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THE AUSTRALIAN MASSIVE SPECIES OF THE CORAL GENUS *FAVOSITES*.

By

O. A. JONES, M.Sc. (Cantab.), M.Sc. (Q.), F.G.S.

(Plates xi-xvi.)

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I. Introduction.

AN attempt has been made in this work to place the massive species of the genus on a sound basis. A number of new species have been described, and type or topotype material of previously described species has been investigated. In cases where forms have been referred to extra-Australian species the types or topotypes of these have been examined as far as possible. This was done by the writer for many of the European species,¹ but it was not possible to investigate many of the American species in this manner, and, as little American material has been described from thin sections, comparison with American species has been difficult; some of the forms described as new by the writer may possibly prove to be referable to American species, when the latter have been investigated by means of thin sections.

Of those forms which have been ascribed to extra-Australian species, the description given is that of the Australian material.

The writer is indebted for much advice as to methods and other matters to Dr. Stanley Smith, of the University of Bristol, and to Dr. G. L. Elles, of Cambridge. He wishes to express his thanks to Dr. R. S. Allan for allowing him the use of his large Silurian collection, and to the authorities of the Australian Museum, Sydney, and the National Museum, Melbourne, for the loan of material; to Professor H. C. Richards and Drs. W. H. Bryan and F. W. Whitehouse for the loan of specimens from the University of Queensland collection; to Dr. W. D. Lang for the loan of specimens from the British Museum; and to Dr. G. L. Elles for reading the manuscript and many useful suggestions.

¹ See Bibliography, p. 100; Jones, 1936.

II. History.

The first reference to the occurrence of the genus *Favosites* in Australia is found in the fossil descriptions by Lonsdale in Strzelecki's "Description of New South Wales", 1845. In that work a coral from Yass Plains was doubtfully referred to *Favosites gothlandica* Lam., but Lonsdale stated that it apparently had only one row of mural pores.

In 1848 Rev. W. B. Clarke, in a paper on the Trilobites of N. S. Wales, mentioned *Favosites gothlandica* and another species of *Favosites* as having been found at Yass Plains, but he gave no description or figure. Later, in 1860, in his excellent work on the southern goldfields, he gave a list of fossils named by Lonsdale. These included *Calamopora*, *Emmonsia* and *Favosites gothlandica*. The collection examined by Lonsdale was presented to the Sedgwick Museum, Cambridge, but only indefinite localities, such as "New South Wales", were given, so that the specimens, many of them splendidly preserved, are of no value for further research. The remainder of Clarke's collection, which was described by de Koninck, was destroyed by fire in 1882.

In 1868 J. J. Bigsby published his comprehensive work, "Thesaurus Siluricus", and quoted several Favositidæ from N. S. Wales.

Smyth, in 1874, mentioned the occurrence of *Favosites* in Victoria.

McCoy's "Prodromus of the Palæontology of Victoria", 1874-77, set a high standard in Australian palæontology. In Decade IV he described and discussed *Favosites goldfussi* from the Devonian beds of Buchan.

In 1876-7 de Koninck's description of W. B. Clarke's collection appeared, the author referring most of the forms to well-known European species. He did not give adequate descriptions of the actual Australian specimens, nor did he give figures. Add to these obvious defects the fact that the types have been destroyed and it becomes apparent that much of his work, in this family at least, is valueless. He determined the following Silurian species: *Favosites forbesi* Ed. & H., *F. aspera* d'Orb., *F. multipora* ? Lons., and *F. gothlandica* Foug. The Devonian forms recorded were: *Favosites goldfussi* d'Orb. and *F. basaltica* (Gold.). From the Carboniferous he recorded a single form, *Favosites ovata* Lons., a species later referred by Etheridge to *Stenopora*.

R. Etheridge, junr., published, in 1878, a very useful "Catalogue of Australian Fossils", in which he gave the ages and localities of, and references to, all the Australian forms described up to that date.

In 1879 the first work on Queensland corals was published by H. A. Nicholson and R. Etheridge, junr. This comprised the description of the corals of the Daintree collection, and included *Favosites gothlandica* and *F. gothlandica* var. *goldfussi*.

Johnson, in his "Geology of Tasmania", 1888, repeated de Koninck's records for the mainland, and recorded two species of *Favosites* from the Gordon River limestone.

