

Redescription of Three Species of Corals from the Lockport Dolomite in New York

GEOLOGICAL SURVEY PROFESSIONAL PAPER 414-G



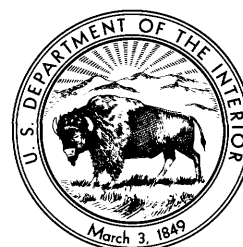
Redescription of Three Species of Corals from the Lockport Dolomite in New York

By WILLIAM A. OLIVER, JR.

SHORTER CONTRIBUTIONS TO GENERAL GEOLOGY

GEOLOGICAL SURVEY PROFESSIONAL PAPER 414-G

*Descriptions of the syntypes of some
corals named by James Hall, 1852*



UNITED STATES DEPARTMENT OF THE INTERIOR

STEWART L. UDALL, *Secretary*

GEOLOGICAL SURVEY

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REDESCRIPTION OF THREE SPECIES OF CORALS FROM THE LOCKPORT
DOLOMITE IN NEW YORK

By WILLIAM A. OLIVER, JR.

ABSTRACT

Three species of rugose and tabulate corals that were originally described by Hall (1852), from the Silurian Lockport Dolomite at Lockport, N.Y., are redescribed. Two of the species, *Diplophyllum caespitosum* and *Cladopora seriata*, are the type species of their respective genera. The type specimens of these and the third species, *Palaeophyllum multicaule* (Hall), have not previously been sectioned and the three species have been frequently misinterpreted in the literature.

INTRODUCTION

The three species here considered, *Diplophyllum caespitosum*, *Syringopora? multicaulis*, and *Cladopora seriata*, were originally described by Hall (1852) from the Lockport Dolomite of Silurian age at Lockport, N.Y. Subsequent descriptions of these species were not based on the syntype collections and Hall's specimens have not previously been sectioned.

D. caespitosum and *C. seriata* are the type species of *Diplophyllum* and *Cladopora* respectively, and knowledge of the Hall specimens is important in stabilizing the usage of these names. *D. caespitosum* and *S.? multicaulis* (here assigned to *Palaeophyllum*) have at times been confused with the Devonian genus *Acinophyllum* (*Synaptophyllum* of authors). Precise knowledge of these species is needed in studies of both Silurian and Devonian corals.

Thin sections of Hall's original specimens are here described and illustrated for the first time, and lectotypes are selected.

All specimens from the Hall type lots are in the collection of the American Museum of Natural History (AMNH). Additional topotype material of *Diplophyllum caespitosum* is in the U.S. National Museum (USNM). I am indebted to Dr. Donald F. Squires of the American Museum and Dr. Richard S. Boardman of the National Museum for permission to section and redescribe the material.

Thin sections were prepared by William C. Pinckney, Jr. Photographs of exteriors are by R. H. McKinney; thin section photographs are by the author.

Order RUGOSA
Family ACERVULARIIDAE
Genus *Diplophyllum* Hall, 1852

1851. *Diplophyllum* Hall, p. 399.
1852. *Diplophyllum* Hall. Hall, p. 115.
1901. *Diplophyllum* Hall. Grabau, p. 139.
1906. [not] *Diplophyllum* Hall. Grabau and Shimer, p. 210.
1909. [not] *Diplophyllum* Hall. Grabau and Shimer, p. 73.
1931. *Acervularia* {*Diplophyllum*} Hall. Smith and Lang, p. 86.
1939. [not] *Diplophyllum* Soshkina, p. 39-40 (homonym).
1940. *Diplophyllum* Hall. Lang, Smith, and Thomas, p. 53.
1944. [not] *Diplophyllum* Hall. Shimer and Shrock, p. 99.
1956. *Diplophyllum* Hall. Hill, p. 277.

Type species.—By monotypy, *D. caespitosum* Hall (1852, p. 116-117), “* * * lower part of the limestone of the Niagara group at Lockport * * *” (lower part of the Lockport Dolomite, Lockport, N.Y.).

Diagnosis.—Compound rugose corals with a distinct inner wall of septal origin, separating the tabularium from a narrow, peripheral dissepimentarium. The tabulae are mostly complete; dissepiments are flat to gently arched, forming a single series in each space bounded by the inner and outer walls and two adjacent septa. Increase is commonly peripheral or lateral.

Remarks.—Hall first described and illustrated the type species of *Diplophyllum* in 1852, although a generic diagnosis was published in 1851. He considered the division into inner and outer zones by the wall to be diagnostic, and he emphasized the differences between *Diplophyllum* and corals with a single peripheral row of normal dissepiments which may give the superficial appearance of a wall. Later, however, Hall (1859, p. 80) stated that *Diplophyllum* was “* * * probably identical with the genus *Diphyphyllum* * * *” to which many Silurian and Devonian corals with normal dissepiments were then assigned.

Grabau (1901, p. 139) followed Hall's earlier interpretation and used his illustrations, but later (Grabau and Shimer, 1906, p. 210; 1909, p. 73) followed Lambe's (1901, p. 158, pl. 13, fig. 3, a-b) erroneous description and illustration of the type species and suggested that *Diplophyllum* differed from *Synaptophyllum* (now

Acinophyllum) only in the lack of lateral connections between corallites.

Shimer and Shrock (1944, p. 99) followed Grabau and Shimer in erroneously diagnosing the genus.

Smith and Lang (1931, p. 86, 91-92) based their redescription of *Diplophyllum* on a topotype fragment from the U.S. National Museum (erroneously stated to be a piece of one of Hall's types). They correctly diagnosed the genus and one variety of the type species. However, Smith and Lang considered *Diplophyllum* to be a 'genomorph' of *Acervularia*, for all practical purposes placing *Diplophyllum* in synonymy with *Acervularia*.

Hill (1956, p. 277) followed Smith and Lang's diagnosis and used their illustrations but considered *Diplophyllum* as a genus distinct from *Acervularia*, included in the *Acervulariidae*. According to Hill, *Acervularia* differs in the possession of a zone of convex dissepiments outside of the zone of flat dissepiments.

The generic diagnosis of this paper is based primarily on the type species, but is broadened to include cerioid species as well. Smith and Lang included two species in *Acervularia* {*Diplophyllum*} in addition to *D. caespitosum*. One of these, *Rhabdophyllum conglomeratum* Wedekind is a subcerioid *Diplophyllum* which differs from *D. caespitosum* in its irregular sagging tabulae and broader outer zone of flat dissepiments. The other, *Acervularia luxurians* var. *breviseptata* Weissmehl, is a cerioid *Diplophyllum* with short septa and flat tabulae and dissepiments. Increase in the first species is intermural (lateral), but in the second, both intermural (lateral) and axial increase occurs. Both of these interpretations are based on the author's study of Smith and Lang's illustrations of material which they subjectively identified as the species indicated. Their illustrations demonstrate the existence of cerioid and phaceloid-subcerioid corals with the *Diplophyllum* structure in addition to the phaceloid type species.

