable intensity. Vortex is most pronounced in the late ephebic stage of the holotype (Plate 6, fig. 4; Fig. 4) but is less pronounced at earlier growth stages and in paratypes. Minor septa are only slightly thinner than major septa and extend up to 0.6 of corallite radius, being largely confined to dissepimentarium. Septal number reaches 70. Lateral dissepiments on septa are not developed.

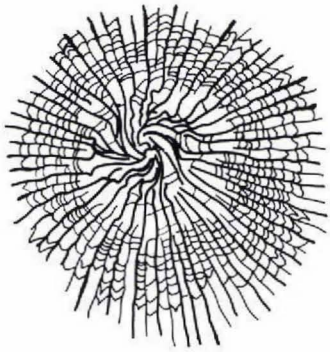

Fig. 4. *Ptychophyllum tysonense* sp. nov. Offley Island Formation, Kap Tyson. MGUH 13917 from GGU 211721, holotype, ×3. See also Plate 6, fig. 4.

Dissepimentarium is broad, composed of moderately to steeply inclined layers of small, weakly globose to slightly elongate dissepiments. Tabularium reaches 7.5 mm in width and is composed of moderately arched, axially flattened layers of elongate tabellae.

Remarks. *P. tysonense* may be distinguished from *P. tenuiseptatum* Ivanovskiy, 1963 by having a weaker axial vortex and thicker septa; it is also somewhat

smaller. The widespread late Llandovery species *P. sibiricum* Ivanovskiy, 1963 also has a stronger axial vortex and has a considerably wider tabularium.

Ptychophyllum sp. A

Plate 6, figs 5, 7

Material. MGUH 13920 from GGU 211724. Offley Island Formation, Kap Tyson, GSC locality 73927.

Remarks. This specimen differs from *P. tysonense* sp. nov. in being considerably larger, having fusiform septa, thickened near the inner margin of the dissepimentarium but very thin in the tabularium, a narrow dissepimentarium with steeply inclined layers of very small dissepiments, and a very broad tabularium. This form may represent a new species, but the material is insufficient for specific assignment.

Ptychophyllum sp. B

Plate 7, figs 1, 7

Material. MGUH 13921 from GGU 211725. Offley Island formation, Kap Tyson, GSC locality 73939.

Remarks. Again there is insufficient material to assign this form specifically, but while being of comparable size to *Ptychophyllum* sp. A, it has larger, more elongate dissepiments, which are in more gently inclined layers.

Subfamily KYPHOPHYLLINAE Wedekind, 1927

Genus *Strombodes* Schweigger, 1819

Strombodes Schweigger, 1819, table vi
Donacophyllum (part.) Dybowski, 1874, p. 460
?Grabauphyllum Foerste, 1917, p. 199
?Kyphophyllum Wedekind, 1927, p. 19

Type species. *Madrepora stellaris* Linnaeus, 1758

Diagnosis. Corallum phaceloid to subcerioid or ?solitary. Septa are generally thin and interrupted peripherally by large presepiments. Tabulae are complete and incomplete, generally forming arched series. Dissepiments are typically elongate.

Discussion. Smith (1945) and Hill (1956) interpreted the internal structure of the type species of *Strombodes, S. stellaris* (Linnaeus), in terms of the transverse section of *Spongophyllum contortiseptatum* Dybowski, 1874 (Dybowski, 1874, p. 483, Pl. 4, fig. 2a) and a longitudinal section of a specimen regarded as conspecific with *S. stellaris* by Smith (1945, Pl. 29, fig. 2). For want of further material and pending revision of the Gotland kyphophyllinids, this interpretation is followed here.

Kyphophyllum Wedekind, 1927 (type species *K. lindstroemi* Wedekind, 1927, Högklint Beds, early Wenlock, Gotland) was regarded as having forms with both solitary and colonial coralla (Wedekind, 1927, p. 19), although only solitary species were described by Wedekind. As noted by Smith (1945, p. 57), *Kyphophyllum* has identical internal morphology to *Strombodes* and is tentatively placed in synonymy here, although it could be retained for solitary *Strombodes* if required (see also discussion by McLean, 1975b, p. 65).

The internal structure of the genus *Grabauphyllum* Foerste, 1917 (type species *G. johnstoni* Foerste, 1917, 'Niagaran dolomite', near Chicago, Illinois) is known only from sections of hypotypes figured by Stumm (1968, Pl. 1, figs 3–5), but is closely comparable to that of *Strombodes*. Stumm considered *Grabauphyllum* to be a cerioid form, but while the corallites are generally closely appressed and subcerioid in places, Stumm's material is clearly not cerioid. However, the single specimen illustrated by Foerste (1917, Pl. 11, fig. 9) may be cerioid or at least subcerioid and the genus would seem likely to vary in structure from subcerioid to closely spaced phaceloid, a range in growth form commonly observed in *Strombodes*. It would seem most probable that the two genera are synonymous.

The writer earlier suggested the genera *Evenkiella* Soshkina, 1955 and *Tenuiphyllum* Soshkina, 1937 may be synonyms of *Strombodes* (McLean, 1975b, p. 65). However, as the type species of *Evenkiella* (*E. helenae* Soshkina, 1955) is a cerioid form, it would seem better to keep it separate from *Strombodes*. The other species referred to *Evenkiella* by Soshkina, *E. obrutschevi* Soshkina, 1955, lacks the common, large presepiments of *E. helenae* and apparently differs from *Entelophyllum* only in its cerioid growth form. It is thus referred here to *Prohexagonaria* Merriam, 1973. The type species of *Tenuiphyllum, T. ornatum* Soshkina, 1937, is also a cerioid form and on that basis alone can be separated from *Strombodes*. It does show some development of presepiments (Soshkina, 1937, Pl. 16, fig. 3; Ivanovskiy & Shurygina, 1975, Pl. 9, fig. 1a), but their development is subordinate to that of normal dissepiments. *Tenuiphyllum* is closely similar to *Prohexagonaria* Merriam, but may be distinguished by its strongly expanded septal bases.

The following colonial species are included in *Strombodes: Madrepora stellaris* Linnaeus, 1758, type species; ?Slite Beds, Wenlock, Gotland; revised by Smith (1945) and Hill (1956), and including the synonym *Spongophyllum contortiseptatum* Dybowski, 1874. *Donacophyllum middendorfi* Dybowski, 1874; Porkuni Horizon, late Ashgill, Estonia; revised by Kaljo (1958b). *Donacophyllum schrencki Dybowski,* 1874; Raikküla Horizon, Middle Llandovery, Estonia; revised by Kaljo (1958b). *Tenuiphyllum flexuosum* Soshkina, 1937; Elkin Horizon, late Wenlock, eastern slopes of the Central Urals; revised by Ivanovskiy & Shurygina (1975) and including the probable synonym *Kyphophyllum elkinense* Sytova, 1952. *Kyphophyllum lindstroemi* Wedekind *sensu* Sytova, 1952 (*?non* Wedekind, 1927); ?Elkin Horizon, late Wenlock, eastern slopes of the Central Urals; revised by Ivanovskiy & Shurygina (1975). *Cyathactis socialis* Soshkina, 1955; Late Llandovery, Siberian Platform. *Tabulophyllum siluriense* Ivanovskiy, 1962a; Late Llandovery, Siberian Platform. *Strombodes concavifundatus* Ivanovskiy, 1965; Late Llandovery, Siberian Platform. *Strombodes sokolovi* Lav-

rusevich, 1972; Kunzhak Horizon, Pridolian – ?early Lockhovian, Zeravshan Range, Tadzhikistan. *Strombodes magnus* Strelnikov, 1973; Greben Horizon, Pridolian, Chernov Uplift, Arctic USSR. *Strombodes rosythensis* McLean, 1975b; Rosyth Limestone, Late Llandovery, New South Wales. *Strombodes infractus* sp. nov.; Cape Schuchert Formation, Late Llandovery, western North Greenland.

Solitary species with the internal morphology of *Strombodes* include the species of *Kyphophyllum* from Gotland described by Wedekind (1927) – *K. lindstroemi, K. conicum, K. tenue, K. cristatum, K. cylindricum, K. biseriale, K. laeve, K. rugosum* and *K. basale*. Revision of this material will very likely show many of the species to be synonymous. Other solitary species include *K. multiseptatum* Soshkina, 1937, *K. intermedium* Soshkina, 1937, *K. primaevum* Wang, 1944 and *K. schmidti* Kaljo, 1958b.

Strombodes limbatus Ulitina *in* Sytova & Ulitina, 1966, from the Akkan Horizon (Ludlow) of Kazakhstan, apparently has peripheral dilation of the septa to form a marked stereozone, and it is likely that this species may be a representative of *Pilophyllum* Wedekind, 1927. However, it requires further study.

Two colonial species referred to *Kyphophyllum, K. greggi* Merriam, 1972 (late Silurian or early Devonian, California) and *K. nevadensis* Merriam, 1973 ('Silurian' coral zone E, late Lochkovian – see Pedder, 1975, Nevada), both show the presepiments and sagging tabulae characteristic of *Neomphyma* Soshkina, 1937 and are here included in that genus.

Present data suggest that *Strombodes* ranges in age from late Ashgill to Pridolian, and possibly earliest Lochkovian.

Strombodes infractus sp. nov.

Plate 7, figs 5, 6, 8, 9; Plate 8, figs 1–3; Fig. 5

Material. Holotype MGUH 13922 from GGU 211726. Cape Schuchert Formation, Kap Schuchert, GSC locality 73965. Paratypes MGUH 13923–13924 from GGU 211727–211728, same horizon and locality.

Diagnosis. Fasciculate *Strombodes* with generally well-spaced corallites and septa only rarely interrupted by presepiments. Dissepiments are large and elongate.

Description. Corallum fasciculate with calicinal, parricidal increase and well-spaced corallites, which are only rarely in lateral contact. Corallite diameter ranges up to 16 mm.

Septa are long, rather thick, with major septa extending almost to corallite axis and minor septa up to 0.8 of length of major septa, although generally shorter. Septal number ranges from 48 to 56 in mature corallites. Major septa are only rarely interrupted peripherally by presepiments, but minor septa are commonly discontinuous radially.

Dissepiments are large and elongate, generally in 1 to 3 rows. Dissepimental layers tend to be flat peripherally, becoming steeply inclined adjacent to tabularium. Tabularium is broad, averaging 0.5 to 0.6 of corallite diameter. Tabulae are complete and incomplete, forming moderately arched floors with a

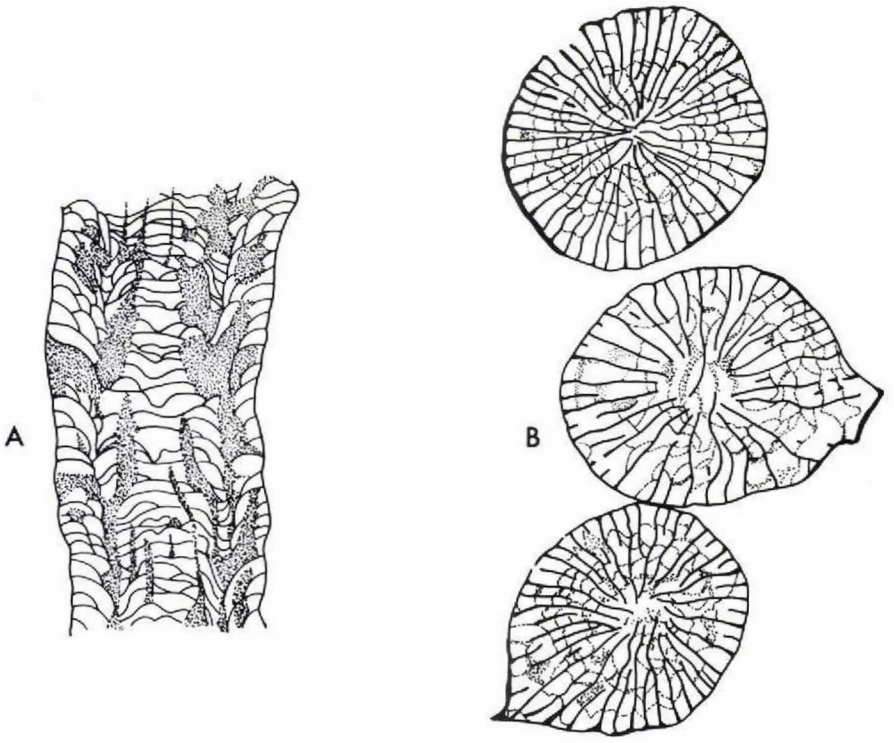

Fig. 5. *Strombodes infractus* sp. nov. Cape Schuchert Formation, Kap Schuchert, ×3. *a*, MGUH 13923 from GGU 211727, paratype. See also Plate 7, fig. 9. *b*, MGUH 13922 from GGU 211726, holotype. See also Plate 7, fig. 8.

wide, axial, flattened region, sometimes with a narrow axial notch. Common tabular spacing is 0.5 to 0.8 mm.

Remarks in having its major septa only rarely interrupted by peripheral presepiments, this species is somewhat intermediate in character between *Entelophyllum* Wedekind, 1927 and *Strombodes*, and emphasises the close relationships between these two genera (see also McLean, 1975b, p. 64). However, the large and elongate dissepiments of *S. infractus* are characteristic of *Strombodes*, and it is felt that there is sufficient development of lonsdaleoid septa, particularly in the minor septa, to justify its inclusion in *Strombodes*.

The weakly lonsdaleoid septa clearly distinguish *S. infractus* from most other described species. The Pridolian *S. magnus* Strelnikov, 1973, from the Greben Horizon of the Chernov Uplift, also has weak presepimental development, at least in late growth stages, but its abundant dissepiments distinguish it from *S. infractus* (Strelnikov, 1973, Pl. 5, figs 3a–g).

Family CHONOPHYLLIDAE Holmes, 1887
Genus *Kodonophyllum* Wedekind, 1927

Kodonophyllum Wedekind, 1927, p. 34
Patrophontes Lang & Smith, 1927, p. 456

Type species. *Streptelasma milne-edwardsi* Dybowski, 1873b, = *Madrepora truncata* Linnaeus, 1758

Diagnosis. Corallum solitary or weakly fasciculate. Septa are strongly dilated to form broad peripheral stereozone, composed of coarse monacanthine trabeculae. Septa become abruptly thinner outside stereozone, extending in some cases to corallite axis where they may be weakly twisted or fused. Tabulae are typically strongly arched, dissepiments are absent.

Remarks. The writer has followed Oliver & Galle (1971) in regarding *Kodonophyllum* as a representative of the Chonophyllidae, which consequently includes other genera earlier included in the Kodonophyllidae Wedekind, e.g. *Schlotheimophyllum* Smith, *Chlamydophyllum* Počta, *Iowaphyllum* Stumm, *Scyphophyllum* Strelnikov and *Niajuphyllum* Strelnikov. This view is based on analysis of the type material of *Chonophyllum* Edwards & Haime, 1850 by Oliver & Galle, which indicates that *Chonophyllum* is unrelated to *Ketophyllum* Wedekind, contrary to Hill (1956) and McLean (1974a).