The "Geology and Palæontology of Queensland and New Guinea", by R. L. Jack and R. Etheridge, junr., 1892, still forms the basis for research into Queensland palæontology. *Favosites gothlandica* and a variety, *goldfussi*, were described from the Devonian rocks.

In 1898 a translation of de Koninck's memoir was published as a memoir of the Geological Survey of N. S. Wales; the coral section was translated by W. S. Dun.

In the same year W. S. Dun described a portion of Mr. Sweet's collection of Victorian fossils. He discussed the relationship of *Favosites gothlandica* and *F. goldfussi*, and agreed with Nicholson and Etheridge, junr., that the latter should be regarded as a variety of the former.

In 1899 R. Etheridge, junr., in an important paper on the Devonian Corals of the Tamworth District, N. S. Wales, made the greatest single contribution to our knowledge of the Australian Favositidæ. His work was an advance on that of de Koninck, as he gave an adequate description of the actual Australian forms figured. He described a form as *Favosites gothlandica* Lam.; new species were *F. squamulifera* and *F. multitabulata*; two new varieties of *F. basaltica* (Gold.), var. *moonbiensis* and var. *salebrosa*, were also described, and a further species was not named, but was apparently close to *F. forbesi* Ed. & H. Etheridge gave good figures and photographs of thin sections, and this paper must form the basis of any further research on the Devonian species of the genus in N. S. Wales. His remarks on the genus *Favosites* may be appropriately quoted here: "I have experienced the greatest difficulty in identifying the *Favosites* of the Tamworth area, and, I may add, of the Australian rocks in general. This arises chiefly from the absence of good microscopic descriptions of the species established by the older European and American writers, except in the case of a few of the best known forms (and even these are often rendered difficult of comprehension by reason of the discrepancies which exist in the respective descriptions); and in a minor degree from the personal want of authenticated species of the countries named" (1899, p. 162).

In 1912 A. B. Walkom gave a thorough description of a new species of *Favosites*, *F. tripora*, from the Yass district, N. S. Wales.

In 1913 Chapman prepared a valuable summary of the Silurian rocks and fauna of Victoria for the Australasian Association for the Advancement of Science meeting for that year. It contained a complete list of the fauna, with localities and references, and was published in 1914.

In 1914 Chapman described and figured *Favosites forbesi* Ed. & H., and a new species, *F. nitida*, from Eastern Victoria.

Chapman in 1920 discussed and figured the species *Favosites gothlandica* Lam., *F. forbesi* Ed. & H., and *F. basaltica* (Gold.) var. *moonbiensis* Eth. fil., from the Yeringian of Eastern Victoria; in the following year he recorded *F. gothlandica* Lam. from Rushworth, and in a further paper he described and figured *F. forbesi* Ed. & H., and *F. (Emmonsia) spinigera*, sp. nov.

In 1922 W. N. Benson published a summary of the work on the Devonian rocks of Australia. This included a very useful bibliographic index of the fossils.

From this brief summary it can be seen that the work done on the Australian Favositidæ consists mainly of isolated descriptions, and that a complete monograph and a revision of the existing records are much needed. This is attempted in the following pages.

III. Structures of the Massive Forms of the Genus.

A great deal of confusion has arisen from the employment of the same terms in various senses by different authors. In discussing the structures of this genus the writer will endeavour, therefore, to make clear the exact sense in which he employs the various terms.

Corallum.—The corallum is invariably cerioid, but varies greatly in form and size. The forms fall into two broad divisions: (a) massive and (b) ramose or

dendroid.² The massive forms, which alone are discussed here, may be globular, pyriform, hemispherical, or in irregularly shaped masses, and all these shapes are frequently found in the same species, the form of a particular individual evidently being mainly determined by environment. The corallites radiate from a point of attachment, which may be in the centre of the base or excentric. In size the massive forms are usually 100 cm. or less (down to as little as 1 cm.) in diameter, but they sometimes reach 200 cm. or more.

Basal Epitheca.—A basal epitheca appears to be always present, except in some globular or spherical colonies, in which the corallites open to all the free surfaces; but it is seldom preserved in weathered or rolled specimens. When seen, it is generally strong and concentrically wrinkled.

Corallites.—The corallites are usually prismatic, a natural result of the compound form; but, when thick-walled, are sometimes rounded, the inner layers of the walls being deposited concentrically. The relative size of the corallites may vary considerably from specimen to specimen and in the same specimen, and is dependent partly on rate of growth and environment. Sometimes two orders of size may be distinguished in a species, and this the writer has elsewhere³ shown to be due to rapid growth in a restricted space.

