

[PROC. ROY. SOC. VICTORIA, 50 (N.S.), PT. I., 1937.]

ART. I.—*On some Stromatoporoids from Griffith's Quarry,
Loyola, Victoria.*

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[Read 8th April, 1937; issued separately, 29th December, 1937.]

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Introduction.

This paper deals with a small collection of stromatoporoids from Griffith's Quarry, Loyola, made by the writer in 1933, and now in the museum of the Department of Geology, University of Melbourne. These stromatoporoids are associated with a rich coral fauna, which has been described by F. Chapman (1914) and placed by him in the Yeringian, being correlated with the Wenlock of Great Britain.

Description of Species.

Family ACTINOSTROMATIDAE Nicholson, 1886
(emend. Stechow, 1922).

Clathrodictyon Nicholson and Murie, 1878.

1878. *Clathrodictyon* Nicholson and Murie, Journ. Linn. Soc., xiv., p. 220.

1886. *Clathrodictyon* Nicholson, Mon. Brit. Strom., Gen. Introd., p. 77.

1936. *Clathrodictyon*, Parks, Univ. Toronto Studies, Geol. Ser., 39, p. 10.

Stromatoporoids in which the coenosteum is usually expanded or laminar, with a basal epitheca and a small area of attachment; built up of horizontal laminae and radial pillars which are confined to one interlaminar space, and which may be formed by the downward inflection of the laminae. Astrorhizae may be present. Skeletal fibre not minutely porous.

Genotype: *Cl. vesiculosum* Nich. & Murie, 1878, Journ. Linn. Soc., xiv., p. 220, pl. II., figs. 11-13. 1889, Nicholson, Mon. Brit. Strom., p. 147, pl. XVII., figs. 10-13; pl. XVIII., fig. 12. Silurian of Europe, North America. *Cl. confertum* Nich. (Mon. Brit. Strom., p. 154, pl. XVIII., figs. 13, 14, 1889) is probably identical with *Cl. vesiculosum*.

CLATHRODICTYON REGULARE (von Rosen).

(Pl. I., figs. 1, 2.)

1867. *Stromatopora regularis* von Rosen, "Ueber die Natur der Stromatoporen," etc., p. 74, pl. ix., figs 1-4.
 1887. *Clathrodictyon regulare* Nicholson, Ann. Mag. Nat. Hist., ser. 5, xix., p. 10, pl. ii., figs. 5-6.
 1888. *Clathrodictyon regulare* Nicholson, Mon. Brit. Strom., p. 155, pl. xviii., figs. 8-11A.
 1908. *Clathrodictyon regulare* Vinassa de Regny, Pal. italica, xiv., p. 182, pl. xxi. (1), figs. 18-20.
 1915. *Clathrodictyon regulare* Boehnke, Palaeontographica, 61, p. 168, text-fig. 12.
 1934. *Clathrodictyon regulare* Le Maitre, Mém. Soc. Géol. du Nord, xii., p. 39; p. 185, pl. xii., figs. 1-6.

Coenosteum massive or laminar; horizontal laminae and vertical pillars distinct. Laminae 3-5 in 1 mm., pillars 3-4 in 1 mm.

Vertical sections show the skeletal mesh to be rather regular. The horizontal laminae are of a uniform, relatively great thickness (0.1 mm.) throughout the coenosteum, and in some examples are flexed at regular intervals, forming domes. In most examples, however, the laminae are quite uninflected, apart from variations in course consequent on the exterior form of the coenosteum. The vertical pillars are stout, of approximately the same thickness as the horizontal laminae, regularly spaced, and complete, i.e., they traverse the whole space between one lamina and the next.

In tangential sections the vertical pillars appear as isolated rounded cross-sections. Areas of dark-coloured material, at present structureless, mark the position of the horizontal laminae. Astrorhizae are rare and poorly developed, and are more readily distinguished in vertical sections, which sometimes show cross-sections of the horizontal canals. There is apparently no vertical grouping of the astrorhizal systems.

