University of Queensland

PAPERS

DEPARTMENT OF GEOLOGY

Volume 1 1939 Number 12

12. The Devonian Rugose Corals of Lilydale and Loyola, Victoria

BY

DOROTHY HILL, Ph.D., M.Sc.

REPRINTED
from
THE PROCEEDINGS OF THE ROYAL SOCIETY OF VICTORIA
51 (N.S.), Pt. II., 1939, pp. 219-256, pls. XIII-XVI.

DEPARTMENT OF GEOLOGY.

VOLUME 1. 1939. NUMBER 12.

THE DEVONIAN RUGOSE CORALS OF LILYDALE AND LOYOLA, VICTORIA.

By

DOROTHY HILL, PH.D., M.SC.,

Department of Geology, University of Queensland.

[Reprinted from the *Proceedings of the Royal Society of Victoria*, Vol. 51 (N.S.), Pt. II., 1939, pp. 219-256, pls. XIII.-XVI.]

THOMAS GILBERT HOPE, Acting Government Printer, Brisbane.

[Proc. Roy. Soc. Victoria, 51 (N.S.), Pt. II., 1939.]

Art. XI.—*The Devonian Rugose Corals of Lilydale and Loyola, Victoria.*

By DOROTHY HILL, M.Sc. (Qld.), Ph.D. (Cantab.).

[Read 10th November, 1938; issued separately, 24th July, 1939.]

(Plates XIII–XVI.)

Summary.

In this paper the Rugosa of Lilydale and Loyola are described and figured, and a review is given of the genera and families to which they are assigned. Remarks on new septal structures are included. Both faunas, previously supposed Upper Silurian, are shown to be Devonian; that of Loyola is probably Lower Devonian, and that of Lilydale older than Upper Devonian.

The Faunas and their Ages.

Corals have been known from Lilydale since 1890, when Etheridge described *Favosites grandipora,* referring to the age as Upper Silurian. The Rugosa from Lilydale have been described by Chapman (1914, 1925, 1931). Rugosa from Loyola were first described by Dun (1898), later by Etheridge (1899) and Chapman (1914) as Upper Silurian. An investigation of the stromatoporoid faunas of Lilydale and Loyola has suggested to Miss Ripper (1933, 1937 *a, b,* 1938) that both are Devonian (1938, p. 241); at Lilydale there is a high proportion of Lower and Middle Devonian species, but the Loyola fauna has Silurian affinities. The present study of the Rugose coral faunas indicates that both are Devonian; that of Loyola is probably Lower Devonian, and that of Lilydale either Lower or Middle Devonian. All the genera involved are characteristic of the Devonian; none has clear Silurian affinities. This determination of the age was made possible by recent work in Europe, notably by Lang and Smith, and Wedekind (see bibliography). For the purposes of the investigation all available figures of the species of the genera involved and of those genera which appear to be related have been studied, and the results of this study are included in the remarks on families and genera. The Tabulate corals are at present being investigated by O. A. Jones and myself, and so far support the conclusions expressed above

The Rugosa from Lilydale are:—

Prismatophyllum chalkii (Chapman).
Prismatophyllum stevensi (Chapman).
Mictophyllum cresswelli (Chapman).
Lyrielasma subcaespitosum (Chapman).

Prismatophyllum and *Mictophyllum* are known elsewhere only from the Devonian. *Lyrielasma* is a new genus with affinities to Lower and Middle Devonian species. From these Rugosa it is difficult to give a more precise age to the Lilydale limestone than Devonian, as none of the species show very close similarity to species known overseas. The presence of *Heliolites,* however, indicates that the fauna is older than Upper Devonian. None of the species occurs in either the Upper Silurian coral faunas of Yass, New South Wales, or the Middle Devonian fauna of Buchan, Victoria, but *L. subcaespitosum* is found at Loyola. The Lilydale coral locality is the quarry at Cave Hill.

The Rugosa from LOYOLA are:—

Acanthophyllum mansfieldense (Dun).
Phillipsastraea speciosa Chapman.
Phillipsastraea sp. indet.
Trapezophyllum elegantulum (Dun).
Thamnophyllum reclinatum sp. nov.
Loyolophyllum cresswelli Chapman.
Lyrielasma subcaespitosum (Chapman).
"*Cystiphyllum*" sp.

Acanthophyllum and *Thamnophyllum* are known only from the Devonian, *Phillipsastraea* is predominantly Devonian although two species have been recorded from the Silurian. *Trapezophyllum* and *Loyolophyllum* are found only at Loyola, but the former has affinities to the Devonian *Disphyllum* (*Phacellophyllum*), and the latter to the Devonian *Fasciphyllum* Schlüter. *Lyrielasma* occurs elsewhere at Lilydale, and cystimorphs are either Silurian or Devonian. It seems clear that this fauna is Devonian. The species *A. mansfieldense* and *T. reclinatum* are very similar to Lower Devonian species from Bohemia, and it is probable therefore that the Loyola fauna is Lower Devonian. *L. subcaespitosum* occurs at Lilydale, and *T. reclinatum* is very similar to *T. mitchellensis* (Etheridge) from Sandy's Creek, on the Mitchell River, Victoria, a locality formerly thought to be Upper Silurian, but I consider both these species indicate the Devonian. None of the other species are known elsewhere in Australia, from either the Upper Silurian Yass beds, or the Middle Devonian of Buchan or Taemas.

Family ACANTHOPHYLLIDAE.

Type Genus: ACANTHOPHYLLUM Dybowski.

Simple Rugosa with a wide dissepimentarium of small, highly arched dissepiments, long septa frequently modified, and numerous, shallowy concave tabulae deepened at the axis. The major septa are unequal, but are never amplexoid, and a metaseptum is the longest.

RANGE.—In Europe the family occurs somewhat rarely in the Lower Devonian, is very common in the Middle Devonian, and rare or absent in the Upper Devonian. There are many undescribed species in the Devonian of Australia. In the Downtonian of Russia, *Neocystiphyllum keyserlingi* (Dybowski; Soschkina, 1937, pl. xix, figs. 3, 4) may be a representative. Its apparent absence from America and Asia is surprising.

REMARKS.—This family comprises those forms related to *Cyathophyllum heterophyllum* Edwards and Haime. It is extremely difficult to decide whether the group is best divided into genera, or into sub-genera, or treated as one genus; or even on the limits of species within the group. Wedekind and others at Marburg have included German Middle Devonian members of the group under the following generic or sub-generic names:—*Mesophylloides* Wedekind (1921, p. 51), *Ptenophyllum* Wedekind (1924, p. 36), *Astrophyllum* Wedekind (1924, p. 46), *Rhopalophyllum* Wedekind (1924, p. 52), *Stenophyllum* Amanshauser in Wedekind (1925, p. 9, genotype *S. diluvianum* Amanshauser), and *Neostringophyllum* Wedekind (1921, p. 16, genotpye *N. ultimum* Wedekind). To evaluate these genera and their species in relation to one another and to the genera and species founded earlier from the same fauna would require a new revision of the German Middle Devonian Rugosa, and this of course could only be undertaken by someone to whom all the types are available. Meanwhile I refer to *Acanthophyllum* Dybowski all forms which I consider to belong to the group, *Acanthophyllum* being the earliest generic name specially applied to any of its members—viz., *Cyathophyllum heterophyllum* Edwards and Haime, and leave unsolved the taxonomic problems created by Wedekind's insufficient study of prior species and genera.

The following figures of Lower Devonian species appear to me to indicate membership of the family:—*Cyathophyllum* cf. *heterophyllum* E. & H., Charlesworth, 1914, pl. xxxi, fig. 6, Eastern Alps; *Pseudochonophyllum pseudohelianthoides* Scherzer, Sochkina, 1937, pl. xviii, figs. 1–4, Urals; *Cyathophyllum baculoides* Barrande, Počta, 1902, pl. 104, fig. 5, Koněprus, Bohemia, and Le Maitre, 1934, pl. v., fig. 18, Chalonnes, France; *Cyathophyllum ungeri* Penecke, 1894, p. viii, figs. 9–10, Graz, Austria.

Most of the Middle Devonian specimens figured by authors as *Cyathophyllum heterophyllum* and *C. torquatum* belong to the group, as also those figured by Wedekind under the generic and sub-generic names listed above. In addition, the following figures probably represent the group:—*Hallia pengellyi* Edwards and Haime, 1853, pl. xlix, fig. 6, Torquay; *Cyathophyllum obtortum* Edwards and Haime, 1853, pl. xlix, fig. 7, Torquay, and *Cyathophyllum roemeri* Edwards and Haime, 1853, pl. 1, fig. 3, Torquay.

I have not seen any figures of specimens from the Upper Devonian which could represent members of the family.

Genus ACANTHOPHYLLUM Dybowski.

Acanthophyllum Dybowski, 1873, p. 339; 1874, p. 493.

Rhopalophyllum Wedekind, 1924, p. 52.

Genosyntypes: Cyathophyllum heterophyllum Edwards and Haime, 1851, pl. x, figs. 1*a–c*. Devonian, Eifel.

Acanthophyllum linarsönii Dybowski, 1874, p. 493, pl. v, figs. 1–1*a*, Silurian, Insel Oesel. [possibly = *Spongophylloides* sp.]

GENOLECTOTYPE.—Chosen Schläter, 1889, p. 38: *Cyathophyllum heterophyllum* Edwards and Haime.

DIAGNOSIS.—Large, simple Rugosa with a wide dissepimentarium of small, highly arched dissepiments, with shallowly concave, axially deepened tabulae, and with long, but unequal major septa. The axial ends of the major septa are arranged in groups in the tabularium, and are straight, or curved vortically, the curvature differing in degree from group to group; the cardinal septum is typically short, and one septum, not a protoseptum, extends to the axis. The septa show different types of modification; they are frequently much dilated, either in the dissepimentarium, or more rarely in the tabularium, or in both; towards the periphery they may be thin and lined with lateral dissepiments; in the tabularium they are sometimes waved and carinate.

RANGE.—Fairly common in the Lower Devonian of Europe, and very common in the Middle Devonian of Europe. Lower and Middle Devonian of Victoria.

REMARKS.—I have examined Edwards and Haime's figured syntype of *C. heterophyllum,* now in the Natural History Museum, Paris. The unpolished vertical section shows concave, axially deepened tabulae, small, arched dissepiments, and vertical sections of the axial ends of the septa with the waves and carinae characteristic of the specimens figured by Wedekind (1924, figs. 76-98) as *Rhopalophyllum.* The major septa are more dilated than the minor septa, and both orders attenuate towards periphery and axis. A transverse section of this syntype was not available, but I consider the vertical section is sufficient to prove its identity with the *Cyathophyllum heterophyllum* E. & H. of Frech (1886, pl. vi, fig. 7), from the Upper *Calceola* beds of Auburg near Gerolstein, which was refigured by Wedekind (1924, fig. 96) as a syntype of his new sub-genus *Rhopalophyllum* of his new genus *Ptenophyllum.* By my here chosing *C. heterophyllum* E. & H., Frech as genolectotype of *Rhopalophyllum, Rhopalophyllum* becomes a synonym of *Acanthophyllum.* Other genera described by Wedekind under his family Ptenophyllidae may well be synonyms of *Acanthophyllum* (see remarks on the Family Acanthophyllidae).

ACANTHOPHYLLUM MANSFIELDENSE (Dun).

(Plate XV, figs. 1–3.)

Cyathophyllum mansfieldense Dun, 1898, p. 87, pl. iii, figs. 3–4; Griffith's Quarry, Loyola, near Mansfield.

HOLOTYPE.—George Sweet Collection, National Museum, Melbourne.

DIAGNOSIS.—*Acanthophyllum* with septa carinate and but slightly curved in the dissepimentarium, the dilatation periodically increasing wedge-wise towards the periphery and then being suddenly reduced.

DESCRIPTION.—This description is based on two fragments collected by Miss E. Ripper, 1646 and 1653 in the Department of Geology, Melbourne University. The first has a diameter of 38 mm., and the second of 15 mm. From these it is inferred that the corallum is simple, and turbinate or trochoid. There are 52 septa, the 26 minor septa being equal in length and extending three-quarters of the way to the axis. The major septa extend unequally into the tabularium; the cardinal septum is the shortest, and none of the proto-septa are predominant in length, the longest septum being a meta-septum in one of the cardinal quadrants. Those parts of the septa in the tabularium may be straight, or turned aside at their axial edges, and waved or carinate, and sometimes swollen slightly at the axial edge; dilatation is not great. Those parts of the septa in the dissepimentarium are dilated, and in transverse section the dilitation would appear to be periodic. Thus the septa thicken outwards like wedges for some distance, when there is a general and sudden reduction, so that wide interseptal loculi appear; then again they thicken outwards wedgewise, and again a sudden reduction occurs. Thus successive but rather irregular stereozones are obtained. The septa are dilated and in contact at the periphery. The fibres of the septal trabeculae are directed obliquely from the median plane of the septum. The floor of the tabularium is slightly concave, with an axial deepening; the tabellae are incomplete, closely placed and shallowly arched. The dissepiments are small and rather highly arched, numerous, slightly inclined at the periphery, but becoming steeply inclined near the tabularium, and are frequently of angular transverse section.

REMARKS.—In the nature of the dilatation of its septa, this species is exactly similar to *Acanthophyllum baculoides* (Barrande in Počta, 1902, pl. 104, fig. 5) from F_2 (Coblenzian), Koněprus, Bohemia, and from the limestone of Chalonnes, France, which Le Maitre (1934) has argued is at the limit between the Coblenzian (top of the Lower Devonian) and Couvinian (base of the Middle Devonian). But *A. baculoides* in contrast to *A. mansfieldense,* shows marked rotation of the septa in the tabularium. *A. baculoides* and *A. mansfieldense* have

a different type of septal dilatation from all other *Acanthophyllum*, in that the septa increase in thickness wedgewise to the periphery, with or without intermittent setbacks; in most *Acanthophyllum* the septa are spindled, dilatation decreasing towards the periphery as well as towards the axis. Connected with these two types of dilatation is the appearance of two types of dissepiment-like plates derived from the septal invaginations. In *A. baculoides* where the dilatation increases towards the periphery, the septa may break down into naic plates (Hill, 1935, p. 502); in *A. richteri* (Wedekind, 1921, pl. i, fig. 2) etc. they are lined with lateral dissepiments.

Family DISPHYLLIDAE.

Type Genus: DISPHYLLUM de Fromentel, 1861, p. 302.

Rugose corals with septa which tend to be dilated and to develop trabecular carinae, and to have an area of divergence of the septal trabeculae; with flat or gently curved axial tabulae, usually complete, often supplemented by inclined, periaxial tabulae; and with globose dissepiments which may be arranged in a vertical series of horse-shoes to form the wall of the tabularium.

RANGE.—Devonian of Europe, America, Australia, and Asia.

REMARKS.

I.—GENERAL.