The number of sides of the adult corallites is normally six, that number giving the geometrical form most economical of space. This is often increased to as many as nine when young corallites are present.

Pseudo-Opercula.—These are plates closing the mouths of the corallites, similar in appearance to those found in some of the *Cystiphyllidæ*. They have been described in a number of species by C. O. Dunbar (1927, pp. 101-14), who concludes that they are a modification of the normal basal epitheca. They have not been observed in any of the Australian species.

Epitheca or *Wall*.—The walls range from extremely thin and hair-like to moderately thick. They are of much the same thickness throughout their length, not having, as have some of the genera of the *Favosites*, a much greater thickness near the surface of the colony than elsewhere.

The "Dark Line".—The so-called "dark line" can usually be seen in the centre of the walls; it appears usually as a line darker than the rest of the walls, but is sometimes lighter. It was formerly supposed to be the junction of the original or "primordial" walls of adjacent corallites compressed together, the rest of the wall being "secondary"; but it has been shown by Miss Ogilvie (1897, p. 128) to be purely the line along which calcification began in two opposite directions, *i.e.*, the "centre" of calcification.

Septal Apparatus.—Septal lamellæ, *i.e.*, continuous lamellæ extending from the top to the bottom of the corallites, are never present in the genus *Favosites*. The septal elements consist of "septal spines"—denticles, tubercles or spines—which arise directly from the walls of the corallites, or frequently are absent altogether.

The spines vary considerably in form—sharp and needle-like, blunt, conical with a broad base and sharp point, etc.—and may be straight or curved, horizontal, or inclined upwardly. They often vary also in number and distribution both vertically and horizontally, even in different parts of the same specimen, and

² Ramose or dendroid does not, as with rugose corals, mean fasciculate; a ramose tabulate coral is one in which the corallites diverge from an imaginary axis, usually at an acute angle; the corallum may or may not branch. It still comes under the heading cerioid.

³ For full discussion of this phenomenon see Jones, 1936, pp. 3-7.

in specimens in which much recrystallisation has taken place they may be completely obscured. In longitudinal sections the spines may be seen in two ways, as spines projecting into the visceral cavity, or as dots, cross sections of the spines, when the section passes close to the corallite wall.

The writer has not seen horizontal septa in any extra-Australian species, but a number of the Australian species exhibit this character in varying degrees; it is best seen in *F. librata*, sp. nov. In addition to the horizontal disposition of the septa, they are at the same level in contiguous corallites, which gives a striking appearance in longitudinal section. This may prove to be an environmental character and a constant varietal difference between the Australian species and otherwise similar species from some other area. This remains to be shown when thin sections of species from other areas are available.

Tabulæ.—The tabulæ may extend wholly across the corallites, when they are known as *complete tabulæ*, or may extend only part way, when they are called *incomplete tabulæ*. In the latter case they are frequently inosculating. In thick-walled species the tabulæ are usually thinner than the walls. The distribution and number of tabulæ depend upon the rate of growth of the corallum, and vary greatly from part to part of the same specimen, so that little weight can be attached to their number and distribution as a specific character. The tabulæ are said to be horizontal when they are perpendicular to the direction of their respective corallites, and oblique when they are inclined to that direction. In either case they may be concave or convex.

Squamulæ.—Squamulæ are horizontally projecting laminae with a more or less tongue-like character. The term was introduced by Rominger (1876, p. 20), who used it in the above sense; but there has been considerable divergence of opinion as to their origin. Rominger, followed by Lambe and other American palæontologists, considered them to be of septal origin (see Rominger, 1876, p. 28; Lambe, 1899, p. 2).

Other palæontologists, notably H. A. Nicholson, have thought them to be a modification of tabulæ. Nicholson (1879, pp. 41–2) concludes: "The fact that their direction is one transverse to the axis of the visceral cavity, and that they occupy the entire width of one of the prismatic faces of a corallite, entirely precludes our believing that they can have been situated in the inside of one of the "mesenteries" of the living animal, and is thus fatal to the conception of their septal character. They must, on the other hand, be regarded as a peculiar modification of the *tabulæ* of the more typical species, and they not uncommonly coexist with these."

Smith and Gullick (1925, p. 116) also take the view that they are of tabulate origin: "it is more probable that they are retrograde tabulæ."

