THE CORALS OF THE GARRA BEDS, MOLONG DISTRICT, NEW SOUTH WALES.

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With Plates II-VIII.

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Introduction.

The species of corals described in this paper are, except for *Favosites nitidus* from Victoria, from localities within the Garra Beds of the Molong district of New South Wales, described by Joplin and Culey (1938). The beds consist of limestones, calcareous shales, tuffs, and quartzites, and contain a coral-brachiopod fauna; they succeed the Silurian Manildra Beds of tuffs, cherts, and indurated shales, and are overlain by conglomerates and reddish, coarse grits, sandstones, and shales referred to the Upper Devonian Lambie Stage. Etheridge[1] referred two species from localities within the Garra Beds to the Upper Silurian (1907, p. 41); Joplin and Culey (1938) have considered the Garra Beds to be Middle Devonian. Specimens from Curra Ck. near Wellington are included, as they are from beds which Joplin and Culey (*in litteris*) consider are probably a northern continuation of the Garra Beds.

The following species are described from the Garra Beds:

MADREPORARIA RUGOSA.

Family Acanthophyllidæ.

Family Calceolidæ.

[1] Throughout this paper "Etheridge" refers to R. Etheridge, Junr.

Age. (*a*) The Rugosa. *Acanthophyllum* sp. has close resemblances to species from the Lower Devonian of the Carnic Alps, and the beds transitional between the Lower and Middle Devonian in France. *Spongophylloides* (*?*) *thomasœ* is only doubtfully referred to this Silurian genus. *Rhizophyllum* ranges through the Gotlandian and Lower Devonian, but is not known in the Middle Devonian. Cystimorphs are characteristic of both Silurian and Devonian. *Pseudamplexus* occurs in the Upper Silurian and the Lower and Middle Devonian. *Tryplasma* ranges from the Upper Ordovician or Lower Silurian into the

Lower Devonian. *Entelophyllum* is known elsewhere only from the Silurian. The occurrence of *Rhizophyllum* and *Tryplasma* thus suggests that the beds are not later than Lower Devonian, and *Entelophyllum* strengthens this view. *Acanthophyllum* sp. indicates a Lower Devonian rather than an Upper Silurian age, and *Pseudamplexus* does not refute this. The Rugosa thus suggest a Lower Devonian age.

(*b*) The Tabulata. These are a mixture of species which occur elsewhere in the Silurian, the Lower Devonian or the Middle Devonian. Thus *Favosites gothlandicus* is Silurian, being represented also in beds transitional between the Lower and Middle Devonian in France, and in the Lower and Middle Devonian elsewhere in Europe by forms closely related to its three Silurian formæ. *F. ovatiporus* occurs in the Lower Devonian of Loyola; *F. bryani* and *F. goldfussi* are known elsewhere in the Lower Middle Devonian, *F. goldfussi* extending into the Upper Middle Devonian. *Striatopora* sp. and *Syringopora* sp. are of no assistance in determining the age. This mixture of *Favosites* is thought to indicate a Lower Devonian age.

(c) The Heliolitida. *Heliolites daintreei* is a Silurian and Lower Devonian species, and *Plasmopora gippslandica* occurs in Silurian and Middle Devonian beds elsewhere in Australia, so that the Heliolitida indicate a broad Siluro-Devonian period.

Considering all three groups of the Madreporaria, a Lower Devonian age seems most likely for the Garra beds. One genus and a species contained in them are Silurian only elsewhere, as well as some forms that are otherwise Lower and Middle Devonian. These two limits indicate a horizon somewhere between them in the Lower Devonian, and this is supported by the occurrence of the Lower Devonian *F. ovatiporus*, and of *Acanthophyllum* sp. with Lower Devonian affinities. Direct comparison with Lower Devonian faunas is difficult as the calcareous facies was not widely developed in beds of that age. *Favosites goldfussi*, *F. gothlandicus* and *Heliolites daintreei* are species occurring also in Europe.

In comparing the coral fauna of the Garra beds with that of the Lower Couvinian Bluff limestone of the Murrumbidgee R., which is the lowest known Middle Devonian fauna in Australia, we find only the genera *Acanthophyllum*, "*Cystiphyllum*" and *Favosites* in common; a wider

comparison with the whole Couvinian succession of the Goodradigbee R., adds to these only the genus *Pseudamplexus*. The only identical species is *Favosites bryani*, which occurs in the Garra beds and in the Murrumbidgee R. Couvinian, but the Garra specimens are atypical. A comparison with the Lower Devonian of Loyola shows the first three genera above common to both, but the distinctive *F. ovatiporus* suggests similarity of age. With the Silurian fauna of Yass there are seven genera in common, *Rhizophyllum*, "*Cystiphyllum*," *Tryplasma*, *Entelophyllum*, *Favosites*, *Heliolites* and possibly *Plasmopora*, and at least two species, *F. gothlandicus* and *H. daintreei*, are identical. But *H. daintreei* ranges as high as the Middle Devonian, and it is suggested later in this paper that *F. gothlandicus* occurs as high as the transitional horizon between the Lower and Middle Devonian in France. Although the Garra fauna does not compare closely with any other known assemblage, we think it nearest in age to that of the Lower Devonian of Loyola, as with it there is the only definite identity of a short-range species.

MADREPORARIA RUGOSA.

Family ACANTHOPHYLLIDÆ.

Acanthophyllidæ, Hill, 1939*a*, p. 56 ; 1939*b*, p. 220.

Rugosa with a wide dissepimentarium of highly arched dissepiments, long septa frequently modified in the dissepimentarium and carinate in the tabularium, and with numerous, shallowly concave tabulæ deepened at the axis. The major septa are long and unequal, never amplexoid, and the two minor septa neighbouring the counter septum are longer than the rest.

The diagnosis of the family is widened to include the Silurian genera *Spongophylloides* Meyer (see Butler, 1934) and *Cymatelasma* Hill and Butler (1936), and the Lower Devonian genus *Lyrielasma* Hill (1939*b*, p. 243), all of which have the family characters of numerous, shallowly concave tabulæ, deepening at the axis, long unequal major septa, carinate in the tabularium, never amplexoid, and except in *Lyrielasma*, two very long minor septa flanking the counter septum. Formerly (1939*b*, p. 243) I considered *Spongophylloides* and *Cymatelasma* as the family Cymatelasmidæ, and thought that the resemblance to them of *Lyrielasma* was not close enough to unite all three in the one family. But the chief difference between these three

genera and those I formerly included in the Acanthophyllidæ was in the characters of the septa in the dissepimentarium, and it now appears to me that such variability is as much diagnostic of the family Acanthophyllidæ as the fixity in the characters of the tabularium. The range of the family is thus extended down into the Gotlandian.

Range. Gotlandian of Europe, Lower and Middle Devonian of Europe and Australia, and Upper Devonian of Europe.

Genus Acanthophyllum Dybowski.

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

Acanthophyllum Hill, 1939*a*, p. 56 ; 1939*b*, p. 222.

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

Diagnosis. Rugosa with a wide dissepimentarium of small, highly arched dissepiments, with shallowly concave, axially deepened tabulæ, 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 typically waved and carinate.

Range. Probably *Actinocystis perfecta* Wedekind (1927, p. 45, pl. xxvi, figs. 15–18), from the Ludlovian of Gotland, is a member of the genus, and if so the range of the genus, formerly given as Lower and Middle Devonian of Australia and Europe, and Upper Devonian of Europe, must be extended down into the Upper Silurian.

Acanthophyllum sp.

(Plate II, figs. 1, 2.)

Holotype. 5171, Sydney University Collection, Garra Beds, Por. 81, Par. Brymedura, Molong District, N.S.W.

Diagnosis. Slenderly trochoid or cylindrical *Acanthophyllum* with narrow dissepimentarium, and septa more dilated in the dissepimentarium than in the tabularium.

Description. The corallum is solitary, and elongately trochoid or cylindrical; one specimen has a diameter of 9 mm., and another, the holotype, of 15 mm. The epitheca of the holotype appears smooth. The 22 to 25 major septa are unequal, the longest extending to the axis, the others almost to the axis. In the holotype the longest septum appears to be the cardinal, while in the second specimen the counter septum seems the longest. The other major septa are arranged in groups as is typical in *Acanthophyllum*. In the holotype they are slightly curved, particularly at their axial ends, but in the second specimen they are almost straight. They are more carinate in the holotype, and are considerably dilated in both dissepimentarium and tabularium in both specimens, particularly at the periphery of the second, where a peripheral stereozone is formed. The tabulæ are flat or slightly sagging, incomplete, and closely spaced; the dissepiments in the second specimen are very large, in not more than two series, sometimes dilated.

Remarks. In its internal structure this species shows considerable resemblance to that of the Lower Devonian fasciculate genus *Lyrielasma*, particularly in the tendency of either the counter or the cardinal septum to be the longest, and in the type of septal dilatation in the dissepimentarium. Very close resemblances are also seen to *Cyathophyllum dianthus* Goldfuss, Le Maitre (1934, p. 153, pl. v, fig. 13) from the Chaudefonds limestone, representing the base of the Middle Devonian and the top of the Lower Devonian, and *C. dianthus* of Charlesworth (1914, p. 363, pl. xxxi, fig. 8) from the Lower Devonian of the Carnic Alps.