The group has been admirably expounded by Lang and Smith (1935*b*) who have recognized five genera and discussed twenty of their synonyms, including one genomorph. The phaceloid *Disphyllum* persists throughout the Devonian, showing a great variety of structure, and its genomorph {*Phacellophyllum*} Giirich (1909, p. 102) also. The phaceloid *Thamnophyllum* Penecke (1894, p. 593) is common in the Lower Devonian and Couvinian of Styria. The cerioid *Prismatophyllum* (Simpson, 1900, p. 218) occurs first in the Lower Devonian, but is more common in the Middle and Upper Devonian. The plocoid *Phillipsastraea* d'Orbigny (1849, p. 12) has been recorded from the Upper Silurian of Estonia (see p. 236). A Lower Devonian species from Bohemia was called *Phillipsastraea* by Počta (1902, p. 158), but the genus had a widespread development in the Middle and Upper Devonian. *Macgeea* Webster (1889, p. 710), a genus of solitary or weakly compound species, is known at present only from the Givetian and Frasnian. A sixth genus is here included, the cerioid *Trapezophyllum* Etheridge (1899, p. 32) from the Lower(?) Devonian of Victoria, which has the same morphological relation to *Prismatophyllum* as {*Phacellophyllum*} has to *Disphyllum*.

The Disphyllidae are extremely important in Australian Devonian faunas, and in order to facilitate comparison of the Australian species with those from known horizons overseas, and thus to ascertain their stratigraphical value, the family is reviewed in this paper. *Disphyllum* and *Macgeea* are discussed immediately, but *Thamnophyllum, Prismatophyllum, Trapezophyllum* and *Phillipsastraea* all have species occurring at Lilydale or Loyola, and are discussed under their separate generic headings.

II.—MORPHOLOGY AND STRATIGRAPHY OF DISPHYLLUM.

A.—Tabularium.

The arrangement of the plates in the tabularium is very varied, and six patterns are recognized. Their relation is proved by more than one of them occurring in the same corallum, and by their association with similar septal and dissepimental characters.

1. In the American Couvinian *panicum* (Winchell, Ehlers and White, 1932, p. 93, pl. i, fig. 1, pl. iii, figs. 3–5, pl. iv, figs. 3–4, pl. v) there is an inner series of unequal tabulae, sometimes complete and horizontal, domed or saucered, and an outer series of tabellae inclined towards the axis. In the co-existent *elongatum* (Simpson, 1900, fig. 42) the outer series is unimportant.

2. In the European Givetian and Frasnian *goldfussi* (Geinitz, Lang and Smith 1935*b*, pl. xxxv, figs. 4, 8) and *caespitosum* (Goldfuss, Lang and Smith, 1935*b*, p. 573) there is an inner zone of very shallowly domed plates, and a narrower outer area of large inclined plates, the outer zone forming a higher part of the calicular floor than the inner.

3. In the European Givetian and Frasnian *trigemme* (Quenstedt, Lang and Smith, 1935*b*, p. 575) this second type is modified so that the plates of the inner area are flat.

4. In the European Upper Givetian or Lower Frasnian *aequiseptatum* (Edwards and Haime, Lang and Smith, 1935*b*, pl. xxxv, fig. 14) the inner series is of incomplete unequal, but rather globose plates inclined towards the axis. The Australian *virgatum* (Hinde, Hill 1936*b*, pl. i, fig. 3) and *depressum* (Hinde, Hill, 1936*b*, pl. i, figs. 4, 7) of similar age belong to this group.

5. In the European Givetian *geinitzi* Lang and Smith, (1936*b*, pl. xxxvi, fig. 3) the outer series is not developed, and the complete tabulae are shallow domes.

6. In the European Frasnian *minus* (Roemer, Lang and Smith, 1936*b*, pl. xxxv, fig. 3, Ma 1937, pl. ii, fig. 1) the outer series becomes unimportant, and an axial series of flatly domed tabellae is superimposed on the inner series of the *goldfussi* type.

B.—Dissepimentarium.

1. In the American Couvinian *arundinaceum* (Billings, Lang and Smith, 1936*b*, p. 561) the interseptal loculi are closed by septal dilatation, except for the spaces within a single series of horse-shoe dissepiments.

2. In the American Couvinian *panicum* and *elongatum,* and the European Givetian and Frasnian *goldfussi,* the dissepiments are globose and inclined towards the axis, the inner series being more inclined than the outer, which also tend to be larger.

3. In the European Givetian and Frasnian *Phacellophyllum caespitosum* and *Phacellophyllum trigemme* there is a single outer series of flat dissepiments and a single inner series of horse-shoe dissepiments.

4. In the European Frasnian *minus* there is only a series of horse-shoe dissepiments.

5. In the European Givetian *geinitzi* there is one or sometimes two series of rather globose or highly inclined dissepiments.

C.—Septa.

1. In the American Couvinian *arundinaceum* the septa are much dilated, the dilatation decreasing sharply in the tabularium.

2. In the American Couvinian *arundinaceum* and *panicum* the septa have trabecular carinae, curved at right angles to the dissepiments.

3. In the European Givetian and Frasnian *caespitosum, trigemme* and *minus* the septa have trabecular expansions over the horse-shoe dissepiments, the curvature of the trabeculae being at right angles to the surfaces of the horse-shoes.

4. In the Australian Upper Givetian or Frasnian *depressum* and *virgatum,* the septa are dilated and in contact at the periphery, and through most of the dissepimentarium, but attenuate towards the axis.

5. In the European Givetian and Frasnian *goldfussi* and *aequiseptatum,* the septa are but slightly thickened, more so towards the periphery, and may be slightly sinuous.

III.—MACGEEA.

Macgeea has a type of septal dilatation (Lang and Smith, 1935*b*, p. 577) not seen in *Disphyllum*, but relationship is proved by the area of divergence in the septal trabeculae corresponding in position with the horse-shoe dissepiments (*loc. cit.* pl. xxxvii, figs. 8, 9), by the dissepimentarium, which resembles that of *Phacellophyllum,* and by the tabularium, which is a modification of the *minus* and *aequiseptatum* types.

Genus THAMNOPHYLLUM Penecke.

Thamnophyllum Penecke, 1894, p. 593.

Thamnophyllum; Lang and Smith, 1935*b*, p. 564.

GENOLECTOTYPE.—Chosen Lang and Smith *loc. cit.: Thamnophyllum stachei* Hornes in Penecke, 1894, p. 594, pl. viii, figs. 1–3, pl. xi, figs. 1–2. *Barrandei* beds (upper part of Lower Devonian) and Couvinian of Graz, Austria.

DIAGNOSIS.—Dendroid Rugosa with typically straight corallites, and increase which is usually parricidal and produces four large marginal offsets which, in their earliest stages, are united by dissepimental tissue occupying the fork formed by the diverging branches. The septa are so dilated in the dissepimentarium that the only loculi are those enclosed by a median series of horse-shoe dissepiments, the trabecular dilatation of the septa being continuous over the surfaces of these dissepiments. In the tabularium the septa are attenuate and do not reach the axis. Typically the tabulae are transverse, flat or slightly domed or saucered, mostly complete, and usually very widely spaced.

RANGE.—Upper part of the Lower Devonian of Austria, Lower Middle Devonian of Austria and France, and possibly Givetian of France.

REMARKS.—The genus differs from *Disphyllum* in the excessive septal dilatation in the dissepimentarium and in the wide spacing of its tabulae. Lang and Smith have considered it wise to regard the group as a separate genus from *Disphyllum,* and their classification is followed herein. From the American Couvinian *Synaptophyllum* Simpson (1900, p. 202) which Lang and Smith (1935*b*, p. 561) consider synonymous with *Disphyllum,* it differs only in growth form and in the absence of carination on the septa. Of the three European species recognized, the genotype has short septa, complete, widely separated tabulae, and dissepiments suppressed by the septal dilatation; *hornesi* Penecke (1894, p. 595, pl. vii, figs. 13, 14; pl. xi, fig. 3) which occurs with *stachei,* differs in having stouter corallites, longer septa, concave and less regular tabulae, and dissepiments which are not entirely masked by stereome; *murchisoni* Penecke (1894, p. 595, pl. vii, figs. 15-17) has long septa which are peripherally strongly dilated and more or less contiguous laterally, crowded tabulae, and dissepiments almost or completely masked by septal dilatation; it occurs in the Lower Devonian of Austria, and specimens from the Givetian of France have been referred to it by Le Maitre (1937, p. 111, pl. vii, figs. 3-5, 11, 12; pl. viii, fig. 7). These, however, may be *Columnaria* cf. *rhenana* Frech.

In *Thamnophyllum,* as Weissermel (1938, p. 67) has remarked, no epitheca has been observed, and the peripheral stereozone is formed entirely by the dilated septa without any circumferential wall of fibres to the interseptal loculi.

THAMNOPHYLLUM RECLINATUM sp. nov.

(Plate XVI, figs. 7, 8.)

HOLOTYPE.—R25186, British Museum (Natural History), London. E. O. Teale Collection, from Griffith's Limestone Quarries, S.W. from Mansfield, Victoria.

DIAGNOSIS.—*Thamnophyllum* with major and minor septa approximately equal in length, with a wide peripheral stereozone of reclined trabeculae, a narrow tabularium, and a series of small horse-shoe dissepiments sometimes supplemented by other steeply inclined globose dissepiments.

DESCRIPTION.—The corallum is dendroid, the corallites being stick-like, from 3 to 5 mm. in diameter, and irregularly spaced, up to 5 mm. apart. No trace of an epitheca is seen on the corallites, the septa projecting outwards as angular ridges. The septa are of two orders, 14 to 16 of each, and the major septa can only with difficulty be distinguished from the minor, both extending about two-thirds of the way to the axis. They are dilated, particularly in the peripheral half of their length, where they are invariably in contact laterally; narrow interseptal loculi appear between the more axial parts. The septa consist of trabeculae arranged in single series, inclined fan-wise, the inclination being at right-angles to that part of the surface of the horse-shoe dissepiment on which they appear to be based; in the peripheral half of the dissepimentarium, outside the horse-shoe dissepiments, this inclination is horizontal. One series of small horse-shoe dissepiments appears in the axial parts of the dissepimentarium; it may be supplemented by an outer series of small, globose, but highly inclined plates. The tabulae are complete or incomplete, supplemented at their margins by smaller plates. They may be flat or sagging, and are rather distant.

REMARKS.—This species resembles *Thamnophyllum mitchellensis* (Etheridge, 1899, p. 30, pl. A, figs. 6, 7, 8, 12; pl. B, fig. 11) from Sandy's Creek on the Mitchell River, Victoria, in the equality in length of the two orders of septa; it differs in the relative width of the dissepimentarium, which is only half the radius of the corallite in *mitchellensis,* in the width of the peripheral stereozone of inclined trabeculae, which is not noticeable in *mitchellensis,* and in the frequent occurrence of more than one series of dissepiments. It differs from all the Austrian species described by Penecke (1894) from the Lower Devonian *barrandei*-beds of Graz, Austria, in having its two orders of septa approximately equal in length. The known range of the genus in Europe is Upper Lower Devonian, and Lower Middle Devonian, and probably the Victorian species are within these age limits.

Genus PRISMATOPHYLLUM Simpson.

Prismatophyllum Simpson, 1900, p. 218.

Prismatophyllum; Lang and Smith 1935*b*, p. 558, q.v. for synonymy.

GENOTYPE.—*Prismatophyllum prisma* Lang and Smith *loc. cit.* (=*Cyathophyllum rugosum* Edwards and Haime *non* Hall. See Lang and Smith *loc. cit.*) Lower Middle Devonian Onondaga ("Jeffersonville") Limestone; Falls of Ohio, etc., U.S.A.

DIAGNOSIS.—Cerioid Rugose corals with septa which may, or may not, reach the axis; tabulae typically differentiated into a horizontally disposed axial series and an axially inclined peri-axial series; and typically numerous, small, globose dissepiments.

RANGE.—*Prismatophyllum* is rare in the Lower Devonian of France, common in the Couvinian of America and the Couvinian and Givetian of Europe, occurs rarely in the Givetian or Frasnian of Western Australia, and is common in the Frasnian of Europe and America. It has been doubtfully recorded from the Middle Devonian of China, and Yü has placed in it specimens believed to come from Lower Carboniferous rocks in China (Yü, 1933, p. 78).

REMARKS.—The cerioid *Prismatophyllum* shows certain differences from the phaceloid *Disphyllum* in the variability of its internal structure. Thus only two types of dissepimentarium are seen—the *goldfussi* type (p. 226) and a type not known in *Disphyllum*, but common in *Phillipsastraea*. A tabularium found in *Prismatophyllum* but not in *Disphyllum* (unless *Pexiphyllum arcuatum* and *ultimum* of Walther, 1928, figs. 24-26, be *Disphyllum*) is the clisioid axial structure. Spindle septa are common in *Prismatophyllum*, but rare in *Disphyllum*.

MORPHOLOGY AND STRATIGRAPHY OF *Prismatophyllum*.—I consider that the following illustrations represent *Prismatophyllum*. The list obviates the necessity to give references in the discussion following.

LOWER DEVONIAN OF FRANCE.

Acervularia namurcensis Barrois, 1889, pl. i, fig. 1.

Acervularia venetensis Barrois, 1889, pl. i, fig. 2.

COUVINIAN OF AMERICA.

Prismatophyllum anna (Whitfield); Stewart, 1938, pl. 9, figs. 11, 12.

Prismatophyllum prisma Lang and Smith; Stewart, *id.*, figs. 13–15.

Prismatophyllum whitfieldi Stewart (*non* Webster and Fenton), *id.*, pl. 10, figs. 3–4. ?=*Prismatophyllum rugosum* Simpson, 1900, figs. 44, 45; *non* Hall, *non* Edwards and Haime. ?=*Prismatophyllum goldfussi* (Edwards and Haime); Ma, 1937, pl. iii, fig. 2.

Prismatophyllum truncatum Stewart, 1938, pl. 10, figs. 1, 2.

Prismatophyllum kirki Stumm, 1937, pl. 55, fig. 7.

Prismatophyllum sedgwicki (Edwards and Haime); Ma, 1837, pl. iii, fig. 3 (Middle Devonian).

GIVETIAN OF EUROPE.

Prismatophyllum quadrigeminum (Goldfuss); Lang and Smith, 1935*a*, pl. xii, figs. 5, 6.
Prismatophyllum hexagonum (Goldfuss); Lang and Smith, 1935*a*, p. 432.
Cyathophyllum hexagonum Goldfuss; Frech, 1886, pl. iii, figs. 20–22.
Campophyllum dianthus (Goldfuss); Ma, 1937, pl. iv. (Middle Devonian).
Also, *Columnaria sulcata* Goldfuss, Lang and Smith, 1935*a*, pl. xii, figs. 1, 2, seems to me a possible Disphyllid (see p. 241).

GIVETIAN OR FRASNIAN OF WESTERN AUSTRALIA.

Prismatophyllum brevilamellatum Hill, 1936*b*, p. 32, figs. 6–8.

FRASNIAN OF EUROPE.

Cyathophyllum davidsoni Edwards and Haime, 1851, topotype, U. of Qld.
Cyathophyllum boloniense Edwards and Haime, 1851, topotype, U. of Qld.
Prismatophyllum quadrigeminum (Goldfuss); Ma, 1937, pl. iii, fig. 1.
Phillipsastraea pentagona (Goldfuss); Frech, pl. iii, fig. 7.
Phillipsastraea pentagona var. *micrommata* (Roemer); Frech, 1885, pl. iii, figs. 11–13.
Phillipsastraea ananas (Goldfuss); Frech, 1885, pl. iii, fig. 14.
Haplothecia filata Frech, 1885, pl. iv, fig. 7.
Heliophyllum troscheli (Edwards and Haime); Schlüter, 1881, pl. iv, figs. 3, 4.
Heliophyllum cf. *limitatum* (Edwards and Haime); Schlüter, 1881, pl. iv, figs. 1, 2.