The skeletal structure of this form places it in the group of the species of *Clathrodictyon* containing *C. regulare* and other forms in which the horizontal and vertical elements of the skeletal mesh are sharply differentiated. It is identical with *C. regulare* in the regularity of the mesh, and in the isolation of the radial pillars as seen in vertical section. A very similar form occurring in the Lilydale limestone, of Yeringian age, described under the name of *C. regulare* var. *cylindrifera* Ripper (1933), differs, however, in some important characters. The skeletal mesh is of the same regular type, but the astrorhizae are rare and poorly developed in comparison with the highly organized superimposed systems in the Lilydale form, and the laminae are as a result more usually straight, and but rarely undulating or bent into regular domes. The vertical pillars are more usually

isolated so that the "hexactinellid" structure as seen in tangential sections is less perfect than in the Lilydale form. The coenosteum is in addition more usually laminar, and is of small size, while that of *C. regulare* var. *cylindrifera* tends to become massive. The median dark line of the horizontal laminae described by Nicholson has not been observed, but this may be due to the mode of preservation. The laminae also appear to be thicker and less crumpled than in the British form.

Horizon.—Yeringian.

Locality.—Griffith's Quarry, Allot. 131, Loyola.

Figured specimen.—Coll. Dept. of Geology, Univ. of Melbourne, Reg. No. 1599.

CLATHRODICTYON aff. CHAPMANI Ripper.

(Pl. I., figs. 3, 4.)

1933. *Clathrodictyon chapmani* Ripper, Proc. Roy. Soc. Victoria, xlv. (II.), p. 159, figs. 4, 6c, 6d.

Coenosteum massive, irregularly laminated, composed of well defined horizontal laminae connected by vertical pillars which traverse one interspace only. Laminae 6 in 1 mm., pillars 5 in 1 mm., rather irregularly spaced.

All specimens are somewhat recrystallized, so that the finer details of structure are obliterated. In vertical section the laminae are seen to be straight and fairly regular. They are, however, of variable thickness, some reaching a thickness of 0.1 mm. As these thicker laminae occur in groups at regular intervals (usually of 2 or 3 mm.) and appear, on account of their greater thickness, to be more crowded than the thinner laminae that separate them, the coenosteum has a banded aspect which is well seen on polished surfaces. There is usually no break in the growth of the coenosteum at these points, but some vertical sections show that the lowermost lamina of such a group rests on an irregular surface, suggesting that deposition has been resumed after interruption. The vertical pillars are straight, slender, and usually traverse the whole interlaminar space. They are usually independent, but may be connected by irregular horizontal processes where the interlaminar spaces are wider.

Tangential sections passing through a lamina show the vertical pillars to be connected by processes of equal width, so that an irregular reticulate mesh is developed, in which the individual pillars cannot readily be distinguished. Astrorhizae are rare and poorly developed, appearing in tangential section as groups of highly inclined wall-less canals radiating from a common centre. The canals are inconspicuous in vertical section, where they are recognizable as rounded cross-sections of somewhat greater diameter than the normal interlaminar space.

Tangential sections of this form resemble very closely those of *C. chapmani* Ripper, in which the vertical pillars are similarly connected by processes of equal diameter, giving rise to a characteristic mesh. This is also seen in the otherwise distinct form *C. drummondense* Parks. In vertical section the pillars are sometimes seen to be connected by irregular horizontal processes in the interlaminar spaces but this feature is not nearly as constant as in *C. chapmani*, and the pillars are usually more complete. The horizontal laminae are in addition thicker and more crowded than in *C. chapmani*, where there are but two or three in 1 mm. The astrorhizae are comparatively poorly developed, and the canals, though steeply inclined as in the Lilydale species, are apparently not grouped into the vertical systems which are so characteristic of vertical sections of *C. chapmani*. In view of these differences, therefore, it is advisable, while recognizing its affinities with *C. chapmani*, to regard this form as being distinct.

Horizon.—Yeringian.

Locality.—Griffith's Quarry, Allot. 131, Loyola.

Figured specimen.—Coll. Dept. of Geology, Univ. of Melbourne, Reg. No. 1598.