Search of the literature indicates that *D. caespitosum* is the only North American species that can be assigned to *Diplophyllum*. North American species other than the type, that have been previously assigned to *Diplophyllum*, are listed as follows with reassignments and references.

Diplophyllum arundinaceum (Billings) Grabau and Shimer (1906, p. 212; 1909, p. 75) is the type species of *Synaptophyllum* as noted by McLaren (1959, p. 16-22).

Diplophyllum callawayensis Branson (1924, p. 50, text fig. 3, pl. 3, fig. 4) is probably a *Disphyllum* as indicated by Stumm, 1955, card 130.

Diplophyllum coralliferum Hall (1852, p. 322, pl. 72, fig. 1a, b, c) has never been redescribed. Examination of a topotype specimen (possibly Hall's holotype) indicates that this species is a stauriid with a single discontinuous row of normal dissepiments.

Diplophyllum integumentum (Barrett), Grabau (1910, p. 106, pl. 10, fig. 1; pl. 15, fig. 9-10; pl. 16, fig. 15, 17) was re-assigned in part to *Synaptophyllum grabau* by Fagerstrom (1961, p. 13). The balance of Grabau's material has normal dissepiments and may be a disphyllid.

Diplophyllum panicum (Rominger), Grabau and Shimer, (1906, p. 212, 1909, p. 75), is a *Cylindrophylloids* as stated by Ehlers and Stumm (1949, p. 27).

Diplophyllum caespitosum Hall, 1852

Plates 1-3

- 1851. *Diplophyllum caespitosum* Hall, p. 399 (nomen nudum).
- 1852. *Diplophyllum caespitosum* Hall, p. 116-117, pl. 33, figs. 1a-r.
- 1859. *Diplophyllum caespitosum* (Hall). Hall, p. 80.
- 1890. [not] *Diplophyllum caespitosum* (Hall). Foerste, p. 343.
- 1899. [not] *Diplophyllum caespitosum* (Hall). Lambe, p. 240.
- 1901. [not] *Diplophyllum caespitosum* (Hall). Lambe, p. 158, pl. 13, fig. 3 a-b.
- 1901. *Diplophyllum caespitosum* Hall. Grabau, p. 139-140, fig. 33.
- 1903. [not] *Diplophyllum caespitosum* Hall. Clarke and Ruedemann, p. 25.
- 1906. [not] *Diplophyllum caespitosum* Hall. Grabau and Shimer, p. 211-212, fig. 117.
- 1909. [not] *Diplophyllum caespitosum* Hall. Grabau and Shimer, p. 74, fig. 117.
- 1928. [not] *Diplophyllum caespitosum* (Hall). Twenhofel, p. 120.
- 1931. *Acervularia* {*Diplophyllum*} *caespitosa* (Hall). Smith and Lang, p. 91, pl. 2, fig. 6-10.
- 1944. [not] *Diplophyllum caespitosum* Hall. Shimer and Shrock, p. 99, pl. 32, fig. 11-12.
- 1956. *Diplophyllum caespitosum* Hall. Hill, p. 277, fig. 188, 6 a, b.

Diagnosis.—Phaceloid *Diplophyllum* with peripheral or lateral increase. The internal structure consists of a wall separating an inner tabularium from an outer zone of flat or gently arched dissepiments. Normal dissepiments are rare.

External features.—Corallum large and phaceloid with peripheral or lateral offsets occurring 1 to 3 or more at a time. Corallites cylindrical, as much as 8 mm (average 5 to 6.2 mm) in diameter; length as much as 12 cm, or more. Offset development is irregular at varying distances. No examples of axial increase were seen. Corallite exteriors are smooth with fine longitudinal septal grooves and wide gentle rugae. Calices are bowl shaped with a peripheral platform corresponding to the outer zone of flat dissepiments discussed below.

No complete colonies have been studied, but they were apparently of large size since fragments 12 by 15 to 15 by 20 cm are in the Hall collection. Spacing of corallites within the colony varies; most specimens show crowding, owing to preservation. Average spacing was approximately one corallite diameter.

Internal features.—Septa are lamellar and radially arranged. The major septa are more or less uniform in length in the corallites of a given corallum, either extending almost to the axis or stopping just inside the inner wall. The minor septa stop just inside the inner wall and are not easily differentiated from the major ones in the coralla with short major septa. All septa are dilated peripherally where they are set in the fibrous-appearing tissue of the outer wall, and periaxially where even greater dilation helps form the inner wall. From the inner wall the long septa taper toward the axis.

The number of major septa ranges from 17 to 22 in cylindrical parts of corallites (diam 5.0 to 7.2 mm). Data in the following table include sections through the early expanding stages of growth as well.

	Specimen ¹				
	AMNH 1696:1	AMNH 1696:2	AMNH 1696:3	USNM 139767	USNM 10347-2
Number of corallites studied....	22	13	7	13	10
Number of major septa: Average.....	18.3	19.5	17.3	18.3	20.1
Observed range.....	16-20	18-21	14-19	15-21	18-22
Diameter in mm: Average.....	5.1	6.2	4.9	5.1	6.2
Observed range.....	3.4-6.4	4.3-8.1	3.3-6.5	3.3-6.7	4.8-7.3
Variety (see text).....	A	B	B	B	A

¹ AMNH 1696:1. Lectotype, original of Hall figures 1m, p.
AMNH 1696:2. Original of Hall figure 1k.
AMNH 1696:3. Original of Hall figure 1o.
USNM 139767 and 10347-2. Topotypes.

The inner wall, mentioned above, is a prominent feature of both longitudinal and transverse sections. It is formed, in most colonies, by septal dilation, but in more attenuate specimens appears as a lateral extension of the septa rather than as a thickening.

Two general types of tabularia are developed within the inner wall. In colonies with long septa, the tabulae are closely spaced (8 to 12 per 10 mm) and arched with a broad often deep axial depression. In colonies with short septa, the tabulae are widely spaced (4 to 10 per 10 mm), flat or gently arched, and commonly with a narrow axial notch or depression.

Outside the inner wall, the dissepimentarium is composed of a single row of flat or slightly arched dissepiments which are somewhat more closely spaced than the corresponding tabulae. A few normal dissepiments, convex toward the axis, have been observed (pl. 3, fig. 6).