The type species of *Kodonophyllum, K. truncatum,* has clearly developed, coarse, monacanthine trabeculae, as shown by Dybowski (1873b, Pl. 13, figs 9, 10, 12) and Smith & Tremberth (1929, Pl. 8, figs 6, 7). Other species showing this structure are listed below. In addition, there are several forms that apparently have a finer trabecular structure (e.g. *K. richteri* Wedekind, 1927). Strelnikov (1964) felt that such forms should be separated generically from *Kodonophyllum,* but it is quite possible that recrystallization may have obliterated the original microstructure in these species. In the writer's experience it is common for specimens of a single species from the same horizon and locality to have variable recrystallization, even in the one specimen, so that some septa show microstructure well preserved, while in others it is partly or entirely destroyed. Until more information can be obtained, the species apparently lacking coarse trabeculae are provisionally placed in *Kodonophyllum.*

Kaljo (1957) described several species from the late Ordovician and early Silurian (early Llandovery) of Estonia as representatives of *Kodonophyllum.* However, all these species show some development of a rather weak axial structure, apparently of *Grewingkia*-type and, according to Strelnikov (1964), have a fine trabecular microstructure. Both Kaljo and Strelnikov suggested that *K. truncatum* (Linnaeus) *sensu* Wang (1948) from the Whitehouse Group (Late Caradoc – Early Ashgill) of Girvan, Scotland, is synonymous with *K. bekkeri* Kaljo, 1957. However, according to Wang (1948, p. 105) the trabeculae of his form are very coarse, and it seems to have only a weak axial structure. It would appear that these forms

could be separated from *Kodonophyllum* on the presence of the axial structure at least, as suggested by Kaljo, but they require further study. It is possible that they may be related to forms like *Grewingkia altaica* (Cherepnina, 1960) and *Grewingkia neumani* McLean, 1974c, which retain a broad stereozone, rather similar to that of *Kodonophyllum,* into late growth stages, but also possess a very broad axial structure of typical *Grewingkia* style. *G. neumani,* in particular, has coarse trabeculae comparable to those of *Kodonophyllum* (McLean, 1974c, Pl. 2, fig. 1).

The genus *Circophyllum* Lang & Smith, 1939 (type species *C. samsugnensis* (Smith & Tremberth, 1927), ?Slite Beds, Wenlock, Gotland) differs from *Kodonophyllum* only in its fasciculate to dendroid growth form and axial thickening of the septa to form a weak axial structure. Further work may well show the genera should be considered to be synonymous, especially as the type species of *Kodonophyllum* varies from being solitary to weakly fasciculate (see particularly Smith & Tremberth, 1929).

Symphyphyllum Spasskiy *in* Bulvanker *et al.,* 1968 (type species *S. styliferum* Spasskiy, 1968, Bargash Suite, 'Coblenzian', Mountainous Altai) is a solitary form that may be distinguished from *Kodonophyllum* by having extensive thickening of the axial ends of the major septa to form a broad, solid axial structure. *K. mulleri* Merriam, 1973 from 'Silurian' coral zone E (Late Lochkovian) of Nevada is closely similar to *S. styliferum* and is here referred to *Symphyphyllum.*

Bulvankeriphyllum Gorianov, 1966 (type species *B. mirandum* Gorianov, 1966, Talbulak Formation, Pragian, Zeravshan Range, Tadzhikistan) apparently differs from *Kodonophyllum* only in having two septa considerably longer than the rest, joining axially where they are lenticularly dilated.

The following species show coarse trabeculae and are here included in *Kodonophyllum: Kodonophyllum truncatum* (Linnaeus, 1758) *sensu* Lang & Smith (1927), Smith & Tremberth (1929), type species; ?Högklint or Slite Beds, Wenlock, Gotland, and includes the synonym *Streptelasma milne-edwardsi* Dybowski, 1873b. *Kodonophyllum teleskopium* Wedekind, 1927; Slite Beds, Wenlock, Gotland. *Kodonophyllum corymbosum* Oliver, 1962; Sayabec Formation, Wenlock – ?Ludlow, Quebec. *Kodonophyllum angustum* Strelnikov, 1965; Wenlock, Vaygach Island. *Kodonophyllum asiaticum* Lavrusevich, 1971; Mukhkak Beds (Horizon G), Middle – ?early Late Llandovery, Zeravshan-Gissar Mountains, Tadzhikistan. *Kodonophyllum leijiatunense* Ke & Yü, 1974; Leijiadwen Formation, Late Llandovery, Kweichow, China.

In addition to these species there are a number of forms that apparently do not possess coarse trabeculae or whose microstructure is inadequately known. They include: *Chonophyllum vadum* Hall, 1882; Louisville Limestone, Late Wenlock – early Ludlow, Indiana–Kentucky; revised by Stumm (1965). *Kodonophyllum richteri* Wedekind, 1927; ?Högklint Beds, early Wenlock, Gotland. *Kodonophyllum primaevum* Wang *in* Wang *et al.,* 1957; 'Lower Middle Silurian', Hupei, China. *Kodonophyllum postteleskopium* Gorianov *in* Bulvanker *et al.,* 1968; Talbulak Formation, Pragian, Zeravshan Range, Tadzhikistan. *Kodonophyllum? pusillum* sp. nov.; Offley Island Formation, Late Llandovery, western North Greenland.

Kodonophyllum? pusillum sp. nov.

Plate 8, figs 4–12

Material. Holotype MGUH 13925 from GGU 211729. Offley Island Formation, Kap Tyson, GSC locality 73926. Paratypes MGUH 13926–13927 from GGU 211730–211731, same horizon and locality. Additional specimen, tentatively included in this species, MGUH 13928 from GGU 211732, same horizon and locality.

Diagnosis. Corallum solitary, very small, with average diameter 8 to 10 mm. Septa are short, minor septa confined to broad peripheral stereozone, major septa extending 0.6 to 0.7 of corallite radius. Tabulae, where clearly developed, tend to sag peripherally and are strongly arched axially. Dissepiments are absent.

Description. Corallum solitary, ceratoid, with maximum diameter 8 to 10 mm and height up to at least 12 mm.

Peripheral stereozone is broad, with average width 2 mm, composed of heavily dilated septa. Minor septa are confined to stereozone, but major septa, numbering 22 to 24, extend 0.6 to 0.7 of corallite radius, becoming abruptly thinner on leaving stereozone.

Tabulae are varyingly suppressed by septa, particularly in early growth stages, but where best developed (Plate 8, fig. 4) show a narrow zone of flat or sagging tabulae adjacent to stereozone and a broad axial zone of flat-topped domes, evenly spaced (average 0.3 to 0.5 mm). Tabulae may be coated with sclerenchyme to a minor degree. Dissepiments are not developed.

Remarks. This species is only doubtfully included in *Kodonophyllum* as its septal microstructure has been largely obscured by recrystallization. Traces of fibres diverging from the septal axis, occasionally rather coarse, may be rarely seen, but the septa are generally structureless. In all other aspects of morphology, however, the Greenland form is typical of *Kodonophyllum* and may be distinguished from other described species by its particularly small size.

One specimen (MGUH 13928 from GGU 211732) is included doubtfully in *K.? pusillum* since it develops a much broader stereozone and coarser septa, which totally suppress tabular development (Plate 8, figs 8, 9, 12). In all other respects it is typical of *K.? pusillum* and as one specimen (MGUH 13927 from GGU 211731) has its septa partially suppressing tabulae (Plate 8, fig. 11), it is possible that MGUH 13928 from GGU 211732 represents an extreme or aberrant example of the species. However, at this stage there is insufficient material available for study to confirm such an interpretation.

Family MUCOPHYLLIDAE Hill, 1940
Genus *Amplexoides* Wang, 1947

Tyrrellia Parks, 1913, p. 193 (*non* Koenike, 1895)
Amplexoides Wang, 1947, p. 174
?Synamplexoides Stearn, 1956, p. 80
Protopilophyllum Ivanovskiy, 1963, p. 62

Type species. *Amplexus appendiculatus* Lindström, 1883

Diagnosis. Solitary or weakly phaceloid coralla with long, slender, amplexoid major septa and weakly developed minor septa. Peripheral stereozone is generally narrow but may become wider near calice of mature specimens. Tabulae are generally complete and flat or slightly arched, with down-turned edges. Dissepiments are lacking.

Discussion. *Amplexoides* is here included in the Mucophyllidae because of its close similarities to the genera *Zelophyllum* Wedekind, 1927 and *Pseudomphyma* Wedekind, 1927; discussion of the latter genera is relevant here. The type species of *Zelophyllum, Z. intermedium* Wedekind, 1927 and *Pseudomphyma, P. profunda* Wedekind, 1927, both have a broad stereozone of short, dilated septa, which show a tendency to extend a short distance on the surface of the tabulae. The amplexoid septal ridges, however, are of only incipient development and are rarely apparent in transverse section (Plate 9, figs 2, 6). There appear to be no significant structural differences that would warrant separation of these two species at the generic level and hence *Pseudomphyma* is regarded here as a junior synonym of *Zelophyllum*. Hill (1956) placed *Pseudomphyma* in synonymy with *Pseudamplexus* Weissermel, 1897, but, as noted by Oliver & Galle (1971, p. 62), *Pseudomphyma* does not possess the coarse rhabdacanthine trabeculae of *Pseudamplexus*. From photographs of the type material of *Pseudomphyma* and *Zelophyllum* kindly provided by Dr. R. Birenheide (Plate 9, figs 1–3, 6), the septa appear to be composed of rather fine trabeculae, although somewhat recrystallized, and are certainly not rhabdacanthine. Oliver & Galle (1971) noted the similarity of *Pseudomphyma* and *Zelophyllum,* but implied that their septal microstructure distinguished them from the mucophyllids (including *Pseudamplexus*). However, the present author feels that septal microstructure is in general not of suprageneric significance and follows Wang (1947) in placing *Zelophyllum* in the Mucophyllidae. It would seem that the only significant differences between *Zelophyllum* (= *Pseudomphyma*) and *Pseudamplexus* lie in their septal microstructure and the tendency towards development of amplexoid septa in *Zelophyllum*.

In proposing *Amplexoides,* Wang (1947, p. 174) considered it differed from *Zelophyllum* in lacking a pronounced peripheral stereozone. However, the illustration of the longitudinal section of the type material of *Amplexoides appendiculatus* (Lindström, 1883, Pl. 6, fig. 7) clearly shows that in the late stages of

ontogeny quite a marked peripheral stereozone is developed in this species, although it is not as evident in the illustrated transverse sections (Lindström 1883, Pl. 6, figs 8, 11, 12). In the material from western North Greenland herein referred to *Amplexoides,* the peripheral stereozone remains thin throughout most of the ontogeny, only becoming broader near the level of the calice (see below and Plate 9, fig. 14). However, the character of this stereozone is comparable to that in *Zelophyllum* and the similarities of tabular development and the presence of amplexoid septa in the two genera suggest that they should be grouped in the one family. From the variability in the described species here assigned to *Amplexoides,* it would seem that it may be distinguished from *Zelophyllum* only in lacking the consistent development of the broad stereozone throughout ontogeny and having consistently longer amplexoid septa. However, there appear to be transitional forms between the two genera. It is likely that *Amplexoides* may have been the oldest representative of the Mucophyllidae, descendants of this genus in the late Silurian and Devonian tending to develop a broader stereozone and reducing septal length.

The genus *Protopilophyllum* Ivanovskiy, 1963 (type species *P. cylindricum* Ivanovskiy, 1963, late Llandovery – Wenlock, Siberian Platform) has long, amplexoid septa comparable to those of *Amplexoides,* but a broader peripheral stereozone which, in places, is similar to that in *Zelophyllum* (Ivanovskiy, 1963, Pl. 15, figs 1a, b). Thus it is intermediate in structure between typical representatives of the two genera. Ivanovskiy (1975, p. 42) included the genus in *Zelophyllum,* but on the basis of the long septa and the apparently thin stereozone in places it is considered synonymous with *Amplexoides.*

Synamplexoides Stearn, 1956 (type species *S. varioseptatus* Stearn, 1956, ?Late Llandovery – Wenlock, Manitoba), differs from typical *Amplexoides* only in its fasciculate growth habit. It is thus tentatively included in *Amplexoides.* Other colonial species which may be representative of *Amplexoides* include *Dokophyllum sociale* Soshkina, 1937, *Tabularia oblonga* Zheltonogova, 1961 and *Pycnostylus? guelphensiformis* Zheltonogova, 1965.

Several other genera show some similarities to *Amplexoides. Tabularia* Soshkina, 1937 (type species *T. turiensis* Soshkina, 1937, Elkin Horizon, late Wenlock, eastern slopes of the Urals, revised by Ivanovskiy & Shurygina, 1975) was regarded as a senior synonym of *Amplexoides* by Ivanovskiy (1965, 1975), but the illustrated transverse section of the holotype (Soshkina, 1937, Pl. 13, fig. 3; Ivanovskiy & Shurygina, 1975, Pl. 18, fig. 3a) shows only rudimentary septa on the corallite wall. In addition, one longitudinal section (Ivanovskiy & Shurygina, 1975, Pl. 18, fig. 3b) shows lamellar tissue lining the corallite wall and including clear, short, septal spines. However, the other longitudinal section (Ivanovskiy & Shurygina, 1975, Pl. 18, fig. 3v) shows a possibility of amplexoid septa on early growth stage tabulae. Without transverse sections of earlier growth levels, the affinities of this genus cannot be determined, although the presence of septal

spines suggests it may be a tryplasmatid. It does not, however, appear to be synonymous with *Amplexoides*.

Lindstroemophyllum Wang, 1947 (type species *L. involutum* Wang, 1947, 'Middle' Silurian, Yunnan, China) lacks dissepiments and has strongly amplexoid septa, but the latter tend to show wedge-shaped dilation in transverse section (Wang, 1947, Pl. 2, fig. 6a). The genus may be related to *Ketophyllum* Wedekind, 1927, as suggested by Hill (1956).

Pseudamplexophyllum Shurygina, 1968 (type species *P. insolitum* Shurygina 1968, early Devonian, eastern slopes of the Urals) has amplexoid septa comparable to those of *Amplexoides* and lacks dissepiments. However, it may be distinguished by having rhabdacanthine trabeculae and a broadly flaring calice. It was regarded as a synonym of *Sanidophyllum* Etheridge, 1899 by Ivanovskiy (1975, p. 47), although retained in the Mucophyllidae. However, *Sanidophyllum* is a phaceloid to cerioid endophyllid, as noted by Hill (1956), and is unrelated to the mucophyllid *Pseudamplexophyllum*.

Although dissepiments are typically lacking in the Mucophyllidae, some forms show very rare dissepiments in the peripheral stereozone. An example is *'Pseudomphyma' (='Zelophyllum) elongata* Wedekind, 1927, which shows several large dissepiments in longitudinal section (Wedekind, 1927, Pl. 6, fig. 6; herein, Plate 9, fig. 1). In general, however, dissepiments in the mucophyllids are suppressed by the stereozone. *Dokophyllum tabulatum* Bulvanker, 1952, from the Skala Horizon (Pridolian) of Podolia shows just such a rare development of dissepiments in the peripheral stereozone (Bulvanker, 1952, Pl. 5, fig. 1a). *Dokophyllum* is regarded here as a synonym of *Ketophyllum* Wedekind, 1927, (see McLean, 1974a), a form typically lacking the peripheral stereozone of *'D.' tabulatum*. It is possible therefore that *'D.' tabulatum*, with its long amplexoid septa, may be an aberrant form of *Amplexoides*. It also shows some similarities to *Pilophyllum* Wedekind, although the latter is characterized by strongly arched, incomplete *Entelophyllum*-like tabulae and more abundant dissepiments. The species does not appear to be related to the cystiphyllid *Dentilasma*, contrary to the earlier suggestion of Ivanovskiy (1962b) and McLean (1974a).

Amplexoides? rariseptatus Lin, 1965 from the 'Middle Ordovician' of Szechwan, China, has no clear evidence of amplexoid septa and is considerably older than known records of *Amplexoides* (see below). It would seem most probably to be a representative of *Streptelasma* Hall *sensu* Neuman, 1969. Yi (1974) referred it to *Brachyelasma* Lang, Smith & Thomas, 1940, a junior synonym of *Streptelasma*.