Localities. Por. 81, Parish Brymedura, Molong District, N.S.W. (Sydney University Collection, 5171); 10 miles north of Molong on the Cumnock Road (probably Por. 52, Parish Eurimbula) (F.3491, University of Queensland Collection). Both Garra Beds.

Genus Spongophylloides Meyer.

Spongophylloides Meyer, 1881, p. 109.

Spongophylloides Lang and Smith, 1927, p. 459; Butler, 1934, p. 541.

Genotype. Spongophylloides schumanni Meyer, 1881, p. 109, pl. v, fig. 12. Drift. East Prussia = (see Lang and Smith, 1927, p. 459) *Cystiphyllum grayi* Edwards and Haime, 1851, p. 465.

Diagnosis. Rugose corals, typically solitary, with major septa which reach or nearly reach the axis, and with a peripheral zone of lonsdaleoid dissepiments in which the septa are developed only as crests, the minor septa being confined to the inner part of the dissepimentarium where normal dissepiments are developed. The septa are wavy, and may be more or less dilated. The tabular floors are concave, deepened axially, and the tabellæ are small, close and but slightly arched.

Remarks. The arrangement of the axial ends of the septa in *Spongophylloides* is very similar to that in *Acanthophyllum*, but the longest septum is not invariably a metaseptum. The peripheral zone of lonsdaleoid dissepiments, which is very well developed in *Spongophylloides*, serves thereby to distinguish this genus.

Spongophylloides (?) thomasæ sp. nov.

(Plate IV, figs. 1*a*, 1*b*.)

Holotype. NS 1296, Sydney University Collection, Garra Beds, near Cudal, N.S.W. This is the only specimen known. Collector, Miss N. Thomas.

Diagnosis. Cerioid *Spongophylloides* with very large corallites, very numerous long major and minor septa, and some geniculate dissepiments.

Description. The corallum is cerioid, the holotype consisting of parts of three adult corallites and an intermural offset. The diameter of the largest corallite is at least 40 mm. The offset has a diameter of 5 mm., and a wide peripheral zone of lonsdaleoid dissepiments. The largest corallite has a peripheral zone 10 mm. wide of large lonsdaleoid dissepiments, in which the septa are represented only by crests on the dissepiments. Attenuate major and minor septa, 33 of each, are both well developed inside this zone ; the parts of the minor septa inside this zone are a little over 10 mm. long, while the major septa are unequal, extending to or almost to the axis ; they are slightly wavy and weakly carinate, both waves and carinæ being parallel to the distal edges of the septa. The tabulæ are closely spaced and incomplete, forming concave floors to the tabularium, with a deep axial depression. The lonsdaleoid dissepiments in the peripheral zone are large, elongate plates, horizontally based, or inclined at about 45°. The inner series of dissepiments are of smaller and

more globose plates, more steeply inclined, and frequently geniculate in transverse section.

Remarks. The known species of *Spongophylloides* are solitary, occurring in the Silurian. This cerioid form is placed somewhat doubtfully in the genus. The general arrangement of its septa is like that of the Acanthophyllidæ, even more like that in *Acanthophyllum* than that in *S. grayi*, but it may be that the resemblance in internal structure to *Spongophylloides* is homœomorphic.

Family Calceolidæ.

Calceolidæ Lindström, 1883, p. 9 ; Hill, 1940.

Genus Rhizophyllum Lindström.

Rhizophyllum Lindström, 1866*a*, p. 279 ; 1866*b*, p. 411 ; 1883, p. 22.

Rhizophyllum Hill, 1940*b*, *q.v.* for Australian Silurian species.

Genotype. *Calceola gotlandica* Roemer, Upper Silurian, Gotland.

Diagnosis. Calceoloid corals with semi-circular operculum ; with undilated, arched, horizontal skeletal elements, none of which extend completely across the lumen, and with vertical skeletal elements reduced to a series of short septa, partly lamellar and partly acanthine, on the flattened side of the corallum.

Range. Gotlandian of Europe, North America and Australia, and Lower Devonian of France.

Rhizophyllum enorme Etheridge.

(Plate II, figs. 3, 4.)

Rhizophyllum enorme Etheridge, 1903, p. 232, pl. xlvii, Boree Ck., Portion 3, Parish of Cudal, Co. Ashburnham, near Molong, N.S.W.

Type Material. Unlocated, formerly in the collection of the Geological Survey of New South Wales.

Diagnosis. Very large, sub-erect *Rhizophyllum*, up to 130 mm. in length.

Description. The corallum is large, the largest specimen collected being incomplete at 120 mm., and the smallest 45 mm. long. There is a slight curvature of the whole corallum, so that the flat (counter) side rests with the calical and apical portions inclined upwards. This

curvature is greatest near the apex. Increase in diameter is rapid at first, 40 mm. being attained in a height of 25 mm. ; thereafter it is slow. In transverse section the corallum is semi-circular in the earlier stages, but becomes more flattened with height, the length of the flattened side between the alar septa being more than twice the width between the cardinal and counter sides. The angles at the alar septa are rounded, so that the greatest width of the corallum is a little to the cardinal side of the alar septa. The epitheca shows marked interseptal ridges and interseptal furrows, and transverse striæ ; growth constrictions also occur. A broad ridge is seen external to the counter septum. The calical characters are imperfectly known ; the cardinal side is set slightly below the flattened side, and there is a deep pit near the inner end of the cardinal septum ; there is a row of alternating major and minor septa along the flattened border of the calice, except at the angles, but none have been observed along the curved border. Fairly large domed plates are visible. The operculum is not known in association with any specimen.

The lumen is filled with unthickened rather large domed horizontal skeletal elements, inclined downwards to a deep fossula at the alar and counter septa. The major septa may extend half-way across the lumen from the flattened edge ; none are seen in the cardinal quadrants ; they are longest at the middle line, and shorten gradually towards the angles. They are straight, alternating in size, and each consists of large, distant trabeculæ so thickened as to be in contact.

Remarks. The species differs from all others by its great size, transcending even *R. gervillei* (Bayle) from the Lower Devonian of France. In proportions and internal structure it is closest to the Gotlandian *R. gotlandicum*, and the Australian Silurian *R. robustum* Shearsby. It occurs in Mandagery's Ck., Por. 73 or 77, Par. Brymedura in addition to the type locality.

Cystimorphs.

This morphological group, which is probably polyphyletic, has already been reviewed (Hill, 1939*b*, p. 248).

"Cystiphyllum" sp.

(Plate II, figs. 5, 6.)

Cylindrical cystimorphs, with average diameter 20 mm., are common in the Garra Beds, at all localities where

corals were collected. Many individuals occur together, possibly forming fasciculate colonies, but this was not proved, no evidence of branching being seen. Fragments 130 mm. long were obtained. The epitheca shows growth striæ, and many growth swellings and constrictions, and with slight weathering longitudinal furrows corresponding to the septa are visible. No vertical skeletal elements are seen in sections, the entire lumen being occupied by large arched plates, which are not clearly divisible into dissepiments and tabulæ, but are arranged in concave floors, the concavity lessening towards the axis. The plates show little or no dilatation, and no trabeculæ can be seen on their surfaces.

Age. As these cystimorphs show neither trabeculæ nor dilatation, two characters important in indicating age, they are of no assistance in determining the age of the deposits, in which they are the commonest coral.

Family Mycophyllidæ.

Mycophyllidæ Hill, 1940.

Genus Pseudamplexus Weissermel.*

Pseudamplexus Weissermel, 1897, p. 878.

Pselophyllum Počta, 1902, p. 82. Genolectotype, chosen Hill, 1940, *Pselophyllum bohemicum* Barrande in Počta, *id.*, Lower Devonian, F_2, Koněprus, Bohemia.

Genotype. Zaphrentis ligeriensis Barrois, 1889, p. 52, pl. iii, fig. 1, Lower Devonian, Erbray, France.

Diagnosis. Large, trochoid or sub-compound Rugosa with sub-equal short major and minor septa dilated and in contact to form a peripheral stereozone in lieu of a dissepimentarium, and with a wide tabularium of distant, horizontal, complete tabulæ.

Range. Lower Devonian of France, Bohemia and the Carnic Alps, Lower Middle Devonian of Silverwood, Queensland. Some of the species placed by Wedekind (1927, p. 37) in his genus *Pseudomphyma*, i.e. those species in which the calical rims are not expanded, from the Wenlock and Ludlow of Gotland, may be *Pseudamplexus*.

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* Lang, Smith and Thomas (1940, April 26, p. 108) have regarded *Pseudamplexus* Weissermel as a genus *caelebs*. But Hill (1940*a*, April 22, p. 158) had already accepted the genus, interpreting Weissermel's statements on p. 877 as placing *Z. ligeriensis* Barrois certainly in the genus.

Pseudamplexus princeps Etheridge.

(Plate III, figs. 1, 2.)

Tryplasma princeps Etheridge, 1907, p. 97, pl. xv, fig. 1 ; pl. xvii, figs. 1–5 (*non* fig. 6) ; pl. xviii, figs. 1, 7 ; pl. xix, figs. 1–3 ; pl. xx ; pl. xxi, figs. 1–9 ; pl. xxii, figs. 1, 10 ; pl. xxiii, figs. 1–3. Molong and Wellington Districts, New South Wales.