FRASNIAN OF AMERICA.

Specimens referred to five species of *Acervularia* Schweigger by Fenton and Fenton, 1924, p. 55, probably are *Prismatophyllum*, but only externals are figured.

The Types of Septa observed in *Prismatophyllum* are:—

1. In the list given above, the French Lower Devonian *namnetensis* and *venetensis*, the European Middle Devonian *hexagonum*, Frech, and Frasnian *pentagonum* and *micrommatum*, *troscheli* and *limitatum* show spindle septa well developed. In spindle septa, dilatation is great towards the inner edge of the dissepimentarium, but lessens towards both axis and periphery. Septa which are not thus dilated may occur in the same corallum.

2. In the American Couvinian and the German Frasnian, the septa have trabecular carinae, opposite or alternate on either side of the septa. The carinae are developed on thick, thin, or spindle septa.

3. In the American Eifelian, the German Givetian, and the French Frasnian, attenuate septa are common; they may be slightly spindled.

4. In the Australian *stevensi* (*vide* infra), the septa are dilated at the periphery and in the dissepimentarium, but attenuate rapidly towards the axis. This is the *Disphyllum depressum* type (see p. 226).

Species with septa not extending beyond the dissepimentarium and species with septa reaching to the axis occur in Lower, Middle and Upper Devonian.

The Tabularium of *Prismatophyllum.*

1. Clisioid; in the American Middle Devonian *sedgwicki* Ma, the tabular floor is domed, and the tabulae are replaced by tabellae; in the German Frasnian *ananas* the tabellae are distinctly grouped in two series, the inner forming a steep dome.

2. In the German Middle Devonian *quadrigeminum* Goldfuss, the French Frasnian *quadrigeminum* Ma, and in the German Frasnian *troscheli* Schlüter, the *Disphyllum minus* type of tabularium occurs with the *goldfussi* type (see p. 225).

3. In the French Lower Devonian *namnetensis,* the American Couvinian *whitfieldi* and the German Frasnian *pentagonum* (Frech) and var. *micrommata* (Frech), and *filatum,* the *Disphyllum geinitzi* type of tabularium (see p. 225) is interrupted by long septa.

4. In the German Middle Devonian *hexagonum* Frech and *dianthus* Ma and the American Couvinian *anna, prisma* and *truncatum,* the *Disphyllum elongatum* type occurs (see p. 225).

The Dissepimentarium is of two types:—

1. In the German Frasnian *troscheli, ananas* and *micrommatum,* there is a change in the direction of inclination of the dissepiments and septal trabeculae near the inner edge of the dissepimentarium. The dissepiments, which are somewhat less globose than in *Disphyllum,* are horizontally based at this critical area, and are inclined on either side. This condition is common in *Phillipsastraea,* but is not yet known in *Disphyllum.*

2. In all other *Prismatophyllum* listed above the dissepiments are inclined towards the axis, the angle of inclination being slight in peripheral series, but increasing in the inner series.

Prismatophyllum stevensi (Chapman).

(Plate XIII, figs. 6, 7.)

Spongophyllum stevensi Chapman, 1925, p. 113, pl. xiv., figs. 17*a*, *b;* pl. xv, figs. 24, 27; Mitchell's Quarry, Cave Hill, Lilydale.

Spongophyllum stevensi; Jones, 1932, p. 52.

Holotype.—13305, National Museum, Melbourne, L. E. Stevens Collection. A portion of the holotype (the only specimen known) is in the collection of the Geological Department of the University of Melbourne, No. 797. Slides cut from this portion are here figured.

DIAGNOSIS.—*Prismatophyllum* with septa dilated in the dissepimentarium and attenuate in the tabularium, with dissepiments globose distally, and two series of dissepiments forming a concave tabular floor.

DESCRIPTION.—The corallum is cerioid and large, with a diameter of 18.7 cm., and a height of 6.8 cm. The corallites are polygonal, usually pentagonal, subequal and straight, with an average diameter of 6 mm. The septa are usually so dilated in the dissepimentarium as to be in contact laterally, but spaces may be left wherein dissepiments are developed. Usually there are 16 major septa alternating with 16 minor septa. The minor septa extend to the inner edge of the dissepimentarium, that is, one-quarter to one-third of the way to the axis. The major septa are unequal in length. Some few of them extend to the axis, but others are very little longer than the minor septa. Those portions of both orders of septa projecting into the tabularium thin rapidly towards the axis. Neither order of septa are waved or carinate, nor do they twist at the axis. The tabulae are typically of two series, an axial series of flat or sagging plates, and an outer series of smaller, inclined plates. Occasionally, however, only one series is present, one or two flat tabulae extending completely across the tabularium. There are one, two, or three vertical series of dissepiments, small, fine, globose distally, and inclined towards the axis.

REMARKS.—In its internal structure this cerioid species resembles very closely the phaceloid *Disphyllum depressum* (Hinde; Hill, 1936, pl. i, figs. 4-8) from the Givetian or Frasnian of Western Australia. It cannot be closely compared with any other *Prismatophyllum* and so does not indicate any particular period, but the known range of the genus is Devonian and possibly Lower Carboniferous. Its septa are like the septa of *D. depressum*. Its dissepiments are those characteristic of the genus, the outer peripheral series being larger and more horizontally based than the others, as in *D. goldfussi*. Its tabularium is divided into an inner and an outer series, like that of *D. panicum*.

The species can thus be removed to the Family Disphyllidae, as it possesses all the salient features of that group, as these were described recently by Lang and Smith (1935*b*). It resembles *Spongophyllum*, however, in having concave tabulae, but in the Spongophyllidae the concave tabulae are parallel and close together, whereas in *stevensi* the tabularium has the lack of parallelism characteristic of the *D. panicum* type (see p. 225).

PRISMATOPHYLLUM CHALKII (Chapman).

(Plate XIII, figs. 1–5.)

Acervularia chalkii Chapman, 1931, p. 94, text-fig. Cave Hill, Lilydale, Victoria. Lower or Middle Devonian.

HOLOTYPE.—Specimen in Mr. Chapman's Collection, Melbourne.

DIAGNOSIS.—*Prismatophyllum* with slightly carinate septa dilated towards the inner edge of the dissepimentarium; the major septa are withdrawn from the axis; the calical floor rises from the periphery to the inner edge of the dissepimentarium; the tabulae are distant, and complete, and slightly domed or saucered plates are mixed indiscriminately with incomplete plates inclined towards the axis.

DESCRIPTION.—The corallum is cerioid, increase being intermural, the offsets often arising in a ring round the parent, both at the angles and along the sides. The divisional walls between the calices are rather thin in the holotype, with a tendency to zig-zag, as in semi-astraeoid coralla, but are of fair thickness in some fragments (F 3254–5, University of Queensland Collection; 1654–5 in Melbourne University Geology Dept. Colln.). No external view of the species has been obtained. The corallites vary very much in size, 8 mm. being the greatest diameter observed; the offsets are 1 mm. in diameter at origin, and at this size the septa are all extremely short, forming a mere fringe, rather ragged, round the offset, which consists therefore mostly of tabularium; no dissepiments are observed in the offsets when they first arise, but they appear as the diameter increases; at first the septa are equally dilated from epitheca to tabularium, but at greater diameters the peripheral parts are thinner. In the adult coralite (6–8 mm. in diameter) there are 26–30 septa, usually 28. They are all spindle shaped in transverse section, because of their attenuation towards the periphery and again towards the axis; their thickest part is just outside the inner edge of the dissepimentarium; they are usually carinate and therefore are wavy in transverse section, the carinae being directed at right angles to the inclination of the dissepiments like the trabeculae, which have an area of divergence near the inner edge of the dissepimentarium; to the outside of this the trabeculae are inclined upwards and outwards, and to the inside they are inclined upwards and inwards. This condition is well seen in Frech's figure (1885, pl. iii, fig. 14) of *Phillipsastraea ananas* Goldfuss. In some parts of the holotype, however, the septa are thin; the minor septa are usually a little thinner than the major septa. The major septa may proceed into the tabularium, sometimes almost to the axis, as very thin wavy extensions, but in most corallites they are only as long as the minor septa. The dissepiments are very fine, globose plates; most of them are inclined towards the periphery, but near the inner edge of the dissepimentarium they are horizontally based, giving a series like horse-shoe dissepiments but not so globose, and inside this they are inclined towards the axis. In transverse section those plates inclined towards the periphery have their concavity outwards, and frequently they are geniculate; a herring-bone pattern may be produced by the inosculation of two series of dissepiments in each interseptal loculus, one dependent on each of

the bounding septa. The innermost series of dissepiments may be dilated; but whether this dilatation is composed of trabecular extensions from the septa as in *Phacellophyllum* or by a thickening of the horizontal tissue cannot be determined from the material I have. The tabulae are distant and irregular; some are complete, horizontal or slighty saucered; others are incomplete and are inclined towards the axis.

REMARKS.—This species has the structure of those Devonian species placed in *Acervularia* Schweigger by Edwards and Haime (1851); the differences between the Silurian and Devonian species of Edwards and Haime's interpretation were first recognized by Simpson (1900, p. 218) who founded *Prismatophyllum* for the Devonian species, but were not generally accepted until Lang and Smith's work on both genotypes was published (1927, p. 451; 1935*b*, p. 558).

This is the only known species of *Prismatophyllum* in which short major septa are combined with an area of divergence in the inclination of the dissepiments and trabeculae. Other species with major septa which do not extend into the tabularium are the Lower Devonian *venetensis,* the American Couvinian *anna, truncatum,* and *kirki,* the Givetian or Frasnian *brevilamellatum,* and the Frasnian *limitatum* E. & H., Schlüter (1881, pl. iv, figs. 1, 2). Other species with an area of divergence of dissepiments and trabeculae are "*Philipsastraea ananas* G." Frech (1885, pl. iii, fig. 14), and *Prismatophyllum approximans* (Chapman, 1914, pl. xlvii) from Victoria.

It is not possible to compare *P. chalkii* closely with any other species of *Prismatophyllum,* and therefore the only assistance it gives in indicating the age of the Lilydale limestone is that the genus is known elsewhere only in the Devonian.

Genus TRAPEZOPHYLLUM Etheridge.

Trapezophyllum Etheridge, 1899, p. 32.

GENOTYPE (by designation): *Cyathophyllum elegantulum* Dun, 1898, p. 85, pl. iii, figs. 5, 6. Limestone Quarry, Loyola.

DIAGNOSIS.—Cerioid Rugose corals with an outer series of flat dissepiments, an inner series of horse-shoe dissepiments, and complete, concave tabulae.

REMARKS.—A frequent development in the phaceloid members of the Disphyllidae is the arrangement of the dissepiments into an outer single series of flat plates, and an inner single series of horse-shoe dissepiments. The cerioid members are so far without such a representative in Europe or America, and it is therefore of interest that the Victorian species *Cyathophyllum elegantulum* is such a cerioid form. The phaceloid species showing these characteristic dissepiments are grouped by Lang and Smith into a genomorph of *Disphyllum* {*Phacellophyllum*} Gürich. It may be that the Australian *C. elegantulum* should be regarded as a

genomorph of the cerioid *Prismatophyllum*; but until more evidence of its phylogeny is obtained it is best referred to the genus *Trapezophyllum*. Etheridge made the species the type of a new section of the genus *Cyathophyllum* characterized by the equality and shortness of the septa. But the work of Lang and Smith indicates that its relations are with the *Disphyllum* group; hence the character of the dissepiments is more important diagnostically than the length of the septa. The genus is known only from Loyola, although Etheridge suggested that *C. pelagicum* Billings (1862, p. 108) and *C. wahlenbergii* Billings (*id.*) from the Silurian of Canada should be placed under *Trapezophyllum*. *C. wahlenbergii* seems from the figures (Lambe, 1901, pl. xi. fig. 2) to be *Xylodes rugosus*. *C. pelagicum* is unfigured.

Trapezophyllum elegantulum (Dun).

(Plate XVI, figs. 9–11.)

Cyathophyllum elegantulum Dun, 1898, p. 85, pl. iii, figs. 5, 6.

Cyathophyllum ? elegantulum; Etheridge, 1899, p. 31, pl. B, figs. 2–4. Sections figured 3, 4, are A.M.2 in Australian Museum.

C. (*Trapezophyllum*) *elegantulum;* Etheridge, 1899, p. 32.

Holotype.—41717, Collection of the Geological Survey of Victoria, formerly part of 107, George Sweet Collection. Limestone Quarry, Loyola. Figured Dun *loc. cit.*, Etheridge *loc. cit.*

Diagnosis.—*Trapezophyllum* with major and minor septa equal and extending half-way to the axis.

Description.—The corallum is cerioid, of unknown shape. Increase is intermural, but sometimes the offsets are not separated from the parent corallites by epitheca, and the corallum is thus locally thamnastraeoid. The corallites are usually hexagonal, with a diameter between 2 and 4 mm. There are 10 to 12 major septa alternating with minor septa, but the minor septa are only with difficulty distinguished from the major septa, both series extending half-way to the axis. They are thin and do not show carinae, but their axial ends are dilated and rarely in contact. Occasionally very short tertiary septa are seen. The dissepiments are arranged in two series; an inner single series of small horse-shoe dissepiments is regularly developed between the axial ends of the septa, and the outer development is usually of a single series of plates transverse or slightly inclined to the periphery, rather fewer than the horse-shoe dissepiments, but there may be two columns of plates which in vertical section are flattened on top and bulge towards the axis, a number giving the appearance of superposed rhombs. The tabulae are complete, and flat or sagging, about 5 in the space of 5 mm.

Remarks.—The sporadic occurrence of tertiary septa is unusual. No comparable cerioid species is known. The phaceloid *Disphyllum* {*Phacellophyllum*} has a similar dissepimentarium,

but the tabularium and septa of *Trapezophyllum elegantulum* are distinctive. *Phacellophyllum* occurs in the European Lower Devonian, Givetian and Frasnian.

Genus PHILLIPSASTRAEA d'Orbigny.

Phillipsastraea d'Orbigny, 1849, p. 12.

Phillipsastraea; Lang and Smith, 1935*b*, p. 556, q.v. for synonymy.

GENOTYPE.—*Astraea Hennahii* Lonsdale, 1840, p. 697, pl. lviii, figs. 3, 3*b* (see Lang and Smith *loc. cit.*). Upper Devonian, Barton Quarry, Newton, Plymouth.

DIAGNOSIS.—Plocoid Rugose corals; typically the septa are dilated at the margin of the tabularium, and are usually carinate; there is no columella, and the tabulae are horizontal, complete or incomplete; dissepiments are numerous, small and rather globose, and those at the inner edge of the dissepimentarium may be horse-shoe shaped.

REMARKS.—Plocoid corals occur commonly in the Devonian, and those which show the characters of the Disphyllidae—globose dissepiments frequently divided into more than one series, septa which are carinate with trabecular carinae, spindled, or dilated in the dissepimentarium, and tabulae typically of two series—may be placed in the genus *Phillipsastraea,* in conformity with Lang and Smith's division of the Disphyllidae into genera primarily according to the form of the corallum.