The following species belong to *Amplexoides* as here interpreted: *Amplexus appendiculatus* Lindström, 1883, type species; Silurian, Szechwan; revised by Wang (1947) and Wang *et al.* (1957). *Tyrrellia severnensis* Parks, 1913; Attawapiskat Formation, ?Wenlock, north-western Ontario; revised by Parks (1917) and Stearn (1956). *Cyathophyllum chaoi* Grabau, 1925; Lojoping Formation, Late Llandovery, Hupeh; revised by Grabau (1928) and Ke and Yü (1974). *Zelophyllum lindstroemi* Wang,

1947. 'Middle Silurian', Yunnan. *Protopilophyllum cylindricum* Ivanovskiy, 1963; Late Llandovery – Wenlock, Siberian Platform. *Tabularia septata* Ivanovskiy, 1963; Wenlock, Siberian Platform. *Protopilophyllum carinatum* Lavrusevich, 1971; Daurich (F) Beds, Early – Middle Llandovery, Zeravshan–Gissar Range, Tadzhikistan. *Amplexoides poulseni* sp. nov.; Offley Island Formation, Late Llandovery, western North Greenland.

In addition to these species, a number of inadequately known forms may also be representative of *Amplexoides*. They include: *Amplexus distans* Lindström, 1883; Silurian, Szechwan. *Amplexus septatus* Foerste, 1909b; Kokomo Limestone, Ludlow – Pridolian, Indiana. *Amplexus lojopingensis* Grabau, 1928; Lojoping Formation, Late Llandovery, Hupeh. *Dokophyllum sociale* Soshkina, 1937; Elkin Horizon, Late Wenlock, eastern slopes of the Central Urals; revised by Ivanovskiy & Shurygina (1975). *Dokophyllum tabulatum* Bulvanker, 1952; Skala Horizon, Pridolian, Podolia. *Amplexoides kaolingpoensis* Tsin, 1956; Kaochaitien Formation, ?Wenlock, Kweichow. *Synamplexoides varioseptatus* Stearn, 1956; Chemahawin Dolomite, Late Llandovery – Wenlock, Manitoba. *Tabularia oblonga* Zheltonogova, 1961; Chagyr Horizon, Wenlock, Mountainous Altai. *Dokophyllum sociale* Soshkina *sensu* Zheltonogova, 1961 (*?non* Soshkina, 1937); Yurman Suite, Wenlock, Salair. *Pycnostylus? guelphensiformis* Zheltonogova, 1965; Chagyr Horizon, Wenlock, Mountainous Altai.

Amplexoides poulseni sp. nov.

Plate 8, figs 13–16; Plate 9, figs 4, 5, 7–14

Material. Holotype MGUH 13929 from GGU 211733, Offley Island Formation, Kap Tyson, GSC locality 73927. Paratypes MGUH 13930 from GGU 211734, same horizon and locality; MGUH 13931–13932 from GGU 211735–211736, Cape Schuchert Formation, Kap Tyson west section, GSC locality 73919. Additional material tentatively referred to this species, MGUH 13933 from GGU 211737, Offley Island Formation, Kap Tyson, GSC locality 73927; MGUH 13934 from GGU 211738, Cape Schuchert Formation; Kap Tyson west section, GSC locality 73919.

Diagnosis. Solitary *Amplexoides* with long, slender major septa and a well-developed peripheral stereozone at level of calice, although stereozone is only weakly developed in earlier ontogeny.

Description. Corallum solitary, trochoid, with slightly flaring calice, commonly showing rejuvenescence. Corallite diameter ranges up to 20 mm, with an average at base of calice of 14 to 15 mm. Corallite height is unknown due to fragmentary nature of material. Major septa are long, extending up to about 0.8 of corallite radius on surfaces of tabulae, slender, ranging in number up to 41 in available material. Minor septa are very short, not extending far beyond narrow peripheral stereozone, which ranges in width up to 1.5 mm in region of base of calice, although it may be somewhat thicker in calice itself. During most of ontogeny, stereozone is only slightly developed. Septal microstructure in stereozone is largely obscured by recrystallization, although rather slender fibres are likely.

Tabulae are generally flat or slightly sagging axially with down-turned margins. They are mainly complete, with an average spacing of 0.8 to 1.2 mm. Dissepiments are absent.

Remarks. The combination of growth form, corallite diameter, septal number and stereozone character in *A. poulseni* distinguishes it from all previously described

species. It shows perhaps closest affinities to *A. appendiculatus* Lindström, 1883, the type species, but from the data of Wang (1947), the latter has a narrower stereozone, particularly in late ontogeny, and is generally smaller.

Two specimens are only tentatively referred to the new species. MGUH 13933 from GGU 211737 has generally thicker septa, although the only transverse section available is virtually in the plane of a tabula and the septa would probably be thicker at this level (Plate 9, fig. 7). The longitudinal section of this specimen is typical of *A. poulseni* (Plate 9, fig. 4). The other specimen, MGUH 13934 from GGU 211738, is considerably smaller than typical *A. poulseni* (corallite diameter 7 mm), but there is insufficient material to determine if it should be separated.

Family STAURIIDAE Edwards & Haime, 1850
Genus *Palaeophyllum* Billings, 1858

Palaeophyllum Billings, 1858, p. 168
Parabrachyelasma Cherepnina, 1960, p. 388
?Modesta Cherepnina, 1962, p. 140

Type species. *Palaeophyllum rugosum* Billings, 1858

Diagnosis (after McLean, 1975a, p. 192). Corallum phacelo-cerioid. Corallites have narrow peripheral stereozone and lack dissepiments. Major septa are long and thin and minor septa are generally short. Tabulae are commonly complete and arched, sometimes with axial depression.

Discussion. *Palaeophyllum* has been reviewed in some detail by Ivanovskiy (1969), Webby (1972) and McLean (1975a). It is a particularly widespread genus in strata of Late Ordovician to Early Silurian age, being rarer in Wenlock to Ludlow horizons. It was most abundant in the Late Caradoc and Ashgill.

Palaeophyllum schuchertense sp. nov.
Plate 10, figs 1, 2, 6; Fig. 6

Material. Holotype MGUH 13935 from GGU 211739. Cape Schuchert Formation, Kap Schuchert, GSC locality 73959.

Diagnosis. Fasciculate *Palaeophyllum* with well-spaced corallites and calical increase. Corallite diameter ranges from 5 to 6 mm, with major septa numbering 19 to 23 and extending almost to corallite axis. Minor septa rarely extend beyond well developed peripheral stereozone. Tabulae are strongly arched with a narrow, axial, flattened zone.

Description. Corallum fasciculate with corallites widely spaced, long, cylindrical, showing calical, probably parricidal increase with up to 4 offsets from the one

Fig. 6. *Palaeophyllum schuchertense* sp. nov. Cape Schuchert Formation, Kap Schuchert. MGUH 13935 from GGU 211739, holotype, transverse sections of different corallites, ×5.

calice. Corallite diameter ranges from 5 to 6 mm in mature specimens, with a common value of 5.3 to 5.5 mm.

Peripheral stereozone is well developed, ranging in width from 0.3 to 0.5 mm. Major septa are long, extending to, or almost to, corallite axis, and vary in number from 19 to 23 in mature corallites. Minor septa rarely project beyond peripheral stereozone. Tabulae are strongly arched, frequently with down-curved lateral margins, sloping up steeply and forming narrow, flattened, axial region. The long septa usually obscure the shape of the tabulae in the axial region in longitudinal section, but a slight axial notch is apparent (Plate 10, fig. 6). Peripheral tabular spacing averages 1 mm.

Remarks. The combination of corallite size, septal length and number, and the broad stereozone distinguishes *P. schuchertense* from other described species. Only two species of comparable age show much similarity to *P. schuchertense*. *P. williamsi* Chadwick *in* Williams, 1919 from the Manitoulin Formation (Early Llandovery) of Manitoulin Island, Ontario, has generally shorter major septa and longer minor septa, with a narrower peripheral stereozone (Bolton, 1966, Pl. 2, figs 17, 18; 1968, Fig. 12, no. 15). In addition the tabulae are generally rather flatter than in *P. schuchertense*. The holotype of this species (GSC 4508) is very poorly preserved, but thin-sections are figured herein (Plate 11, figs 1, 4). *P. tubuliferum* Reiman, 1958 [*? = P. fasciculum* (Kutorga, 1837) – see Ivanovskiy, 1969], from the Tamsalu Horizon (Early Llandovery) of Estonia, also has longer minor septa and a narrower peripheral stereozone than *P. schuchertense*, and has a distinctly different tabular shape, with a tendency towards development of incomplete tabulae peripherally (Reiman, 1958, Fig. 1 and Pl. 2, figs 1–3).

Palaeophyllum cf. *P. hubeiense* Ke & Yü, 1974
Plate 10, figs 3–5, 7, 8; Plate 11, figs 5–7

cf. *Palaeophyllum hubeiense* Ke & Yü, 1974, p. 166, Pl. 73, figs 21, 22

Material. MGUH 13936–13939 from GGU 211740–211743, Cape Schuchert Formation, Kap Schuchert, GSC locality 73974.

Diagnosis. Fasciculate *Palaeophyllum* with widely spaced corallites. Corallite diameter ranges from 6.5 to 7.5 mm, major septa number 20–24 and are strongly withdrawn from corallite axis, minor septa are very short, but clearly developed and peripheral stereozone is very weakly developed. Tabulae are weakly arched.

Description. The Greenland material is generally fragmented and the mode of increase cannot be determined. Corallites are long and cylindrical, ranging in diameter from 6.5 to 7.5 mm with an average of 7 to 7.5 mm.

Major septa are generally short, extending from 0.6 to 0.8 of corallite radius, ranging in number from 20 to 24 in mature corallites. Minor septa average 0.1 to 0.2 of length of major septa. Peripheral stereozone is very narrow when apparent.

Tabulae are weakly arched, occasionally with a slight axial notch. Flattened axial region is broad and peripheral spacing averages 1 to 1.8 mm.

Remarks. The material described above is closely similar to *P. hubeiense* Ke & Yü, 1974 from the Lojoping Formation (Late Llandovery) of Yichang, Hupeh, China. The Greenland form differs slightly in having generally slightly longer and more numerous septa and somewhat more widely spaced tabulae. However, there is insufficient figured material of *P. hubeiense* for its variability to be determined and it is very likely that the Greenland form is conspecific.

P. troedssoni Poulsen, 1941 from the slightly younger Offley Island Formation at Kap Madison (southern Washington Land) has comparable corallite size and septal number to *P.* cf. *P. hubeiense,* but has considerably longer major and minor septa (Troedsson, 1928, Pl. 27, fig. 1c, Poulsen, 1941, Pl. 1, fig. 10).

Family CYSTIPHYLLIDAE Edwards & Haime, 1850
Subfamily CYSTIPHYLLINAE M'Coy, 1851
Genus *Cystilasma* Zaprudskaya & Ivanovskiy, 1962

Cystilasma Zaprudskaya & Ivanovskiy, 1962, p. 51

Type species. *Cystilasma sibiricum* Zaprudskaya & Ivanovskiy, 1962

Diagnosis. Corallum solitary. Septa consist of short spines in early growth stages, being absent or ?sparse in late growth stages, based mainly on corallite wall. Horizontal skeletal elements occur in two series, small globose to elongate dissepiments forming a narrow layer on corallite wall while rest of corallite is filled by large, globose to elongate dissepiments and/or tabellae.

Discussion. The following species are included in *Cystilasma: Cystilasma sibiricum* Zaprudskaya & Ivanovskiy, 1962, type species; Late Llandovery, Siberian Platform. *Cystilasma porfirievi* Zaprudskaya & Ivanovskiy, 1962; Late Llandovery, Siberian Platform.

Possible representatives include: *Cystiphyllum aseptatum* Sugiyama, 1940; Early Ludlow, Japan. *Cystilasma arcticum* Strelnikov, 1965; Llandovery, Dolgiy Island, western Soviet Arctic. *Cystilasma? rarum* sp. nov.; Offley Island Formation, Late Llandovery, western North Greenland.

Cystilasma mirabile Ivanovskiy, 1963 from the Late Llandovery of the Siberian Platform, possesses the distinctive, irregularly-shaped dissepiments of *Kymocystis* Strelnikov, 1968 and, as suggested by Strelnikov (1968, p. 15), is referred to that genus. For further discussion of *Cystilasma,* see McLean (1974b, 1976a).

Cystilasma? rarum sp. nov.
Plate 11, figs 2, 3, 8, 13

Material. Holotype MGUH 13940 from GGU 211744. Offley Island Formation, Kap Tyson, GSC locality 73927. Paratypes MGUH 13941–13943 from GGU 211745–211747. Offley Island Formation, Offley Ø, GSC locality 73956.

Diagnosis. Possible *Cystilasma* in which sparse septal spines are developed peripherally in late stages of growth.

Description. Material is highly fragmentary and may have been fasciculate as many corallites occur randomly together, but no evidence of budding was observed. Corallites are trochoid, with diameter up to 30 mm observed. Epitheca is generally not preserved due to corrosion of specimens. Septa are developed as sparse, short, very slender spines based on corallite wall, usually piercing 1 or 2 layers of dissepiments. A narrow layer of small, strongly elongate dissepiments, including zone of septal spines, lines corallite wall, but they are frequently not preserved due to abrasion. Remainder of corallite is occupied by very coarse, globose to moderately elongate dissepiments and tabellae.

Remarks. Lack of septal spines in the late stages of growth has been generally regarded as the major feature distinguishing *Cystilasma* from *Cystiphyllum* Lonsdale, 1839. However, the type species, *Cystilasma sibiricum* Zaprudskaya & Ivanovskiy, 1962, in particular, differs from *Cystiphyllum* also in having a narrow zone of very small dissepiments lining the corallite wall, contrasting with the very coarse dissepiments or tabellae filling the remainder of the corallite (Zaprudskaya & Ivanovskiy, 1962, Pl. 2, figs 1a–v; Ivanovskiy, 1963, Pl. 29, figs 2a–v). *Cystiphyllum* generally has a relatively even progression in dissepimental size from the periphery to the axis (e.g. see McLean, 1974b). The Greenland form has an arrangement of the horizontal skeletal elements closely comparable to that in *C. sibiricum,* but differs in having septal spines developed in the peripheral

zone in late growth stages. Until the variability in representatives of *Cystilasma,* particularly those from the Siberian Platform, is ascertained more thoroughly, the Greenland species cannot be placed in the genus with certainty. However, it seems likely that the interpretation of *Cystilasma* should be altered to include forms with late-stage peripheral septal spines.

The genus *Microplasma* Dybowski, 1874 has ephebic peripheral septal spines as in *C.? rarum,* but differs by being fasciculate (in the Silurian at least) and having horizontal skeletal elements comparable to those of *Cystiphyllum.*

Genus *Hedstroemophyllum* Wedekind, 1927

Hedstroemophyllum Wedekind, 1927, p. 66
?Hedstroemoplasma Spasskiy & Kravtsov *in* Spasskiy *et. al.*, 1974, p. 171

Type species. *Hedstroemophyllum articulatum* Wedekind, 1927

Diagnosis (after McLean, 1976a, p. 296). Corallum solitary or fasciculate. Septa consist of discrete spines piercing several dissepimental layers; their primary microstructure is monacanthine, although this is often modified by recrystallization to holacanthine. Coarse tabellae, less commonly tabulae, usually are developed axially.

Discussion. The genus has been reviewed by McLean (1974b) and little further discussion is necessary here. Its species composition is as follows: *Hedstroemophyllum articulatum* Wedekind, 1927, type species; ?Högklint Beds, early Wenlock, Gotland (*H. weissermeli, H. stolleyi* and *H. tenue* of Wedekind (1927) may be synonyms but the variability of *H. articulatum* has not been determined). *Hedstroemophyllum crassum* Wedekind, 1927; Högklint Beds, early Wenlock, Gotland. *Hedstroemophyllum nikiforovae* Strelnikov, 1971; Greben Horizon, Pridolian, Subpolar Urals. *Hedstroemophyllum crebrum* McLean, 1974b; Quarry Creek Limestone, Late Llandovery, New South Wales. *Hedstroemophyllum rhaphis* sp. nov.; Offley Island Formation, Late Llandovery, western North Greenland.