Lectotype (here chosen). F 35502 (Australian Museum), Boree Ck. (either Portion 2, 3 or 12 $\frac{44}{1}$), Parish Cudal, Co. Ashburnham ; Garra Beds, figured Etheridge, 1907, pl. xviii, fig. 1 ; pl. xix, figs. 1–3.

Diagnosis. Sub-compound *Pseudamplexus* with relatively narrow peripheral stereozone.

Description. The corallum may be solitary, or a sub-compound corallum may be formed by the growth of one or more series of offsets by peripheral increase after the parent corallite has attained a large diameter, and as many as 13 such offsets may arise at once from the one calice. The individual corallites are conical at first and cylindrical later, particularly those from which offsets do not arise. One such individual was 25 cm. long, with diameter 55 mm. Those individuals characterised by earlier increase are conical rather than cylindrical, and usually somewhat shorter. Most coralla are erect, but some are slightly curved. Many possess rootlets ; the offsets may have connecting processes. The epitheca shows well-marked longitudinal ridges and furrows, the ridges usually broader than the furrows ; growth annulation is also common, and some few corallites show growth constrictions and swellings.

There are between 70 and 80 septa about 3 or 4 mm. long, the major being with difficulty distinguishable from the minor. They are so dilated as to be in contact laterally for half their length, and thus to form a peripheral stereozone 1 or 2 mm. wide—which of course appears wider in tangentially weathered surfaces. This number of septa is present very early, so that much of the later increase in diameter of the corallum is accounted for by the increase in the width of the septa, rather than by an increase in their number. In some large corallites the septa may be 3 mm. wide at their bases, but a more usual width is 1 to 2 mm. In suitably broken specimens the septa are seen to continue as thin, very low ridges on the upper surfaces

of the tabulæ, almost half-way to the axis, so that they must be amplexoid (Hill, 1935, p. 502). Whether they were better developed in the early stages of the corallum cannot at present be determined, as no tips of coralla are available. The micro-structure of the septa is as described for the genus (Hill, 1940*a*). They consist of a single series of rhabdacanths, much expanded laterally and very closely placed, fine lamellar sclerenchyme being interwoven with the "rods" of the rhabdacanths; but this growth-laminated sclerenchyme of each septum is not continuous with that of neighbouring septa. The tabulæ are thin, usually complete, and almost horizontal, but without great regularity; their spacing varies in different corallites, being as great as 4 mm., or as little as 1 mm. There are no dissepiments. The rootlets are hollow with a thick lining of lamellar sclerenchyme.

Remarks. The species resembles the Bohemian Lower Devonian (F_2) *P. obesus* Počta, 1902, pl. 32, figs. 16, 17) in the width of the stereozone, but differs in having the ability to produce offsets. It also resembles *Pseudomphyma profunda* Wedekind (1927, pl. 6, figs. 8–10) from the Ludlovian of Gotland, but has not the clear distinction between major and minor septa of the Gotland species. Etheridge compared his species to the Chinese Silurian *Amplexus appendiculatus* Lindström (1883, pl. vi, figs. 7, 8) but the similarities are not so great as those with the Lower Devonian *Pseudamplexus*.

Localities. In addition to the type locality, the species occurs at: 10 miles north of Molong on the Cumnock road (Por. 52, Par. The Gap); Mandagery's Ck., Por. 73 or 77, Par. Brymedura, probably Por. 73; Por. 31, Par. Bell; Por. 174, Par. Bell (Crystal Springs); Por. 170, Par. Curra, near Wellington (Curra Ck. crossing).

Family Rhabdocyclidæ.

Acanthocyclidæ Hill, 1936, p. 193.
Rhabdocyclidæ Hill, 1940*b*.

Genus Tryplasma Lonsdale.

Tryplasma Lonsdale, 1845, p. 613.

Tryplasma Hill, 1940*b*, *q.v.* for list of synonyms.

Genolectotype. Tryplasma æquabile Lonsdale, 1845, pp. 613, 633, pl. A, figs. 7, 7*a*. Silurian. River Kavka, near Bogoslovsk (east of the Northern Urals).

Diagnosis. Simple or fasciculate Rugose corals with a narrow peripheral stereozone of rhabdacanthine, holacanthine or dimorphacanthine septa in continuous lamellar sclerenchyme, the trabeculæ being free distally; with complete tabulæ, and no dissepiments.

Range. Borkholm beds (Upper Ordovician or more probably Valentian of Estland), Silurian of Europe, Asia, America and Australia, and Lower Devonian of Europe and Australia.

Tryplasma columnare Etheridge.

(Plate III, figs. 3, 4.)

Tryplasma columnaris Etheridge, 1907, p. 85, pl. xv, fig. 6; pl. xix, fig. 5; pl. xxiv, figs. 2–5. Garra Beds, Molong District, and Silurian of Quedong, Co. Wellesley, N.S.W.

Lectotype (here chosen). F 35519, Australian Museum Collection, Garra Beds, Molong District (either Por. 4, Par. Boree Nyrang, or Boree Ck., Por. 2, Par. Cudal, Co. Ashburnham, N.S.W.), figured Etheridge, *loc. cit.*, pl. xix, fig. 5, being the only figured syntype not missing.

Diagnosis. Simple *Tryplasma*, with long, stout corallites (up to 25 mm. in diameter), and close, complete or incomplete tabulæ.

Description. The corallum is solitary, without offsets, turbinate at first, then long, cylindrical, straight or slightly curved, attaining a diameter of 25 mm. The epitheca shows low, rounded longitudinal ridges, with (in Sydney University specimen 5169 from Nora Ck.) epithecal scales as described by Lindström. Growth striæ and growth swellings and constrictions are characteristic. There are 60 to 80 rhabdacanthine septa, forming a stereozone about 3 mm. wide, the minor septa being but little shorter. than the major. Trabeculæ may arise from the tabulæ. Both complete and incomplete tabulæ occur, so that the arrangement of these plates is somewhat irregular. They are rather close.

Remarks. I have not seen the syntype from Quedong. Three specimens (Sydney University 5168–5170) have been collected from a new locality, Nora Ck., at the south end of Por. 191, Par. The Gap, Co. Ashburnham. Somewhat slenderer corallites, of 15 mm. diameter (S.U. 5165) occur at the turn-off to Wellington Caves from the main road between Wellington and Molong, and are probably

referable to *T. columnare*. Other localities, in addition to the types, are 10 miles north of Molong on the Cumnock road (Por. 52, Par. The Gap) ; Por. 73 or 77 Par. Brymedura (Mandagery's Ck.) ; Por. 31, Par. Bell.

Family Entelophyllidæ.

Entelophyllidæ Hill, 1940.

Genus Entelophyllum Wedekind.

Entelophyllum Wedekind, 1927, p. 22.

Xylodes Lang and Smith, 1927, p. 461 ; Hill, 1940*b*.

Genotype by designation : *Madreporites articulatus* Wahlenberg, 1821 (1819), p. 97. Upper Silurian, Gotland.

Diagnosis. Compound Rugose corals typically with peripheral increase, long thin septa of which the major reach, or nearly reach the axis, an axial structure of axial tabellæ surrounded by concave periaxial tabellæ, and numerous, small, globose dissepiments.

Range. Wenlock and Ludlow of Europe, America and Australia. The species described below extends the range of the genus into the Lower Devonian.

Entelophyllum arborescens sp. nov.

(Plate III, fig. 5.)

Holotype. 6190, Sydney University Collection, from the Garra Beds (? Lower Devonian) of Nora Ck., Par. The Gap, near Molong, N.S.W., collected by Miss J. Johnston.

Diagnosis. *Entelophyllum* with xyloid septa, and with the tabulæ in a series of domes widely depressed axially.

Description. The corallum is large, fasciculate or partly cerioid, with individual corallites varying in diameter between 5 and 20 mm. ; their shape is not known owing to the massive nature of the rock containing them, but they are probably trochoid. Increase appears to be peripheral, the hystero-corallites tending to spread out one from another like the branches of a shrub. In a corallite 18 mm. in diameter there are 36 major septa extending about three-quarters of the way to the axis, being slightly turned aside from a radial course in the tabularium. They are rather ragged and a little thickened with xyloid carinæ in the disseptimentarium, but are thin and without carinæ in the tabularium. There are 36 minor septa, extending to the

inner edge of the dissepimentarium, *i.e.*, about half-way to the axis, with xyloid carinæ, but usually somewhat less thickened than the major septa. The tabularium occupies half the diameter of the corallite. The tabulæ are typically complete, domed, with a very wide axial sag, sometimes with a few supplementary tabellæ at the edge of the sag near the outer part of the tabularium. The dissepiments are small and distally distended ; those of the outermost series may be rhomboid and rather large ; only the innermost series are steeply inclined.

Remarks. The species differs from the genotype, to which it appears closer than to other known species, in the comparative simplicity of the axial structure, many of the tabulæ being complete, instead of being represented by numerous tabellæ as in the genotype. The tabular floor is still a dome with an axial sag, but the axial sagging portion is wider than in *E. articulatus*. The dissepiments are like those of *E. articulatus*.