Considering the facts as stated by Nicholson, the writer is of the opinion that it is impossible to regard *squamulæ* as other than *incomplete* or *retrograde tabulæ*.

Mural Pores.—The mural pores of the Australian forms are almost invariably round, and are sometimes surmounted by a small raised rim. In all the species they are in the sides, not the angles, of the corallites.

Many palæontologists have inclined to the view that the arrangement and number of rows of pores are of small systematic value for two reasons; first, that they vary in number and arrangement in the same species and, indeed, in the same specimen, and, second, that they frequently cannot be seen owing to

the type of preservation. The number of rows of pores on the corallite faces of a particular specimen certainly varies with the size of the face, but sometimes a small species has a greater number of rows than a larger. That is, the number of rows varies with the size of the face in the one species, but not from species to species. Further, by far the greater number of faces of a specimen are found to have the same number of rows, and this the writer has found to be constant for all specimens of the same species. This arrangement of pores may be called the *typical arrangement*, and, as will be seen later, is of some importance as a specific character.

With regard to the second objection, the mural pores can almost invariably be seen in longitudinal section if not in the hand specimen.

In the Australian Silurian specimens the preservation is such that the mural pores can usually be seen in the hand specimen. The Devonian ones are less well preserved in this respect, but the arrangement of the pores can be detected in longitudinal sections.

Beecher (1893a, p. 210), followed by Vaughan, regarded the mural pores as aborted buds, attempts at budding which failed owing to lack of space. While the tendency to reproduction is undoubtedly very strong in *Favosites*, this view of the function of the mural pores would imply a much greater activity than seems probable. Further, the mural pores are always opposite each other on faces that are in contact, *i.e.*, they form a communication from one corallite into the surrounding ones, and this fact is more in harmony with the view that the mural pores are homologous with the hollow connecting processes of *Syringopora*.

The writer has not succeeded in tracing any young corallites into mural pores, nor has he been able to observe a mural pore at the pointed base of any young corallite.

Reproduction.—Reproduction takes place by *lateral gemmation*, the bud always being affixed to the wall of the polyp and never to the peripheral region of the calyx.

Growth of Corallum.—According to Beecher (1893a, p. 210; 1893b, p. 215, *et seq.*), the first stage is that of a simple cyathiform corallite. The production of the first bud gives an *Aulopora*-like stage. Further lateral budding ensues, the first corallite is surrounded by a ring of buds, and the corallites become polygonal. Further increase takes place by budding at the periphery and by intermural gemmation whenever sufficient space appears between the polyps. This space obviously first appears at the corallite angles, so that the buds always arise there. The young corallites are at first triangular, but rapidly assume the hexagonal form of the adult corallites. Adult corallites with immature individuals adjoining them will have more than six (possibly up to twelve) sides.

Sufficiently young and complete coralla have not been found in Australia to test this mode of development.

Preservation.—Except for many of the specimens from the Bowspring limestone at Yass, which are silicified, the Australian forms are preserved in calcite. Specimens from the Upper Silurian at Yass generally split along the middle of the walls and are admirably suited for the observation of mural pores. In general, the Silurian specimens are not excessively crystalline, and the septa and other structures are seldom obscured. The Devonian forms are usually more crystalline, the septa are sometimes obliterated, and the mural pores can seldom be observed in hand specimens.

IV. Trends in the Australian Species.

Special attention has been given to the question of "trends" or lines of evolution in the Australian assemblage. Owing possibly to the non-existence or at least non-recognition and collection of Lower Devonian forms, it has not been possible to work out any definite lines; but two general tendencies may be noted: (1) The Middle Devonian forms have thicker walls than the Silurian. (2) Species with incomplete tabulæ are much more common in the Middle Devonian than in the Silurian, and the only species of *Emmonsia* occurs in the Middle Devonian.

V. List of Species Discussed in the Paper.

The genera and species to which the original author referred the forms are given in the left-hand column, and the genera and species in which the writer places them in the right. When an author has used a name with neither description nor figure it is not included in this list or in the synonymies. As the specimens described by de Koninck (1877) were destroyed and his figures are few and poor, his records are not listed.