In addition, there are a number of species with inadequately known septal microstructure, but which may be representatives of *Hedstroemophyllum.* They include: *Hedstroemophyllum fasciculatum* Zheltonogova, 1961 (type species of *Hedstroemoplasma* Spasskiy & Kravtsov, 1974); Yurman Suite, Wenlock, Salair. *Hedstroemophyllum tubulatum* and *H. nikolaevae* Sytova *in* Sytova & Ulitina, 1966; Aynasu Horizon, Pridolian – ?early Lochkovian, central Kazakhstan.

H. multispinatum Ke & Yü, 1974 from the Leijiadwen Formation (Late Llandovery) of Kweichow, China, develops very densely packed spines and may be a representative of *Gyalophyllum* Wedekind, 1927, although rhabdacanths are not recorded in this species (Ke & Yü, 1974, Pl. 74, figs 6–8).

Hedstroemophyllum rhaphis sp. nov.
Plate 11, figs 10–12

Material. Holotype MGUH 13944 from GGU 211748. Offley Island Formation, Kap Tyson, GSC locality 73927.

Diagnosis. *Hedstroemophyllum* with sparse, long, very slender septal spines.

Description. Corallum solitary, subcylindrical, with diameter up to 18 mm. Septal spines are confined to peripheral region of corallite, based on corallite wall and surfaces of dissepiments, piercing several dissepimental layers. Spines are very thin, of indeterminate microstructure, in some cases with their bases embedded in a thin peripheral stereozone.

Peripheral dissepiments, small and elongate, form a narrow zone grading into a broad, axially sagging series of widely spaced, incomplete tabulae and tabellae.

Remarks. Only one fragmentary, recrystallized specimen was available for study and the variability of this species could not be determined. The very slender spines, which distinguish *H. rhaphis* from other described forms, have a holacanthine structure, although their original microstructure is unknown. However, they are too slender to have been rhabdacanthine and this precludes the possibility of assigning the species to *Holmophyllum*.

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APPENDIX

Stratigraphic and faunal details for cited GSC localities
(data from Norford, 1972)

(a) Kap Tyson section: Offley Island Formation.
GSC locality 73940. Unit 17, 1175–1195 ft (358.1–364.2 m) above base of section.
Rugosa: *Craterophyllum prolatum*.
Other fossils: Tabulate corals, stromatoporoids, brachiopods, algae, gastropods, pelecypods, bryozoans, echinoderm debris, straight cephalopods.

GSC locality 73939. Unit 17, 1057–1070 ft (322.2–326.1 m) above base.
Rugosa: *Craterophyllum vatium, Ptychophyllum* sp. B.
Other fossils: As in GSC locality 73940.

GSC locality 73936. Unit 16, 1016–1025 ft (309.7–312.4 m) above base of section.
Rugosa: *Craterophyllum exporrectum.*
Other fossils: Tabulate corals, brachiopods, echinoderm debris, pelecypods, straight cephalopods, trilobites.

GSC locality 73927. Unit 9, 388–408 ft (118.3–124.4 m) above base of section.
Rugosa: *Pseudophaulactis plectilis, Kenophyllum? congestum, Ptychophyllum tysonense, Ptychophyllum* sp. A, *Amplexoides poulseni, Cystilasma? rarum, Hedstroemophyllum rhaphis.*
Other fossils: Tabulate corals, stromatoporoids, algae, pentamerid brachiopods, echinoderm debris, large pelecypods, bryozoans, gastropods, straight cephalopods, ostracods, trilobites.

GSC locality 73926. Unit 3, 263–268 ft (80.2–81.7 m) above base of section.
Rugosa: *Kodonophyllum? pusillum.*
Other fossils: Stromatoporoids, tabulate corals, large pelecypods, gastropods.

(b) Kap Tyson west section. Cape Schuchert Formation, approximately laterally equivalent to Unit 3 to basal Unit 9 of the Offley Island Formation of the main Kap Tyson section.
GSC locality 73919. Unit 1, 44–45 ft (13.4–13.7 m) above base of section.
Rugosa: *Amplexoides poulseni.*
Other fossils: Tabulate corals, brachiopods, stromatoporoids, echinoderm debris.

(c) Offley Ø section. Offley Island Formation.
GSC locality 73956. Unit 6, 570–580 ft (173.7–176.8 m) above base of section.
Rugosa: *Cystilasma? rarum.*
Other fossils: Tabulate corals, stromatoporoids, algae, echinoderm debris, brachiopods, straight cephalopods, large pelecypods.

GSC locality 73952. Unit 2, 124–128 ft (37.8–39.0 m) above base of section.
Rugosa: *Crassilasma offleyense?*
Other fossils: Tabulate corals, stromatoporoids, algae, brachiopods, large gastropods, pelecypods.

(d) Kap Schuchert section. Cape Schuchert Formation.
GSC locality 73965. Unit 3, 175–195 ft (53.3–59.4 m) above base of section.
Rugosa: *Strombodes infractus.*
Other fossils: Tabulate corals, stromatoporoids, brachiopods, echinoderm debris, gastropods, algae, bryozoans, trilobites.

GSC locality 73959. Unit 1, bioherm 10–90 ft (3.0–27.4 m) above base of section.
Rugosa: *Grewingkia cuneata, Palaeophyllum schuchertense.*
Other fossils: Tabulate corals, stromatoporoids, algae, brachiopods, trilobites.

(e) Unmeasured section at Kap Schuchert, one mile (1.6 km) to north of measured section, (d). Cape Schuchert Formation.
GSC locality 73974. 10 ft (3.0 m) of beds in upper part of lateral equivalent of unit 3 of measured section (d).
Rugosa: *Palaeophyllum* cf. *P. hubeiense.*
Other fossils: As in GSC locality 73965.

REFERENCES

Amsden, T. W. 1949: Stratigraphy and paleontology of the Brownsport Formation (Silurian) of western Tennessee. *Bull. Peabody Mus. nat. Hist.* **5,** 134 pp.

Bassler, R. S. 1950: Faunal lists and descriptions of Paleozoic corals. *Mem. geol. Soc. Am.* **44,** 315 pp.

Bigsby, J. J. 1824: Notes on the geography and geology of Lake Huron. *Trans. geol. Soc. Lond.* (2) **1,** 175–209.

Billings, E. 1858: Report for the year 1857. *Rep. Prog. geol. Surv. Can.* **1857,** 147–192.

Billings, E. 1862: New species of fossils from different parts of the Lower, Middle and Upper Silurian rocks of Canada. *Geol. Surv. Can. Palaeozoic Fossils* **1,** (4), 96–168.

Bolton, T. E. 1966: Illustrations of Canadian fossils. Silurian faunas of Ontario. *Pap. geol. Surv. Can.* **66–5,** 46 pp.

Bolton, T. E. 1968: Silurian faunal assemblages, Manitoulin Island, Ontario. *In* Liberty, B. A. & Sheldon, F. D.: The geology of Manitoulin Island. *Mich. Basin geol. Soc. Ann. Field Excursion.* 38–49. Lansing: Mich. Basin geol. Soc.

Bulvanker, E. Z. 1952: Korally rugoza silura Podolii. *Trudy vses. nauchno-issled. geol. Inst.*, 33 pp.

Bulvanker, E. Z., Gorianov, V. B., Spasskiy, N. Ya. & Shchukina, V. Ya. 1968: Novye predstaviteli chetyrekhluchevykh korallovykh polipov SSSR. *in* Markovskiy, B. P. (edit.) *Novye vidy drevnikh rasteniy i bespozvonochnykh SSSR,* **2,** (2), 14–15, Moscow: Nedra.

Cherepnina, S. K. 1960: Rugozy ordovika. *In* Khalfin, L. L. (edit.) Biostratigrafiya paleozoya Sayano – Altayskoy gornoy oblasti. Tom 1. Nizhniy paleozoy. *Trudy sib. nauchno-issled. Inst. Geol. Geofiz. miner. Syr.* **19,** 387–393.

Cherepnina, S. K. 1962: O novom rode tetrakorallov iz ordovikskikh otlozheniy Gornogo Altaya. *Trudy sib. nauchno-issled. Inst. Geol. Geofiz. miner. Syr.* **23,** 140–1.

Chernyshev, F. N. 1885: Fauna nizhnyago devona zapadnago sklona Urala. *Trudy geol. Kom.* **3,** (1), 107 pp.

Dybowski, W. 1873a–1874: Monographie der Zoantharia Sclerodermata rugos aus der Silurformation Estlands, Nord Livlands und der Insel Gotland. *Arch. Naturk. Liv-, Est- u. Kurlands* (1) **5,** (3), 257–414 (1873), 415–532 (1874).

Dybowski, W. 1873b: Beschreibung einer neuen silurischen *Streptelasma-* Art. *Z. dt. geol. Ges.* **25,** 409–420.

Edwards, H. M. & Haime, J. 1850: A monograph of the British fossil corals. Pt. 1. Introduction; Corals from the Tertiary and Cretaceous Formations. *Palaeontogr. Soc. (Monogr.)* i-lxxxv, 1–72.

Ehlers, G. M. 1973: Stratigraphy of the Niagaran Series of the Northern Peninsula of Michigan. *Pap. Paleont. Mus. Paleont. Univ. Mich.* **3,** 200 pp.

Etheridge, R. 1878: Palaeontology of the coasts of the Arctic lands visited by the late British expedition under Captain Sir George Nares, R. N., K.C.B., F.R.S. *Q. Jl geol. Soc. Lond.* **34,** 568–636.

Flügel, H. W. & Saleh, H. 1970: Die paläozoischen Korallenfaunen Ost-Irans. 1. Rugose Korallen der Niur-Formation (Silur). *Jb. geol. Bundesanst.* **113,** 267–302.

Foerste, A. F. 1906: The Silurian, Devonian and Irvine Formations of east-central Kentucky, with an account of their clays and limestones. *Bull. Ky geol. Surv.* **7,** 369 pp.

Foerste, A. F. 1909a: Fossils from the Silurian formations of Tennessee, Indiana and Illinois. *Bull. Sci. Lab. Denison Univ.* **14,** 61–116.

Foerste, A. F. 1909b: Silurian fossils from the Kokomo, West Union and Alger horizons of Indiana, Ohio and Kentucky. *J. Cincinnati Soc. nat. Hist.* **21,** 1–41.

Foerste, A. F. 1917: Notes on Silurian fossils from Ohio and other central States. *Ohio J. Sci.* **17,** 187–204, 233–266.

Gorianov, V. B. 1966: Bulvankeriphyllinae – novoe podsemeystvo kodonofillid (Tetracoralla). *Vest. leningr. gos. Univ., (geol. geogr.)* **18,** 53–59.

Grabau, A. W. 1925: Summary of the faunas from the Sintan Shale. *Bull. geol. Surv. China* **7,** 77–85.

Grabau, A. W. 1928: Palaeozoic corals of China. Part I Tetraseptata. II. Second contribution to our knowledge of the streptelasmoid corals of China and adjacent territories. *Palaeont. sinica* **B 2,** (2), 1–175.

Hill, D. 1935: British terminology for rugose corals. Geol. Mag. **72,** 481–519.

Hill, D. 1956: Rugosa. *In* Moore, R. C. (edit.) *Treatise on invertebrate paleontology. Part F. Coelenterata,* F233–F324. Lawrence: Geol. Soc. Am. & Univ. Kansas Press.

Ivanovskiy, A. B. 1960: Novye vidy roda *Dinophyllum* Lindström iz silura Sibirskoy Platformi. *Trudy sib. nauchno-issled. Inst. Geol. Geofiz. miner. Syr.* **8,** 92–94.

Ivanovskiy, A. B. 1961: Nekotorye Streptelasmatidae srednego i verkhnego ordovika s r. Podkamennaya Tunguska. *Trudy sib. nauchno-issled. Inst. Geol. Geofiz. miner. Syr.* **15,** 197–213.

Ivanovskiy, A. B. 1962a: Elementy devonskoy fauny v silure Sibirskoy Platformy. *Trudy sib. nauchno-issled. Inst. Geol. Geofiz. miner. Syr.* **23,** 120–125.

Ivanovskiy, A. B. 1962b: Dva novykh roda siluriyskikh rugoz. *Trudy sib. nauchno-issled. Inst. Geol. Geofiz. miner. Syr.* **23,** 126–133.

Ivanovskiy, A. B. 1963: *Rugozy ordovika i silura Sibirskoy Platformy,* 160 pp. Moscow: Nauka.

Ivanovskiy, A. B. 1965: *Drevneyshie rugozy,* 152 pp. Moscow: Nauka.

Ivanovskiy, A. B. 1969: *Korally semeystv Tryplasmatidae i Cyathophylloididae (rugozy),* 112 pp. Moscow: Nauka.

Ivanovskiy, A. B. 1975: Rugozy. *Trudy Inst. Geol. Geofiz. Sib. Otd. Akad. Nauk SSSR* **242,** 123 pp.

Ivanovskiy, A. B. & Kulkov, N. P. 1974: Rugozy, brakhiopody i stratigrafiya silura Altae-Sayanskoy gornoy oblasti, *Trudy Inst. Geol. Geofiz. sib. Otd. Akad. Nauk SSSR* **231,** 122 pp.

Ivanovskiy, A. B. & Shurygina, M. V. 1975: Reviziya rugoz Urala. *Trudy Inst. Geol. Geofiz. sib. Otd. Akad. Nauk SSSR* **218,** 67 pp.

Kaljo, D. L. 1956: Rody *Primitophyllum* gen. n. i *Leolasma* gen. n. *In* Kiparisova, L. D. *et. al.* (edit.) Materialy po paleontologii. Novye semeystva i rody. *Vses. nauchno-issled. geol. Inst. (N.S.)* **12,** *(paleont.),* 35–37.

Kaljo, D. L. 1957: Codonophyllacea ordovika i llandoveri Pribaltiki. *Ezheg. Obsch. estest. Akad. Nauk Est. SSR* **50,** 153–168.

Kaljo, D. L. 1958a: K sistematike roda *Streptelasma* Hall opisanie nekotorykh novykh tetrakorallov. *Trudy Inst. Geol. Akad. Nauk Est. SSR* **2,** 19–26.

Kaljo, D. L. 1958b: Nekotorye novye i maloizvestnye rugozy Pribaltiki. *Trudy Inst. Geol. Akad. Nauk Est. SSR* **3,** 101–122.

Kaljo, D. L. 1961: Dopolneniya k izucheniyu streptelazmid ordovika Estonii. *Trudy Inst. Geol. Akad. Nauk Est. SSR* **6,** 51–67.

Ke, C. C. & Yü, C. M. 1974: Silurian corals. *In* Nanking Inst. Geol. Palaeont. (edit.) *A handbook of the stratigraphy and paleontology in southwest China.* 165–173. Nanking, Science Press. (In Chinese).

Koch, L. 1929: Stratigraphy of Greenland. *Meddr Grønland* **73,** (2), 205–320.

Lambe, L. M. 1901: A revision of the Canadian Palaeozoic corals; the Madreporaria aporosa and the Madreporaria rugosa. *Contr. Can. Palaeont.* **4,** (2), 97–197.

Lang, W. D. 1926: *Naos pagoda* (Salter), the type of a new genus of Silurian corals. *Q. Jl geol. Soc. Lond.* **82,** 428–435.

Lang, W. D. & Smith, S. 1927: A critical review of the rugose corals described by W. Lonsdale in Murchison's "Silurian System". *Q. Jl geol. Soc. Lond.* **83,** 448–491.

Laub, R. S. 1975: The ancestry, geographical extent, and fate of the Brassfield coral fauna (Middle Llandovery, North America). *Bull. Am. Paleont.* **67,** (287), 273–286.

Lavrusevich, A. I. 1971: Rugozy rannego silura Zeravshano – Gissarskoy gornoy oblasti. *In* Lavrusevich, A. I. (edit.) Paleontologiya i stratigrafiya. Vyp 3. *Trudy Uprav. geol. sov. Minist. Tadzhik. SSR* 38–136.