MADREPORARIA TABULATA.

Family FAVOSITIDÆ.

Genus Favosites Lamarck.

Favosites Lamarck, 1816, p. 294.

Favosites Smith and Gullick, 1925, p. 117 ; Jones, 1936, p. 2.

Genotype : Favosites gothlandicus Lamarck, 1816, p. 204, Silurian of Gotland.

Favosites allani Jones.

(Plate V, figs. 1*a*, 1*b*.)

Favosites allani Jones, 1937, p. 90, pl. xii, figs. 4, 5.

Diagnosis. Favosites with small corallites, with numerous septal spines which are short, horizontal and with a broad base, with small circular mural pores typically in one row, and with thin, horizontal and usually complete tabulæ, 12 to 17 in 5 mm.

Description of a specimen from near Wellington (Sydney University 5181). The corallites are of two sizes—1 to 1·5 mm. in diameter and 1·5 to 2 mm. in diameter, the former being triangular and hexagonal and the latter hexagonal to octagonal. The walls are in the main moderately thin but across the section runs a band 10 to

15 mm. wide in which they are markedly thickened (up to 0·25 mm. thick). The septa consist of numerous short spines, horizontally directed or with a slight upward inclination. The mural pores are usually in one row but sometimes in two. The tabulæ are thin, complete and almost invariably horizontal ; they vary greatly in distance apart, there being 6 in 5 mm. in one part and 13 in 5 mm. in another part of the section.

Remarks. This specimen is quite typical of the species except in two characters—the walls are rather thicker even in the thinner walled part and much thicker in the thickened band, than in any other specimen we have examined ; and the tabulæ are more widely spaced. It should be noted that some specimens from the Upper Silurian of Yass have slightly thicker walls than that figured by Jones *loc. cit.*

Locality. Por. 50, Par. Curra, near Wellington, N.S.W. Mapping is being carried out in this area by Misses Basnett and Colditz and as yet the age of these limestones has not been established.

Favosites bryani Jones.

(Plate V, figs. 2*a*, 2*b*.)

Favosites bryani Jones, 1937, pp. 96-7, pl. xv, figs. 3-6.

Diagnosis. Favosites with small moderately thick walled polyhedric corallites, long, slender, sharply pointed septal spines, one row of circular mural pores, and fairly numerous tabulæ, which are mostly complete.

Description of the Molong specimen (University of Queensland Geological Museum, F.3503, two sections). The corallum is small, weathered and incomplete, but is flatly domed. The corallites are polygonal, octagonal to triangular, but usually hexagonal. The corallite walls are of a similar thickness to those of the holotype (Jones, *loc. cit.*, pl. xv, fig. 3) but the angles are slightly less rounded. The longitudinal section obtained is small and poor but a few long and slender septal spines of exactly the type illustrated in Jones' figures (*loc. cit.*, figs. 4, 6) can be seen. This section also shows the circular mural pores in one row and tabulæ as in the holotype but with a larger number inosculating.

Localities and Range. One of us has (Jones, *loc. cit.*) recorded this species from the Lower Middle Devonian of Good Hope near Yass, N.S.W., first limestone on the

Taemas Bridge Road from Yass, N.S.W., and of the limestones at the Yass end of the Taemas Bridge, N.S.W.; the specimen here described is from Por. 3, Par. Cudal, near Molong, N.S.W.

Favosites gothlandicus group and Favosites goldfussi.

The Silurian forms *Favosites gothlandicus* Lamarck, *Favosites forbesi* Edwards and Haime and *Favosites multiporus* Lonsdale have been fully discussed by one of us (Jones, 1936, pp. 2-14, text-figs. 1-12, pl. i) and shown to be conspecific. It was suggested that they be regarded as formæ distinguished as follows :

Favosites gothlandicus Lamarck, forma *gothlandica* Lamarck, forms with no or very few septa and with thin walls.

F. gothlandicus Lamarck, forma *forbesi* Ed. and H., forms with some septa and thicker walls.

F. gothlandicus Lamarck, forma *multipora* Lonsdale, forms with many septa and with relatively thick walls.

It was further pointed out (*loc. cit.*, p. 14) that *F. maximus* Quenstedt, non Troost, is a form closely related to *F. gothlandicus* forma *gothlandica*, differing only in the size of the corallites.

The Middle Devonian *Favosites goldfussi* d'Orbigny was also discussed (*loc. cit.*, pp. 19-21, pl. ii, figs. 8-10). While it was recognised to be a variable form similar in many respects to some of the *gothlandicus* group, some specimens in particular closely resembling forma *forbesi* and forma *multipora*, though others have more thickened walls, rounded angles to the corallites and longer septa, it was kept as a separate species owing to the difference in age and the absence of connecting forms from the Lower Devonian. Comparatively few species of *Favosites* have been described from the Lower Devonian, the most being by Počta (1902), but his work was based mainly on externals and polished surfaces, so that exact comparison with other species is difficult. The Molong fauna described in this paper is probably of Lower Devonian age ; typical specimens of *F. gothlandicus* forma *gothlandica* and forma *forbesi* occur with others which might be placed either in

forma *multipora* or *F. goldfussi*. Two specimens in particular have long septa and rather rounded angles and are like those specimens of *F. goldfussi* which are less like forma *multipora*.

This suggests that *F. goldfussi* is a member of the *F. gothlandicus* group which survived into the Middle Devonian with only slight modifications.

In support of this idea the following observations are made : Some authors have regarded *F. goldfussi* as identical with, or as a variety of, *F. gothlandicus*, *e.g.* Nicholson (1879). The Middle Devonian form from the Eifel (consisting of small coralla with corallites of two sizes as is common in forma *forbesi*) has been regarded as a variety—var. *eifelensis*—of *F. goldfussi* by some authors, and by others as a separate species—*F. eifelensis* ; there are in the University of Queensland collection numerous specimens of this form from Auburg in the Eifel, some of which show little rounding of the angles and comparatively short septa so that they might equally well be referred to *F. gothlandicus* forma *forbesi*. The specimen from the Middle Devonian of the Eifel figured by Penecke (1894, p. 604, pl. ix, figs. 5, 6) as *F. eifelensis* is fairly thin walled and has fairly short septa, and it might easily be placed in *F. gothlandicus* forma *forbesi*. Other Devonian forms which may be related to the *F. gothlandicus* group are *F. graffi* Penecke (1897, p. 604, pl. ix, figs. 7-9 ; pl. xi, fig. 8) from the Middle Devonian, which is like *F. eifelensis* but has no septa ; *F. styriacus* Penecke (1894, p. 603, pl. ix, figs. 3, 4) from the Lower and Middle Devonian which is like *F. gothlandicus* forma *multipora*, but has smaller corallites (1·25 to 1·5 mm. in diameter) and shorter septa ; *F. bohemicus* Barrande, Počta (1902, p. 241, pl. 85, figs. 1-9 ; pl. 106, figs. 3, 4) from the Lower and Middle Devonian which is very like a large *F. gothlandicus* forma *gothlandica* and probably should be referred to that species ; *F. helderbergiæ* Hall, Loewe (1914, p. 15, pl. iv, figs. 4*a-e*) from the Devonian of Ellesmereland which is like *F. gothlandicus gothlandica* with corallites 2 mm. in diameter and 4 to 7 tabulæ in 3 mm.

Summarising, the evidence points to *F. goldfussi* being a member of the *F. gothlandicus* group but is insufficient at present to merge *F. goldfussi* in forma *forbesi* and forma *multipora*. Two specimens from Molong are placed in

F. goldfussi and the remainder in the *F. gothlandicus* group.[1]

F. gothlandicus Lamarck, forma gothlandica Lamarck.

(Plate V, figs. 3*a*, 3*b*.)

Favosites gothlandica Lamarck, 1816, vol. ii, p. 206.

Favosites gothlandica Smith and Gullick, 1925, p. 118, pl. viii, fig. 1.

Favosites gothlandicus forma *gothlandica* Jones, 1936, p. 8, pl. i, figs. 1-4 ; Jones, 1937, p. 86, pl. xi, figs. 1, 2.

For description and figures, see Jones, 1936 and 1937.

Localities. Garra Beds of Por. 31, Par. Bell, Molong District ; Por. 81, Par. Bell, Molong District ; Por. 52 (probably), Par. Eurimbula, The Gap, near Molong, N.S.W. Also from the limestone in Pors. 46, 47 and Reserve, Par. Burrawang, Molong District, horizon unknown.

Favosites gothlandicus Lamarck forma forbesi Edwards and Haime.

(Plate V, figs. 4*a*, 4*b*.)

Favosites forbesi Edwards and Haime, 1851, pp. 238-9 ; 1855, pp. 258-9, pl. lx, figs. 2, 2*a-e*, 2 *g* (excluding 2*f*).

Favosites gothlandicus Lamarck forma *forbesi* Edwards and Haime, Jones, 1936, pp. 9-12, pl. 1, figs. 5-7.

For description and figures see Jones, 1936.