	<i>Favosites allani</i> , sp. nov., p. 90.
<i>Favosites basaltica</i> (Gold.), var. <i>moonbiensis</i> Eth. fil., 1899	<i>F. basaltica</i> (Gold.) var. <i>moon-</i> <i>biensis</i> Eth. fil., p. 96.
<i>F. basaltica</i> (Gold.) var. <i>moonbiensis</i> Eth. fil.; Chapman, 1912b	" " " , p. 96.
" " " ; Chapman, 1920b	" " " , p. 96.
<i>F. basaltica</i> (Gold.) var. <i>salebrosa</i> Eth. fil., 1899	<i>F. salebrosa</i> Eth. fil., p. 95.
	<i>F. bryani</i> , sp. nov., p. 96.
<i>F. forbesi</i> E. & H.; Chapman, 1914b	? <i>F. nitida</i> Chapman, p. 93.
" " " ; " , 1920b	<i>Favosites</i> sp., p. 94.
<i>F. goldfussi</i> d'Orb.; McCoy, 1877	<i>F. goldfussi</i> d'Orb., p. 94.
	<i>F. gothlandica</i> Lam. var. <i>goth-</i> <i>landica</i> Lam., p. 86.
<i>F. gothlandica</i> Lam.; Nich. and Eth. fil., 1879	<i>Favosites</i> sp., sp. nov. (?), p. 98.
" " " ; Eth. fil., 1892	<i>Favosites</i> sp., sp. nov. (?), p. 98.
" " " ; Dun, 1898	<i>F. goldfussi</i> d'Orb., p. 94.
" " " ; Eth. fil., 1899	" " " , p. 94.
" " " ; Chapman, 1907	? <i>F. allani</i> , sp. nov., p. 90.
" " " ; " , 1914a	? " " " , p. 90.
" " " ; " , 1914b	? " " " , p. 90.
" " " ; " , 1920a	" " " , p. 90.
" " " ; " , 1920b	? " " " , p. 90.
" " " ; Dun, 1898	<i>F. goldfussi</i> d'Orb., p. 94.
<i>F. gothlandica</i> Lam. var. <i>goldfussi</i> Nich. and Eth. fil., 1879	" " " , p. 94.
<i>F. gothlandica</i> Lam. var. <i>goldfussi</i> Eth. fil., 1892	" " " , p. 94.
	<i>F. librata</i> , sp. nov., p. 87.
<i>F. multitabulata</i> Eth. fil., 1899	<i>F. multitabulata</i> Eth. fil., p. 97.
" " "	<i>F. murrumbidgeensis</i> , sp. nov., p. 98.
" " " ; Chapman, 1912a ..	<i>F. multitabulata</i> Eth. fil., p. 97.
<i>Favosites nitida</i> Chapman, 1914	<i>F. nitida</i> Chap., p. 93.

<i>F. ovata</i> Lonsdale	Referred to <i>Stenopora</i> by Eth. fil. and Foord.
	<i>F. regularis</i> , sp. nov., p. 91.
	<i>F. richardsi</i> , sp. nov., p. 89.
<i>Favosites (Emmonsia) spinigera</i> Chapman ..	? <i>F. allani</i> , sp. nov., p. 90.
<i>F. squamulifera</i> Eth. fil., 1899	<i>Emmonsia squamulifera</i> (Eth. fil.), p. 99.
<i>F. tripora</i> Walkom, 1912	<i>F. tripora</i> Walkom, p. 88.
	<i>F. yassensis</i> , sp. nov., p. 92.

VI. The Age of the Various Species.

Name.	Age in Australia.	Age Elsewhere.
<i>Favosites allani</i> sp. nov.	Upper Silurian. ⁵	—
<i>F. gothlandica</i> Lam. var. <i>gothlandica</i> Lam. . .	" "	Throughout the Silurian. ⁶
<i>F. nitida</i> Chap.	" " (Yeringian).	—
<i>F. regularis</i> sp. nov.	" "	—
<i>F. richardsi</i> sp. nov.	" "	—
<i>F. tripora</i> Walkom	" "	—
<i>F. yassensis</i> sp. nov.	" "	—
<i>F. bryani</i> sp. nov.	Middle Devonian.	—
<i>F. goldfussi</i> D'Orb.	" "	Throughout the Devonian.
<i>F. moonbiensis</i> Eth. fil.	" "	—
<i>F. multitubulata</i> Eth. fil.	" "	—
<i>F. murrumbidgeensis</i> sp. nov.	" "	Middle Devonian at Reefton, South Island of New Zealand (R. S. Allan, MS.).
<i>F. salebrosa</i> Eth. fil.	? Silurian in Victoria.	—
<i>Emmonsia squamulifera</i> (Eth. fil.)	Middle Devonian.	—

The following facts stand out from this table:

- (1) No Silurian species range into the Devonian.
- (2) With one doubtful exception no Devonian species are found in the Silurian.
- (3) Only two forms can be referred to extra-Australian species, and these agree in age with their extra-Australian age.