The oldest species which has been placed in *Phillipsastraea* is *walli* Etheridge (1892, p. 169, pl. xi, fig. 7) from the Lower Ludlow of New South Wales. This is plocoid, but its dissepiments are not so globose as in typical Disphyllidae, nor are its tabulae, which are deeply concave, differentiated into two series, and its septa show none of the modifications of the Disphyllidae. It may be that this species is not a member of the Disphyllidae at all, and should therefore be moved from *Phillipsastraea.* It differs from *Arachnophyllum,* the Silurian plocoid genus, in having neither the septal modification nor the axial structure of that genus, and in having parallel, deeply concave, complete tabulae. No figures of the fine structure of *P. silurica* Lahusen are available, but Weissermel (1894, p. 611) considered it a true Silurian *Phillipsastraea.*

No figures of the fine structure of the Bohemian Lower Devonian *P. cuncta* Počta (1902, pl. 113, fig. 18) are available, and the plocoid form from the Lower(?) Devonian of Ellesmereland referred to *P. gigas* Billings by Loewe (1914, p. 14, pl. iv, fig. 2) is insufficiently figured.

Stumm (1937) has considered the Eifelian plocoid species of Nevada to be separable from *Phillipsastraea,* and has placed them in *Radiastraea* Stumm (1937, p. 439) and *Billingsastraea* Grabau. Leowe (1914) considered three species from the Middle Devonian

of Arctic America to be *Phillipsastraea*, but his figures are insufficient. No *Phillipsastraea* has been recorded as such from the Middle Devonian of Europe, but *Keriophyllum astraeiforme* Sochkina (1936, p. 63, figs. 71-72) from the Northern Urals may be one.

From the Upper Devonian comes the type *P. hennahii*, a form with spindle septa, a dissepimentarium in which there is an area of divergence in the inclination of the plates near the inner boundary, and a tabularium of the *Disphyllum goldfussi* type (see p. 225). *P. boloniense* (see Lang and Smith 1935*b*, p. 556, text-figs. 12-13) has similar septa, but the dissepiments are horizontally based near the periphery, and steeply inclined at the inner edge of the dissepimentarium. The tabulae are of the *Thamnophyllum* type. *P. delicatula* Hill (1936, p. 30, text-figs. 4, 5) from Western Australia has unthickened septa, but dissepiments and tabulae as in *boloniense*. The Upper Devonian of Europe and America has a second group of Phillipsastraeids commonly but wrongly called *Pachyphyllum* (see Lang and Smith, 1935*b*, p. 555), such as *devoniense* (Edwards and Haime, 1852, p. 397), *bouchardi* (Edwards and Haime, 1851, pl. 7, fig. 7), *ibergense* (Roemer, 1855, pl. vi (xxi), fig. 24), *johanni* (Hall and Whitfield; Fenton and Fenton, 1924, pl. xv, figs. 6, 7), *woodmani* (White; Fenton and Fenton, 1924, pl. vii, figs. 1-3) etc. This second group is known so far only from the Upper Devonian, and is characterized by the excessive dilatation of the septa near the inner margin of the dissepimentarium.

The only record of a *Phillipsastraea* from Asia is that of "*Smithia hennahi*" in Deprat and Mansuy, 1912 (*fide* Yabe and Hayasaka 1920, p. 101) from the Couvinian of Yun-nan.

RANGE.—Upper Devonian of Europe, America and Western Australia. Doubtfully from the Upper Silurian of New South Wales and the Baltic states, from the Lower Devonian of Bohemia, and from the Middle Devonian of Europe and Arctic America.

PHILLIPSASTRAEA SPECIOSA Chapman.

(Plate XVI, figs. 1–4.)

Phillipsastraea speciosa Chapman, 1914, p. 306, pl. xlix, figs. 10, 11; Plate I, figs. 12–14. Griffith's Quarry, Loyola, near Mansfield.

HOLOTYPE.—2487, W. H. Ferguson Collection, Geological Survey of Victoria, and two slides cut from it, here figured, 1387 and 1388, National Museum, Melbourne.

DIAGNOSIS.—Astraeoid *Philipsastraea* with spindle septa sometimes extending to the axis as thin plates or as discontinuous trabeculae, or projecting just within the tabularium; with the

greatest height of the floor of the dissepimentarium at its inner border, the outer dissepiments being inclined towards the periphery; and with concave tabulae.

DESCRIPTION.—The corallum is astraeoid and spreading, the greatest thickness observed being 24 mm. The corallites are 4 to 6 mm. wide, irregularly pentagonal and not bounded by an epitheca, their margins being defined by lines along which the septa are turned aside to meet those of neighbouring corallites at an angle. The tabularia are about 2 mm. in diameter, and from 4 to 7 mm. apart. The stereozone is narrow, at the inner edge of the dissepimentarium. There are from 26 to 30 septa, alternately major and minor. They are dilated so as to be in contact or almost so at the inner edge of the dissepimentarium, but the dilatation decreases very gradually outwards. They never become attenuate, and in some cases may be carinate. The carinae are extensions from the trabeculae, and may be opposite or sub-opposite, when the septum appears zig-zag in transverse section. The trabeculae are more or less distinct, and have an area of divergence near the inner border of the dissepimentarium. The minor septa end rather bluntly just inside the tabularium, but the major septa sometimes extend to the axis, thinning very gradually as they do so, or being represented by discontinuous trabeculae; or they may be very little longer than the minor septa. The tabulae are shallowy concave, usually complete, and they may be supplemented at the margin of the tabularium by small inclined tabellae. In some corallites when the septa are very long, the tabulae are domed. The dissepiments are globose and very small, and frequently do not extend completely across the interseptal loculi, but inosculate with one another. The innermost series is more globose and projects higher than the rest of the tissue; they are almost horse-shoe dissepiments. The others are disposed horizontally or inclined towards the periphery.

REMARKS.—The species is close to the species-group of the genotype from the Upper Devonian of Europe. In the manner of its septal dilatation, and the size of the corallites, it is closest to the form figured by Edwards and Haime (1853, pl. 54, fig. 4) but the variation in the development of the septa within the dissepimentarium distinguishes it; the discontinuous trabeculae are not seen in *hennahii,* to my knowledge.

Corallites in which the major septa are short closely resemble those of *P. currani* Etheridge (1892, pl. xi, figs. 1–6) from Fernbrook, New South Wales, except that they are smaller.

PHIILLIPSASTRAEA sp. indet.

(Plate XVI, figs. 5, 6.)

Phillipsastraea walli Etheridge; Chapman, 1914, p. 305, pl. xlviii, figs. 7–9, Loyola; *non Phillipsastraea walli* Etheridge, 1892, p. 169, pl. xi, fig. 7, Upper Silurian, Yass, New South Wales.

MATERIAL.—Two slides, 1374 and 1375 (figured *mihi*, and Chapman *loc. cit.*), National Museum, Melbourne, cut from specimen 2491, whose whereabouts are unknown; and three slides cut from specimen 2489, W. H. Ferguson Collection, Geological Survey Museum, Melbourne, Victoria. All from Griffith's Quarry, Loyola, near Mansfield.

DESCRIPTION.—The corallum is thamnastraeoid or in part astraeoid; the tabularia are 1.5 to 2 mm. in diameter, and 3 to 6 mm. apart. There are 22 to 24 septa, half of which extend further towards the axis than the others (the minor septa), which project only very slightly into the tabularium. The septa are all thin, with short, sharp irregular waves, and are continuous throughout the dissepimentarium, not being broken up by the dissepiments. The dissepiments are small, crowded, and frequently geniculate. Their reverse curvature in the peripheral parts of the dissepimentarium suggests that there is an area of divegence in their inclination, as in *speciosa*. An inconclusive vertical section shows distant, horizontal, complete tabulae.

REMARKS.—The New South Wales Upper Silurian *walli* Etheridge is distinguished by the discontinuity of the septa in the outer parts of the dissepimentarium, by the marked radiality of arrangement of the septa in a wreath round the tabularium, and by the deep almost parallel-sided concavity of the tabulae; Loyola specimens show none of these three characters, and I think that the equation of the Loyola specimens to *walli* cannot be sustained, in spite of the general similarity in size of corallite and number of septa. On the other hand the specimens show some similarity to *speciosa*, with which they occur, but not the spindle septa believed to be characteristic of *speciosa*. More material is necessary for a safe determination of the species.

Genus LOYOLOPHYLLUM Chapman.

Loyolophyllum Chapman, 1914, p. 306; proposed as sub-genus of *Columnaria* Goldfuss, 1826 (=*Favistella* Hall, 1847); by a typographical error the name is spelt *Loyolophyllia* on p. 301.

GENOTYPE, by monotypy: *Columnaria* (*Loyolophyllum*) *cresswelli* Chapman, 1914, p. 306, pl. li, figs. 15, 16; pl. lii, figs. 17, 18. Griffith's Quarry, Loyola, near Mansfield.

DIAGNOSIS.—Cerioid corals with small corallites, thin septa, complete, horizontal or saucered tabulae, and sporadically an incomplete series of vertically elongate dissepiments lining the wall in the interseptal loculi.

RANGE.—The genus is known only from the type locality.

REMARKS.—Chapman observed that this form was very similar in structure to *Columnaria* of the *alveolata* morphology, and regarded it as a sub-genus of *Columnaria*, from which it differed by the tabulae being saucered rather than domed, and by the

presence of dissepiments. Like Etheridge (1918, p. 53), I consider these distinctions, particularly the presence of dissepiments, to be generic in value, and, like Chapman, I consider the genus to be related to *Columnaria alveolata,* i.e. to *Favistella* Hall. There is, however, some doubt whether the family should be called Columnariidae or Favistellidae, and for this reason I have departed from the orthodox method of reviewing the family before the genus. The family and the difficulties in its nomenclature are discussed in the following remarks on *Favistella* and similar genera:—

There are in the Ordovician, Silurian and Devonian a number of compound corals whose structure is very simple—major and very short minor septa, and tabulae, without mural pores. Goldfuss (1826) founded the genus *Columnaria* for such forms, his syntypes being *alveolata* from the Ordovician of North America (a species later described as *Favistella stellata* by Hall, 1847), *laevis* from the ? Jurassic of Italy, and *sulcata* from the Devonian of Prussia. The first of these has no dissepiments; but the third, which was chosen by M'Coy (1849, p. 121) as the genolectotype, has. Most authors have, however, followed Edwards and Haime's later (1851, p. 308) and therefore invalid selection of *C. alveolata* as type, and have interpreted *Columnaria* as synonymous with *Favistella* Hall.

Frech (1891, *fide* Weissermel, 1897, p. 867) considered the genus *Cyathophylloides* Dybowski (1873, p. 379), with genosyntypes *kassariensis* Dybowski, *fasciculus* Kutorga and *irregularis* Dybowski, as a synonym of *Columnaria;* and indeed Weissermel's figures (1897, p. 871) of *kassariensis,* which Lang and Smith (1935*b*, p. 543) chose as genotype of *Cyathophylloides,* show a generic similarity to *Columnaria alveolata,* and *Cyathophylloides* is to be regarded as synonymous with whatever genus takes *alveolata.*

Weissermel (1897) recognized four compound species and two solitary species, all with thick walls and without dissepiments, as a sub-genus of *Columnaria* (which he appears to have interpreted on *alveolata*). These species were: the phaceloid *Densiphyllum tamnodes* Dybowski from the Ordovician of Estland, the cerioid *Cyathophylloides* (*Densiphyllum*) *contorta* Weissermel (1894, pl. 1, fig. 2) from the Ordovician or Silurian of Europe, the cerioid *Columnaria devonica* Schlüter (1889, p. 272) and the phaceloid *Columnaria rhenana* Frech (1886, pl. iii, fig. 19) from the Devonian of Germany, and the solitary *Densiphyllum thomsoni* Dybowski and *Densiphyllum rhizobolon* Dybowski, both from the Ordovician of Estland. Weissermel named the genus *Pycnophyllum* Dybowski, *Pycnophyllum* being a correction for *Densiphyllum* Dybowski, made (*fide* Weissermel, 1897, p. 867, footnote) by its author. But by Article 19 of the Rules of Zoological Nomenclature, the original orthography of

a name is to be preserved unless an error of transcription, a *lapsus calami,* or a typographical error is evident, so that *Densiphyllum* must be retained for Dybowski's genus. No type has ever been chosen for *Densiphyllum,* and until good sections of Dybowski's syntypes have been illustrated, critical remarks on the extent and relations of the genus are without value.

Lang and Smith (1935*a*) studied Goldfuss' specimens of *alveolata* and *sulcata,* and concluded that they were congeneric. But this conclusion I doubt, from the evidence of the published figures. The vertical sections which they figure from the type of *sulcata* show dissepiments, very similar to, but perhaps less globose than, those of *Disphyllum geinitzi* figured by the same authors (compare L. and S. 1935*b*, pl. xxxvi, fig. 3, with L. and S., 1935*a,* pl. xii, fig. 2, which is inverted). And it seems to me that *sulcata* might easily be a cerioid member of the Disphyllidae, with the internal structure closely similar to that of *D. geinitzi.*

Should a re-study of the type material confirm my opinion, then *Columnaria* would have to be applied only to such cerioid Disphyllidae, and not to species like the Ordovician *alveolata,* which have no dissepiments. For the latter, Hall's name *Favistella* would need to be revived, and *Cyathophylloides* Dybowski regarded as synonymous with it, and not with *Columnaria.*

Lang and Smith (1935*b*, p. 548) have considered *Fasciphyllum* Schlüter (1885, p. 52, genotype, by designation, *"Fascicularia?" conglomerata* Schlüter, 1880, p. 147 from the Givetian of the Eifel) to be a synonym of *Columnaria* (genotype *sulcata*). *Conglomeratum,* however, possesses a single series of vertically elongate dissepiments like those found in *Loyolophyllum;* i.e., they are dependent on the wall in the interseptal loculi, and are unlike those of *sulcata.* No dissepiments occur in *alveolata,* and I cannot accept that *conglomeratum* is congeneric with either *sulcata* or *alveolata,* but consider that palaeontological comparisons will probably be more exact and stratigraphical correlation made easier by regarding these three species as belonging to different genera, thus: *Columnaria sulcata, Favistella alveolata,* and *Fasciphyllum conglomeratum.*

In summary, a study of the published figures leads me to the view that the species we have been considering are best grouped as follows:—

Family DISPHYLLIDAE.—The Middle Devonian cerioid *Columnaria sulcata* Goldfuss, *Columnaria arctica* (Loewe, 1914, pl. ii, fig. 3, Ellesmereland).

Family FAVISTELLIDAE.—*Favistella alveolata* (Goldfuss = *F. stellata* Hall), cerioid, from the American Ordovician; *Favistella calicina* (Nicholson, 1874; 1879, pl. x, fig. 2), phacelocerioid, American Ordovician; *Favistella fascicula* (Kutorga,

Weissermel), phaceloid, Ordovician of the Baltic States; *Favistella kassariensis* (Dybowski, Weissermel), cerioid, Silurian of the Baltic States; *Favistella gothlandica* (Edwards and Haime, 1851, pl. 14, fig. 2), cerioid, Silurian of Gotland; *Favistella pauciseptata* (Etheridge, 1897, pl. viii), cerioid, Silurian of New South Wales; *Favistella neminghensis* (Etheridge, 1918, pl. ix), cerioid, Devonian of New South Wales; *Favistella symbiotica* (Charlesworth, 1914, pl. xxxi, fig. 2), phaceloid, Lower Devonian, Eastern Alps; *Fasciphyllum conglomeratum* (Schlüter, phaceloid, Middle Devonian of Germany), ?. = *Cyathophyllum syringoporoides* Charlesworth (1914, pl. xxxi, fig. 1, Lower Devonian, Eastern Alps); *Loyolophyllum cresswelli* Chapman, cerioid, Lower Devonian, Victoria.