Localities. Por. 171, Par. Curra, near Wellington, N.S.W. ; Por. 31, Par. Bell, near Garra, N.S.W. ; Por. 73 or 77 (probably 73), Par. Brymedura, Molong District—all University of Queensland Collection. Crystal Springs, west of Molong, N.S.W. (University of Sydney Collection sections 714, 715). Cudal, near Molong (U.S. section 708).

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[1] Since the above was written a paper by M. Lecompte (1939, " Les Tabules Dévonien moyen et supérieur du Bord sud du Bassin de Dinant ", *Mem. Mus. Roy. Hist. Nat. Belg.*, 90, 227 pp., 22 pls.) has come to hand. Lecompte suggests (p. 88) that *F. goldfussi* may be a descendant of the *F. gothlandicus* group, but states that with the Silurian material available to him he does not feel justified in assuming a relation.

Favosites gothlandicus Lamarck forma **multipora**, Lonsdale.

(Plate VI, figs. 1*a*, 1*b*.)

Favosites multipora Lonsdale, 1839, p. 683, pl. xv, bis, figs. 5, 5*c*, not necessarily figs. 5*a*, 5*b*.

Favosites multipora Edwards and Haime, 1851, p. 237.

Favosites forbesi (partim) Edwards and Haime, 1855, p. 258, pl. lx, fig. 2*f* only.

Favosites gothlandicus forma *multipora* Jones, 1936, pp. 13-14, pl. i, figs. 8-12.

For description and figures, see Jones, 1936.

Localities. Por. 3, Par. Cudal, near Molong; Por. 73 or 77 (probably 73), Par. Brymedura, north of Garra, N.S.W. (University of Queensland Collection).

Favosites goldfussi d'Orbigny.

(Plate VI, figs. 2*a*, 2*b*.)

Favosites goldfussi (*partim*) d'Orbigny, 1850, p. 107 (fig. 3*b* of Goldfuss, 1892, only).

Favosites forbesi Edward and Haime var. *eifelensis* Nicholson, 1879, p. 61, pl. ii, fig. 3; pl. iii, figs. 1, 1*a-b*.

Favosites gothlandica Etheridge, 1899, p. 162, pls. xxii, xxiii.

Favosites goldfussi Jones, 1936, pp. 19-21, pl. ii, figs. 8-10; Jones, 1937, pp. 94-95, pl. xiii, fig. 6; pl. xiv, fig. 1.

For description and figures, see Jones, 1936 and 1937.

Localities. Por. 3, Par. Cudal, near Molong; Por. 73 or 77 (probably 73), Par. Brymedura near Garra, N.S.W.

FAVOSITES NITIDUS–FAVOSITES SALEBROSUS group.

Favosites salebrosus Etheridge (1899) and *Favosites nitidus* Chapman (1914) have been briefly dealt with by one of us (Jones, 1937) and the resemblance of *F. nitidus* to *F. salebrosus* was pointed out. The examination of more of Chapman's material and of specimens from Molong, N.S.W., has convinced us that they are best regarded as the end members of a group and that forms occur which in some or all characters are intermediate between the two. Both species are very variable in almost all characters, but *salebrosus* is distinguished by having a considerable number of reclined corallites, which as a result are alveo-

litoid in transverse section; again, polygonal corallites have the angles rounded. In *F. nitidus* the diameter of the corallites is more variable, 0·5 mm. to 0·75 mm., while in *salebrosus* it is fairly consistently 0·5 mm. None of Chapman's specimens of *nitidus* which we have seen show reclined or alveolitoid corallites, but all are small fragments.

A comparison may be drawn with *Favosites intricatus* Barrande, Počta (1902). The figures, pl. 88, figs. 11, 12, 15, 16; pl. 91, fig. 11, are of specimens with external form similar to *F. nitidus*, while the figures, pl. 95, figs. 1, 2, 4, 6, 11 show specimens with external form similar to *F. salebrosus*. This species differs, however, in internal characters (see Table 1). All the figured specimens were from Koneprus and of Lower Devonian age, whereas there is an age variation in the *F. nitidus-F. salebrosus* group from Upper Silurian [? Lower Devonian[1]] (*F. nitidus*) to Middle Devonian (*F. salebrosus*). *F. proasteriscus* Charlesworth (1914, p. 373, pl. xxxiii, figs. 1*a*, 1*b*) is described as having " undulating " corallites (? reclined) but no mention is made of, nor do the figures show, any alveolitoid corallites; the species has no septa, close tabulæ and one row of large mural pores. It is from the Lower Devonian of the Carnic Alps. *F. salebrosus* has been adequately described by one of us (Jones, 1937, p. 95) except that mention was not made of the reclined position of many corallites. The feature is common to all specimens we have seen from the Woolomol, Moore Creek, and Nundle road limestones. It is possible, as has been suggested to us by Dr. Stanley Smith of Bristol, that the reclined posture of the corallites, with which is correlated the alveolitoid shape of the calices, may be the expression of an alveolitoid trend which may have acted in *Favosites* many times, producing species which have been referred to *Alveolites*. Thus *Alveolites* would be a polyphyletic genus.

We now propose to make a new variety of *F. nitidus* for the Molong form. *F. nitidus* will first be redescribed in more detail. See Table 1 for comparison with other species.

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[1] The Deep Creek fauna contains a species of *Prismatophyllum* Simpson which suggests a Lower Devonian age, but the fauna needs further investigation.

TABLE 1.—*Comparison of Various Species of* Favosites.

Species.	Size of Corallites (mm.).	Form of Corallites.	Walls.	Septa.	Mural Pores.	Tabulæ.	Range.
F. ovatiporus sp. nov.	1·0	Polyhedric irregular in shape.	Thin or moderately thin.	None.	One row, very large, usually oval.	Complete 5–8 in 5 mm.	Lower Devonian in Australia.
F. allani Jones.	1·0–2·0	Polyhedric irregular in shape.	Thin.	Numerous, short.	Usually one row, small circular.	Usually complete horizontal 11–17 in 5 mm.	Upper Silurian in Australia.
F. regularis Jones.	0·75–1·0	Polyhedric, regular in shape.	Slightly thickened.	Horizontal spines with broad base, variable in length.	Usually two rows, small circular.	Thin horizontal complete, 15–20 in 5 mm.	Upper Silurian in Australia.
F. yassensis Jones.	0·75–1·0	Polyhedric, regular in shape.	Moderately thin.	Very short inclined spines.	Usually three rows, small circular.	22–35 in 5 mm.	Upper Silurian in Australia.
F. ottiliæ Penecke	0·5 –0·75	Polyhedric, regular in shape.	Moderately thin.	None.	One row, fairly small, circular.	Complete about 18 in 5 mm.	Lower and Middle Devonian, Europe.
F. ottiliæ Penecke, specimen figured by le Maitre.	0·75–1·25	Polyhedric, regular.	Moderately thick.	None.	One row "large", circular, numerous.	Complete, about 15 in 5 mm.	Transition beds between Lower and Middle Devonian in France.
F. alpinus R. Horn ms. Penecke.	Some 0·5 Most 0·75	Polyhedric, regular.	Thin.	Numerous short horizontal spines.	?	Thin, horizontal or inclined complete, occasionally inosculating 10–14 in 5 mm.	Lower Devonian in Europe.
F. alpinus specimen figured by le Maitre.	0·75–1·0	Polyhedric, regular.	Moderately thin.	Fairly long horizontal spines of the type of *F. librata* Jones not so numerous as in Penecke's figures.	One row ?, circular ? similar to those in *inosculans*.	Thin, horizontal or slightly concave about 6 in 5 mm.	Transition beds between Lower and Middle Devonian in France.
F. inosculans Nicholson, specimen figured by le Maitre.	0·5	Polygonal to alveolitoid with the angles rounded.	Fairly thick.	None.	One row circural often near the angles so that three corallites communicate with one another.	Thin, horizontal inclined sometimes incomplete and inosculating about 3 in 5 mm.	Transition beds between Lower and Middle Devonian in France.

TABLE 1.—*Comparison of Various Species of* Favosites.—Continued.

Species.	Size of Corallites (mm.).	Form of Corallites.	Walls.	Septa.	Mural Pores.	Tabulæ.	Range.
F. basalticus Goldfuss.	2·0	Polyhedric, regular in shape.	Moderately thin.	None.	Usually one row, occasionally two, 0·25 to 0·4 mm. in diameter.	Complete horizontal 9 in 5 mm.	Devonian.
F. salebrosus Etheridge.	0·5	Polyhedric or rounded, frequently reclined, and alveolitoid.	Moderately thick.	Few, short, blunt spines.	One row, large circular.	7 in 5 mm. complete thin, horizontal or inclined.	Middle Devonian in Australia.
F. intricatus Barrande; Počta.	1·0	Some specimens erect and polyhedric, others reclined and alveolitoid in parts.	Thin in some, moderately thick in others.	From the figures none in specimens, many in others.	One, sometimes two, rows, circular.	Complete 35 in 1 cm. (misprinted 1 mm.).	Lower Devonian.
F. proasteriscus Charlesworth.	About 1·0	Polyhedric, undulating.	Moderately thin.	None.	Large, circular, one row.	Complete, 12 in 5 mm.	Lower Devonian, Europe.
F. nitidus Chapman.	0·5 –0·75	Erect and polyhedric or with angles a little rounded; reclined and alveolitoid very rare or absent.	Moderately thick.	Numerous in parts of corallum. Short, blunt spines with broad base.	One row, circular, large, more numerous than in *F. salebrosus*.	Usually complete, some inosculating 15–20 in 5 mm.	Upper Silurian [?Lower Devonian].
F. nitidus Chapman var. *medius* var. nov.	0·5 a few 0·75	Most erect and polyhedric, angles slightly or not at all rounded. A few reclined and alveolitoid.	Slightly thickened.	Sparsely distributed short, blunt spines with broad base.	One row, large, circular, more numerous than in *F. salebrosa*.	Complete, thin, usually horizontal, sometimes reclined 7–9 in 5 mm. in some specimens, 15–19 in 5 mm. in other specimens.	Lower Devonian in Australia.
F. bryani Jones	1·0	Polyhedric or with angles slightly rounded, regular.	Moderately thick.	Long slender pointed spines.	Medium size, one row, circular.	Usually complete, some inosculating 17 in 5 mm.	? Lower Middle Devonian in Australia.