VII. Description of the Species.

***Favosites gothlandicus* Lamarck forma *gothlandica* Lamarck.**

(Plate xi, figs 1-2.)

Favosites gothlandica Lamarck, 1816, p. 206. *Non* Nicholson and Etheridge, 1879, p. 219. *Non* Etheridge, junr., 1892, pp. 50-51, pl. 3, figs. 1-3; 1899, pp. 162-4, pls. xxii and xxiii. *Non* Chapman, 1907, p. 72; 1914, p. 222; 1920a, p. 173, pl. xiv, fig. 12; 1920b, p. 186, pl. xx, fig. 10, pl. xxi, figs. 12-14, pl. xxiii, figs. 18, 19. *Non* Benson, 1922, pp. 73-4.

Favosites gothlandica Lamarck. Smith and Gullick, 1925, pp. 118-9, pl. viii, fig. 1.

Favosites gothlandicus Lamarck forma *gothlandica* Lam. O. A. Jones, 1936, p. 9.

Description.—Corallum massive, pyriform or in irregular masses, probably also hemispherical. Corallites contiguous, prismatic, polygonal, radiating from a point in the base, three- to seven-sided, but with the six-sided predominating

⁵ Throughout the paper Silurian is used as equivalent to Gothlandian; thus Upper Silurian equals the Wenlock and Ludlow of England. Yeringian is the name used for the Upper Silurian of Victoria.

⁶ This species has also been recorded from the Devonian of Europe and America. For discussion of these records see Jones, 1936.

in numbers, equal or subequal, two to three millimetres in diameter; young corallites three-, four- or five-sided, intercalated amongst the older. Walls extremely thin or very slightly thickened. Septa absent. Mural pores circular, medium sized, surmounted by a small raised rim on the outsides of the corallites, typically in two, sometimes three or one, rows on each corallite face; the pores on one face usually alternate, but sometimes opposite or subopposite. Tabulæ complete, thin, usually horizontal, but may be slightly flexuous, four to six in a space of three millimetres.

Remarks.—The coralla of this species, in the writer's possession, are all incomplete and sometimes consist only of fragments; the majority appear to have been pyriform in shape; the largest, from near Molong, measures about 11 cm. across and was possibly twice as large originally. The basal epitheca has not been observed. No septa have been found in any specimen. Two of the specimens from Chillagoe, Queensland, referred to this species, are rather badly preserved; the corallites are rather smaller than in most of the specimens from other localities, but otherwise they agree well. A third specimen from Chillagoe has corallites of the more usual size, but is not sufficiently large to section.

The Australian representatives agree well with specimens of the species from Gothland and England,⁷ with the exception that occasional feeble septal spines have been found in a few European specimens, while the Australian ones appear to be entirely devoid of them.

There have been many records of this species from various parts of Australia. The early records, such as those by Lonsdale (1845) and Clarke (1848 and 1860), are impossible to verify, since no figures are given and it has not been possible to trace the specimens. The others will be discussed under the species to which they are referred.

Localities.—Derrengullen Creek, Yass, N. S. Wales; Barrandella shales, Hatton's Corner, Yass, N. S. Wales; Bowspring limestone, Hatton's Corner, Yass, N. S. Wales; Rosebrook Caves, six miles N.N.E. of Cooma, N. S. Wales; about twenty miles north of Molong toward Cumnock, N. S. Wales; Wellington, N. S. Wales; Mungana, near Chillagoe, Queensland; Chillagoe Caves, Chillagoe, Queensland.

Age.—Upper Silurian.

Favosites librata,⁸ sp. nov.

(Plate xi, figs. 3-6.)

Description.—Corallum massive, hemispherical; corallites radiating from a point in the base, prismatic, polygonal, subequal, two to three millimetres in diameter; young corallites triangular. Walls thin. Septa in the form of sharp spines with a broad, strong base, usually markedly horizontal, sometimes with slight upward inclination; usually at the same level in contiguous corallites, but often not at the same level on different faces of the same corallite; one or two, sometimes three, between each pair of tabulæ. Mural pores circular, or slightly elongated along the corallite; of medium size; one to one and a half times their diameter apart; typically in two rows on each corallite face; usually opposite or sub-opposite, but sometimes alternating. Tabulæ complete, horizontal, frequently concave upwards, regularly spaced, about one per millimetre.