In all probability some of the species placed by Weissermel in the sub-genus *Densiphyllum* (see p. 240), are members of the Favistellidae.

Thus in the author's opinion *Loyolophyllum* is a member of the Favistellidae. Its closest relative is *Fasciphyllum* Schlüter from the Lower Devonian of the Eastern Alps and the Middle Devonian of Germany. It is cerioid, whereas *Fasciphyllum* is phaceloid. These dissepimented Favistellids differ from *Spongophyllum kunthi* Schlüter (1880; 1881, pl. viii, figs. 1, 2, Couvinian, Germany) and related forms in that the dissepiments do not break through the septa but occupy the loculi between them, whereas in *kunthi* the dissepiments are lonsdaleoid, and the septa are withdrawn from the periphery.

Loyolophyllum cresswelli Chapman.

(Plate XV. figs. 8–11.)

Columnaria (*Loyolophyllum*) *cresswelli* Chapman, 1914, pp. 306–8, pl. li, figs. 15–16; pl. lii, figs. 17–18. Griffith's Quarry, Loyola.

Loyolophyllum cresswelli; Etheridge, 1918, p. 51.

Holotype.—12904, and 5 paratypes (12905–9). A. W. Cresswell's Collection, National Museum, Melbourne.

Diagnosis.—As for genus.

Description.—The corallum is cerioid, mushroom shaped, expanding very rapidly from an apex, attaining a diameter of 10 cm. Increase is intermural. The corallites are usually hexagonal, with average diameter 2 mm., though they are only 1.13 mm. in the type. There are 10 septa, continuous at their bases with a very narrow peripheral stereozone, about 0.25 mm. thick. The major septa are unequal in length; four to six may extend almost to the axis, as in *Stauria*. The minor septa may be one-third as long as the major septa. The septa show no carinae; some sections suggest that they are acanthine, but the material is very badly preserved. Development of the elongated dissepiments is variable; it may be limited to a few scattered

plates adhering to the epitheca by their upper and lower edges; or the lower edge of one plate may rest on the upper part of an earlier dissepiment; or one complete vertical series may be formed. The tabulae are complete, usually sagging, sometimes horizontal, about 10 in the space of 1 cm.

REMARKS.—This cerioid species has a similar internal structure to the phaceloid *Fasciphyllum conglomeratum* (Schlüter) from the Middle Devonian of Germany and *Fasciphyllum syringoporoides* (Charlesworth) from the Lower Devonian of the Eastern Alps, as already mentioned in the remarks on the genus.

ZOANTHARIA RUGOSA INCERTAE SEDIS.

Genus LYRIELASMA nov.

(Lurion = a lyre, elasma = a plate; from the fanciful resemblance of the septa to the strings of a lyre.)

GENOTYPE.—*Cyathophyllum subcaespitosum* Chapman, 1925, p. 112, pl. xiii., figs. 15, 16*a, b.* Cave Hill, Lilydale.

DIAGNOSIS.—Fasciculate Rugosa with the major septa directed towards the median plane, with wide, deeply concave incomplete tabulae, and with a peripheral stereozone of irregular width, formed by the dilatation of major and minor septa in the dissepimentarium.

RANGE.—The genus is known with certainty only from the Lower Devonian of Loyola, and the Lower of Middle Devonian of Lilydale, Victoria. Possible species, however, occur in the Lower and Middle Devonian of Europe.

RELATIONS.—*Lyrielasma* shares the arrangement of its septa and the deep concavity of its tabulae with the European Silurian *Cymatelasma* Hill and Butler (1936) and *Spongophylloides* Meyer (see Butler, 1934), and with a large number of German and American Devonian forms. It differs from *Cymatelasma* and *Spongophylloides* in being compound and in the characters of the dissepimentarium. No dissepiments at all have been seen in the peripheral stereozone of *Cymatelasma;* in *Spongophylloides* there is a lonsdaleoid border of very steeply inclined dissepiments. In *Lyrielasma* dissepiments occur fairly frequently within the interseptal loculi in the peripheral stereozone, but usually do not cause the septa to become discontinuous; they are steeply inclined like those of *Spongophylloides.* It does not seem reasonable to place *Lyrielasma* with the Cymatelasmidae. The classification of the Devonian forms into genera and families is not yet satisfactory. Wedekind (1924, 1925) in his study of the Rugosa of the German Couvinian and Givetian, has placed such Givetian corals into the family Stringophyllidae, most of them showing in addition a tendency for the septa to be represented in the dissepimentarium by discontinuous trabeculae. *Lyrielasma* differs

from this group in having the septa continuous and dilated in the dissepimentarium. The Couvinian Digonophyllinae described by Volbrecht (1926) differ chiefly in the presence of a key-hole fossula in the tabularium.

It is possible that this arrangement of septa and tabulae is a homeomorphic development which is as much characteristic of the Devonian as the axial structure is characteristic of the Carboniferous.

The arrangement and peripheral dilatation of the septa of some forms from the Upper Ludlow of the Urals, placed by Sochkina (1937, pl. xiv, figs. 1-5) in *Omphyma,* recall *Lyrielasma,* but the Russian species have large lonsdaleoid dissepiments and tabulae which are flat rather than concave, and I do not think any close relation is indicated.

Species from the Lower Devonian of the Eastern Alps and the Chalonnes Limestone, and from the Middle Devonian of the Eifel, which might belong to the genus, are discussed in the remarks on the genotype.

Lyrielasma subcaespitosum (Chapman).

(Plate XIV., figs. 1–6, plate XV, figs. 6, 7.)

Cyathophyllum subcaespitosum Chapman, 1925, p. 112, pl. xiii, figs. 15, 16*a, b*. Cave Hill, Lilydale.

Holotype.—1731 and 14065, National Museum, Melbourne.

Diagnosis.—*Lyrielasma* with wide, low, septal carinae, parallel to the distal edges of the septa.

Description.—The corallum is fasciculate, the corallites diverging slightly. The largest fragment of corallum is 75 mm. in diameter and 60 mm. high; the corallites in it are unequally spaced, being in contact or very close immediately after increase, and up to 10 mm. apart later; they have an average diameter of 12 mm., and may be slightly compressed. The epitheca shows faint longitudinal grooves, with broad ribs. Growth annulation is also faintly marked. No calices are available for study.

There are from 24-30 major septa, alternating with an equal number of minor septa, the number increasing as the width of the corallum grows from 8 mm. to 12 mm. The minor septa may be two-thirds as long as the major septa. The septa are dilated and in contact in a peripheral stereozone of variable width; in many corallites it is mostly as wide as the dissepimentarium, and in these the septa are moderately dilated in the tabularium also; but in a few (one in the holotype, and two individuals found isolated—F 1329*a, b,* Australian Museum) it is very narrow, and the septa are almost attenuate. The septa are slightly waved, the crests of the waves running along the sides of the septum, parallel to its upper edge; sometimes, particularly when the septa are thin, the crests are angular, and

thin carinae grow out from them. The septa are directed towards a median plane of the tabularium; this plane is probably that of the cardinal and counter septa, but direct proof is lacking. The septum at each end of the plane is usually very short, particularly in the larger corallites; but occasionally, in the smaller corallites, one may be very long, extending to the axis; this long one is presumably the counter-septum. The two or three neighbours of these " directive " septa are usually curved slightly towards the axial ends of the " directive " septa. The remaining septa are not curved, and are unequal. Dissepiments are developed when the dilatation of the septa is not so great as to fill the interseptal loculi; they are equal and steeply inclined as in *Spongophylloides*. Discontinuity of the septa occurs extremely rarely—in one individual in the holotype, the section showed a few scattered lonsdaleoid dissepiments (plate xiv, fig. 1). The tabularium is usually oval, and is just more than one-third the width of the corallite in the direction of the median plane, and just less than one-third this width in the direction at right angles. The tabular floors are inverted cones; the tabellae are wide and shallowly curved, and slope at about 60° towards the axis, about three in the space of 2 mm. The dissepiments, when they are free to develop in the interseptal loculi because the septa are not dilated, are smaller, and more globose, and less steeply inclined than the tabellae.

OCCURRENCE.—Three corallites probably from one corallum have been collected from Griffith's Quarry, Loyola, in the Lower Devonian. They show somewhat greater dilatation than the types from Lilydale, and in all three the counter-septum is very long.

REMARKS.—A corallite figured by Charlesworth (1914, pl. xxxi, fig. 8, *non* fig. 7) from the Lower Devonian Reef-limestone of the Eastern Alps is so similar in transverse section to *L. subcaespitosum* that it might have been drawn from the type, but a longitudinal section is needed before generic identity can be proved. Le Maitre has described and figured very similar individuals from the Chalonnes limestone, France, as *Cyathophyllum elongatum* Le Maitre (1934, p. 152, pl. v, figs. 10-12) and *Cyathophyllum dianthus* Goldfuss. She considers the Chalonnes limestone to occupy a horizon transitional between Coblenzian and Couvinian. Specimens (Sedgwick Museum, Cambridge, A 8636, A 9100, and A 9102-3) from the Middle Devonian of the Eifel differ from the Victorian species in the absence of dilatation, in the greater length of the septal carinae, and in the less conspicuous median plane. But close relationship, probably generic, is indicated by the general arrangement of the plates.

In the oval tabularium and the waving of the septa, the Upper Silurian species placed by Sochkina (1937, p. 74, pl. xiv) in *Omphyma* resembles *L. subcaespitosum,* but the horizontal

skeletal elements are very different. Differences from the Silurian *Cymatelasma* and *Spongophylloides* have been sufficiently noticed in the remarks on the genus.

Genus MICTOPHYLLUM Lang and Smith.

Mictophyllum Lang and Smith, 1939, p. 155.

GENOTYPE.—*Mictophyllum nobile* Lang and Smith, *id.*, pl. iv. Upper Devonian (Frasnian), Lower Chute, Redknife River, a tributary of the Mackenzie R., which enters the main stream between Great Slave Lake and Fort Simpson, North-West Canada. Pl. XIII, figs. 8–9.

DIAGNOSIS.—Simple Rugose corals with septa at first dilated in the dissepimentarium and thin in the tabularium, later thinning in the dissepimentarium also; the axial ends of the major septa have an irregular vortical curvature. The tabulae are domed and replaced by tabellae. The dissepiments are geniculate and sometimes dilated, the dilatation being continuous with that of the septa, and are small, rather globose and steeply inclined.

REMARKS.—In the irregular vortical curvature of the axial ends of the septa, the geniculate dissepiments, and the domed, incomplete tabulae, this genus resembles the Australian Upper Silurian Phaulactid *Hercophyllum* Jones (1936, p. 53). But in *Hercophyllum* as in other Phaulactids the septa are never dilated in the dissepimentarium, while in *Mictophyllum* a peripheral stereozone is present in the young stages. I have seen figures of only one European species which may belong to this genus. This is *Cyathophyllum graecense* Penecke (1894, p. 600, pl. viii, figs. 14, 15; pl. xi, figs. 5, 6) from the Coblenzian *Heliolites barrandei*-beds of Graz, Austria. Thus the known range of the genus is Lower Devonian of Europe and Upper Devonian of Canada.

I cannot indicate any genus as being closely related to *Mictophyllum*, and so have not placed it in any family.

MICTOPHYLLUM CRESSWELLI (Chapman).

(Plate XIV, figs. 7–11.)

Cyathophyllum cresswelli Chapman, 1925, p. 111, pl. xiii, figs. 11–14. Cave Hill, Lilydale.

HOLOTYPE.—1267 and 1270 (one corallum cut vertically), National Museum, Melbourne.

DIAGNOSIS.—Sub-cylindrical, erect or slightly curved *Mictophyllum* with long minor septa.

DESCRIPTION.—At first the corallum is patellate and curved (13302, National Museum, Melbourne); later increase in diameter is gradual, and the corallum is sub-cylindrical and erect or but

slightly curved. The largest diameter seen is 34 mm., and the greatest length (fragment only) is 76 mm. There are slight rejuvenescence constrictions in diameter in most corallites. The epitheca shows fine growth annulation, broad, low longitudinal ridges, and narrow longitudinal furrows. The calice is not known.

At 14 mm., the diameter of the smallest cross-section observed, the outer edges of the 32 major septa and 32 minor septa are dilated and in contact in a peripheral stereozone 1.5 mm. wide. The inner part (about 1 mm.) of each minor septum is attenuate, so that the dissepiments, usually curved, sometimes geniculate, develop in the loculi. The axial ends of the major septa are attenuate and extend unequally almost to the axis; the curvature of these ends is irregular and the interseptal loculi are unequal.

At a diameter of 23 mm. (Australian Museum F. 1242), 38 major septa and 38 minor septa are present. The peripheral stereozone is 2 mm. wide, and the length of the unthickened axial parts of the minor septa is 2 mm. The dissepiments between these unthickened parts are thin and usually curved, though sometimes geniculate. The curvature of the axial ends of the major septa is vortical, but irregular due to the different widths of the interseptal loculi.

At the average adult diameter of 28 mm., 35 major septa and 35 minor septa are present, and the fossula is indistinct. The minor septa are slightly thinner than the major septa, and are about two-thirds as long. Dilatation decreases as the height of the corallum increases, and no continuous stereozone is present in the later stages, interseptal loculi separating the septa right to the epitheca; but where there is dilatation, it is continuous from septum to septum across the dissepiments, which are usually geniculate. The attenuate axial ends of the major septa are curved vortically but irregularly, the irregularity being due to the expansion near the axis of some loculi or pairs of loculi, and the consequent crowding of the remaining ends; some of the axial ends are shorter than the others, and in crowded areas may abut on to the longer ones. In the adult stages most of the dissepiments are geniculate in transverse section, but some few are still curved. In the vertical section they are seen to be small, rather globose, and usually steeply inclined. The dissepimentarium is about 8 mm. wide at a diameter of 28 mm., and is equal to the length of the minor septa. The tabulae are usually incomplete, and the tabellae are then thin, small and not highly arched, and the tabular floors are low domes; when the tabulae are complete they are slightly saucered.

Remarks.—The species is known only from Lilydale in Victoria. It is closer to *M. graecense* (Penecke, 1894, p. 600, pl. viii, figs. 14, 15; pl. xi, figs. 5, 6) from the Coblenzian of Graz

than to the Frasnian genotype, for it has well-developed minor septa like *graecense,* whereas in *nobile* the minor septa have disappeared, leaving inosculating dissepiments.

Cystimorphs.

Cystimorphs are Rugose Corals in which the vertical skeletal elements are very much reduced, and the corallum is constructed almost entirely of arched horizontal skeletal elements, none of which extend completely across the lumen. The earliest cystimorphs occur in the Valentian of England (*Cystiphyllum cylindricum* Lonsdale, Smith, 1930, p. 300), Stage 7c α of Norway (*Cystiphyllum signatum* Lindström MS. Scheffen, 1933, pl. vi, figs. 3, 4) and the Clinton of North America (*Cystiphyllum spinulosum* Foerste, 1906, p. 321, pl. v, fig. 1, Bassler, 1915, p. 372). Thereafter cystimorphs, which can arise in many different lineages by the degeneration of the vertical skeletal elements ("cystiphylloid trend" Lang, 1938, p. 150), are common until the Upper Devonian, when only rare examples occur. None are known in the Carboniferous or Permian.