Family STROMATOPORIDAE Nicholson, 1886.

Stromatopora Goldfuss, 1826.

STROMATOPORA TYPICA von Rosen.

1867. *Stromatopora typica* von Rosen, "Ueber die Natur der Stromatoporen," etc., p. 58, pl. i., figs. 1-3; pl. ii., fig. 1.
 1886-1891. *Stromatopora typica* Nicholson, Mon. Brit. Strom., Gen. Introd., pl. i., fig. 3; pl. v., figs. 14, 15; p. 169, pl. xxi., figs. 4-11; pl. xxii., figs. 1, 2.
 1915. *Stromatopora typica* Boehnke, Palaeontographica, 61, p. 181, pl. xvii., fig. 7, text-figs. 32, 33.
 1929. *Stromatopora typica* Yavorsky, Bull. Com. Géol. Leningrad, xlviii. (1), p. 95, pl. x., figs. 2-7.
 1934. *Stromatopora typica* Le Maitre, Mém. Soc. Géol. du Nord, xii., p. 193, pl. xv., fig. 4.

Coenosteum massive, latilaminar, composed of well defined relatively thick radial pillars, 4-6 in 1 mm., and irregularly distributed horizontal laminae.

The available specimens are all fragmentary and much recrystallized, so that the finer details of structure are completely obliterated, and it is impossible to give satisfactory figures. The pillars, which are about 0.1 mm. thick, are the most conspicuous features of vertical sections; they are usually parallel, separated by interspaces equal to their own width, and in better preserved parts of the sections show the porous structure characteristics of the genus. The latilaminae, which are straight

or gently curved, and 2-3 mm. wide, are each made up of six or seven horizontal laminae, which are inconspicuous and usually very thin.

Tangential sections show the cut ends of the radial pillars, which are united by processes of almost equal diameter, so that a mesh of the vermiculate type seen in *Stromatopora* is the result. Astrorhizae are abundant and well-developed, the horizontal canals being much branched. The centres of the systems are 2 or 3 mm. apart.

These specimens are in a very poor state of preservation, but are clearly identical with some examples from Wenlock limestone of Great Britain (Nicholson Collection, Brit. Mus. Nat. Hist. Reg. Nos. P5563, P5559, P5561), referred by Nicholson to *Str. typica* von Rosen. This form, while being best placed in the same species, is, however, distinct in some respects from the *S. typica* occurring in Gotland and Esthonia, since the radial pillars are far more distinct, and the laminae are not so thickened. These differences suggest that the British form, with which the Victorian form has been identified, and which may also be associated with the Continental form, e.g., at Lille-shall Quarry, Wenlock Edge, is the less advanced, since the merging of the pillars and laminae into a reticulate skeletal mesh is not so complete, and the form therefore resembles some species of *Syringostroma*, coming particularly close to *S. barretti* Girty. It also has characters in common with *Str. antiqua* Nich. & Mur. of the Niagaran of Canada

Horizon.—Yeringian.

Locality.—Griffith's Quarry, Allot. 131, Loyola.

STROMATOPORA BÜCHELIENSIS (Bargatzky).

1881. *Caunopora bücheliensis* Bargatzky, "Die Stromatoporen des rheinischen Devons," p. 62.

(For further synonymy see Ripper, Proc. Roy. Soc. Vic. xlix., (II.), 1937.)

Coenosteum massive, built up of conspicuous radial pillars, 5 or 6 in 2 mm., which are connected at intervals by horizontal processes of similar breadth. These are rarely united to form laminae. Skeletal fibre porous; skeletal mesh reticulate.

The radial pillars are stout, up to 0.3 mm. broad, and separated by interspaces rather narrower than their diameter. In better preserved parts of the sections the minutely porous structure of the skeletal fibre can be seen, but in general the preservation is very indifferent, so that it is impossible to distinguish finer details of structure, and figures cannot be given. The very slender horizontal processes connecting the radial pillars, called "tabulae" by Nicholson, who considered the interspace to be

zooidal tubes, are thus not discernible in vertical sections. Broader processes of essentially the same nature as the pillars are, however, of relatively frequent occurrence.