⁷ For full discussion and description of these specimens see Jones, 1936, pp. 2-7.

⁸ *Libratus* = horizontal. From the horizontal disposition of the septa.

Remarks.—The septa are very striking in this species; their broad bases, sharp points, horizontality, and the frequency with which they are on the same level in contiguous corallites, are very noticeable and characteristic features. They vary considerably in length and are irregularly spaced. The spacing of the tabulæ is more regular than in many species of the genus, but it varies somewhat from specimen to specimen.

The type of septa separates this species from any other of the same size. The writer has not observed similar septa in any species which occurs outside Australia, but some other Australian species show this character in a lesser degree.

Description of Holotype.—The holotype is a specimen from the Upper Silurian of Derrengullen Creek, Yass. It is an incomplete rather weathered colony, which originally was probably globular or almost so. The corallites radiate from a point and on the fractured surfaces the mural pores are exceptionally well displayed. A portion of the upper surface has been polished and two sections have been cut. The specimen is preserved in the Geological Museum of the University of Queensland.

Localities.—Derrengullen Creek, Yass, N. S. Wales; Limestone Creek, Yass, N. S. Wales; Humewood, near Yass, N. S. Wales; Wellington, N. S. Wales.

Age.—Upper Silurian.

Favosites tripora Walkom.

(Plate xii, fig. 1.)

Favosites tripora Walkom, 1912, pp. 700–1, pls. xxx–xxxi.

Description.—Corallum compound, massive, hemispherical or pyriform. Corallites radiating from a point, prismatic, polygonal, pentagonal and hexagonal forms predominating. Average diameter of corallites 2.5 to 3 mm. Walls thin. Septa well developed, short spines inclined upwards, twelve in number, regularly placed, and reaching only a short distance in from the walls. Mural pores rather small and typically in three rows, sometimes in two, alternately placed. Tabulæ thin, numerous, horizontal, and usually complete, very occasionally incomplete and inosculating, about two to one mm., usually opposite or sub-opposite in adjacent corallites.

Remarks.—This species is common at Yass and is distinguished by the constant number (twelve) of septa and the regularity of their spacing. This regularity is rare in the genus *Favosites*. The septa are obscured in some sections owing to crystallisation. This is the case with the holotype, in which the septa are better seen on the weathered surface, where they appear in the form of pits owing to the substance of the coral weathering away more rapidly than the matrix. This appearance of the weathered surface recalls Rominger's figures (1876, pl. iv, figs. 1, 3, 4; pl. v, fig. 2) of *F. favosus* and *F. niagarensis*. These species, however, differ in internal structure.

Walkom states that *F. tripora* is most closely allied to the coral from Tamworth described by R. Etheridge, junr., as *F. gothlandica*. *F. tripora* differs from this coral, which the writer refers to *F. goldfussi* d'Orb., in several particulars. In *F. tripora* the walls are thin, the septa are twelve in number and short, and the mural pores are typically in three rows. In the Tamworth coral the walls are moderately thick, the septa are long and irregularly distributed, and mural pores only in two rows.

The twelve regularly spaced septa distinguish this species from all other Australian species.

Description of Holotype.—The holotype is a specimen from Derrengullen Creek, Yass, and is now in the Queensland University Geological Museum. It was an incomplete weathered colony, which on being sectioned broke into seven pieces, four of which have been glued together and are figured in Pl. xii, fig. 7. It is about 7 cm. long, 3 cm. wide and 2 cm. thick. The appearance of the septa on the weathered upper surface has been referred to above. Slices have been cut from the upper and lower surfaces and from one end.

Localities.—Derrengullen Creek, Yass, N. S. Wales; Barrandella shales, Hatton's Corner, Yass, N. S. Wales; Bowspring limestone, Hatton's Corner, Yass, N. S. Wales.

Age.—Upper Silurian.

For the holotype of this species the writer is indebted to Dr. R. S. Allan, to whom Dr. A. B. Walkom was kind enough to give it for the purpose of this work.

Favosites richardsi, sp. nov.

(Plate xii, figs. 2-3.)