Favosites nitidus Chapman.

(Plate VI, figs. 3*a*, 3*b*, 3*c*.)

Favosites nitida Chapman, 1914, p. 309, pl. liv, figs. 21-23 ; pl. lv, figs. 24, 25.

Favosites nitida Jones, 1937, p. 93, pl. xii, figs. 4, 5.

Lectotype. Chapman, *loc. cit.*, did not choose a holotype, but figured three cotypes (M.D. 564, M.D. 576 and M.D. 749) and two paratypes (M.D. 588 and M.D. 592), all from Deep Creek, Thomson River, Gippsland, Victoria, except M.D. 749, which is from Cooper's Creek, Gippsland, Victoria. We choose as lectotype the specimen in the National Museum, Melbourne, M.D. 749 with two slides 1335, from Cooper's Creek, Walhalla, Victoria.

Diagnosis. Favosites with small, erect polyhedric corallites, blunt septal spines which are very irregularly distributed and may be entirely absent in parts of the corallum, one row of large circular mural pores and fairly numerous complete tabulæ.

Description of the lectotype. The external form of the corallum is unknown. The corallite walls are usually moderately thick ; the corallites are erect and polygonal and are usually polyhedric but the angles may be a little rounded ; alveolitoid corallites are rare or entirely absent. The diameter of the corallites is 0·5 to 0·75 mm. The septal spines are numerous in some parts of the corallum, but may be entirely absent in other parts ; they are short blunt spines with a broad base, and a slight upward inclination. The mural pores are in one row which may be sinuous ; they are large and close together—0·4 to 0·5 mm. between their centres. The tabulæ are thin, usually complete, occasionally incomplete and inosculating, horizontal or oblique, three or four in one millimetre.

Localities and Age. Deep Creek, Thomson River, Victoria, and Cooper's Creek, Victoria. Upper Silurian [? Lower Devonian.]

Favosites nitidus Chapman var. medius var. nov.

(Plate VI, figs. 4*a*, 4*b* ; Plate VII, figs. 1*a*, 1*b*, 2.)

Holotype. 5178, with two sections (Sydney University Collection), Por. 51, Par. Eurimbula, between Wellington and Molong, N.S.W.

Diagnosis. Favosites with the external form of *F. nitidus* but with a few corallites alveolitoid ; with the

internal characters of *F. salebrosus*, but some with more numerous tabulæ.

Description. The external form is unknown, but nearly all the corallites are erect, only a few being reclined, the diameter of the corallites is 0·5 mm., with a few 0·75 mm. The walls of the corallites are slightly thickened but the angles are only slightly or not at all rounded. Only a few corallites are alveolitoid. The septa vary considerably in number in different parts of the corallum, but mostly they are sparsely distributed. They are short blunt spines with a broad base, upwardly inclined or almost horizontal, but in some parts they may be fairly numerous, longer and curved. The mural pores are large and circular, in one row. The tabulæ are complete, usually horizontal, sometimes inclined or concavo-convex, in some specimens 7 to 9 in 5 mm. (like *salebrosus*), in others 15 to 19 in 5 mm. (like *nitidus*).

Localities and Age. Por. 3, Par. Cudal, near Molong; Mandagery's Creek, probably Por. 77, Par. Brymedura, near Molong; Por. 51, Par. Eurimbula, between Wellington and Molong. Probably Lower Devonian.

Favosites ovatiporus sp. nov.

(Plate VII, figs. 3*a*, 3*b*, 4*a-c*; Plate VIII, figs. 1, 2*a*, 2*b*.)

Holotype. Specimen in the University of Sydney Geological Museum F.5177, with (two sections) from Por. 184, Par. Cudal, near Molong, N.S.W.

Diagnosis. *Favosites* with small corallites, no septa, and very large usually oval mural pores; tabulæ complete, rather distant.

Description. The external form of the corallum is unknown. The corallites are mostly five- or six-sided, polyhedric, 0·75 to 1·5 but the majority 1 mm. in diameter, with walls thin or slightly thickened; the sides of the corallites are unequal, so that the shape is irregular. There is no trace of septa. The mural pores are in one row, very large and usually oval, the vertical axis being the longer, but a few are circular or almost circular. The size of the pores varies greatly but usually they are almost or quite as wide as the face they occupy. The long axis of the oval ones is about 1 mm. When smaller than the width of the face they may occupy any position on the face. The tabulæ are complete horizontal or inclined, 5 to 8 in a space of 5 mm.

Remarks. The very large usually oval mural pores (see Plate VIII, fig. 1) are a striking feature of the species and distinguish it from all other species we know. In transverse section one-half to the whole of sides of corallites is frequently missing as a result of the large size of the pores.

One specimen from Parish Cudal (University of Sydney Geological Department Slides 706–707) shows an unusual character. In the transverse section approximately half the section shows adult corallites with a diameter of 1 to 1·5 mm. while the other half has corallites with a diameter 0·5 to 0·75 mm. (see pl. vii, fig. 4*a*). The change from one size to the other is not gradual but quite sudden. This is probably the result of a difference in the environment (food supply ?, light ?) of one part of the corallum to that of the other part. Another transverse section cut from a different part of the specimen shows corallites of only the normal size.

Table 1 gives a comparison of this species with others which present any character in common with it.

Localities and Age. Por. 184, Par. Cudal, near Molong (S.U. 5177); Par. Cudal near Molong (S.U. slides 706, 707); Por. 3, Par. Cudal, near Molong (University of Queensland); all probably Lower Devonian. Loyola, near Mansfield, Victoria (University of Queensland), Lower Devonian.

Genus Striatopora Hall.

Striatopora Hall, 1851, p. 400.

Genotype. Striatopora flexuosa Hall, 1851, p. 400, Niagaran, New York.

Striatopora sp.

(Plate VIII, figs. 3*a*, 3*b*, 3*c*.)

A single specimen from Crystal Springs (Por. 174, Par. Bell) near Molong probably belongs to *Striatopora*, but we do not propose to give it a specific name as the genus is much in need of revision. The corallum is cylindrical and branches dichotomously, the branches having a diameter up to 18 mm. The internal characters are illustrated by the figures. *Striatopora* occurs in the Silurian and Devonian.

Family Syringoporidæ.

Genus Syringopora Goldfuss.

Syringopora Goldfuss, 1826, p. 75.

Genotype. *Syringopora ramulosa* Goldfuss, Carboniferous, Olne near Limburg, Germany.

Syringopora sp.

(Plate VIII, fig. 4.)

Two specimens from Crystal Springs near Molong (Por. 174, Par. Bell) belong to *Syringopora* Goldfuss. This genus is in need of revision and we do not propose to give the specimens a trivial name at present. *Syringopora* ranges from the Upper Ordovician to the Carboniferous.

MADREPORA HELIOLITIDA.

Family Heliolitidæ.

Genus Heliolites Dana.

Heliolites Dana, 1846, p. 541; Lindström, 1899, p. 38; Jones and Hill, 1940, p. 198.

Genotype. *Astræa porosa* Goldfuss, 1826, p. 64, pl. xxi, fig. 7, Devonian of the Eifel.

Heliolites daintreei Nicholson and Etheridge.

(Plate VIII, fig. 5.)

Heliolites daintreei Nicholson and Etheridge, 1879, p. 224, pl. xiv, figs. 3, 3*a*. Devonian, Broken River, North Queensland, Jones and Hill, 1940, p. 199.

Lectotype. 90248, British Museum (Natural History).

Diagnosis. *Heliolites* with tabularia of variable size, with twelve short lamellar septa having numerous long upcurved spines vertical near the axis and swollen at their apices in late forms; with distant, regularly horizontal tabulæ; with tubuli regularly polyhedric or vermiform, sometimes rounded in late forms; and with the walls of the tabularia rather thickened in late forms.

Remarks. This species, including the Molong specimens, is described in a paper on the Heliolitida in the Proceedings of the Royal Society of Queensland (Jones and Hill, 1940), where we show it to be divisible into four ill-defined groups.

The Molong specimens are placed in a group with others from the Upper Silurian of Yass and the Devonian of Broken River, North Queensland.

Locality. Por. 3, Par. Cudal, just west of Boree Ck. on back road from Manildra to Cudal, near Molong, N.S.W.