Lavrusevich, A. I. 1972: Novye pozdnesiluriyskie rugozy sredney Azii. *In* Zanina, I. E. (edit.) *Novye vidy drevnikh rasteniy i bespozvonochnykh SSSR* 80–82. Moscow: Nauka.

Lin, B. Y. 1965: Ordovikskie korally prov. Kweichow i Szechwan i ikh stratigraficheskoe znachenie. *Acta paleont. sin.* **13,** 64–93. (In Chinese with Russian summary.)

Lindström, G. 1883: Obersilurische Korallen von Tshau-tiën im nordöstlichen Theil der Provinz Sz'-Tshwan. *In* von Richthofen, F. *China,* **4,** 50–74. Berlin: Dietrich Reimer.

Linnaeus, C. 1758: *Systema Naturae.* Tomus I., iv + 1–823. Editio Decima, Reformata. Stockholm.

McLean, R. A. 1974a: Chonophyllinid corals from the Silurian of New South Wales. *Palaeontology* **17,** 655–668.

McLean, R. A. 1974b: Cystiphyllidae and Goniophyllidae (Rugosa) from the Lower Silurian of New South Wales. *Palaeontographica* Abt. A, **147,** 1–38.

McLean, R. A. 1974c: The rugose coral genera *Streptelasma* Hall, *Grewingkia* Dybowski and *Calostylis* Lindström from the Lower Silurian of New South Wales. *Proc. Linn. Soc. NSW* **99,** 36–53.

McLean, R. A. 1975a: Silurian rugose corals from the Mumbil area, central New South Wales. *Proc. Linn. Soc. NSW* **99,** 181–196.

McLean, R. A. 1975b: Lower Silurian rugose corals from central New South Wales. *J. Proc. R. Soc. NSW* **108,** 54–69.

McLean, R.A. 1976a: Genera and stratigraphic distribution of the Silurian and Devonian rugose coral family Cystiphyllidae Edwards and Haime. *Pap. geol. Surv. Can.* **76–1,** (B) 295–301.

McLean, R. A. 1976b: Middle Devonian cystiphyllid corals from the Hume Formation, northwestern Canada. *Bull. geol. Surv. Can.* **274.**

Merriam, C. W. 1972: Silurian rugose corals of the Klamath Mountains region, California. *Prof. Pap. U.S. geol. Surv.* **738,** 50 pp.

Merriam, C. W. 1973: Silurian rugose corals of the central and southwest Great Basin. *Prof. Pap. U.S. geol. Surv.* **777,** 66 pp.

Neuman, B. E. 1969: Upper Ordovician streptelasmatid corals from Scandinavia. *Bull. geol. Inst. Univ. Uppsala* (N. S.) **1,** 1–73.

Neuman, B. E. 1975: New Lower Palaeozoic streptelasmatid corals from Scandinavia. *Norsk geol. Tidsskr.* **55,** 335–359.

Nikolaeva, T. V. 1955: Podklass Rugosa ili Tetracoralla – chetyrekhluchevye korally. *In* Nikiforova, O. I. (edit.) *Polevoy atlas ordovikskoy i siluriyskoy fauny Sibirskoy Platformy,* 21–24. Moscow: Gosgeoltekhizdet.

Norford, B. S. 1972: Silurian stratigraphic sections at Kap Tyson, Offley Ø and Kap Schuchert, northwestern Greenland. *Meddr Grønland* **195,** (2), 1–40.

Oliver, W. A., Jr. 1962: A new *Kodonophyllum* and associated rugose corals from the Lake Matapedia area, Quebec. *Prof. Pap. U.S. geol. Surv.* **430–C** 21–31.

Oliver, W. A., Jr. & Galle, A. 1971: Rugose corals from the Upper Koněprusy Limestone (Lower Devonian) in Bohemia. *Sb. geol. Věd* paleont. **14,** 35–106.

Parks, W. A. 1913: Notes on fossils. *In* Tyrrell, J. B., Hudson Bay exploring expedition, 1912. *Ann. Rept Ontario Bur. Mines* **22,** (1), 161–209.

Parks, W. A. 1917: Palaeozoic fossils from a region southwest of Hudson Bay. *Trans R. Can. Inst.* **11,** (1915), 2–95.

Pedder, A. E. H. 1965: A revision of the Australian Devonian corals previously referred to *Mictophyllum. Proc. R. Soc. Vict.* **78,** 201–220.

Pedder, A. E. H. 1975: Sequence and relationships of three Lower Devonian coral faunas from Yukon Territory. *Pap. geol. Surv. Can.* **75–1** (B), 285–295.

Poulsen, C. 1934: The Silurian faunas of North Greenland. I. The fauna of the Cape Schuchert Formation. *Meddr Grønland* **72** (2) 1, 46 pp.

Poulsen, C. 1941: The Silurian faunas of north Greenland. II. The fauna of the Offley Island Formation. Part I. Coelenterata. *Meddr Grønland* **72** (2) 2, 28 pp.

Reiman, V. M. 1958: Novye rugozy iz verkhneordovikskikh i llandoveriyskikh otlozheniy Pribaltiki. *Trudy Inst. Geol. Akad. Nauk Est. SSR* **2,** 33–47.

Salter, J. W. 1873: *A catalogue of the collection of Cambrian and Silurian fossils contained in the Geological Museum of the University of Cambridge*. Cambridge: University Press.

Scheffen, W. 1933: Die Zoantharia Rugosa des Silurs auf Ringerike im Oslogebiet. *Skr. norske Vidensk. Akad.* (1932, **2**, (5), 1–64.

Schouppé, A. von & Stacul, P. 1966: Morphogenese und Bau des Skelettes der Pterocorallia. *Palaeontographica* Suppl. **11**, 186 pp.

Schweigger, A. F. 1819: Beobachtungen auf Naturhistorischen Reisen. xii + 127 pp. Berlin. (not seen).

Scrutton, C. T. 1971: Palaeozoic coral faunas from Venezuela, I. Silurian and Permo-Carboniferous corals from the Mérida Andes. *Bull. Br. Mus. nat. Hist. Geol.* **20**, 183–227.

Scrutton, C. T. 1973: Palaeozoic coral faunas from Venezuela, II. Devonian and Carboniferous corals from the Sierra de Perijá. *Bull. Br. Mus. nat. Hist. Geol.* **23**, 223–281.

Scrutton, C. T. 1975: Corals and stromatoporoids from the Ordovician and Silurian of Kronprins Christian Land, northeast Greenland. *Meddr Grønland* **171**, (4), 43 pp.

Shurygina, M. V. 1968: Pozdnesiluriyskie i rannedevonskie rugozy vostochnogo sklona severnogo i srednego Urala. *In* Ivanovskiy, A. B. (edit.) *Korally pogranichnykh sloev silura i devona Altae – Sayanskoy gornoy oblasti i Urala*. 117–150. Moscow: Nauka.

Smith, S. 1930: Some Valentian corals from Shropshire and Montgomeryshire with a note on a new stromatoporoid. *Q. Jl geol. Soc. Lond.* **86**, 291–330.

Smith, S. 1945: Upper Devonian corals of the Mackenzie River region, Canada. *Spec. Pap. geol. Soc. Am.* **59**, 126 pp.

Smith, S. & Tremberth, R. 1927: *Ptilophyllum* and *Rhysodes* gen. nov. *Ann. Mag. Nat. Hist.* (9) **20**, 309–313.

Smith, S. & Tremberth, R. 1929: On the Silurian corals *Madreporites articulatus* Wahlenberg and *Madrepora truncata* Linnaeus. *Ann. Mag. nat. Hist.* (10) **3**, 361–376.

Soshkina, E. D. 1937: Korally verkhnego silura i nizhnego devona vostochnogo i zapadnogo sklonov Urala. *Trudy paleozool. Inst.* **6**, (4), 112 pp.

Soshkina, E. D. 1955: Korally. *In* Ivanova, E. A. *et al.* Fauna ordovika i gotlandiya nizhnego techeniya r. Podkamennoy Tunguski, ee ekologiya i stratigraficheskoe znachenie. *Trudy paleont. Inst.* **56**, 118–128.

Spasskiy, N. Ya., Kravtsov, A. G. & Tsyganko, V. S. 1974: Kolonnalyne Tsistimorfy. *In* Sokolov, B. S. (edit.) Drevnie Cnidaria, Tom I. *Trudy Inst. Geol. Geofiz. sib. Otd. Akad. Nauk SSSR* **201**, 170–172.

Stearn, C. W. 1956: Stratigraphy and paleontology of the Interlake Group and Stonewall Formation of southern Manitoba. *Mem. geol. Surv. Can.* **281**, 162 pp.

Strelnikov, S. I. 1964: Ob obeme semeystva Kodonophyllidae (Rugosa). *Paleont. Zh.* **1964**, (4), 49–60.

Strelnikov, S. I. 1965: Ordovikskie i siluriyskie rugozy ostrovov Vaygach i Dolgogo. *Uchen. Zap. nauchno-issled. Inst. Geol. Arkt. (Paleont. Biostratigr.)* **8**, 24–57.

Strelnikov, S. I. 1968: Novye tsistifillidy (Rugosa) iz silura Pripolyarnogo Urala i Gryady Chernysheva. *Paleont. Zh.* **1968**, (3), 12–22.

Strelnikov, S. I. 1971: Znachenie rugoz dlya stratigrafii siluriyskikh otlozheniy Pripolyarnogo Urala i Gryady Chernysheva. *In* Ivanovskiy, A. B. (edit.) Rugozi i stromatoporoidei paleozoya SSSR. *Trudy II vses. simp. izuch. iskopaem. korallov SSSR* **2**, 71–88.

Strelnikov, S. I. 1972: Novye pozdnesiluriyskie korally Pripolyarnogo Urala. *In* Zanina, I. E. (edit.) *Novye vidy drevnikh rasteniy i bespozvonochnykh SSSR*. 97–101. Moscow: Nauka.

Strelnikov, S. I. 1973: Rugozy iz siluriyskikh otlozheniy Podnyatiya Chernova i Polyarnogo Urala. *Paleont. Zh.* **1973**, (2) 46–51.

Stumm. E. C. 1965: Silurian and Devonian corals of the Falls of the Ohio, *Mem. geol. Soc. Am.* **93**, 184 pp.

Stumm, E. C. 1968: A redescription of the Middle Silurian compound coral *Grabauphyllum johnstoni* Foerste. *Contr. Mus. Paleont. Univ. Mich.* **22**, 71–73.

Sugiyama, T. 1940: Stratigraphical and palaeontological studies of the Gotlandian deposits of the Kitakami Mountainland. *Sci. Rep. Tohoku Univ.* (2), **21,** 81–146.

Sytova, V. A. 1952: Korally semystva Kyphophyllidae iz verkhnego silura Urala. *Trudy paleont. Inst.* **40,** 127–158.

Sytova, V. A. & Ulitina, L. M. 1966: Rugozy isenskoy i biotarskoy svit. *In* Chetverikova, N. P. *et al.* Stratigrafiya i fauna siluriyskikh i nizhnedevonskikh otlozheniy Nurinskogo Sinklinoriya. *Mater. Geol. Tsent. Kazakh.* **6,** 198–255.

Troedsson, G. T. 1928: On the Middle and Upper Ordovician faunas of northern Greenland, part II. *Meddr Grønland* **72,** (1), 198 pp.

Tsin, H. P. 1956: New material of Silurian fossils from the vicinity of Kueiyang, central Kueichou. *Acta paleont. sin.* **4,** 621–639. (In Chinese with English summary).

Wang, H. C. 1944: The Silurian rugose corals of northern and eastern Yunnan. *Bull. geol. Soc. China* **24,** 21–32.

Wang. H. C. 1947: New material of Silurian rugose corals from Yunnan. *Bull. geol. Soc. China* **27,** 171–192.

Wang, H. C. 1948: Notes on some rugose corals in the Gray Collection, from Girvan, Scotland. *Geol. Mag.* **85,** 97–106.

Wang, H. C., Yü, C. C. & Yoh, S. S. 1957: Coelenterata. *In* Palaeont. Res. Centre, Chinese Science Dept. (edit.) *Chinese Index Fossils, Invert.* **1,** 16–49. Peking. (In Chinese).

Webby, B. D. 1972: The rugose coral *Palaeophyllum* Billings from the Ordovician of central New South Wales. *Proc. Linn. Soc. NSW* **97,** 150–157.

Wedekind, R. 1927: Die Zoantharia Rugosa von Gotland (bes. Nordgotland). *Sver. geol. Unders. Afh.* **Ca 19,** 94 pp.

Williams, M. Y. 1919: The Silurian geology and faunas of Ontario Peninsula, and Manitoulin and adjacent islands. *Mem. geol. Surv. Can.* **111,** 195 pp.

Yi, N. 1974: A preliminary study on the stratigraphical distribution and zoogeographical province of the Ordovician corals of China. *Acta geol. sin.* **1974,** (1), 5–22. (In Chinese with English summary).

Zaprudskaya, M. A. & Ivanovskiy, A. B. 1962: Dva novykh roda siluriyskikh tsistifillid (Rugosa) s Sibirskoy Platformy. *Trudy vses. neft. nauchno-issled. geol.-razv. Inst.* **196,** *(paleont. sborn.)* 3, 48–53.

Zheltonogova, V. A. 1961: Siluriyskaya sistema. Podklass Tetracoralla (Rugosa). Tetrakorally. *In* Khalfin, L. L. (edit.) Biostratigrafiya paleozoya Sayano–Altayskoy gornoy oblasti. Tom II, Sredniy paleozoy. *Trudy sib. nauchno-issled. Inst. Geol. Geofiz. miner. Syr.* **20,** (2), 74–88.

Zheltonogova, V. A. 1965: Znachenie rugoz dlya stratigrafii silura gornogo Altaya i Salaira. *In* Sokolov, B. S. & Ivanovskiy, A. B. (edit.) Rugozy paleozoya SSSR. *Trudy I vses. simp. izuch. iskopaem. korallov SSSR* **3,** 33–44.

Plate 1

Crassilasma offleyense? (Etheridge, 1878)
Offley Island Formation, Offley Ø, ×2

Figs 1–3. MGUH 13897 from GGU 211701.
Figs 4–6. MGUH 13899 from GGU 211703.
Fig. 7. MGUH 13898 from GGU 211702.
Fig. 9. MGUH 13901 from GGU 211705.
Fig. 11. MGUH 13903 from GGU 211707.
Fig. 13. MGUH 13902 from GGU 211706.

Grewingkia cuneata sp. nov.
Cape Schuchert Formation, Kap Schuchert, ×3

Figs 8, 10, 12. Holotype MGUH 13908 from GGU 211712.