Microstructure.—All the specimens studied are preserved in dolomite and are more or less affected by recrystallization. Locally, however, structures that may be remnants of the original microstructure are preserved. These indicate a close similarity in origin of the septa and inner wall. In transverse section (pl. 3, fig. 5) the peripheral ends of the septa appear ball

shaped and set into a socket in the outer wall. The outer wall is preserved as small elongate crystals arranged at right angles to the surface of the wall, suggesting original fibers similarly oriented, as shown for *Acervularia* by Wang (1950, pl. 8, fig. 60a).

The septa and inner wall are composed of dense tissue with a stippled centerline. In transverse section there is no evidence of axially diverging fibers such as shown by Wang. In longitudinal section, however, the upward divergence in the inner wall region is shown in several specimens (pl. 1, fig. 6; pl. 2, figs. 4-5; compare Wang, 1950, pl. 8, fig. 60b).

It is concluded that the microstructure of *Diplophyllum* and *Acervularia* are similar and that the genera are closely related, as indicated by Smith and Lang (1931) and most subsequent workers.

Material studied.—The above description is based on the lot of specimens described and illustrated by Hall (1852) (AMNH 1696) and additional topotype material in the U.S. National Museum (USNM 10347; illustrated specimens are renumbered USNM 139767 and 139768). The Hall collection consists of 5 large fragments of colonies and several additional fragments of 1 or a few corallites. Available topotype material includes six medium- to large-sized fragments of colonies. Counts and measurements are from 65 corallites in 5 colonies.

Intercolony variation.—Two distinct varieties are present in the collections. Variety A includes coralla with long major septa, extending nearly to the axis, and closely spaced tabulae (8 to 12 per 10 mm) that are arched with a broad axial depression. In the Hall collection three large fragments (originals of Hall's figs. 1m and p, 1l and r, and 1n) and most of the smaller fragments (originals of figs. 1g-h-i, 1e, and 1a and f) are of this type. The original of Hall's figures 1m and p is here designated lectotype. Four of the USNM topotypes belong to variety A also.

Variety B includes coralla with short major septa, barely entering the tabularium, and widely spaced tabulae (4-10 per 10 mm) that are flat or gently arched, commonly with a narrow axial notch. In the Hall collection, 2 large fragments (originals of figures 1k and 1o) and 1 small one (original of fig. 1c) are of this type. Two large fragments from the USNM group and the specimen of Smith and Lang (1931) belong to variety B.

In the studied collections, the two varieties are distinct and can be easily separated on the basis of septal length. Although there is some overlap in the observed range of tabulae spacing, the average or most common spacing in colonies or individuals falls into two classes, corresponding to the varieties.

Although these might be considered as separate species it is doubtful that this could be supported by the material at hand or by additional collections from the same locality. The varieties cannot be differentiated on size characteristics, septal number, corallum form, or microstructure. Distribution in time and space might be different, but these factors are not known at present. In the absence of data on distribution the differences are here considered as varietal within a single species.

Remarks.—*Diplophyllum caespitosum* was first described and illustrated by Hall in 1852, although a synopsis of his generic description was published in 1851. He emphasized the long septa of the species and interpreted the forms with short septa as due to recrystallization of the tabularium region. Most of Hall's types do have long septa and the lectotype is selected from this group. All Hall's material is from the lower part of the Lockport Dolomite at Lockport, N.Y.

Foerste (1890, p. 343-344) assigned specimens from several localities in Ohio to *D. caespitosum*, but his description suggests that he was not dealing with specimens of *Diplophyllum*.

Lambe (1899, p. 240; 1901, p. 158, pl. 13, fig. 3, a-b) described specimens from Anticosti Island as *Diplophyllum caespitosum* Hall that have normal dissepiments and are not congeneric with Hall's material.

Grabau's description (1901, p. 139-140, text fig. 33) is based on Hall and his illustrations are copies of Hall's figures 1m, l, and o. There is no indication that Grabau studied any new material.

Clarke and Ruedemann (1903, p. 25-28) discussed the generic relationships and previous descriptions of the species, but their poorly preserved material from the Guelph Dolomite could belong to almost any phaceloid coral genus.

Grabau and Shimer (1906, p. 211-212, fig. 117; 1909, p. 74, fig. 117 and Twenhofel (1928, p. 120) based their diagnosis on the incorrect description of Lambe (1901), rather than on Hall even though Grabau (1901) had earlier correctly discussed the species.

Smith and Lang (1931, p. 91-92; pl. 2, figs. 6-10) were the first to add significantly to Hall's original study of *D. caespitosum*. Basing their description on a fragment from the U.S. National Museum topotype collection (erroneously cited as a piece of one of Hall's types), they diagnosed the genus and briefly described the short-septa variety (B) of the species. They interpreted *Diplophyllum* as a phaceloid "diphymorph" of *Acervularia*.

In spite of this excellent work, Shimer and Shrock (1944, p. 99, pl. 32, fig. 11-12) erroneously followed Lambe in their diagnosis of the genus and species.

Hill (1956, p. 277, fig. 188, 6), however, followed Smith and Lang and is correct in her generic diagnosis except with respect to septal length.

Significant observations on *Diplophyllum caespitosum* have been made only by Hall and by Smith and Lang. All their material and all the material in the present study is from the lower part of the Lockport Dolomite at Lockport, N.Y. Hall's material and the block from which the Smith and Lang fragment was presumably removed have been restudied. The sum total of work to date is the description of a comparatively small number of corallum fragments from the type locality. Study of additional material from other localities and stratigraphic levels is necessary for an adequate understanding of the species and its two varieties.

Family STAURIIDAE

Genus *Palaeophyllum* Billings

1858. *Palaeophyllum* Billings, p. 168.

1956. *Palaeophyllum* Billings. Hill, p. 268.

1959. *Palaeophyllum* Billings. Hill, p. 4.

Type species.—*Palaeophyllum rugosum* Billings (1858, p. 168; Hill, 1959, pl. 1, fig. 6 a-b). Black River or Trenton (Middle Ordovician), Lake St. John, Little Discharge, Quebec, Canada (type data from Hill, 1959, p. 4).

Diagnosis.—Phacelo-cerioid coralla, with peripheral, nonparricidal increase; corallites with narrow peripheral stereozone and without dissepiments; major septa long, thin toward axis, without paliform lobes; minor septa short; tabulae thin, distant, commonly complete and with marked axial depression, peripheral edges of some downturned. (Hill, 1959, p. 4.)