Genus Plasmopora Edwards and Haime.

Plasmopora Edwards and Haime, 1849, p. 262 ; Lindström, 1899, p. 75 ; Jones and Hill, 1940, p. 204.

Genotype. Porites petaliformis Lonsdale, 1839, p. 687, pl. xvi, figs. 4, 4*a*, from the Wenlock shale, Walsall, England.

Plasmopora gippslandica (Chapman).

(Plate VIII, fig. 6.)

Heliolites interstincta var. *gippslandica* Chapman, 1914, p. 331, pl. lx, figs. 35, 36. Silurian, [? Devonian], Cooper's Ck., Thomson River, Victoria.

Plasmopora gippslandica (Chapman), Jones and Hill, 1940, p. 206.

Holotype. MD. 746, with slide 1336, National Museum, Melbourne.

Diagnosis. Plasmopora with the tubuli of the aureola usually elongated radially ; neighbouring aureolæ in contact, or occasionally separated by one or two rows of tubuli ; tubuli walls continuous vertically ; septa absent.

Remarks. The specimens from Molong are described with others in a paper on the Heliolitida (Jones and Hill, 1940). The species is known elsewhere from the Devonian of Johannsen's Caves near Rockhampton, Queensland, and of the Nundle road near Tamworth, N.S.W., and from the Upper Silurian of Yass, in addition to the type locality.

Localities in the Garra Beds. Pors. 37 and 174, Par. Bell, Co. Ashburnham, near Molong ; Por. 170, Par. Curra, near Wellington. Probably Lower Devonian.

Summary.

In this paper the coral fauna of the Garra Beds is described. It contains four new species, one new variety and fourteen other forms known elsewhere in the Silurian, Lower or Middle Devonian, and is in all probability Lower Devonian. European species of *Favosites* and *Heliolites* occur.

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References.

Barrois, C., 1889 : Faune du Calcaire d'Erbray. *Mém. Soc. Géol. Nord.*, *3*, 348 pp., xvii pls.

Butler, A. J., 1934 : On the Silurian Corals *Spongophylloides grayi* (Edwards and Haime) and *Spongophylloides pusillus* sp. n. *Ann. Mag. Nat. Hist.*, (10), *13*, pp. 540-549, pls. xvii, xviii.

Chapman, F., 1914 : Newer Silurian Fossils of Eastern Victoria. *Rec. Geol. Surv. Vict.*, *3*, pp. 301-316, pls. xlvi-lxi.

Charlesworth, J. K., 1914 : Das Devon der Ostalpen. V. Die Fauna des devonischen Riffkalkes. IV. Korallen und Stromatoporoiden. *Z. deuts. Geol. Ges. Berlin*, *56*, pp. 347-407, pls. xxx-xxxiv.

Dana, J. D., 1846-48 : United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N. Zoophytes by James D. Dana, A.N., Geologist to the Expedition, with a folio atlas of 61 plates. Pp. x+740, Philadelphia. (Pp. 1-120 and 709-720 appeared previously, folio Philadelphia, Feb., 1846. The complete work appeared in March, 1848 ; Atlas in Nov., 1849.)

Dybowski, W. N., 1873-74 : Monographie der Zoantharia Sclerodermata Rugosa. *Arch. Naturk. Liv-, Ehst- u. Kurl.*, (1), *5*, 1873, pp. 257-414, pls. i, ii ; 1874, pp. 415-531, pls. iii-v.

Edwards, H. M., and Haime, J., 1849 : Mémoire sur les Polypiers apparement groupes naturels des Zoanthaires perforés et des Zoanthaires tabulés. *Comp. Rend. Séances Acad. Sci., Paris*, *29*, pp. 257-263.

———, 1850-54 : A Monograph of the British Fossil Corals. 1850. Introd. and Pt. 1, lxxxv+71 pp., pls. i-xi ; 1851, 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. *Palæontogr. Soc.* [*Monogr.*]

———, 1851 : Monographie des Polypiers Fossiles des Terrains Paléozoiques. *Arch. Mus. Hist. Nat., Paris*, *5*, 502 pp., 20 pls.

Etheridge, R., Jr., 1899 : On the Corals of the Tamworth District, chiefly from the Moore Ck. and Woolomol Limestones. *Rec. Geol. Surv. N.S.W.*, *6*, pp. 151-182, pls. xvi-xxxviii.

———, 1903 : An unusually large Form of *Rhizophyllum*, lately discovered in N. S. Wales. *Ibid.*, *7*, pp. 232-233, pl. xlvii.

Etheridge, R., Jr., 1907 : A Monograph of the Silurian and Devonian Corals of New South Wales. II. The Genus *Tryplasma*. *Mem. Geol. Surv. N.S.W. Palæont.*, No. 13, pp. 41-102, pls. x-xxviii.

Goldfuss, G. A., 1826 : Petrefacta Germaniæ, *1*, Pt. 1, pp. 1-76, pls. i-xxv. Folio, Dusseldorf.

Hall, J., 1851 : New Genera of Fossil Corals from the Report by J. Hall on the Palæontology of New York. *Amer. J. Sci.*, (2), *11*, pp. 298-401.

Hill, D., 1935 : British Terminology for Rugose Corals. *Geol. Mag.*, *72*, pp. 481-519, 21 text-figs.

————, 1936 : The British Silurian Rugose Corals with Acanthine Septa. *Philos. Trans.*, (B), *226*, pp. 189-217, pls. xxix-xxx.

————, 1939*a* : The Middle Devonian Rugose Corals of Queensland. I. Douglas Creek and Drummond Creek, Clermont District. *Proc. Roy. Soc. Queensl.*, *50*, pp. 55-65, pls. iv, v.

————, 1939*b* : The Devonian Rugose Corals of Lilydale and Loyola, Victoria. *Proc. Roy. Soc. Vict.*, (N.S.), *51*, pp. 219-256, pls. xiii-xvi.

————, 1940*a* : The Middle Devonian Rugose Corals of Queensland. II. The Silverwood-Lucky Valley Area. *Proc. Roy. Soc. Queensl.*, *51*, pp. 150-168, pls. ii, iii.

————, 1940*b* : The Silurian Rugosa of the Yass-Bowning District, New South Wales. *Proc. Linn. Soc. N.S.W.*, *65*, pp. 388-420, pls. xi-xiii.

Hill, D., and Butler, A. J., 1936 : *Cymatelasma*, a new Genus of Silurian Rugose Corals. *Geol. Mag.*, *73*, pp. 516-527, pl. xvi.

Jones, O. A., 1929 : On the Coral Genera *Endophyllum* Edwards and Haime and *Spongophyllum* Edwards and Haime. *Ibid.*, *66*, pp. 84-91, pl. x.

————, 1936 : The Controlling Effect of Environment upon the Corallum in *Favosites* ; with a Revision of some Massive Species on this Basis. *Ann. Mag. Nat. Hist.*, (10), *17*, pp. 1-24, pls. i-iii.

————, 1937 : The Australian Massive Species of the Coral Genus *Favosites*. *Rec. Aust. Mus. Sydney*, *20*, pp. 79-102, pls. xi-xvi.

Jones, O. A., and Hill, D., 1940 : The Heliolitidæ of Australia, with a discussion of the Morphology and Systematic Position of the Family. *Proc. Roy. Soc. Queensl.*, *51*, pp. 183-215, pls. vi-xi.

Joplin, G. A., and Culey, A. G., 1938 : The Geological Structure and Stratigraphy of the Molong-Manildra District. *J. Roy. Soc. N.S.W.*, *71*, pp. 267-281, pl. ii.

Lamarck, J. B., 1816 : Histoire naturelle des Animaux sans Vertèbres, Vol. II, 568 pp., 8vo, Paris.

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.*, *83*, pp. 448-491, pls. xxxiv-xxxvii.

Lang, W. D., and Smith, S., 1939 : Some New Generic Names for Palæozoic Corals. *Ann. Mag. Nat. Hist.*, (11), *3*, pp. 152-156, pl. iv.

Lang, W. D., Smith, S., and Thomas, H. D., 1940 (April 26) : Index of Palæozoic Coral Genera, pp. vii+231, London (British Museum).

Lecompte, M., 1936 : Revision des Tabulés dévoniens décrits par Goldfuss. *Mém. Mus. Roy. Hist. Nat. Belgique*, No. 57, 105 pp., 14 pls.

Le Maitre, D., 1934 : Etudes sur la Faune des Calcaires dévoniens du Bassin d'Ancenis Calcaire de Chaudefonds et Calcaire de Chalonnes (Maine-et-Loire). *Mém. Soc. Géol. Nord.*, *12*, 267 pp., 18 pls.

Lindström, G., 1866*a* : Nagra Takttagelso ofver Zoantharia Rugosa. *Forh. K. Svensk. Vidensk. Akad.*, *22*, pp. 271-294, pls. xxx, xxxi.

————, 1866*b* : Some Observations on the Zoantharia Rugosa. *Geol. Mag.*, *3*, pp. 356-362 ; pp. 406-414, pl. xiv.

————, 1883 : Om de Palæozoiska Formationernas Operkelbarande Koraller. *K. Svensk. Vetensk. Akad. Handl.*, *7*, No. 4, 112 pp., 9 pls.