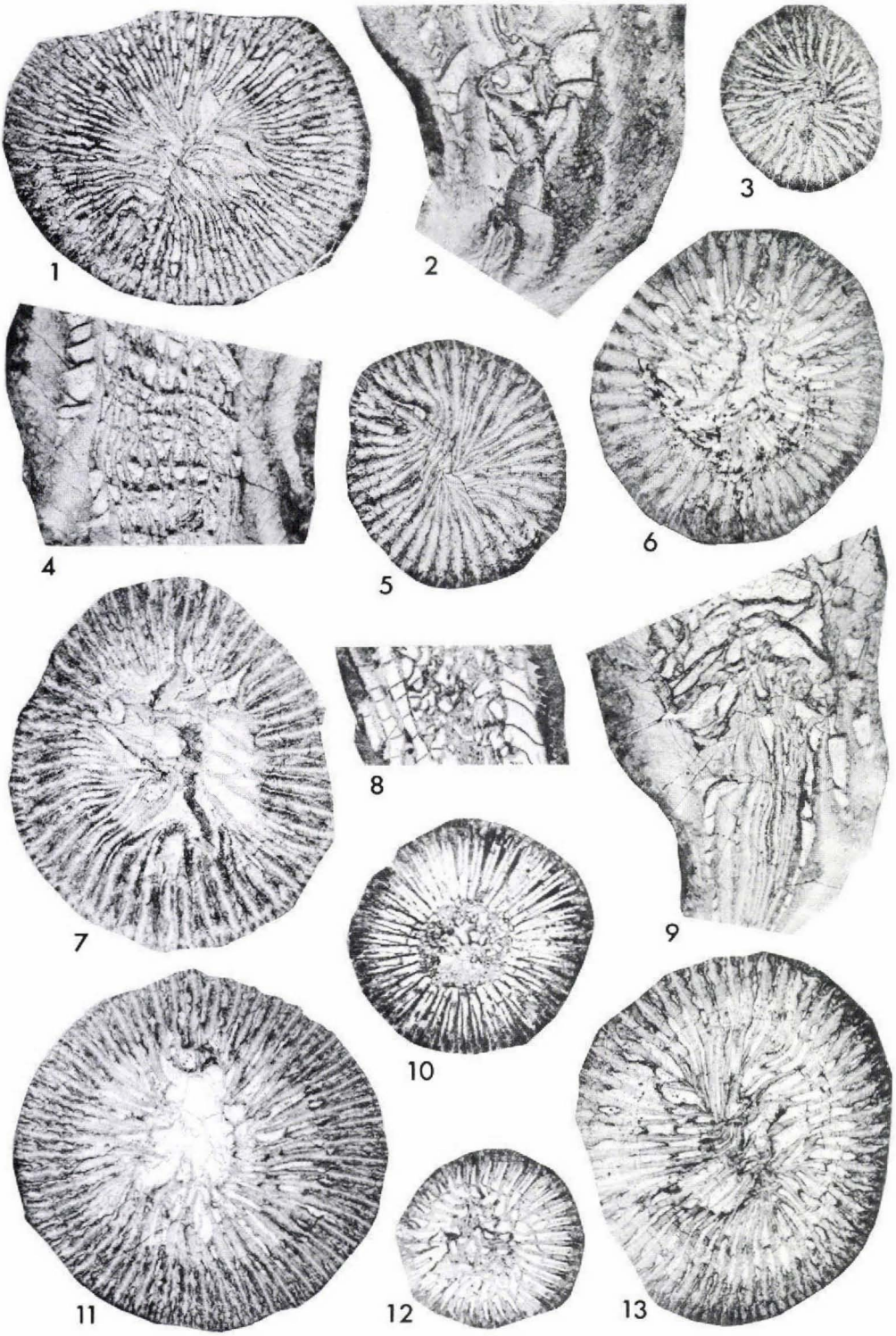
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Plate 2

Pseudophaulactis plectilis sp. nov.
Offley Island Formation, Kap Tyson, ×2

Figs 1–3. Holotype MGUH 13904 from GGU 211708.
Fig. 4. Paratype MGUH 13907 from GGU 211711.
Figs 5, 6, 9. Paratype MGUH 13905 from GGU 211709.
Figs 7, 8. Paratype MGUH 13906 from GGU 211710.

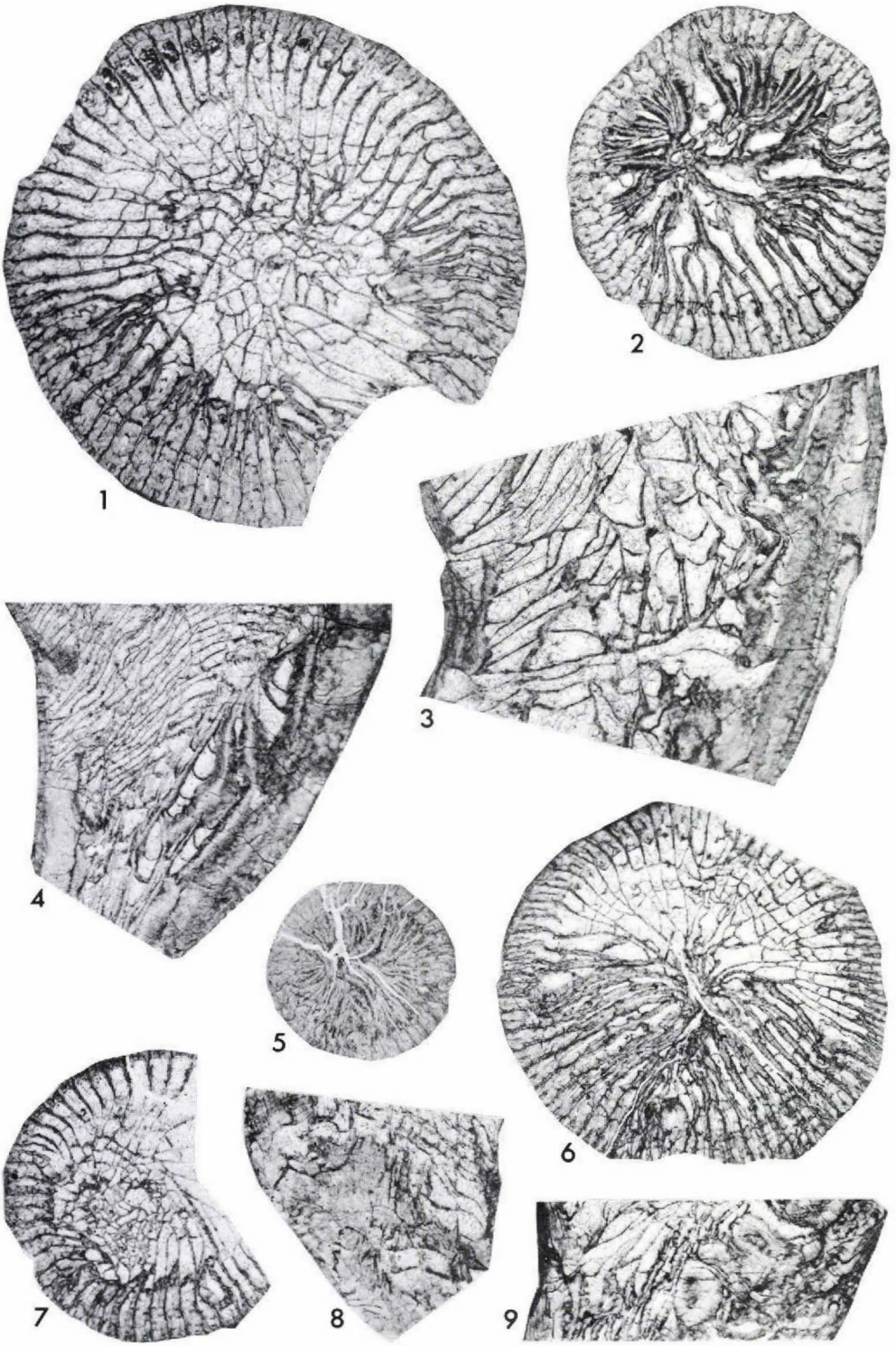
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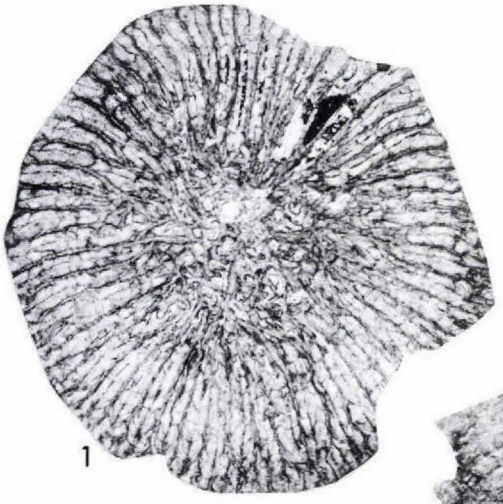
Plate 3

Kenophyllum? congestum sp. nov.
Offley Island Formation, Kap Tyson, ×2.

Figs 1–3. Holotype MGUH 13909 from GGU 211713.
Figs 4, 5. Paratype MGUH 13910 from GGU 211714.

Craterophyllum vulcanius Foerste, 1909
Brownsport Formation, west of Hope Creek, Perry Country, Tennessee.

Figs 6, 7. Holotype USNM 84761. Specimen figured in exterior view by Foerste (1909a, Pl. 1, fig. 12). Figure 6 shows details of septal structure in transverse section, ×6. Figure 7 is same section, ×2.



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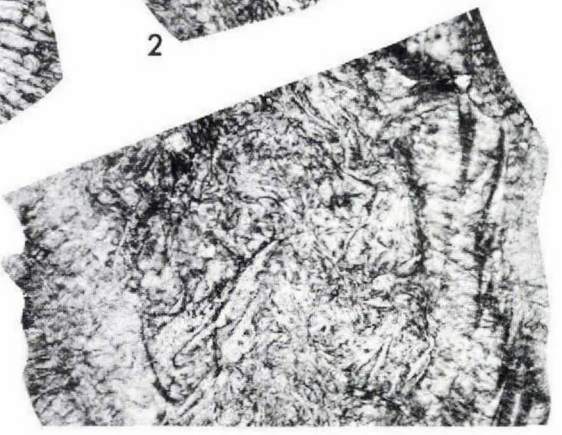

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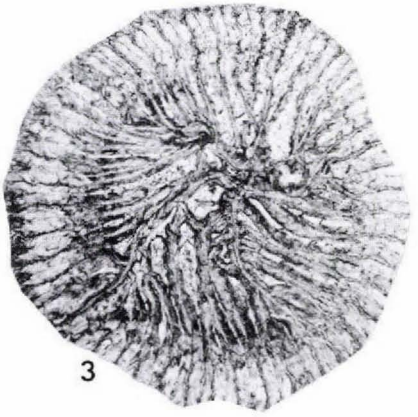

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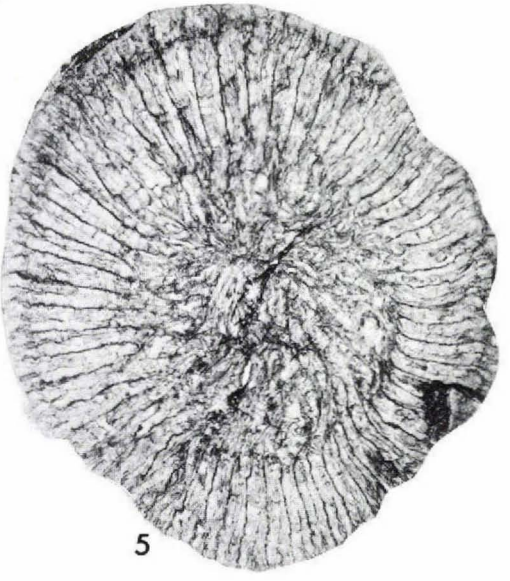

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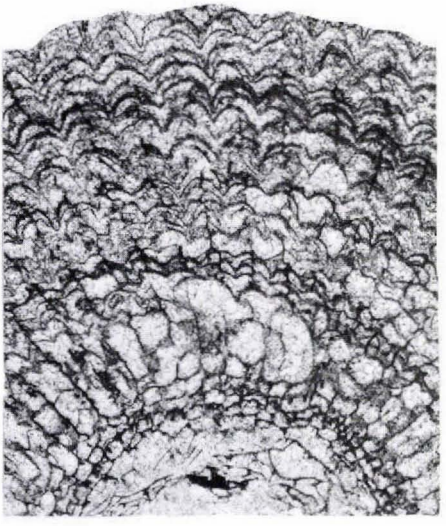

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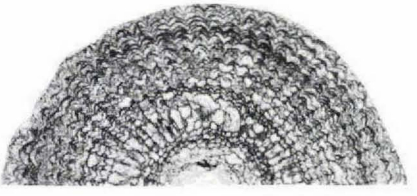

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Plate 4

Craterophyllum vatium sp. nov.
Offley Island Formation, Kap Tyson, ×2

Figs 1, 2, 6. Holotype MGUH 13911 from GGU 211715.

Craterophyllum vulcanius Foerste, 1909
Brownsport Formation, west of Hope Creek, Perry County, Tennessee. ×2

Fig. 3. Holotype USNM 84761. Specimen figured in exterior view by Foerste (1909a, Pl. 1, fig. 12). See also Plate 3, figures 6, 7.

Craterophyllum prolatum sp. nov.
Offley Island Formation, Kap Tyson, ×2

Figs 4, 5. Paratype MGUH 13916 from GGU 211720.
Figs 7, 8. Holotype MGUH 13915 from GGU 211719.

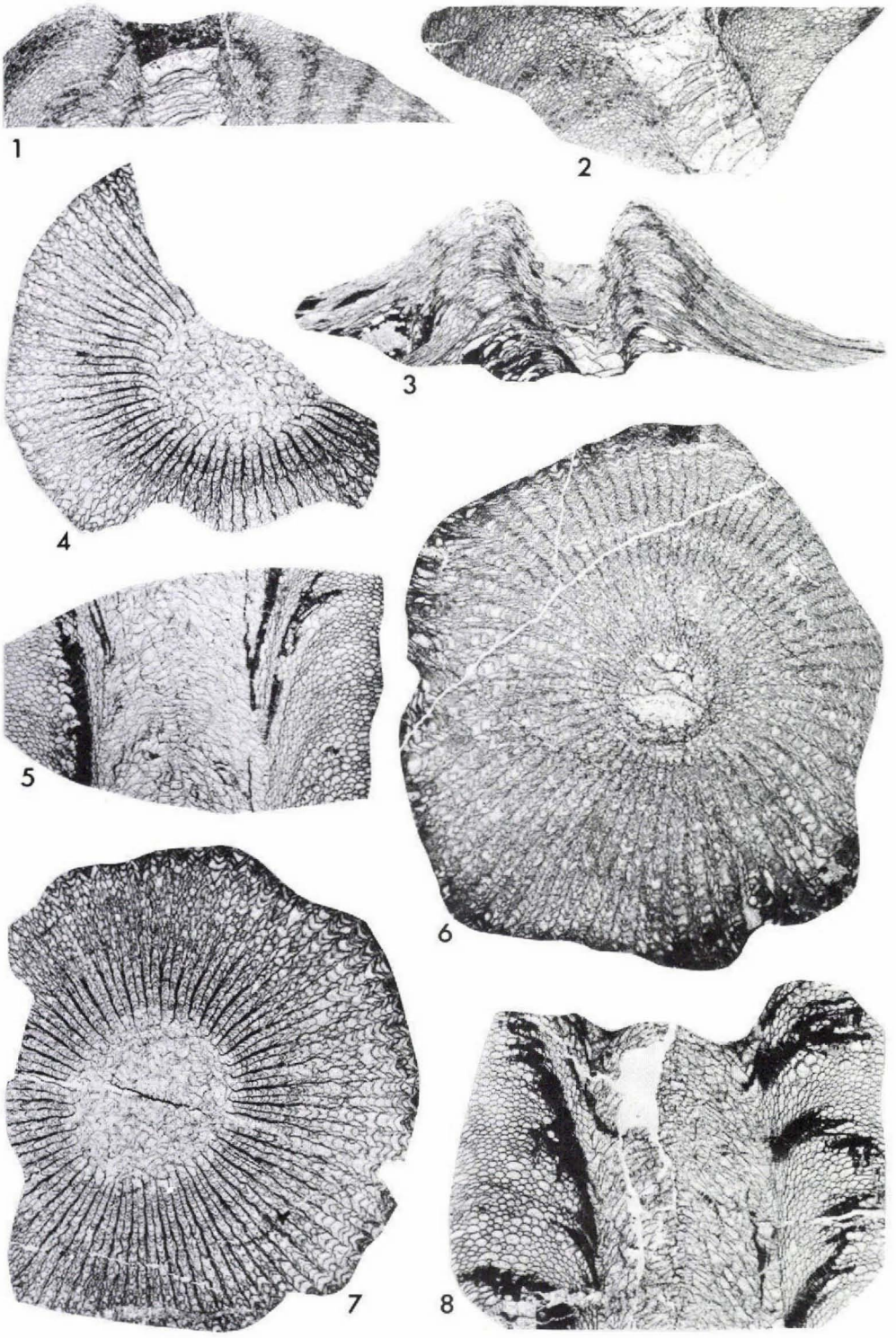
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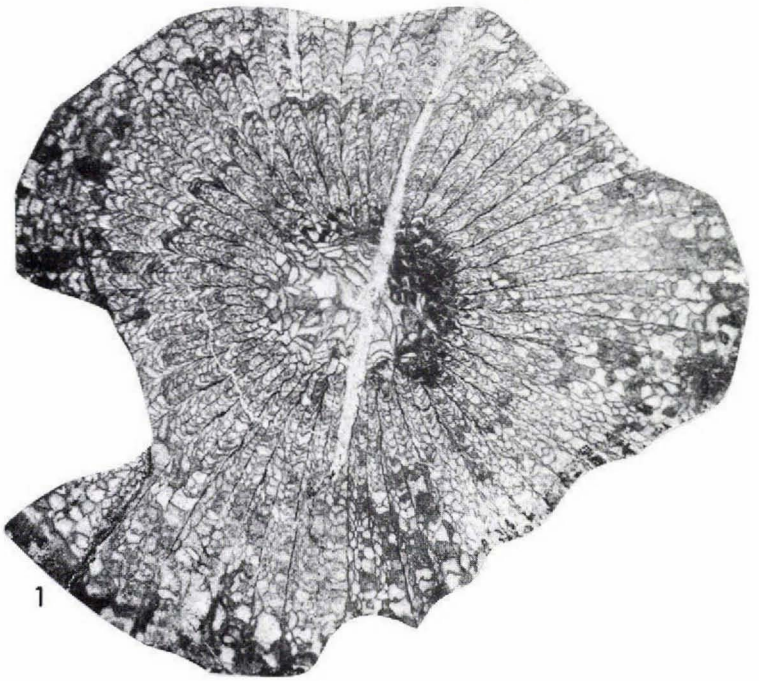
Plate 5