In England, *Cystiphyllum* (genotype *C. siluriense* Lonsdale) continues in the Wenlock and Ludlow (Lang and Smith, 1927, p. 455); *Goniophyllum* Edwards and Haime (Lindström, 1882, p. 42), a gonioid cystimorph with septal fragments which are linear and not acanthine, and *Microplasma* Dybowski, a fasciculate cystiphyllid (Lang and Smith, 1927, p. 478) occur in the Wenlock; *Hedströmophyllum* Wedekind (1927, p. 66), a cystiphyllid with very long trabeculae, has been recorded from the Aymestry limestone (Alexander, 1936, p. 106). These four genera also occur in the Middle and Upper Gotlandian of Gotland, with in addition *Araeopoma* Lindström (1882, p. 57), a cystiphyllid with remarkable epithecal trails, *Gyalophyllum* Wedekind (1927, p. 64) a cystiphyllid with a peripheral stereozone of closely packed holacanths in lamellar sclerenchyme, *Rhizophyllum* Lindström (1865; 1882, p. 22), calceoloid cystimorph with septal fragments which are linear and not acanthine, and *Holmophyllum* Wedekind (1927, p. 31), a cystimorph with deeply concave tabulae, and long, discontinuous trabeculae in the wide dissepimentarium of fine dissepiments. The Lower Ludlow (*fide* Lang and Smith, 1927, p. 476) of Tachlowitz in Bohemia contains numerous *Cystiphyllum* (Počta, 1902, p. 164). Cystiphyllids have been recorded from the Niagaran of America (Bassler, 1915, p. 371), and *C. cylindricum* occurs in China (Lindström, 1883, p. 73). *Rhizophyllum* occurs in the Upper Silurian of Australia), Etheridge, 1891, p. 201).

There is considerable diversity in the structure of these Silurian cystimorphs, and they probably belong to more than one family; *Goniophyllum,* for instance, may be related to the Phaulactidae.

Cystiphyllum itself has septa represented by holacanths, set in lamellar sclerenchyme which dilates the horizontal skeletal elements (Hill, 1936*a*, p. 211). It is difficult to distinguish between dissepiments and tabulae.

Several cystimorphs have been illustrated from Lower Devonian strata, but their generic relations are uncertain. These are three from the Eastern Alps (Charlesworth, 1914, pl. xxxii), three from the Eastern Urals (Tschernychew, 1893, pl. xiv, figs. 9, 18, 19), one from the Western Urals (Sochkina, 1937, pl. xv, figs. 5, 6), a phaceloid form from Maryland, U.S.A. (Swartz, 1912, pl. xxi, figs. 7-9), and two haploid species from Koněprus, Bohemia (Počta, 1902, pl. 117, fig. 3, pl. 105, figs. 1, 2).

Wedekind (1924) has illustrated several Couvinian cystimorphs under his new genera *Zonophyllum, Pseudozonophyllum* and *Lekanophyllum*. The detailed structure of the remnants of septa in these forms has not been described, but many of the dissepiments have truncated oval transverse sections; this character I have never seen in any Silurian cystimorph, but it is present in many Devonian cystimorphs. Stumm (1937, p. 440) placed three American Couvinian cystimorphs in *Mesophyllum* Schlüter, but they do not appear to me to be congeneric with the genotype, *Mesophyllum defectum* Schlüter as figured by Wedekind (1925, pl. 13, fig. 76). Two of them show a marked distinction between dissepimentarium and tabularium; none show any trace of the fossula which characterizes the *Mesophyllum-Mochlophyllum* group. None of the Devonian cystimorphs which I have examined show holacanths; but Wedekind (1937, pl. vii, fig. 1) gives a diagram which possibly indicates that true *Cystiphyllum* with holacanths existed at the base of the Couvinian.

In the German Givetian cystimorphs it is apparent that the septal remnants are of septa whose trabeculae were monacanths arranged in single radial series, close enough together in each series to form a septum pinnately fibrous about its median plane. Amongst them is an easily distinguishable group in which the septal remnants are visible only in successive zones of skeletal dilatation; each zone of dilated tissue is deposited on one old skeletal floor, and the dilatation is greatest in the middle of the floor, and decreases towards the periphery; as the calical floor is conical in all these forms, the zone of dilatation is conical also. This group includes *Cystiphyllum pseudoseptatum* Schulz (1883, pl. xxiii, figs. 2-4), and possibly also part of *Cystiphyllum vesiculosum* Goldfuss; Wedekind (1925) and Wedekind and Vollbrecht (1931) have figured it under the generic names *Lythophyllum, Nardophyllum, Paralythophyllum* and *Plagiophyllum*. The cystimorphs *Mesophyllum defectum* Schlüter (see Wedekind's figure, 1925, pl. 13, fig. 76), *Cosmophyllum* Vollbrecht (1922) and *Atelophyllum* Wedekind (1925, p. 37)

seem to me to be a different group; they are without the successive cones of septal dilatation, and the remnants of septa have greater radial extension, and are in the form of " bars " at the periphery. *Diplochone* Frech (1886) from the boundary between the Middle and Upper Devonian has no septal remnants but has a very narrow dissepimentarium of elongate dissepiments, and a wide tabularium of large concave plates.

In the Upper Devonian, cystimorphs occur in Western Australia (Hill, 1936*b*, p. 27), and in Canada (Fenton and Fenton, 1924, p. 41).

" Cystiphyllum " sp.

(Plate XV, figs. 4, 5.)

One weathered fragment of a trochoid corallum was obtained from Loyola by Miss E. A. Ripper (Melbourne University, Geology Department No. 620). It increases in diameter from 15 mm. to 20 mm. in a distance of 12 mm. The calice and apex were not preserved and the epitheca was weathered off. Horizontal skeletal elements are dominant; they are distally arched and are roughly divisible into a peripheral zone of smaller plates steeply inclined from the periphery, about one-third as wide as the radius of the corallum, and an axial zone of larger plates, whose inclination becomes less steep towards the axis, where they are arched about a horizontal plane. They are without any regularity of position. One or two are truncated ovals in transverse section. They are dilated in zones, each zone presumably at the position of a past calice, and the dilatation appears to lessen from the periphery to the axis. The dilated tissue is fibrous, the fibres lying at right angles to the curvature of the plate. Individual trabeculae can be distinguished in it only near the periphery, where they are seen in vertical section to be about 0.5 mm. in diameter, and to consist of fibres directed upwards and outwards from their axes; that is, they are monacanths (Hill, 1936*a*, p. 194). In transverse section the trabeculae may sometimes be continuous from one dissepiment to the next, so that short radial fragments of septa are present, about 0.5 mm. thick.

Remarks.—The fragment differs from the Silurian Cystiphyllids and resembles Devonian cystimorphs in having monacanthine and not holacanthine trabeculae. It differs from the Lower Givetian Cystiphyllids described by Wedekind (1925, p. 32), as *Lythophyllum* in having the dilatation of its horizontal skeletal elements increasing from the axis outwards. Truncated oval sections of dissepiments are common in Devonian cystimorphs, and one or two occur in this Loyola specimen. The specimen cannot be regarded as of any great significance for the determination of the age of the limestone, but it indicates the Devonian rather than the Silurian.

Acknowledgments.

This work has been carried out while the author held consecutively the Old Student's Fellowship at Newnham College, Cambridge, a Senior Studentship of the Royal Commission for the Exhibition of 1851, and a Research Fellowship within the University of Queensland financed by Commonwealth funds through the Council for Scientific and Industrial Research. She is indebted for facilities for study, at the Sedgwick Museum, Cambridge, to Prof. O. T. Jones, F.R.S. and Mr. A. G. Brighton, M.A., and at the University of Queensland to Prof. H. C. Richards, D.Sc. Specimens have been generously loaned by the Dept. of Geology of the University of Melbourne, the National Museum, Melbourne, the Geological Survey of Victoria, the Australian Museum, Sydney, the British Museum (Natural History), London, Miss E. A. Ripper, Ph.D., and Mr. F. Chapman, A.L.S. Dr. E. S. Hills kindly arranged for me to collect at Lilydale. The photographs are the work of Mr. E. V. Robinson. I am indebted to Prof. E. W. Skeats, D.Sc., for obtaining a sum towards the cost of publication from the Sweet Fund of the University of Melbourne.

References.

ALEXANDER, F. E. S., 1936. The Aymestry Limestone of the main Outcrop. *Quart. J. geol. Soc. Lond.*, xcii, pp. 103-115, pl. viii.

BARROIS, C., 1889. Faune du Calcaire d'Erbray. *Mem. Soc. géol. Nord,* iii, 348 pp., xvii pls.

BASSLER, R. S., 1915. Bibliographic Index of American Ordovician and Silurian Fossils, I, *Bull U.S. Nation. Mus.*, 92, viii + 718 pp.

BILLINGS, E., 1861–1865. Palaeozoic Fossils, I. *Geol. Surv. Canad.*, 426 pp.

BUTLER, A. J., 1934. On the Silurian Corals *Spongophylloides grayi* (Edwards and Haime) and *Spongophylloides pusillus*, sp. n. *Ann. Mag. nat. Hist.* (10), xiii, pp. 540-549, pls. xvii-xviii.

CHAPMAN, F., 1914. Newer Silurian Fossils of Eastern Victoria, Part 3. *Rec. geol. Surv. Vic.*, iii, Pt. 3, pp. 301-316, pls. xlvi--lxi.

————, 1925. New or little-known Fossils in the National Museum. Part 28.—Some Silurian Rugose Corals. *Proc. Roy. Soc. Vic.* (n.s.), xxxvii (1), pp. 104-118, pls. xii-xv.

————, 1931. A new Silurian Coral from Lilydale. *Vic. Naturalist,* xlviii, p. 94, text-fig.

CHARLESWORTH, J. K., 1914. Das Devon der Ostalpen. V. Die Fauna des devonischen Riffkalkes. 4. Korallen und Stromatoporoiden. *Z. dtsch. geol. Ges.*, lxvi, pp. 347-407, pls. xxx-xxxiv.

DUN, W. S., 1898. Contributions to the Palaeontology of the Upper Silurian Rocks of Victoria, based on Specimens in the Collections of Mr. George Sweet, Part 1. *Proc. Roy. Soc. Vic.* (n.s.), x, pp. 79-90, pl. iii.

DYBOWSKI, W. N., 1873-1874. Monographie der Zoantharia sclerodermata rugosa aus der Silurformation Estlands, Nord-livlands und der Insel Gotland. *Arch. Naturk. Liv-, Esth-u. Kurl.* (1), V. 1873, Lief 3, pp. 257-414, pls. i, ii; 1874, pp. 415-531, pls. iii-v.

EDWARDS, H. M., and HAIME, J., 1850-1854. A Monograph of British Fossil Corals. 1850: Introd. and Pt. 1, lxxxv + 71 pp., 11 pls.; 1851*a*: Pt. 2, pp. 73-145, pls. xii-xxx; 1852: Pt. 3, pp. 147-210, pls. xxxi-xlvi; 1853: Pt. 4, pp. 211-244, pls. xlvii-lvi; 1854: Pt. 5, pp. 245-299, pls. lvii-lxxii. *Palaeontogr. Soc.* [*Monogr.*].

————, and HAIME, J., 1851*b*. Monographie des Polypiers Fossiles des Terrains Palaeozoiques, précédée d' un Tableau Général de la Classification des Polypes. *Arch. Mus. Hist. nat. Paris,* V, 502 pp., 20 pls.

EHLERS, G. M., and WHITE, T. E., 1932. *Cylindrophyllum panicum* (Winchell) and *Cylindrophyllum hindshawi*, sp. nov., Tetracoralla from the Traverse Group of Michigan. *Contrib. Mus. Palaeont. Univ. Michigan,* IV, pp. 93-100, pls. i-v.

ETHERIDGE, R., 1890. Descriptions of Upper Silurian Fossils from the Lilydale Limestone, Upper Yarra District, Victoria. *Rec. Aust. Mus.* I, pp. 60-67, pl. viii.

————, 1891. The Operculate Madreporaria Rugosa of New South Wales, *Ibid.*, pp. 201-205, pl. xxx.

————, 1892. Descriptions of four Madreporaria Rugosa—Species of the Genera *Phillipsastraea, Heliophyllum,* and *Cyathophyllum*—from the Palaeozoic Rocks of New South Wales. *Rec. Geol. Surv. N.S.W.* II, pp. 165-174, pls. xi-xii.

————, 1897. On the Occurrence of the Genus *Columnaria* in the Upper Silurian Rocks of New South Wales. *Rec. Aust. Mus.*, iii, pp. 30-33, pl. viii.

————, 1899. Descriptions of new or little-known Victorian Palaeozoic and Mesozoic Fossils, No. 1. *Prog. Rept. Geol. Surv. Vic.,* xi, pp. 30-36, pls. A, B.

————, 1918. Two remarkable Corals from the Devonian of New South Wales. *Rec. Aust. Mus.,* xii, pp. 49-51, pls. vii-ix.

FENTON, C. L., and FENTON, M. A., 1924. The Stratigraphy and Fauna of the Hackberry Stage of the Upper Devonian. *Contrib. Mus. Geol. Univ. Michigan,* I, viii + 260 + vi pp., xlv pls.

FRECH, F., 1885. Die Korallenfauna des Oberdevons in Deutschland. *Z. dtsch. geol. Ges.,* xxxvii, pp. 21-130, pls. i-xi.

————, 1886. Die Cyathophylliden und Zaphrentiden des deutschen Mitteldevon. *Palaeont. Abhandl.,* III, Heft 3, pp. 117-234, pls. xiii-xx.

FROMENTEL, E. DE, 1858-1861. Introduction a l'Etude des Polypiers Fossiles 8vo. Paris, 358 pp.

GOLDFUSS, G. A., 1826-1833. Petrefacta Germaniae. . . Theil 1, Düsseldorf.

GÜRICH, G., 1909. Leitfossilien. Part 2. Devonian, pp. 97-199, pls. xxix-lii, 8vo., Berlin

HALL, J., 1847. Natural History of New York, VI. Palaeontology, I, xxiii + 338 pp., 33 pls. 4to. Albany.

HILL, D., 1935. British Terminology for Rugose Corals. *Geol. Mag. Lond.* lxxii, pp. 481-519.

————, 1936*a*. The British Silurian Rugose Corals with Acanthine Septa. *Phil. Trans. R. Soc. Lond.* (B), ccxxvi, pp. 189-217, pls. 29-30.

————, 1936*b*. Upper Devonian Corals from Western Australia. *J. Roy. Soc. W.A.,* xxii, pp. 25-39, pl. i.

———— and BUTLER, A. J., 1936. *Cymatelasma*, a new Genus of Silurian Rugose Corals. *Geol. Mag. Lond.,* lxxiii, pp. 516-527, pl. xvi.

JONES, O. A., 1932. A Revision of the Australian Species of the Coral Genera *Spongophyllum* E. & H., and *Endophyllum* E. & H., with a Note on *Aphrophyllum* Smith. *Proc R. Soc. Qld.,* xliv, pp. 50-63, pls. iii-iv.

JONES, O. A., 1936. On the Silurian Corals: *Cyathophyllum shearsbyi* and *Heliophyllum yassense*. *Mem. Qld. Mus.*, xi., pp. 53-58, pls. v-vii.