Remarks.—Hill's diagnosis was based on a restudy of the type specimens of *P. rugosum* Billings. She included *P. thomi* (Hall) in the genus after restudying its types, but pointed out that *P. thomi* was phaceloid and had more highly domed tabulae. The author's comparison of the types of *P. thomi* with those of *Syringopora? multicaulis* Hall, described below, indicates that the two species are congeneric. Hall's species is assigned to *Palaeophyllum* on the basis of this relationship. No attempt has been made to further analyze the genus and the synonymy includes only references that are of use in this discussion.

Species of *Palaeophyllum* are best known from the Ordovician and the existence of Silurian species has been considered doubtful. Hill (1959, p. 9-10) reviewed North American occurrences including three Silurian species which are discussed below. More recently the

author has seen specimens of *Palaeophyllum*, collected above *Halysites* and other Silurian corals, from the Fusselman Dolomite in New Mexico. *P. multicaule* (Hall) redescribed below, from the lower part of the Lockport Dolomite, at Lockport, N.Y., is the youngest species of *Palaeophyllum* yet recognized.

***Palaeophyllum multicaule* (Hall), 1852**

Plate 4, figures 1-7

1852. *Syringopora? multicaulis* Hall, p. 119, pl. 33, fig. 3 a-g.

Diagnosis.—Phaceloid *Palaeophyllum* with lateral increase. Corallite diameter is small; the outer wall is relatively thick; tabulae strongly arched with an axial notch.

External features.—The coralla are phaceloid and of medium size. One incomplete specimen in the type lot (original of Hall, pl. 33, fig. 3a) measures 15 by 9 by 5 cm. Increase is lateral at irregular intervals. Spacing of corallites varies but distances are commonly 2 mm or less. Lateral supports are formed by epithecal expansions. Corallite diameters in the lectotype corallum range from 2.0 to 3.2 mm and average 2.8 mm in 20 corallites measured. Other specimens in the type lot are comparable. External features consist of fine encircling grooves and occasional expansions for support. No longitudinal markings have been seen. Calice not known.

Internal features.—The septa are radially arranged and lamellar. Major septa extend nearly to the axis and number 13 to 15 in the 20 measured corallites of the lectotype (14 septa in 16 of the corallites). Minor septa are short and not recognizable in parts of most individuals. The peripheral parts of all septa are dilated to form a septal stereozone 0.2-0.3 mm thick.

Tabulae are highly arched with a narrow axial depression or notch; they appear as smooth arches in slightly eccentric longitudinal sections. Tabulae are widely spaced, averaging 3 or 4 per 2 mm. There are no dissepiments.

The specimens studied are preserved in dolomite and microstructure is largely obscured. In transverse section some septa appear to show a fibrous pinnate arrangement.

Sections through neanic parts of individuals show short major septa that extend less than half the distance to the axis. With growth these lengthened and septa and wall thickened to the ephebic condition described above.

Material studied.—The above description is based on 1 small and 3 medium-sized fragments of coralla that comprise the type lot on which Hall based the species (AMNH 1695). The fragment that is the original of

Hall's figures 3b, c, and d is best preserved and is here chosen as lectotype. Most of the illustrated thin sections are from the lectotype.

Remarks.—Many authors since 1852 have described specimens which they assigned to Hall's species without adequate knowledge of the species and without re-examination of the types. Preparation of a proper synonymy is beyond the scope of this paper as it would require reexamination of all this material. The following is believed to be a comprehensive listing of such descriptions. It is worth noting that Hall's description and illustrations are rather good. He describes and shows the configuration of septa and tabulae and mentions no dissepiments, although clearly differentiating between dissepiments and other structures in descriptions of other corals. The genera *Eridophyllum*, *Diphyphyllum*, and *Synaptophyllum*, as used by the following authors, all have dissepiments, indicating that Hall's description was misconstrued from the beginning.

- 1865. *Eridophyllum vennori* Billings, p. 431. Placed in *D. multicaule* by Lambe but Lambe's material is not conspecific with Hall's (see below).
- 1876. *Diphyphyllum multicaule* (Hall). Rominger, p. 122-123, pl. 45, fig. 3-4. This is described as having dissepiments ("vesiculose plates") and if so is unrelated to *P. multicaule*.
- 1899. *D. multicaule* (Hall). Lambe, p. 241-242.
- 1901. *D. multicaule* (Hall). Lambe, p. 159, pl. 13, figs. 4, a-c. Lambe shows dissepiments in his diagrammatic illustrations, so this is not related to Hall's species.
- 1910. *Synaptophyllum multicaule* (Hall). Grabau, p. 105-106, pl. 12, fig. 6. Grabau described "hollow molds" which are probably not determinable.
- 1919. *S. multicaule* (Hall). Williams, pl. 16, fig. 1. The illustration shows a phaceloid coral of unknown structure. Corallite diameter is large and the species is probably not the same as Hall's.
- 1939. *S. multicaule* (Hall). Northrup, p. 143. Apparently based on Lambe's interpretation of the structure.
- 1939. *Diphyphyllum multicaule* (Hall). Shrock and Twenhofel, p. 251. Not recognizable from the description.
- 1944. *Synaptophyllum multicaule* (Hall). Shimer and Shrock, p. 95, pl. 29, fig. 25-28. Based on Rominger and Lambe, and not on Hall's species.

Silurian species.—Three North American species have previously been assigned to *Palaeophyllum* from rocks of Early Silurian age. These are discussed and compared with *P. multicaule* in the following paragraphs.

Columnaria (*Palaeophyllum*) *troedssoni* Poulson (1941, p. 11-12, pl. 1, fig. 9-10) from the Offley Island formation in North Greenland, has corallites with large diameter, comparatively thin walls, and more broadly arched tabulae than *P. multicaule*. The age is upper Llandovery, according to Poulson (p. 9) and Swartz and others (1942, chart).

Palaeophyllum williamsi Chadwick (in Williams, 1919, p. 128-129, pl. 5, fig. 2) and *P. umbellicrescens* Chadwick (in Williams, 1919, p. 129) were both described from the Manitoulin dolomite, on Manitoulin Island, Ontario. The formation is of Early Silurian age (early Llandovery, according to Swartz and others, 1942). Neither species was adequately described or illustrated. If properly assigned to *Palaeophyllum*, the first species has larger corallites and apparently more gently arched tabulae than *P. multicaule*. *P. umbellicrescens* differs from all the others in its mode of increase and corallum shape.

Order TABULATA
Family FAVOSITIDAE
Subfamily PACHYPORINAE

Genus Cladopora Hall

1851. *Cladopora* Hall, p. 400.