————, 1883*a* : Obersilurischen Korallen von Tshau-Tien in nordostlichen Theil der Provinz Sz'-Tshwan. in Bd. IV of F. von Richthofen's China, pp. 50-74, pls. v-vii.

————, 1899 : Remarks on the Heliolitidæ. *K. Svensk. Vetens. Akad. Handl.*, *32*, No. 1, 140 pp., 12 pls.

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., 1839 : *In* R. I. Murchison, The Silurian System. Corals, pp. 675-699. 4to, London, pp. xxxii+1+768.

————, 1845 : *In* R. I. Murchison, E. de Verneuil, and A. von Keyserling, The Geology of Russia in Europe and the Ural Mts., Vol. I, pp. xxiv+i+700 pls., etc. Descriptions of some characteristic Palæozoic Corals of Russia, pp. 591-683.

Nicholson, H. A., 1879 : On the Structure and Affinities of the "Tabulate Corals" of the Palæozoic Period, xii+342 pp., xv pls., 8vo, Edinburgh and London.

Nicholson, H. A., and Etheridge, R., Jr., 1879 : Description of Palæozoic Corals from Northern Queensland. *Ann. Mag. Nat. Hist.*, (5), *4*, pp. 216-226, 265-285, pl. xiv.

d'Orbigny, A., 1850 : Prodrome de Paléontologie Stratigraphique universelle des Animaux mollusques et rayonnés, Vol. I, pp. lx+294, 8vo, Paris.

Penecke, K. A., 1894 : Das Grazer Devon. *Jb. K. K. geol. Reichsanst.*, *43*, pp. 567-616, pls. vii-xii.

Počta, P., 1902 : *In* Barrande, J., Systême Silurien du Centre de la Bôhème, 1st Pt. : Recherches Paléontologiques, continuation éditée par le Musée Bohême, Vol. VIII, Tome II, Anthozoaires et Alcyonaires, viii+347 pp., pls. 20-118.

Smith, S., and Gullick, B., 1925 : The Genera *Favosites* and *Emmonsia* and the Species *Emmonsia parasitica* (Phillips). *Ann. Mag. Nat. Hist.*, (9), *15*, pp. 116-126, pl. viii.

Wedekind, R., 1927 : Die Zoantharia Rugosa von Gotland (bes, Nord-Gotland). *Sver. Geol. Undersokn.* (Ca), No. 19, 94 pp., 30 pls.

Weissermel, W., 1897 : Die Gattung *Columnaria* und Beiträge zur Stammegeschichte der Cyathophylliden und Zaphrentiden. *Z. deuts. geol. Ges. Berlin*, *49*, pp. 865-888.

Explanation of Plates.

Plate II.

Rugosa of the Garra Beds, N.S.W.

All figures approximately ×2 diameters, except where otherwise indicated.

Acanthophyllum sp.

Fig. 1.—Holotype, 5171, Sydney University Collection, Por. 81, Par. Brymedura. Transverse section.

Fig. 2.—F.3491, University of Queensland Collection, 10 miles north of Molong, on the Cumnock road, probably Por. 52, Par. The Gap. *a*, transverse section ; *b*, vertical section.

Rhizophyllum enorme Etheridge.

Fig. 3.—F.3488, University of Queensland Collection, Por. 3, Par. Cudal, Boree Ck. External view, ½ natural size.

Fig. 4.—F.3489, University of Queensland Collection, Por. 3, Par. Cudal, Boree Ck. *a*, transverse section ; *b*, vertical section.

"*Cystiphyllum*" sp.

Fig. 5.—F.3485, University of Queensland Collection, Curra Ck. crossing, Por. 170, Par. Curra near Wellington. Transverse section.

Fig. 6.—F.3486, University of Queensland Collection, Curra Ck. crossing, Por. 170, Par. Curra near Wellington. Vertical section.

Plate III.

Rugosa of the Garra Beds, N.S.W.

All figures approximately ×2 diameters, except where otherwise indicated.

Pseudamplexus princeps (Etheridge).

Fig. 1.—F.3480, University of Queensland Collection, Mandagery's Ck., Por. 73 or 77, Par. Brymedura. Natural size.

Fig. 2.—Doubtfully identified with this species, F.3483, University of Queensland Collection, Curra Ck. crossing, Por. 170, Par. Curra near Wellington. *a*, transverse section ; *b*, vertical section.

Tryplasma columnare Etheridge.

Fig. 3.—F.3492, University of Queensland Collection, 10 miles north of Molong on the Cumnock road, probably Por. 52, The Gap. Transverse section.

Fig. 4.—From F.3510, University of Queensland Collection, Por. 31, Par. Bell. Part of vertical section.

Entelophyllum arborescens sp. nov.

Fig. 5.—Holotype 6190, Sydney University Collection, Nora Ck., Par. The Gap.

PLATE IV.

Rugosa of the Garra Beds, N.S.W.

Figures approximately ×2 diameters.

Spongophylloides (*?*) *thomascæ* sp. nov.

Fig. 1.—NS.1296, Sydney University Collection, holotype, near Cudal. *a*, transverse section ; *b*, vertical section.

PLATE V.

Tabulata of the Garra Beds, N.S.W.

Figures approximately ×2 diameters.

Favosites allani Jones.

Fig. 1.—5181, Sydney University Collection, Por. 50, Par. Curra. *a*, transverse section ; *b*, vertical section.

Favosites bryani Jones.

Fig. 2.—F.3503, University of Queensland Collection, Mandagery's Ck., probably Por. 73, Par. Brymedura. *a*, transverse section ; *b*, vertical section.

Favosites gothlandicus Lamarck forma *gothlandica* Lamarck.

Fig. 3.—F.3469, University of Queensland Collection, 20 miles north of Molong on the Cumnock road (limestone in Pors. 46, 47 and Reserve, Par. Burrawang). *a*, transverse section ; *b*, vertical section.

Favosites gothlandicus Lamarck forma *forbesi* Edwards and Haime.

Fig. 4.—F.3474, University of Queensland Collection, Curra Ck. crossing, Por. 170, Par. Curra. *a*, transverse section ; *b*, vertical section.

PLATE VI.

Tabulata of the Garra Beds, N.S.W., and of Cooper's Ck., Victoria.

Figures approximately ×2 diameters.

Favosites gothlandicus Lamarck forma *multipora* Lonsdale.

Fig. 1.—F.3493, University of Queensland Collection, Mandagery's Ck., probably Por. 73, Par. Brymedura. *a*, transverse section ; *b*, vertical section. Neither of these photographs shows as many septal spines as the sections.

Favosites goldfussi d'Orbigny.

Fig. 2.—F.3496, University of Queensland Collection, Mandagery's Ck., probably Por. 73, Par. Brymedura. *a*, transverse section ; *b*, vertical section.

Favosites nitidus Chapman.

Fig. 3.—Holotype MD.749, National Museum, Melbourne, Cooper's Ck., Walhalla, Victoria. *a*, *b*, transverse section ; *c*, vertical section.

Favosites nitidus Chapman var. *medius* var. nov.

Fig. 4.—Holotype, 5178, Sydney University Collection, Por. 51, Par. Eurimbula. *a*, transverse section ; *b*, vertical section.

Plate VII.

Tabulata of the Garra Beds, N.S.W.

Figures approximately ×2 diameters.

Favosites nitidus Chapman var. *medius* var. nov.

Fig. 1.—F.3497, University of Queensland Collection, Mandagery's Ck., probably Por. 77, Par. Brymedura. *a*, transverse section ; *b*, vertical section.

Fig. 2.—F.3499, University of Queensland Collection, Boree Ck., Por. 3, Par. Cudal. Vertical section.

Favosites ovatiporus sp. nov.

Fig. 3.—Holotype, F.5177, Sydney University Collection, Por. 184, Par. Cudal. *a*, transverse section ; *b*, vertical section.

Fig. 4.—707=706, Sydney University Collection, Cudal. *a*, *b*, transverse section ; *c*, vertical section.

Plate VIII.

Tabulata and Heliolitida from the Garra Beds, N.S.W., and from Loyola, Victoria.

Figures ×2 diameters, except where otherwise indicated.

Favosites ovatiporus sp. nov.

Fig. 1.—F.3501, University of Queensland Collection, Boree Ck., Por. 3, Par. Cudal. Vertical section.

Fig. 2.—F.3502, University of Queensland Collection, Loyola, Victoria. *a*, transverse section ; *b*, vertical section.

Striatopora sp.

Fig. 3.—F.3513, University of Queensland Collection, Crystal Springs, Por. 174, Par. Bell. *a*, natural size, external ; *b*, transverse section ; *c*, vertical section.

Syringopora sp.

Fig. 4.—5176, Sydney University Collection, Crystal Springs, Por. 174, Par. Bell. External view. Natural size.

Heliolites daintreei Nicholson and Etheridge.

Fig. 5.—F.3408, University of Queensland Collection, Boree Ck., Por. 3, Par. Cudal. Transverse section.

Plasmopora gippslandica (Chapman).

Fig. 6.—F.3510, University of Queensland Collection, Por. 31, Par. Bell. *a*, transverse section ; *b*, vertical section.