Craterophyllum exporrectum sp. nov.
Offley Island Formation, Kap Tyson, ×2

Figs 1–3. Holotype MGUH 13914 from GGU 211718. Figure 1 shows transverse section at base of calice with septa barely extending into tabularium. Transverse section in Figure 3, approximately 1 cm in corallite below that in Figure 1, shows major septa extending almost to corallite axis.



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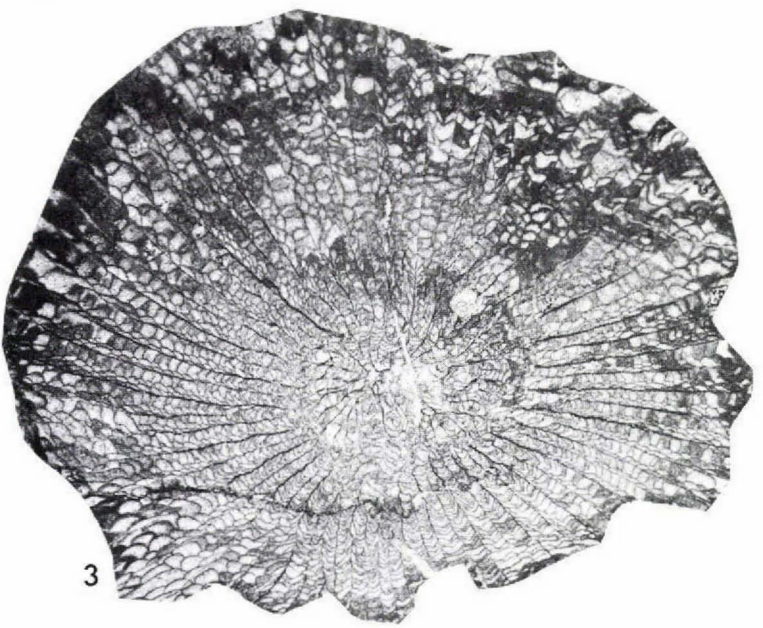

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Plate 6

Craterophyllum nymphale (Billings, 1862)
?La Vieille Formation, L'Anse à la Vieille,
Chaleur Bay, Quebec. ×2.

Figs 1, 2. Holotype GSC 3037. Portion of transverse section in Figure 2 shows septa weakly extending into tabularium, top left. Specimen illustrated by Lambe (1901, Pl. 18, figs 1, 1a).

Ptychophyllum tysonense sp. nov.
Offley Island Formation, Kap Tyson, ×3

Figs 3, 4. Holotype MGUH 13917 from GGU 211721.
Fig. 6. Paratype MGUH 13918 from GGU 211722. See also Plate 7, fig. 2.

Ptychophyllum sp. A.
Offley Island Formation, Kap Tyson, ×3

Figs 5, 7. MGUH 13920 from GGU 211724.

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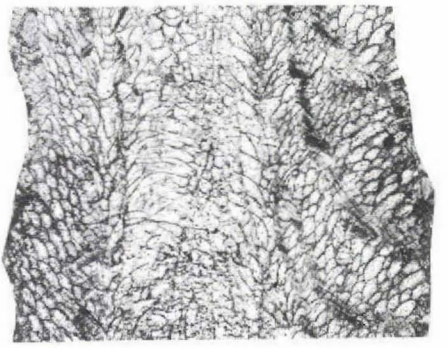

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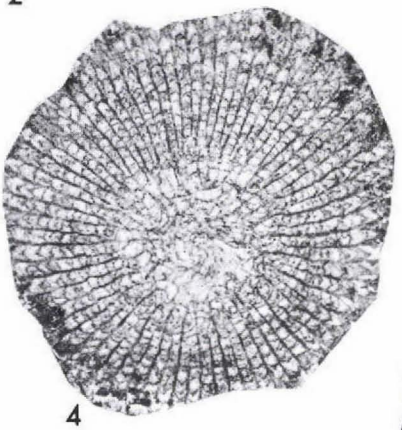

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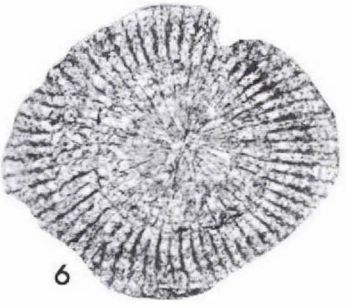

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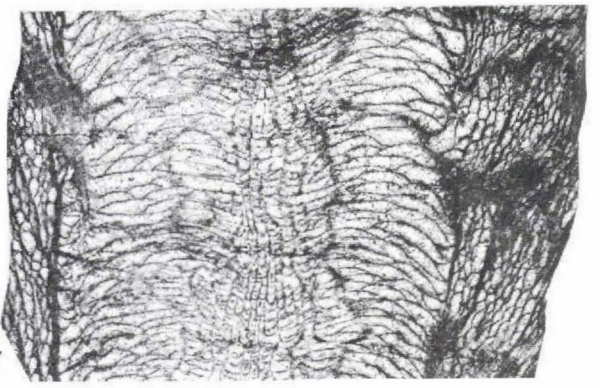

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Plate 7

Ptychophyllum sp. B.
Offley Island Formation, Kap Tyson, ×3

Figs 1, 7. MGUH 13921 from GGU 211725.

Ptychophyllum tysonense sp. nov.
Offley Island Formation, Kap Tyson, ×3

Fig. 2. Paratype MGUH 13918 from GGU 211722. See also Plate 6, figure 6.
Figs 3, 4. Paratype MGUH 13919 from GGU 211723.

Strombodes infractus sp. nov.
Cape Schuchert Formation, Kap Schuchert, ×2

Figs 5, 6. Paratype MGUH 13924 from GGU 211728.
Fig. 8. Holotype MGUH 13922 from GGU 211726. See also Plate 8, figures 1–3.
Fig. 9. Paratype MGUH 13923 from GGU 211727.

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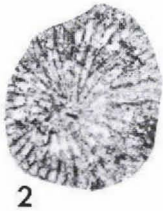

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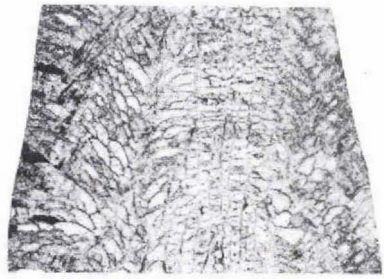

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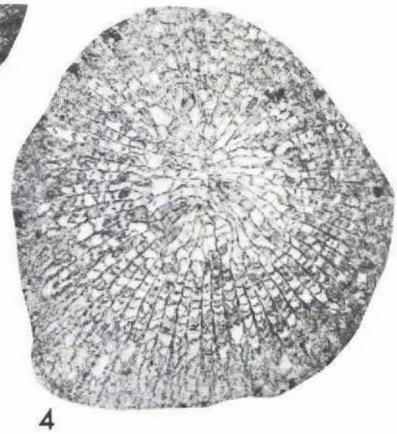

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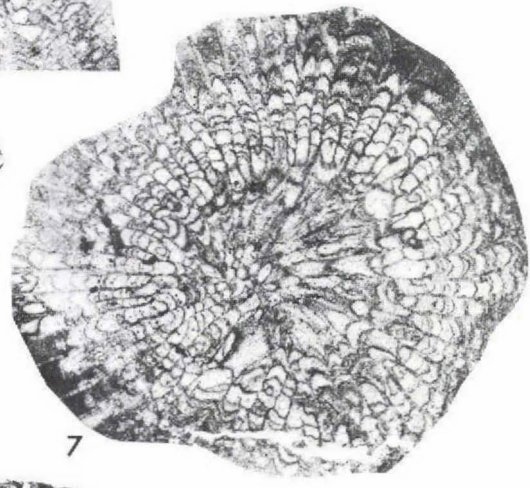

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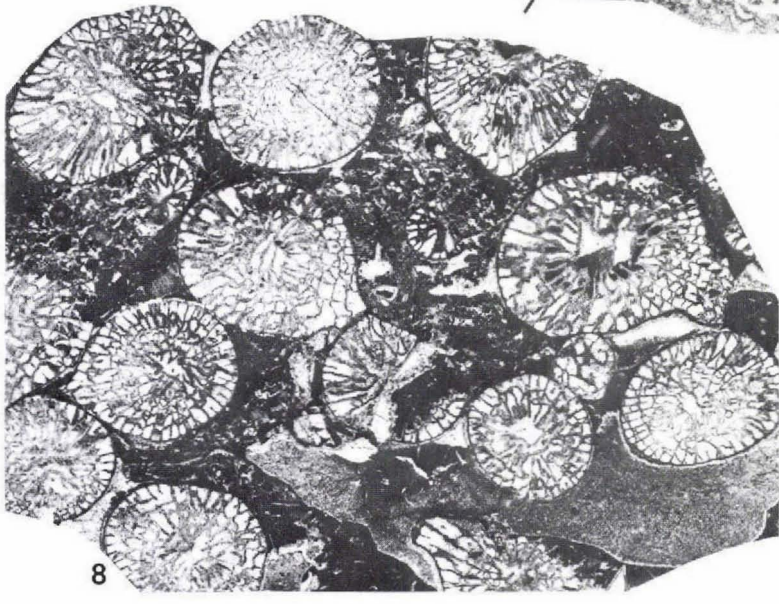

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Plate 8

Strombodes infractus sp. nov.
Cape Schuchert Formation, Kap Schuchert, ×2

Figs 1–3. Holotype MGUH 13922 from GGU 211726. See also Plate 7, figure 8.

Kodonophyllum? pusillum sp. nov.
Offley Island Formation, Kap Tyson, ×4

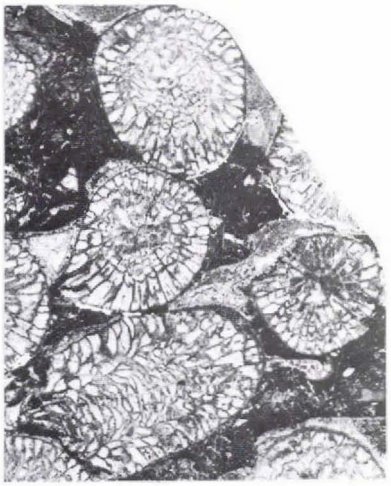
Figs 4, 5. Holotype MGUH 13925 from GGU 211729.
Figs 6, 11. Paratype MGUH 13927 from GGU 211731.
Figs 7, 10. Paratype MGUH 13926 from GGU 211730.
Figs 8, 9, 12. MGUH 13928 from GGU 211732. Specimen doubtfully referred to *K.? pusillum*.

Amplexoides poulseni sp. nov.
Cape Schuchert Formation, Kap Tyson west, ×3

Fig. 13. Paratype MGUH 13932 from GGU 211736. Oblique section showing amplexoid nature of septa.

Offley Island Formation, Kap Tyson, ×3

Figs 14–16. Holotype MGUH 13929 from GGU 211733. Transverse section in Figure 14 shows broad stereozone immediately prior to rejuvenescence and narrow stereozone in portion of corallite to the right after rejuvenescence.



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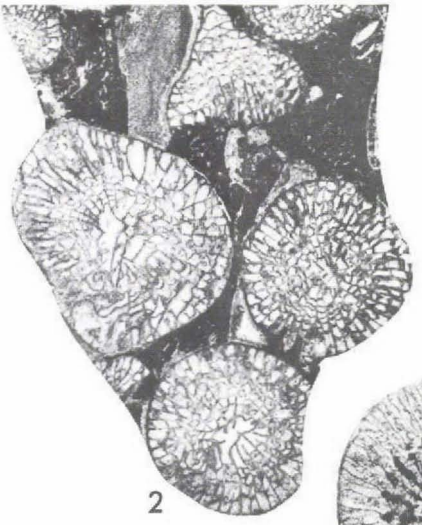

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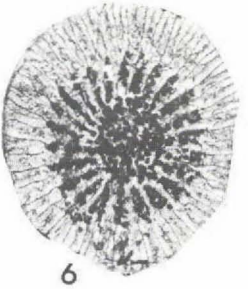

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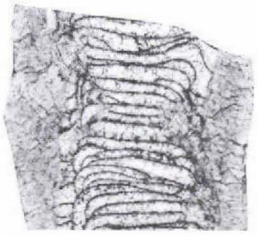

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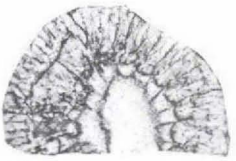

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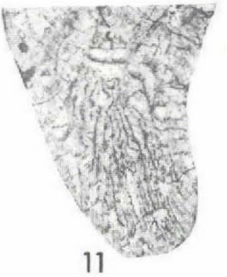

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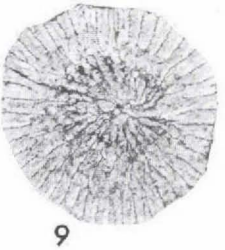

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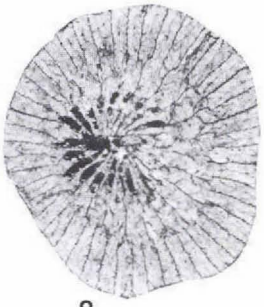

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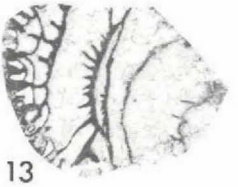

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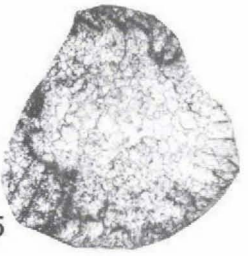

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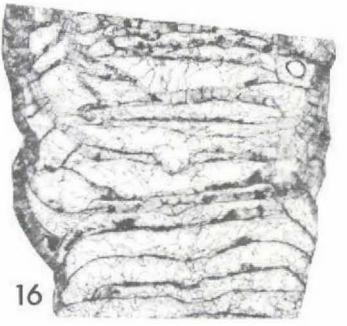

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Plate 9

Zelophyllum elongatum (Wedekind, 1927)
Högklint Beds or Slite Beds, Storungs, Gotland, ×3

Figs 1, 2. Holotype SMF Wdkd 10878, 10879. Type species of *Pseudomphyma* Wedekind, 1927. Note amplexoid septa in upper right of transverse section, SMF Wdkd 10879, Figure 2. Specimen figured by Wedekind (1927, Pl. 6, figs 6, 7).