1852. *Cladopora* Hall. Hall, p. 137.

1939. *Cladopora* Hall. Lecompte, p. 75-78.

1960. *Cladopora* Hall. Stumm, p. 133-134.

Type species.—*Cladopora seriata* Hall, (1852, p. 137-138, pl. 38, fig. 1 a-m) by subsequent designation of Miller (1889, p. 178). Lockport Dolomite, Lockport, N.Y.

Diagnosis.—"Dendroid, phaceloid, or reticulate corals, with corallites rising obliquely from median axes of stems. Corallite walls thin. Apertures circular to lunate. Mural pores irregularly scattered. No tabulae present." (Stumm, 1960, p. 134).

Remarks.—The history and morphology of *Cladopora* have been discussed by Lecompte (1939) and Stumm (1960). The purpose of the present contribution is to provide illustrations of the type specimens of the type species, which have not been sectioned previously.

***Cladopora seriata* Hall**

Plate 5, figures 1-4

1852. *Cladopora seriata* Hall, p. 137-138, pl. 38, fig. 1 a-m.

1960. *C. seriata* Hall. Stumm, p. 134-135, pl. 1, fig. 4-6.

Diagnosis.—The corallum is ramose with cylindrical branches that average 2 mm in diameter. Branches are composed of corallites that are parallel near the axis, but which gradually diverge to intersect the surface of the branch at an angle of approximately 30°. Corallite lengths range from 2 to 3 mm. The corallites gradually expand toward the surface where diameters of 0.4 to 0.5 mm are common. Apertures are lozenge shaped and restricted by wall dilation. Thickness of walls at periphery varies from 0.15 to 0.2 mm. Mural pores are medium sized and rare. No tabulae or septal ridges are present.

Remarks.—The above description is based partly on

Stumm (1960, p. 134) but is rewritten to fit more precisely the type specimens of Hall. Minor differences between Hall's syntypes and Stumm's hypotype are indicative of variation that can be described only on the basis of extensive suites of material from the same and other localities. The synonymy given above is incomplete.

Material studied.—Hall's illustrations were based on 5 fragments of coralla (AMNH 1679), ranging in size from 4 by 4 by 3 cm to 8 by 5 by 5 cm. The original of Hall's figures 1l and m is best preserved and is here chosen as lectotype. All the illustrated thin sections are from this specimen.

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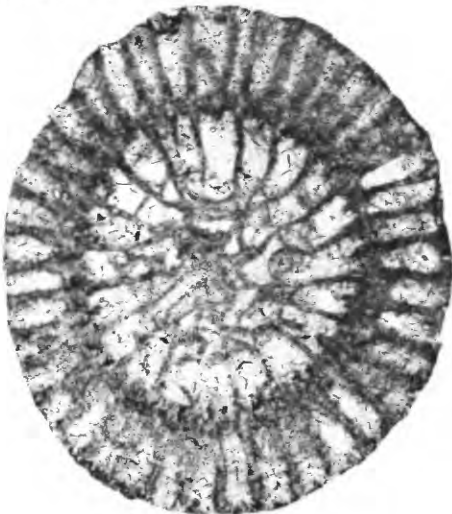
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PLATES 1–5

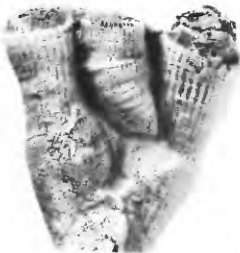
PLATE 1

FIGURES 1-8. *Diplophyllum caespitosum* Hall (p. 2).

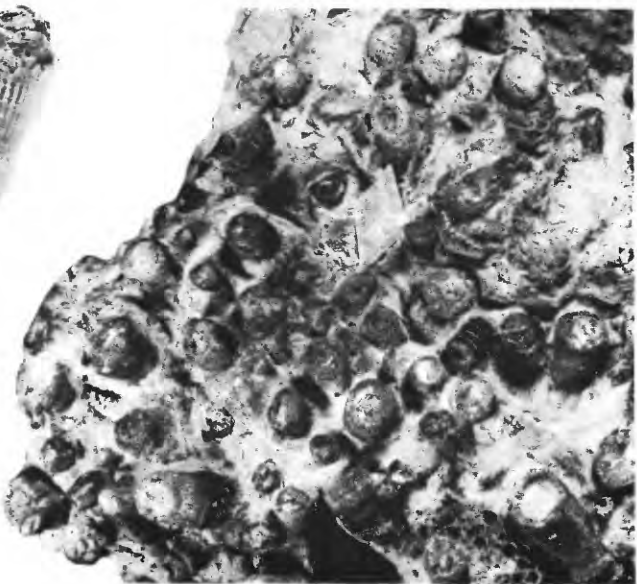
1. Top view of part of paratype ($\times 1$); original of Hall, 1852, pl. 33, fig. 1k. AMNH 1696: 2.
2. Side view of part of lectotype ($\times 1$); original of Hall, 1852, pl. 33, fig. 1m and p. AMNH 1696: 1.
3. Side view showing lateral increase ($\times 2$); another part of lectotype corallum seen in fig. 2. AMNH 1696: 1.
4. Side view showing lateral increase ($\times 2$); paratype, original of Hall, 1852, pl. 33, fig. 1c. AMNH 1696: 7.
- 5-6. Transverse thin section ($\times 10$) and longitudinal thin section ($\times 5$) of variety A corallite; topotype, USNM 139768.
- 7-8. Transverse thin section ($\times 1\frac{1}{2}$) of variety B (USNM 139767, topotype) and variety A (AMNH 1696: 1, lectotype) coralla.