Tangential sections show a completely reticulate mesh in which the radial pillars are not distinguishable as separate skeletal elements, as they are connected by processes of equal breadth. The mesh is very regular, but is interrupted by the abundant astrorhizal canals. These are relatively short, sometimes branching, and are grouped into indefinite systems. "Caunopora" tubes are not present in the only available specimen, and the skeletal mesh consequently is very similar to that of typical British and European examples of the species. It is in this respect distinct from that of examples from Lilydale, where the species is abundant, since these commonly contain numerous large "Caunopora" tubes, and the skeletal mesh of the coenosteum becomes as a consequence very distorted.

The only other Victorian form with which this species may be confused is *S. lilydalensis* Ripper, in which the skeletal mesh is similarly dominated by the radial pillars. In *S. lilydalensis*, however, the radial pillars are somewhat more crowded and they tend to become divergent, as opposed to their parallel habit in *S. bücheliensis*, so that vertical sections of the Lilydale form are readily distinguishable.

Horizon.—Yeringian.

Locality.—Griffith's Quarry, Allot. 131, Loyola.

Remarks on the Stromatoporoid Fauna.

The stromatoporoid fauna of this limestone is rather poor in species, a collection of 17 specimens yielding only four forms. The difference between it and the Lilydale fauna, which is also placed in the Yeringian, may be due to differences in facies, since the small size and laminar and encrusting habit of many of the coenostea at Loyola suggest that they grew under unfavorable conditions. Of the four species here prescribed, three have already been described from European localities:—

| Species. | Horizon. | Localities. |
|---|-------------|------------------------|
| <i>Clathrodictyon regulare</i> (von Rosen) .. | Wenlock .. | Great Britain, Gotland |
| <i>Stromatopora typica</i> (von Rosen) .. | Wenlock .. | Great Britain, Gotland |
| <i>Str. bücheliensis</i> (Bargatzky) .. | Givetian .. | Devon, Eifel, Paffrath |

and the fourth is closely allied to *Clathrodictyon chapmani* Ripper of the Lilydale limestone. The affinities of a fauna of which so far only four species are known must necessarily

be rather indefinite, but the presence of *C. regulare* and *Stromatopora typica* in some abundance suggests that it has something in common with the British Wenlock fauna. A Devonian aspect is given, however, by the occurrence of isolated examples of *S. bücheliensis* and *Stromatoporella* (not described in this paper).

Summary.