Zelophyllum intermedium Wedekind, 1927
Högklint Beds. reef limestone at Högklint, Gotland, ×3

Figs 3, 6. Holotype SMF Wdkd 10207, 10208. Type species of *Zelophyllum* Wedekind, 1927. Note weakly amplexoid septa at intersection of tabula in lower right of transverse section, SMF Wdkd 10208, Figure 6. Specimen illustrated diagrammatically by Wedekind (1927, Pl. 5, figs 1–3).

Amplexoides poulseni sp. nov.
Offley Island Formation, Kap Tyson, ×3

Figs 4, 7. MGUH 13933 from GGU 211737, specimen doubtfully referred to *A. poulseni*. Transverse section in Figure 7 is largely in plane of a tabula.
Figs 12, 14. Paratype MGUH 13930 from GGU 211734. Note broad peripheral stereozone in calice prior to rejuvenescence in longitudinal section. Figure 14.

Cape Schuchert Formation, Kap Tyson west, ×3

Figs 5, 8, 9. MGUH 13934 from GGU 211738, specimen doubtfully referred to *A. poulseni*.
Figs 10, 11, 13. Paratype MGUH 13931 from GGU 211735. Transverse sections are from larger corallite to the left in Figure 13.

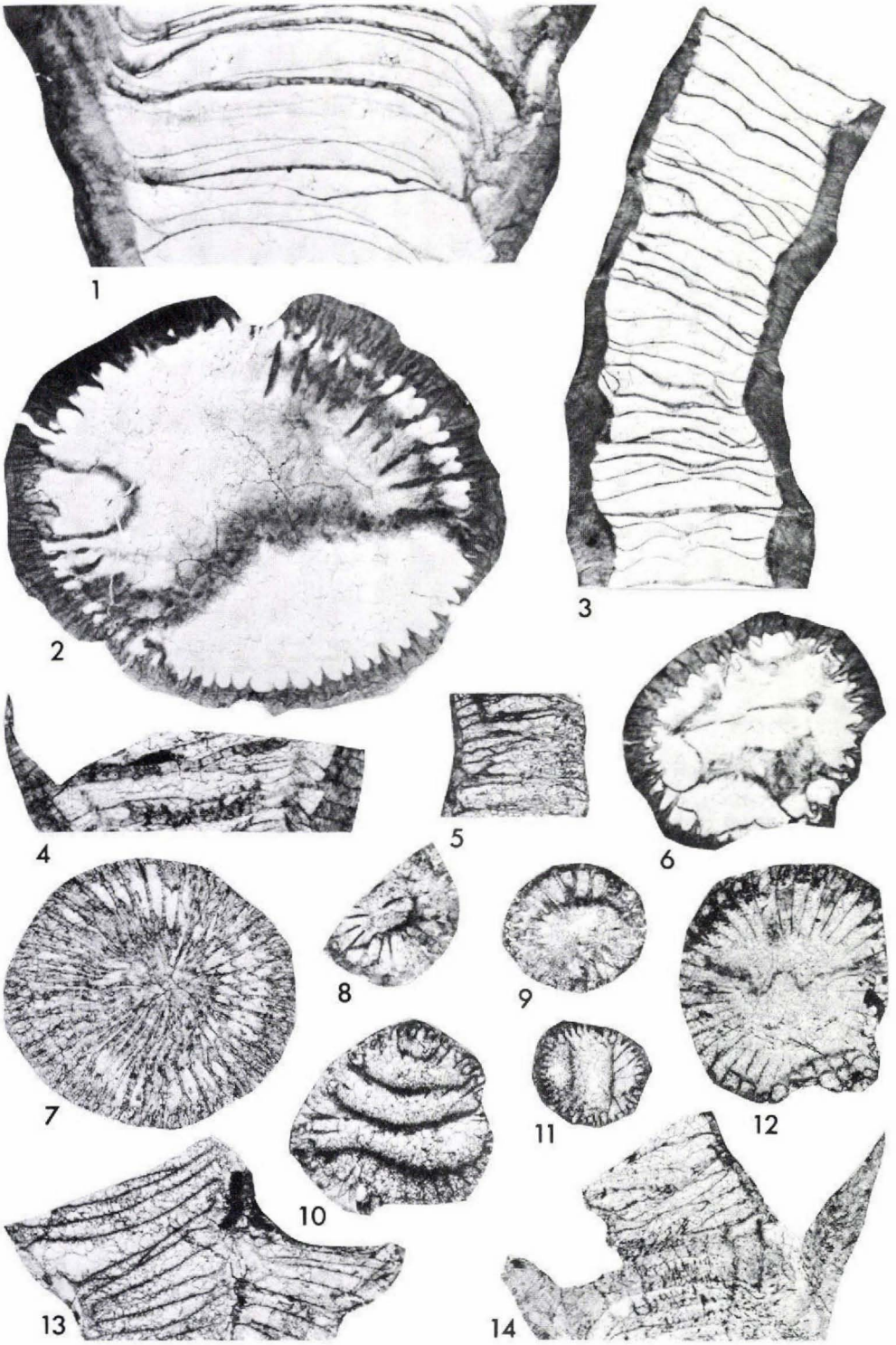
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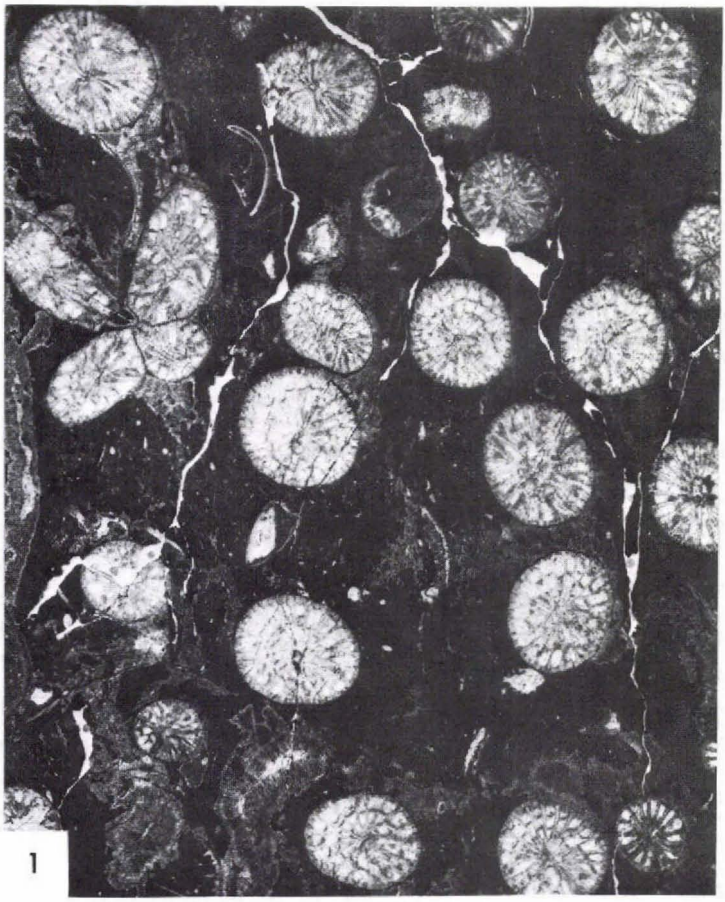
Plate 10

Palaeophyllum schuchertense sp. nov.
Cape Schuchert Formation, Kap Schuchert.

Figs 1, 2, 6. Holotype MGUH 13935 from GGU 211739. Figure 1 is ×3. Figures 2, 6 are ×4. Note quadripartite increase in Figure 1.

Palaeophyllum cf. *P. hubeiense* Ke & Yü, 1974
Cape Schuchert Formation, Kap Schuchert, ×4

Figs 3, 5. MGUH 13937 from GGU 211741. See also Plate 11, figure 5.
Figs 4, 7, 8. MGUH 13938 from GGU 211742. See also Plate 11, figure 6.



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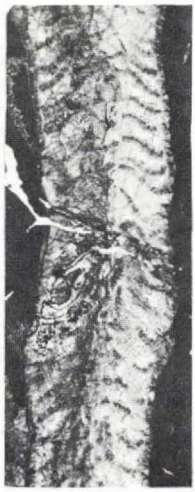

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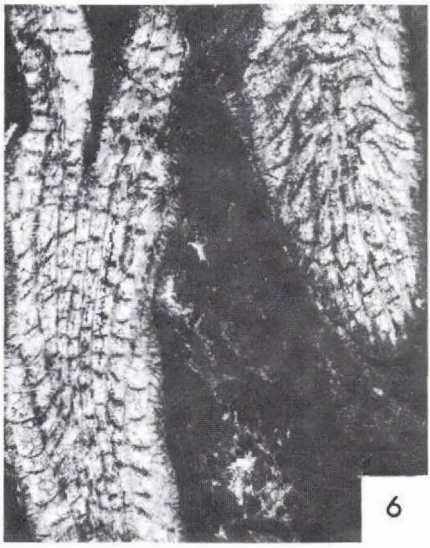

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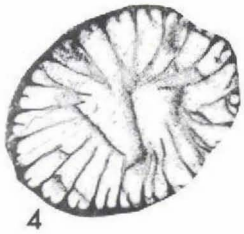

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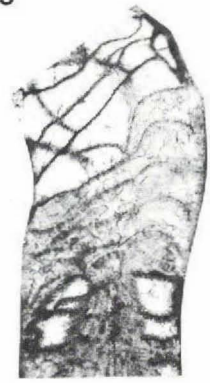

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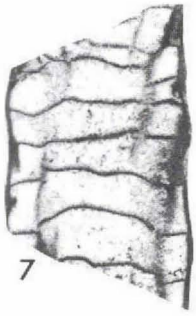

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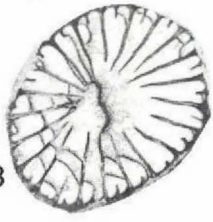

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Plate 11

Palaeophyllum williamsi Chadwick *in* Williams, 1919
Manitoulin Formation, east of Manitowaning Bay, Manitoulin Island, Ontario, ×4

Figs 1, 4. Holotype GSC 4508. Specimen figured in external view by Williams (1919, Pl. 5, fig. 2).

Cystilasma? rarum sp. nov.
Offley Island Formation, Offley Ø

Fig. 2. Paratype MGUH 13942 from GGU 211746. Portion of longitudinal section showing large septal spine on corallite wall, ×6.
Fig. 3. Paratype MGUH 13941 from GGU 211745. Portion of transverse section with small peripheral dissepiments and septa preserved only at top of figure, ×2.

Offley Island Formation, Kap Tyson, ×2

Figs 8, 13. Holotype MGUH 13940 from GGU 211744. Note short, thin septal spines on corallite wall in transverse section, Figure 8.

Palaeophyllum cf. *P. hubeiense* Ke & Yü, 1974
Cape Schuchert Formation, Kap Schuchert, ×4

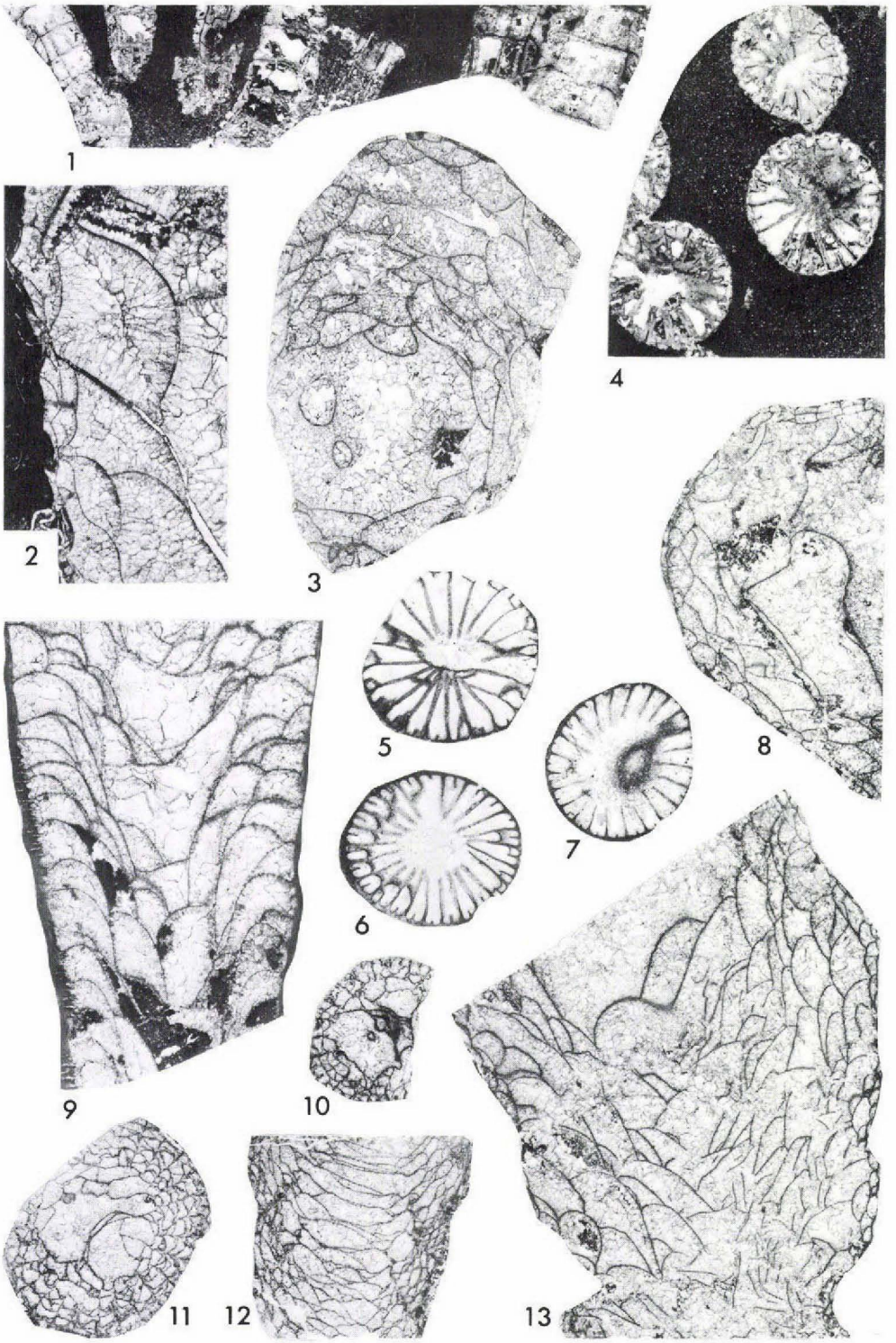
Fig. 5. MGUH 13937 from GGU 211741. See also Plate 10, figures 3, 5.
Fig. 6. MGUH 13938 from GGU 211742. See also Plate 10, figures 4, 7, 8.
Fig. 7. MGUH 13939 from GGU 211743.

Microplasma? tubiforme (Poulsen, 1941)
Offley Island Formation, Kap Morton (northern Washington Land), ×4

Fig. 9. Paratype MMH 3855. Note well-developed septal spines on corallite wall at left of figure. Specimen illustrated by Poulsen (1941, Pl. 1, fig. 8).

Hedstroemophyllum rhaphis sp. nov.
Offley Island Formation, Kap Tyson, ×2

Figs 10–13. Holotype MGUH 13944 from GGU 211748.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