5



4



1



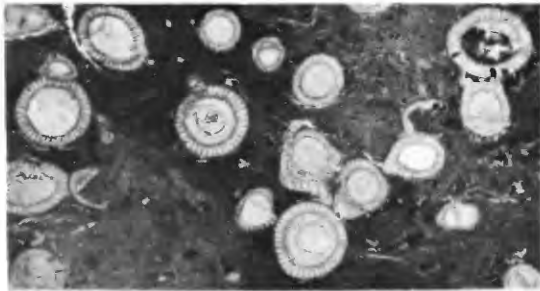
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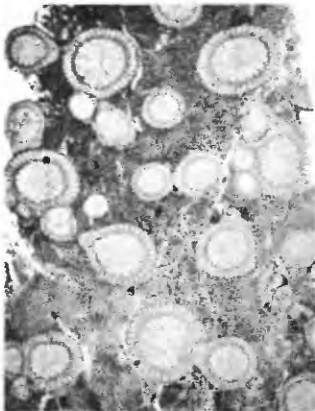
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DIPLOPHYLLUM CAESPITOSUM HALL

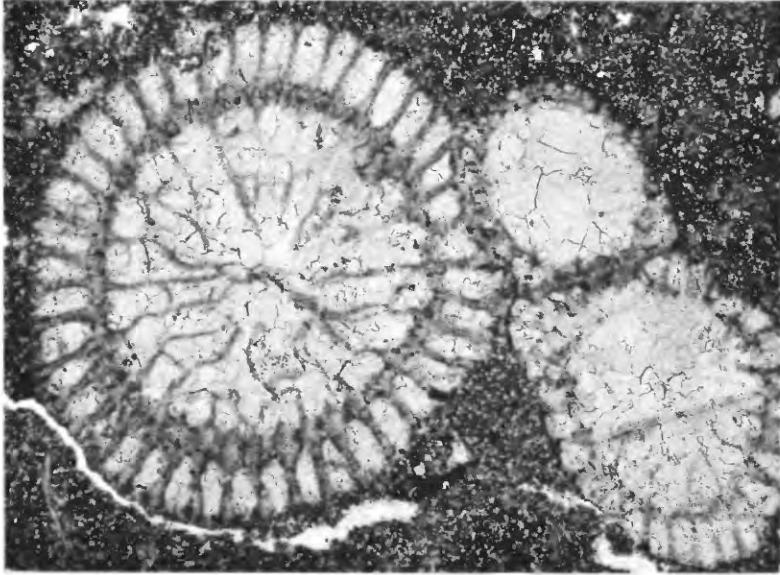
PLATE 2

FIGURES 1-5. *Diplophyllum caespitosum* Hall (p. 2). Lectotype, AMNH 1696: 1.

1-3. Transverse thin sections ($\times 10$) of corallites with lateral buds. Variety A, with long septa (details of pl. 1, fig. 8).

4. Longitudinal thin section of corallite ($\times 10$).

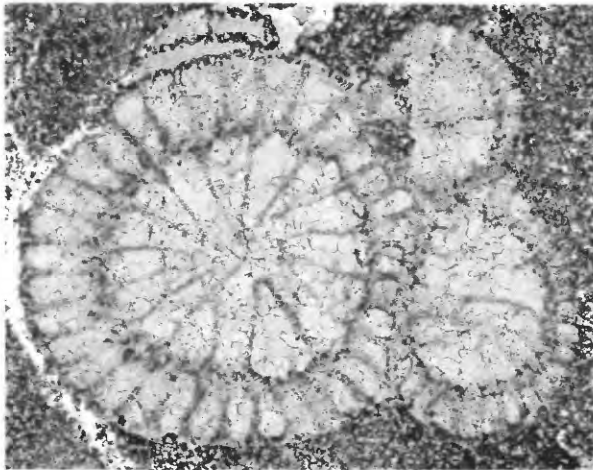
5. Structure of inner wall in longitudinal thin section ($\times 50$). Same corallite as in fig. 4.



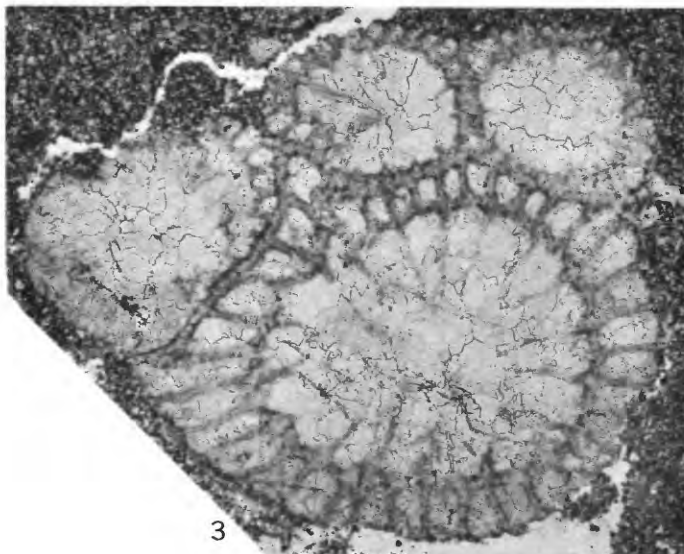
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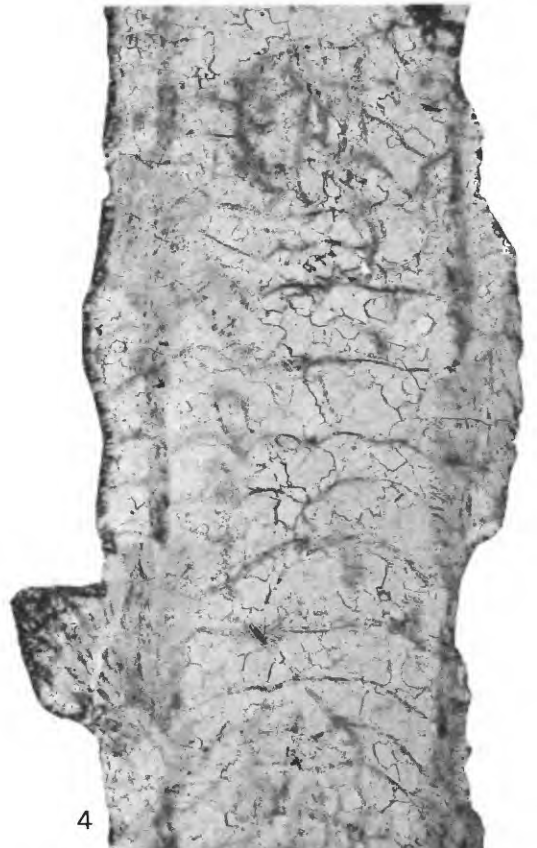
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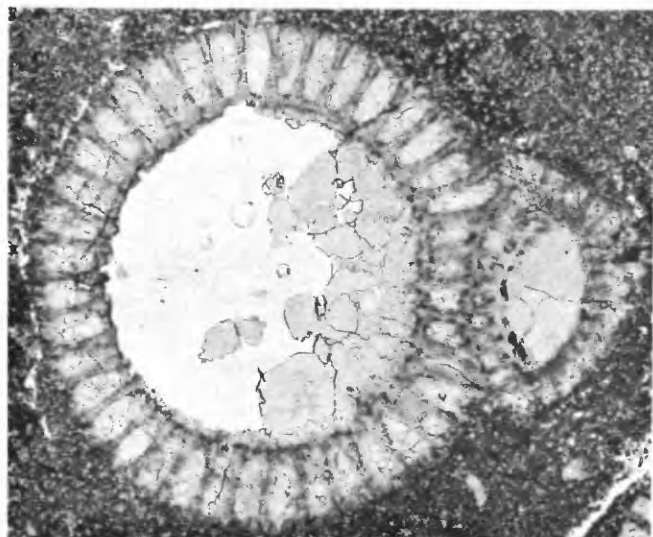
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DIPLOPHYLLUM CAESPITOSUM HALL