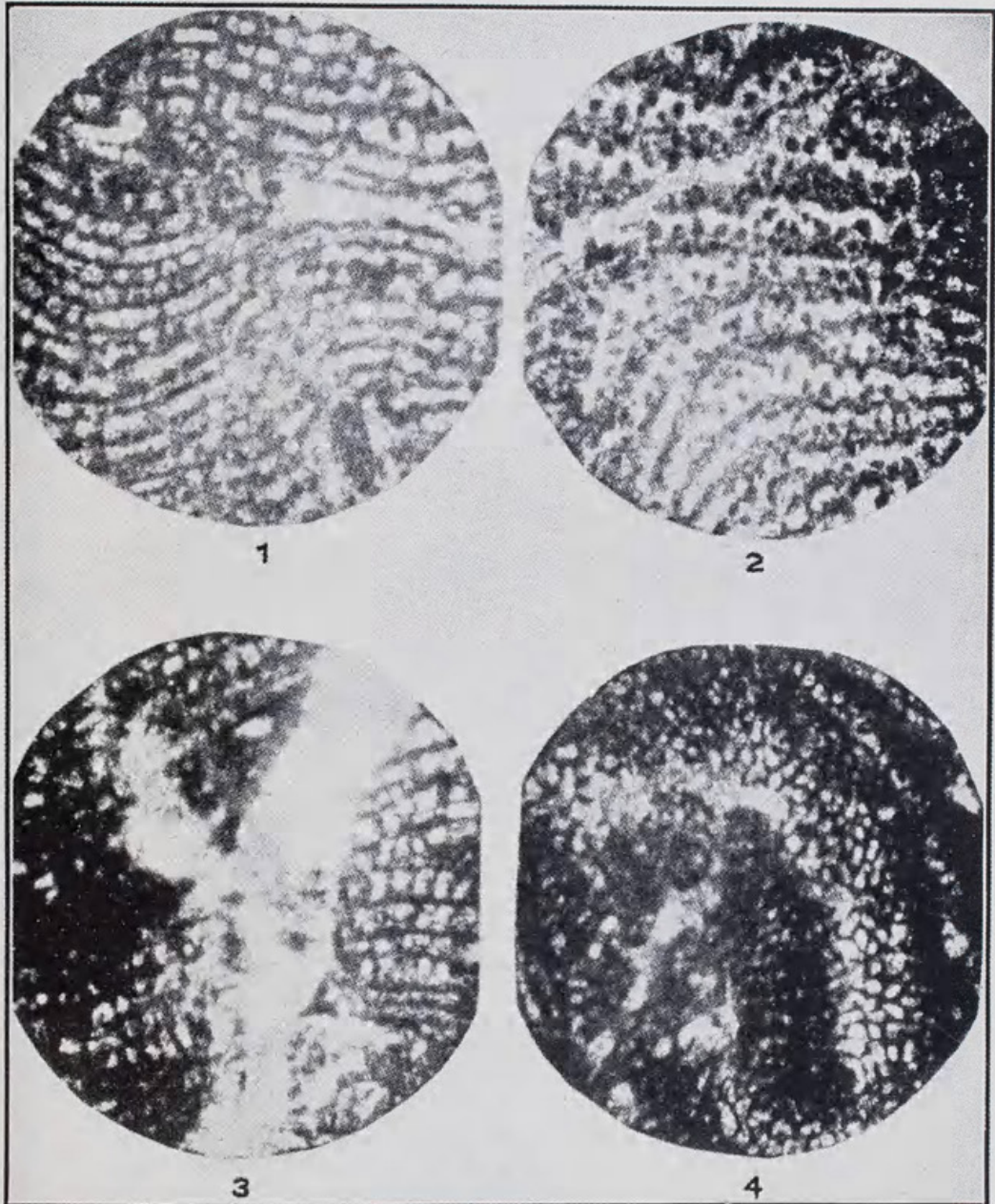
The stromatoporoid fauna of the Yeringian limestone of Griffith's Quarry, Loyola, contains as far as at present known four species: *Clathrodictyon regulare* (von Rosen), *C. aff chapmani* Ripper, *Stromatopora typica* von Rosen and *S. bücheliensis* (Bargatzky), as well as a *Stromatoporella* not here described. This fauna has little in common with the much larger and more varied fauna of the Yeringian limestone of Lilydale, and the presence in some abundance of *Clathrodictyon regulare* and *Stromatopora typica*, two characteristic Wenlock species, suggests that this limestone should perhaps be placed on a lower horizon than that of Lilydale, which contains a fauna having strong Devonian affinities.

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Explanation of Plate I.

- Fig. 1.—*Clathrodictyon regulare* (von Rosen). Griffith's Quarry, Loyola. Yeringian. Vertical section. Coll. Dept. of Geology, Univ. of Melbourne, Reg. No. 1599. $\times 9$ approx.
- Fig. 2.—Same species. Tangential section of the same specimen. $\times 9$ approx.
- Fig. 3.—*Clathrodictyon* aff. *chapmani* Ripper. Griffith's Quarry, Loyola. Yeringian. Vertical section. Coll. Dept. of Geology, Univ. of Melbourne, Reg. No. 1598. $\times 9$ approx.
- Fig. 4.—Same form. Tangential section of the same form. $\times 9$ approx.



Loyola Stromatoporoids.



Ripper, Elizabeth A. 1937. "On some Stromatoporoids from Griffith's Quarry, Loyola, Victoria." *Proceedings of the Royal Society of Victoria. New series* 50(1), 1–9.

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