LAMBE, L. M., 1901. A Revision of the Genera and Species of Canadian Palaeozoic Corals. The Madreporaria Aporosa and the Madreporaria Rugosa. *Contrib. Canad. Palaeont.*, iv (2), pp. 97-197, pls. vi-xviii.

LANG, W. D., 1938. Some further Considerations on Trends in Corals. *Proc. Geol. Assoc.*, xlix, pp. 148-159, pl. vii.

LANG, W. D., and SMITH, S., 1927. A critical Revision of the Rugose Corals described by W. Lonsdale in Murchison's "Silurian System." *Quart. J. geol. Soc. Lond.*, lxxxiii, pp. 448-491, pls. xxxiv-xxxvii.

————, 1934. Ludwig's "Corallen aus Paläolithischen Formationen" and the Genotype of *Disphyllum* de Fromentel. *Ann. Mag. nat. Hist.* (10), xiii, pp. 78-81.

————, 1935*a*. On the Genotype of *Columnaria* Goldfuss. *Ibid.*, xvi, pp. 426-433, pl. xii.

————, 1935*b*. *Cyathophyllum caespitosum* Goldfuss, and other Devonian Corals considered in a Revision of that Species. *Quart. J. geol. Soc. Lond.*, xci, pp. 538-590, pls. xxxv-xxxvii.

————, 1939. Some new Generic Names for Palaeozoic Corals. *Ann. Mag. nat. Hist.* (11), III, pp. 152-156, pl. iv.

LINDSTRÖM, G., 1882. Anteckningar om silurlagren på Carlsöarne. *Öfvers K. Vetens.-Akad. Förhandl.*, 1882, No. 3, pp. 5-30, pl. iv.

————, 1883*a*. Om de Palaeozoiska Formationernas Operkelbärande Koraller. *Bihang K. Svensk. Vetens.-Akad. Handl.*, vii, No. 4. 112 pp., 9 pls.

————, 1883*b*. Obersilurische Korallen von Tschau-tiën. in F. von Richthofen's "China," vol. IV, pp. 50-74, pls. v-vii.

LOEWE, S., 1914. Die devonischen Korallen von Ellesmereland. Rept. of the Second Norwegian Arctic Expedition in the "Fram," 1898-1902, No. 30, 24 pp., 7 pls.

LONSDALE, W., 1840, in A. Sedgwick and R. I. Murchison—On the Physical Structure of Devonshire, and on the Subdivision and geological Relations of its Older Stratified Deposits, etc. *Trans. Geol. Soc. Lond.* (2), v, pp. 633-703, pl. lviii.

MA, T. Y. H., 1937. On the seasonal Growth in Palaeozoic Tetracorals and the Climate during the Devonian Period. *Palaeont. sinica* (B), II, Fasc. 3, 96 pp., 22 pls.

LE MAITRE, D., 1934. Études sur la Faune Calcaires dévoniens du Bassin d'Ancenis. *Mém. Soc. géol. Nord.*, xii, 267 pp., 18 pls.

————, 1937. Étude de la Faune corallienne des Calcaires givétiens de la Ville-De-d'Ardin (Deux-Sevres). *Bull. Soc. géol. France*, vii, pp. 105-128, pls. vii-x.

M'COY, F., 1849. On some new Genera and Species of Palaeozoic Corals and Foraminifera. *Ann. Mag. nat. Hist.* (2), III, pp. 1–20, 119-136.

NICHOLSON, H. A., 1879. On the Structure and Affinities of the Tabulate Corals of the Palaeozoic Period, xii + 342 pp., xv pls. Edinburgh.

ORBIGNY, A. DE, 1849. Note sur les Polypiers fossiles. 12 pp., 12mo. Paris.

PENECKE, K. A., 1894. Das Grazer Devon. *Jahrb. K. K. geol. Reichsanst*, xliii, pp. 566-616, pls. vii-xii.

POČTA, P., 1902. In Barrande, J., Système silurien du Centre de la Bohême, 1st Part: Recherches paléontologiques, continuation éditée par le Musée Bohême, Vol. VIII, Tome II, Anthozoaires et Alcyonaires, viii + 347 pp., pls. 20-118.

RIPPER, E. A., 1933. The Stromatoporoids of the Lilydale Limestone. Part 1. *Actinostroma* and *Clathrodictyon*. *Proc. Roy. Soc. Vic.* (n.s.), xlv (1), pp. 152-164, pls.

————, 1937*a*. The Stromatoporoids of the Lilydale Limestone. Part 2. *Syringostroma, Stromatopora,* and other Genera. *Ibid.*, xlix, pp. 178-205, pls. viii-ix.

————, 1937*b*. On some Stromatoporoids from Griffith's Quarry, Loyola, Victoria. *Ibid.*, l, pp. 1-8, pl. i.

————, 1938. Notes on the Middle Palaeozoic Stromatoporoid Faunas of Victoria. *Ibid.*, pp. 221-243.

RÖMER, F. A., 1855. Beiträge zur geologischen Kenntniss des nordwestlichen Harzgebirges. Abt. 3. *Palaeontogr.* V, pp. i-iv, 1-44, pls. i-viii and map.

SCHEFFEN, W., 1933. Die Zoantharia Rugosa des Silurs auf Ringerike im Oslogebeit. *Skr. Norske Videns.-Akad. Oslo.* 1. Math. Naturv. Klasse (1932), No. 5, 64 pp, xi pls.

SCHLÜTER, C., 1881. Ueber einige Anthozoen des Devon. *Z. dtsch. geol. Ges.*, xxxiii, pp. 75-108, pls. vi-xiii. Also *Verh. Naturh. Ver. preuss. Rheinl. u. Westfalens, Jahrg.*, xxxviii, pp. 189-232, pls. ii-ix.

————, 1889. Anthozoen des rheinischen Mittel-Devon. *Abhandl. geol. Specialkarte Preuss. Thüring. Staat.*, viii, Pt. 4, pp. 259-465, 16 pls.

SCHULZ, E., 1883. Die Eifelkalkmulde von Hillesheim. *Jahrb. K. preuss geol. Landesanst.* (1882), pp. 1-94 (reprint, Bonn, separately paged), pls. xix-xxiii.

SIMPSON, G. B., 1900. Preliminary Descriptions of new Genera of Palaeozoic Rugose Corals. *Bull. N.Y. State Mus.*, viii, pp. 199-222.

SKEATS, E. W., 1929. The Devonian and Older Palaeozoic Rocks of the Tabberabbera District, North Gippsland. *Proc. Roy. Soc. Vic.* (n.s.), xli (2), pp. 97-120.

SMITH, S., 1930. Valentian Corals from Shropshire and Montgomeryshire, with a Note on a new Stromatoporoid. *Quart. J. geol. Soc. Lond.*, lxxxvi, pp. 291-330, pls. xxvi-xxix.

SOCHKINA, E. D., 1936. Les Coraux Rugosa du Devonien moyen de l'Oural du Nord. *Trans. Polar Comm.*, Fasc. 28, pp. 15-76.

————, 1937. Corals of the Upper Silurian and Lower Devonian of the Eastern and Western Slopes of the Urals. *Acad. Sci. U.R.S.S. Trav. Inst. Paléozool.*, VI, Livr. 4, 153 pp., 21 pls.

STEWART, G. A., 1938. Middle Devonian Corals of Ohio. *Geol. Soc. Amer. Special Pubn.* 8, vii + 120 pp., 20 pls.

STUMM, E. C., 1937. The Lower Middle Devonian Tetracorals of the Nevada Limestone. *J. Palaeont.*, xi, pp. 423-443, pls. 53-55.

SWARTZ, C. K., 1913. Coelenterata. In Swartz, C. K., and others, Lower Devonian, *Maryld. geol. Surv.*, pp. 195-227, pls. xvii-xxx.

TSCHERNYSCHEW, T., 1893. Die Fauna des unteren Devon am Ostabhange des Ural. *Mém. Com. géol. St. Pétersb.*, IV, No. 3, 221 pp, 14 pls.

VOLLBRECHT, E., 1926. Die Digonophyllinae aus dem unteren Mittel-Devon der Eifel. *N. Jahrb. Mineral*, lv (B), pp. 189-273, pls. viii-xvi.

WALTHER, C., 1928. Untersuchungen über die Mitteldevon-Oberdevongrenze *Z. dtsch. geol. Ges.*, lxxx, pp. 97-152.

WEBSTER, C. L., 1889. Description of a new Genus of Corals, from the Devonian Rocks of Iowa. *Amer. Naturalist*, xxiii, pp. 710-712.

WEDEKIND, R., 1921. Beiträge zur Kenntnis der Mesophyllen. *Palaeont. Z.*, iv, pp. 48-63. pls. i-ii.

————, 1922. Zur Kenntnis der Stringophyllen des oberen Mitteldevon. *Sitz. Ges. Förder. ges. Naturw. Marburg, Jahrg.* 1921, pp. 1-16, figs. 1-18.

WEDEKIND, R., 1924. Das Mitteldevon der Eifel. I. Die Tetrakorallen des unteren Mitteldevon. *Schr. Ges. Beförd. ges. Naturw. Marburg,* xiv, Heft. 3, vii + 93 pp., 122 text-figs.

————, 1925. Das Mitteldevon der Eifel. II. Materialen zur Kenntnis des mittleren Mitteldevon. *Ibid.,* Heft. 4, vii + 84 pp., 17 pls., 1 table.

————,1927. Die Zoantharia Rugosa von Gotland (bes. Nordgotland). *Sverig. geol. Undersökn.* (Ca) *Avhandl.* 19, 94 pp., 30 pls.

————, 1937. Einführung in die Grundlagen der historischen Geologie II. Mikrobiostratigraphie die Korallen- und Foraminiferenzeit, viii + 136 pp., Stuttgart.

————, and Vollbrecht, E., 1931. Die Lytophyllidae des mittleren Mitteldevon der Eifel. *Palaeontogr.,* lxxv, pp. 81-96, pls. xv-xlvi; lxxvi, pp. 97-120, pls. ix-xiv. Issued separately, pp. 81-120, pls. i-xxxviii.

WEISSERMEL, W., 1894. Die Korallen der Silurgeschiebe Ostpreussens und des ostlichen Westpreussens. *Z. dtsch. geol. Ges.,* xlvi, pp. 580-674, pls. xlvii-liii.

————, 1897. Die Gattung *Columnaria* und Beiträge zur Stammes geschichte der Cyathophylliden und Zaphrentiden. *Ivid.,* xlix, pp. 865-888.

————, 1938. Eine altpaläozoische Korallenfauna von Chios. *Ibid.,* xc, pp. 65-74, pl. 2.

YABE, H., and HAYASAKA, I., 1920. Palaeontology of Southern China. 221 pp. + summary in Japanese. Atlas of Fossils (28 pls.). Geographical Research in China. Tokyo geogr. Soc.

YÜ, C. C., 1933. Lower Carboniferous Corals of China. *Palaeont. sinica* (B), xii, Fasc. 3, 211 pp., 24 pls.

Plate XIII.

Rugose Corals from Lilydale and Canada.

All figures, except figures 1, 8, and 9, approximately × 2 diameters.

Fig. 1.—*Prismatophyllum chalkii* (Chapman). Holotype, from Lilydale. Chapman Collection. Natural size.
Fig. 2.—The same. Topotype 626, Melbourne University Geology Department Collection. Transverse section.
Figs. 3-4.—The same. Topotype 628-9, Melbourne University Geology Department Collection. Oblique section.
Fig. 5.—The same. Topotype 627, Melbourne University Geology Department Collection. Vertical section.
Fig. 6.—*Prismatophyllum stevensi* (Chapman), holotype. Vertical section 624, Geological Dept., Melbourne University. Lilydale.
Fig. 7.—The same. Transverse section, 625, same collection.
Fig. 8.—*Mictophyllum nobile* Smith, holotype, Geol. Surv. Canada Colln. Frasnian, Mackenzie R. Canada. Transverse section. × 1½ diameters.
Fig. 9.—The same. Vertical section. × 1½ diameters.

Plate XIV.

Rugose Corals from Lilydale.

All figures approximately × 2 diameters.

Fig. 1.—*Lyrielasma subcaespitosum* (Chapman), holotype, 1731, National Museum, Melbourne. Transverse section.
Fig. 2.—The same. Transverse section.
Figs. 3*a, b*.—The same. Vertical sections.
Figs. 4*a, b*.—The same, topotype F 1329*a*, Australian Museum, Sydney. Vertical and transverse sections.
Fig. 5.—The same, topotype F 1329*b*, Australian Museum, Sydney. Vertical section.
Fig. 6.—The same. Transverse section.
Fig. 7.—*Mictophyllum creswelli* (Chapman), topotype F 1146, Australian Museum, Transverse section.
Fig. 8.—The same. Vertical section.
Fig. 9.—The same, topotype 630, Melbourne University Geology Department Collection. Vertical section.
Fig. 10.—The same, topotype F 1242 Australian Museum, Sydney. Vertical section.
Fig. 11.—The same. Transverse section,

Plate XV.

Rugose Corals from Loyola.

The figured sections and the specimens from which they were cut are in the Geology Department, University of Melbourne.

All figures approximately × 2 diameters.

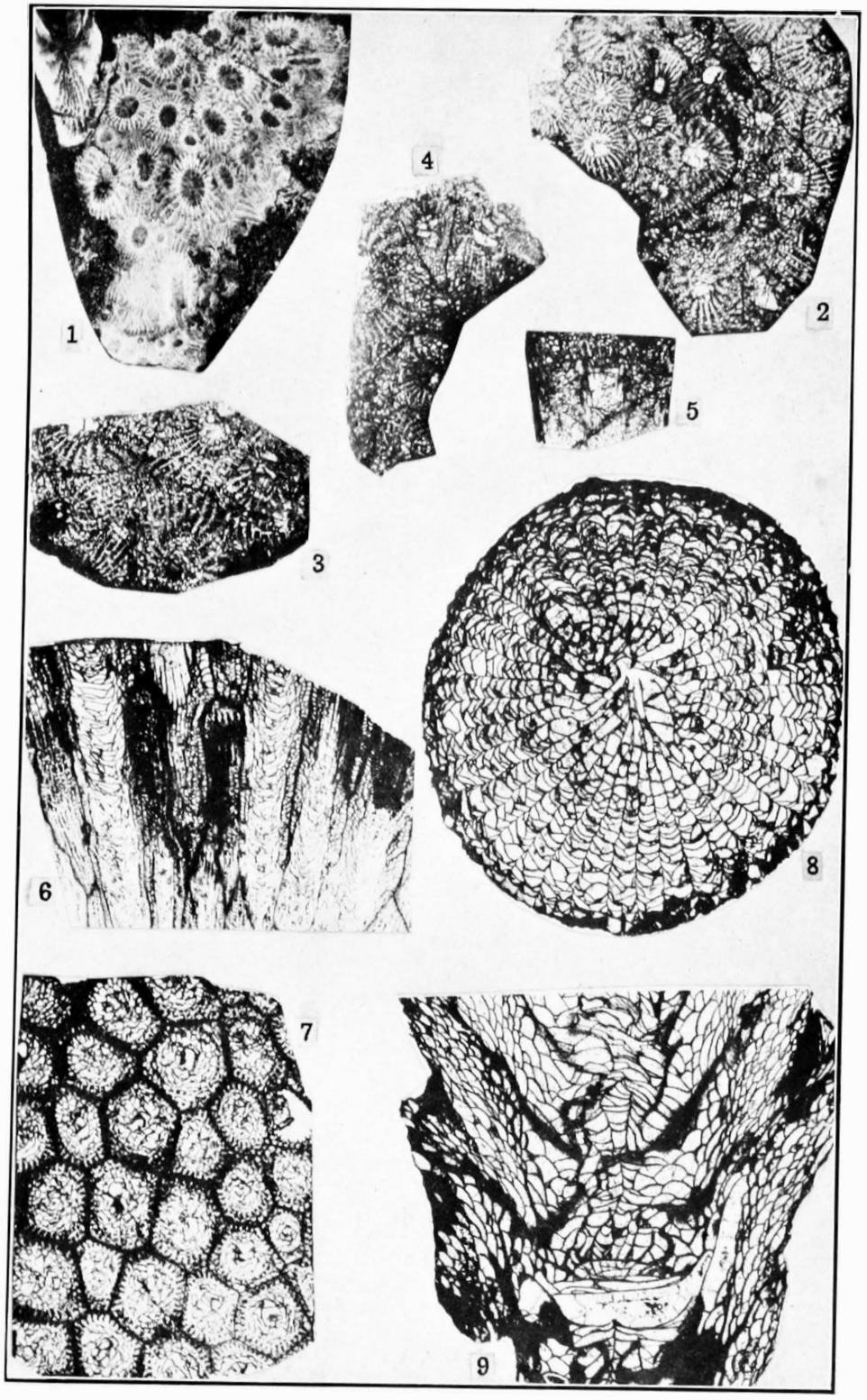
Fig. 1*a*.—*Acanthophyllum mansfieldense* (Dun), topotype. Transverse section 608.
Fig. 1*b*.—The same. Lighter print of central part of fig. 1, to show the waving and carinae of the septa.
Fig. 2.—The same. Vertical section 609.
Fig. 3.—The same, topotype. Transverse section 610.
Fig. 4.—"*Cystiphyllum*" sp. Transverse section 620*a*.
Fig. 5.—The same. Vertical section 620*b*.
Fig. 6.—*Lyrielasma subcaespitosum* (Chapman), transverse section 621.
Fig. 7.—The same, 622.
Fig. 8.—*Loyolophyllum cresswelli* Chapman, topotype. Transverse section 616.
Fig. 9.—The same. Oblique section 617.
Fig. 10.—The same. Vertical section 618.
Fig. 11.—The same. Transverse section 619.
Fig. 12.—Gen et sp. indet. Oblique section 623.