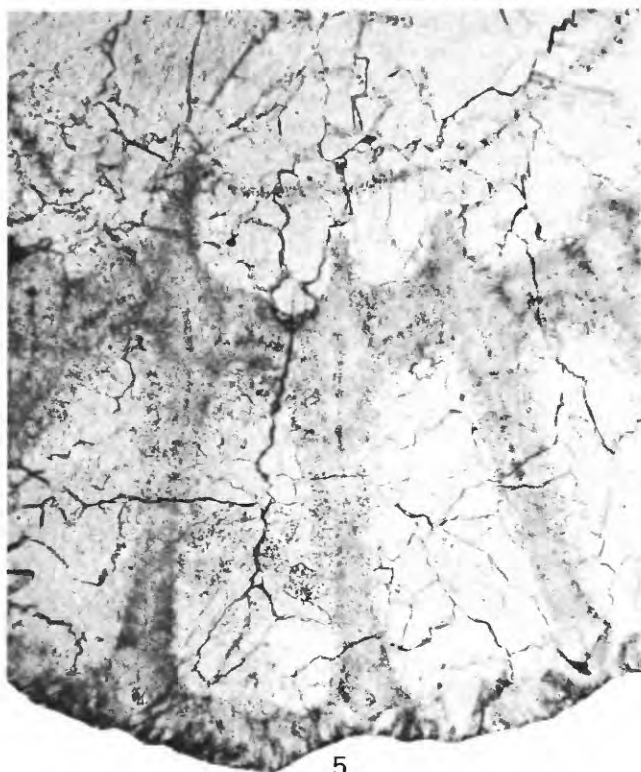
PLATE 3

FIGURES 1-6. *Diplophyllum caespitosum* Hall (p. 2). Topotype, USNM 139767.

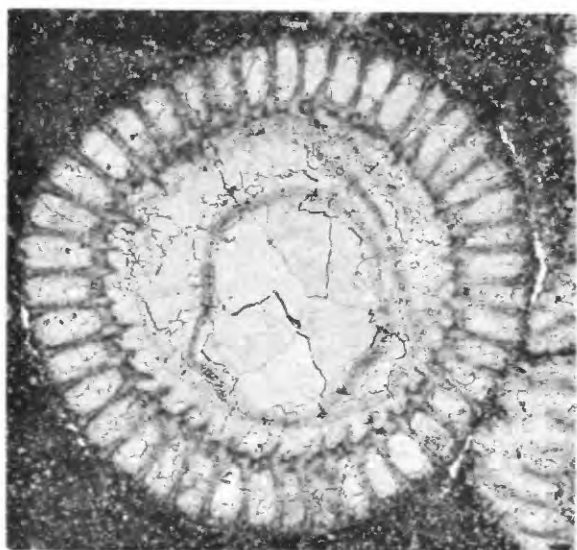
- 1-4. Transverse thin sections ($\times 10$) of corallites. Variety B, with short septa. Figs. 1-3 are details of pl. 1, fig. 7; fig. 4 is from the same thin section.
5. Detail ($\times 50$) of fig. 2 showing the structure of the inner wall and septa and the outer wall.
6. Longitudinal thin section ($\times 4$) of corallite from same corallum. Note wide-spaced tabulae and the normal dissepiment in the middle of the left side.



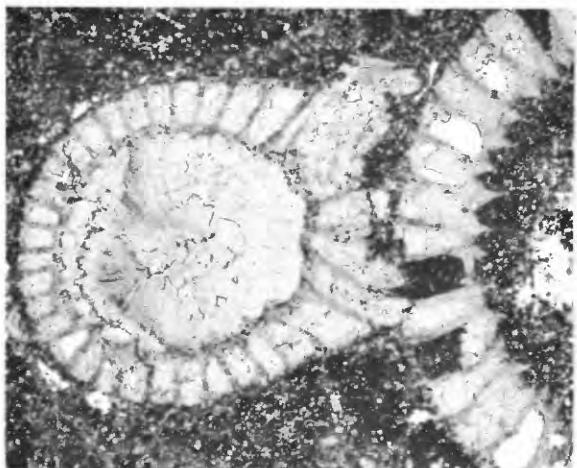
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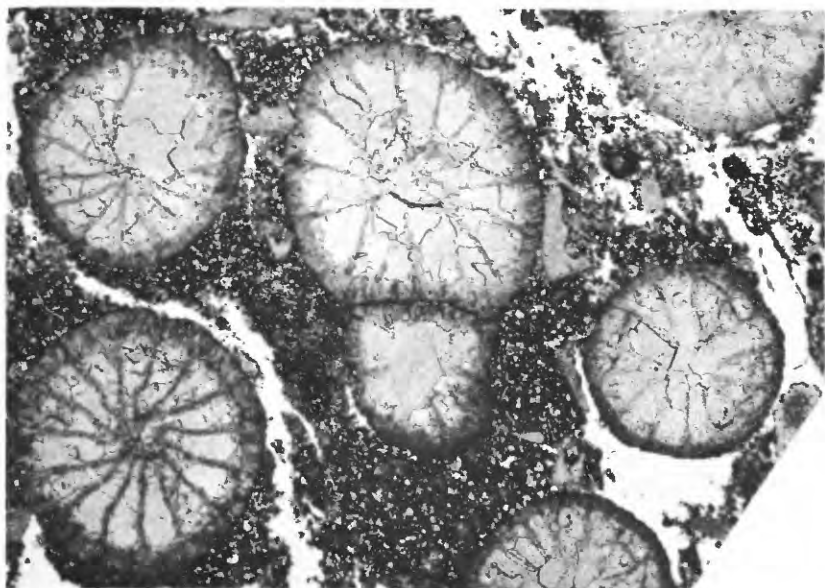
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DIPLOPHYLLUM CAESPITOSUM HALL