Plate XVI.

Rugose Corals from Loyola.

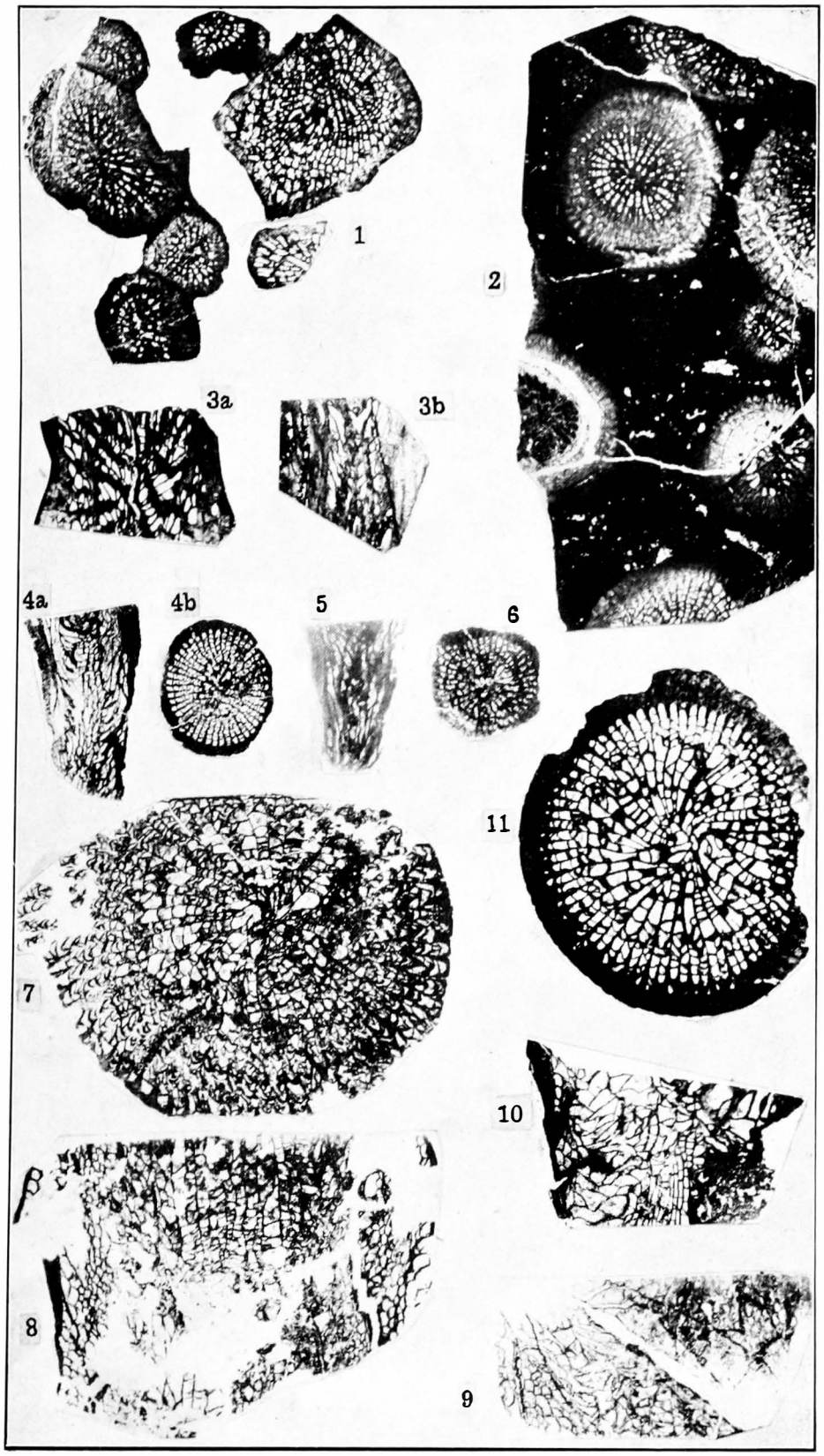
All figures approximately × 2 diameters.

Fig. 1.—*Phillipsastraea speciosa* Chapman, holotype, 2487 Geological Survey of Victoria. Vertical section 1388, National Museum, Melbourne.
Fig. 2.—The same. Transverse section 1387, National Museum, Melbourne.
Fig. 3.—The same, topotype, University of Melbourne, Geological Dept. Transverse and part of a vertical section (611) through corallum with septa withdrawn from the tabularium.
Fig. 4.—The same. Vertical section 612.
Fig. 5.—*Phillipsastraea* sp. indet., 2491, Geological Survey of Victoria. Transverse section 1374, National Museum, Melbourne.
Fig. 6.—The same. Oblique section 1375, National Museum, Melbourne.
Fig. 7.—*Thamnophyllum reclinatum* sp. nov., holotype, R 25186, British Museum (Natural History), London. Transverse section.
Fig. 8.—The same. Vertical section.
Fig. 9.—*Trapezophyllum elegantulum* (Dun), topotype of genotype, University of Melbourne, Dept. of Geology. Transverse section 613.
Fig. 10.—The same. Vertical section 614.
Fig. 11.—The same. Vertical section 615.



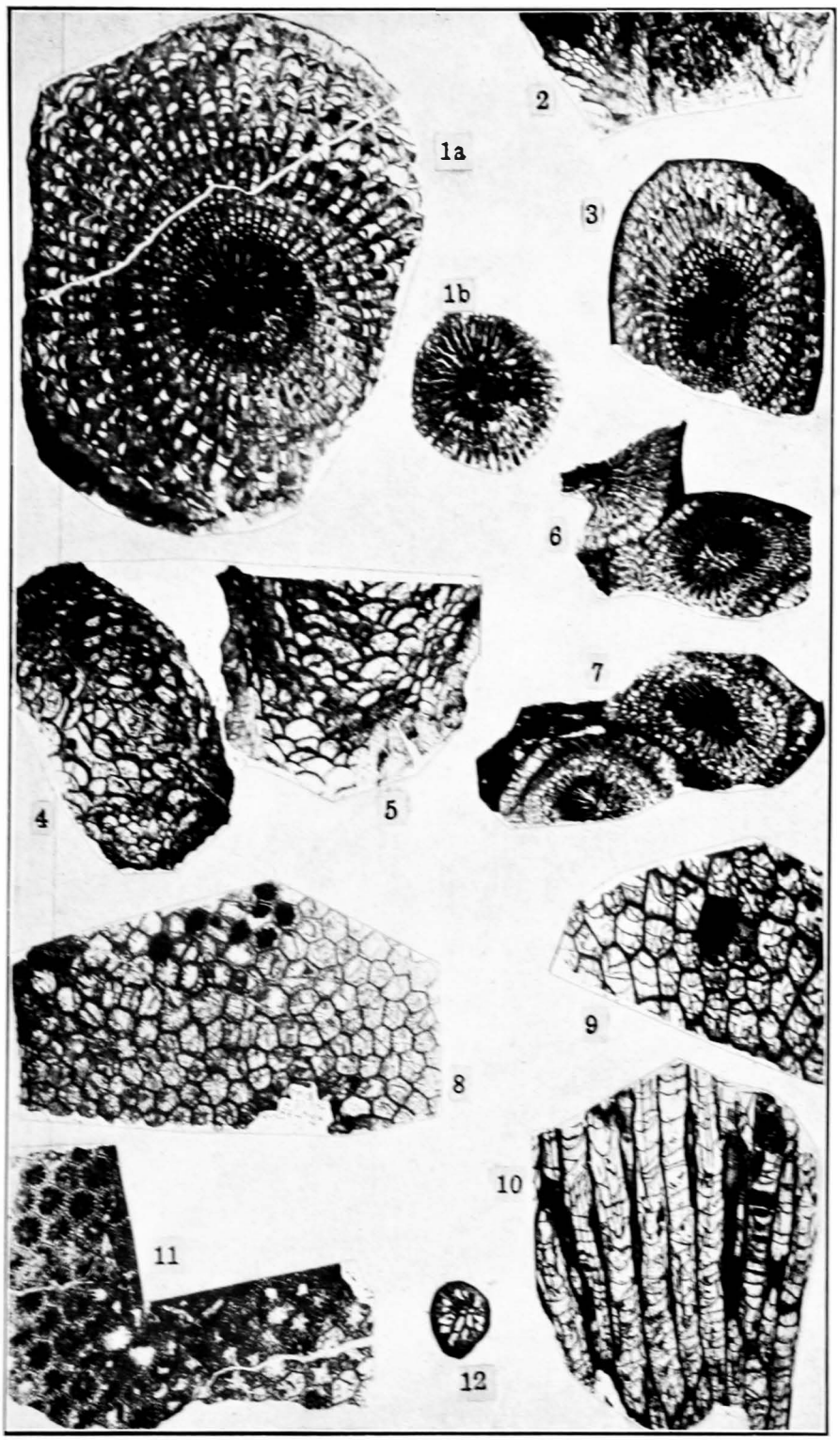
Lilydale—*Prismatophyllum.*
Canada—*Mictophyllum.*

[*Page 257.*]



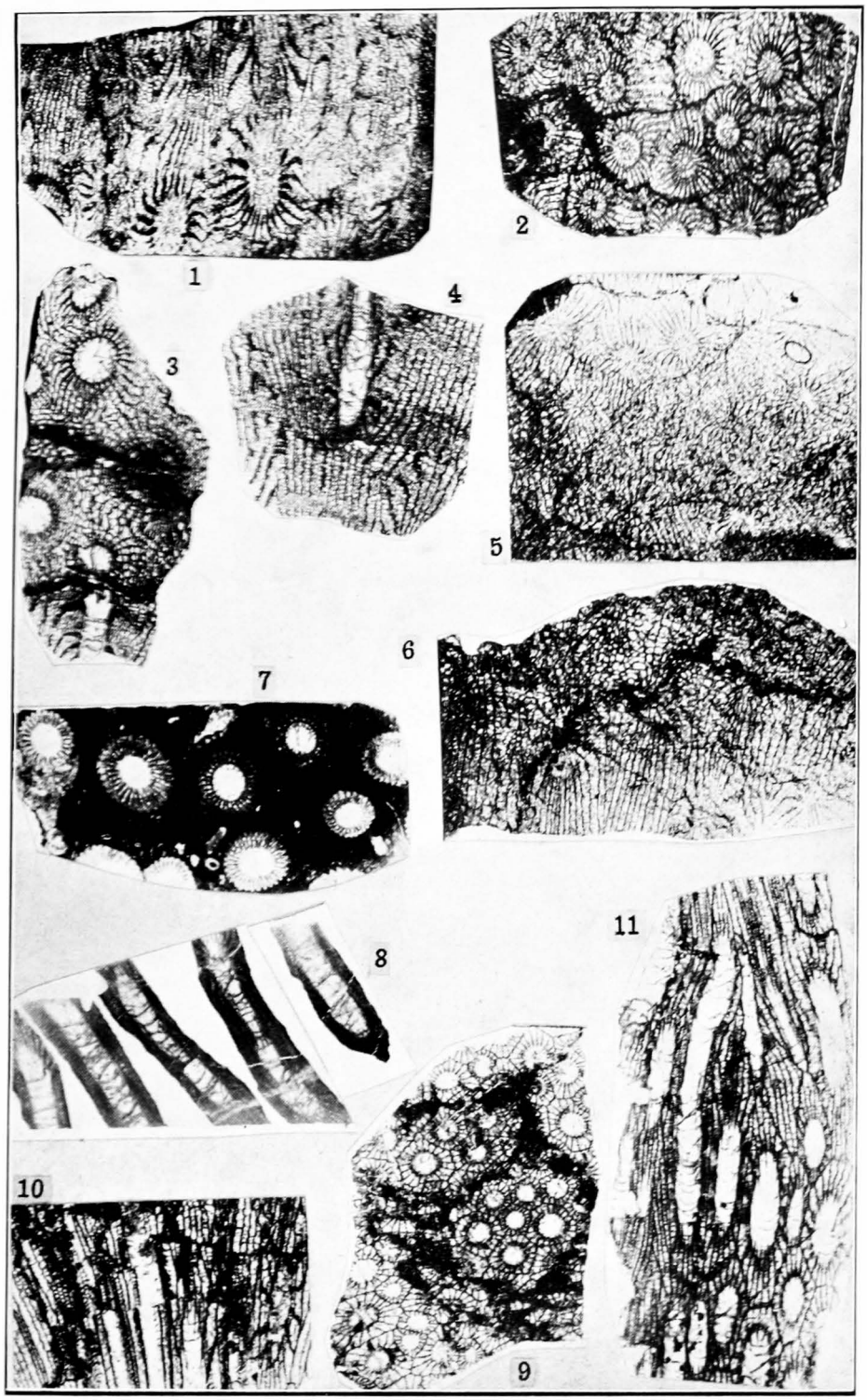
Lilydale—*Lyrielasma* and *Mictophyllum*.

[Page 259.]



Loyola—*Acanthophyllum*, "*Cystiphyllum*," *Lyrielasma* and *Loyolophyllum*.

[Page 261.]



Loyola—*Phillipsastraea, Thamnophyllum, Trapezophyllum.*