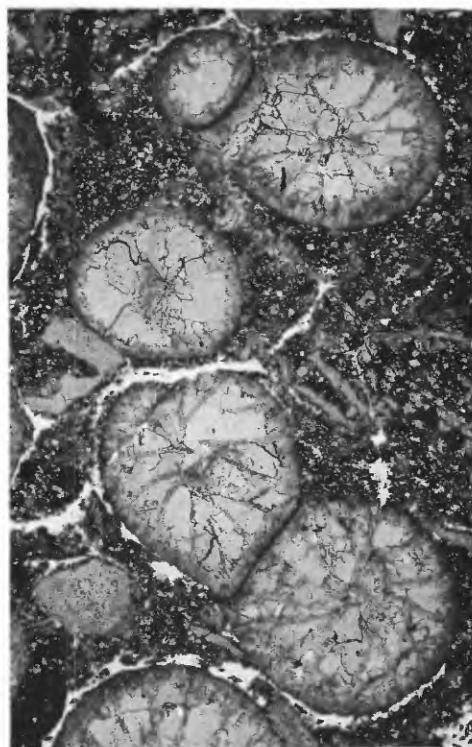
PLATE 4

FIGURES 1-7. *Palaeophyllum multicaule* (Hall) (p. 5).

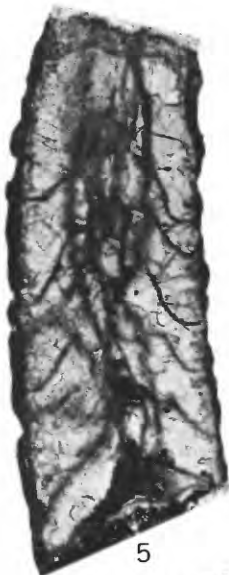
- 1-3. Thin sections of lectotype ($\times 10$), AMNH 1695:1. 1-2, transverse; 3, longitudinal.
4-6. Thin sections of paratype ($\times 10$), AMNH 1695. 4, transverse; 5-6, longitudinal.
7. Surface marking of three corallites ($\times 4$). Paratype; original of Hall, 1852, pl. 33, fig. 3e.



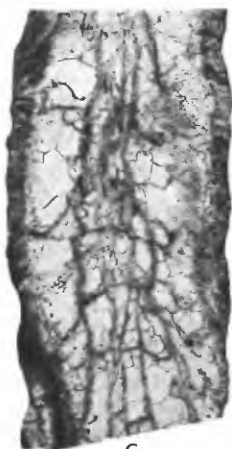
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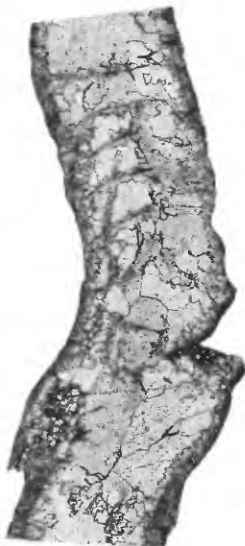
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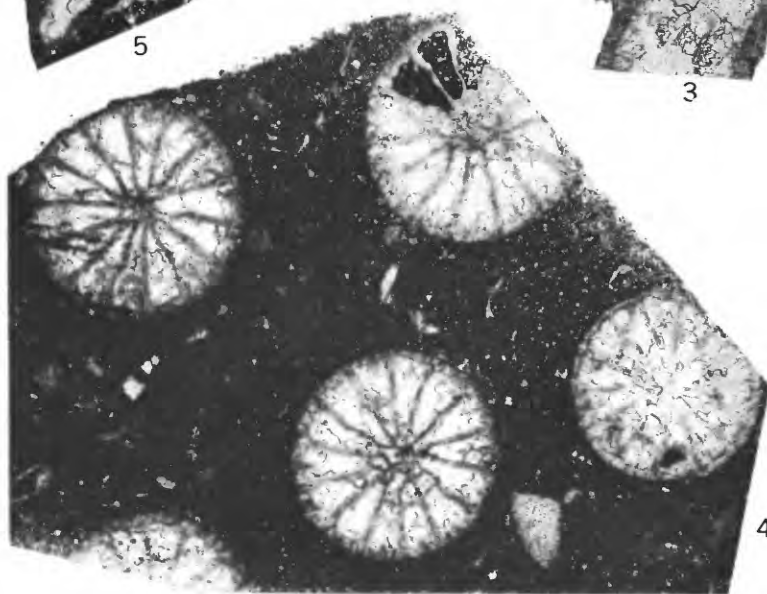
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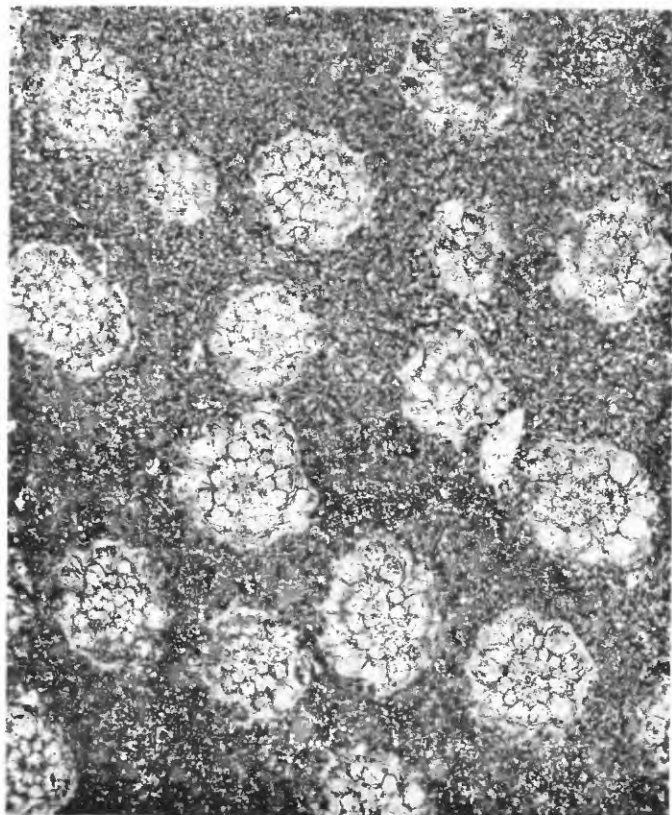


7

PALAEOPHYLLUM MULTICAULE (HALL)

PLATE 5

FIGURES 1-4. *Cladopora seriata* Hall (p. 6). Lectotype, AMNH 1679: 1.
1-3. Transverse and longitudinal thin sections ($\times 10$).
4. Lateral view of exterior ($\times 4$).



1



2



4



3

CLADOPORA SERIATA HALL