Description.—Corallum massive, pyriform, with a flattened top, or in irregular radiating masses. Corallites radiating from a central point of attachment in the base; contiguous, polygonal and prismatic. Corallites very variable in diameter, the adult being 2.5 to 4 mm. in diameter, but the many younger individuals may be as small as 1.5 mm. Most of the larger corallites have more than six sides owing to truncation of the angles by young corallites. Walls thin. Septal spines numerous, short but stout, with a rather broad base and sharply pointed; horizontally directed, or almost so, and usually at the same level in contiguous corallites; one or two spines between each pair of tabulæ. Mural pores large, and rather irregular in arrangement, but most usually in three rows on the faces of full sized corallites; the smaller corallites have often only two rows. Tabulæ complete, thin and horizontal; variable in number, 3 to 6 in a space of 3 mm.

Remarks.—This is a rather variable species, especially as regards size of the corallites, and spacing of the tabulæ. Septa were not observed in all specimens, some being much too crystalline for them to be preserved. The mural pores have only been seen in specimens from the Bowspring limestone at Hatton's Corner, Yass; all the specimens from this locality are silicified, but the mural pores are well displayed. The basal epitheca has not been observed, as most of the specimens are weathered, incomplete colonies.

This species is a rapidly growing one like *F. gothlandicus* forma *forbesi* and forma *multipora*.⁹ It differs from these latter in the septal system; the var. *forbesi* has very few and irregular septa, while var. *multipora* has a large number of long and upwardly inclined septa.

The species is most nearly related to *F. librata* of the Australian forms. It differs in having slightly thicker walls, less strong septa, which are not so constantly horizontal, and less regularly spaced tabulæ; the mural pores are smaller and greater in number.

Description of Holotype.—A specimen from the Barrandella shales, Hatton's Corner, Yass. The specimen is a rather weathered colony, 7 cm. across and 3 cm. high; it has a flat top displaying well the corallites with their difference in size; the base terminates in an eccentric point of attachment, the corallites radiating from that point. A piece has been broken from one edge, from which to cut

⁹ See Jones, 1936, pp. 9-14.

sections. The septa are visible in both transverse and longitudinal sections; the tabulæ are rather closer than the average for the species; mural pores cannot be seen.

The specimen is in the Queensland University Geological Museum.

Localities.—Barrandella shales, Hatton's Corner, Yass, N. S. Wales; Limestone Creek, Yass, N. S. Wales; Derrengullen Creek, Yass, N. S. Wales; Bowspring limestone, Hatton's Corner, Yass, N. S. Wales.

Age.—Upper Silurian.

Favosites allani, sp. nov.

(Plate xii, figs. 4-5.)

? *Favosites gothlandica* Lam.; F. Chapman, 1907, p. 72, pl. ii, fig. 5. *Id.* F. Chapman, 1914a, p. 222. *Id.* F. Chapman, 1914b, p. 303, pl. liii, fig. 20. *Id.* F. Chapman, 1920a, p. 173, pl. xiv, fig. 12. *Id.* F. Chapman, 1920b, p. 186, pl. xx, fig. 10; pl. xxi, figs. 12-14.

? *Favosites (Emmonsia) spinigera*; F. Chapman, 1921b, pp. 214-15, pl. xi, fig. 21.

Description.—Corallum massive, hemispherical, pyriform, globular or in irregular masses. Corallites polygonal and prismatic, but inclined to be irregular and variable in number of sides; triangular to octagonal, but pentagonal and hexagonal forms much predominating; subequal, diameter one to two millimetres. Walls thin. Septa numerous, short spines with a rather broad base, horizontally directed or with slight upward inclination, usually at the same level in contiguous corallites; in number very variable, but as many as sixteen in a cycle. Mural pores circular, with a slight raised rim, rather small, and about twice their diameter apart vertically; typically in one row in the centre of each corallite face, but quite frequently in two which alternate. Tabulæ numerous, thin, usually complete, very occasionally incomplete and inosculating; horizontal but inclined to be flexuous, close but rather irregularly spaced; seven to ten in a space of three millimetres.

Remarks.—The writer has not seen any complete coralla of this species, but specimens indicate that it may assume any of the forms mentioned above. The species is rather a variable one in respect to corallite size, resulting in a somewhat irregular appearance in transverse sections, but quite constant in its characteristic septa. In most specimens the septa are well preserved and easily observed in sections; in a few specimens in the writer's collections they are obscured by recrystallisation.

The specimens figured as *Favosites gothlandica* Lam. by Chapman (1920b, p. 186, pl. xx, fig. 10; pl. xxi, figs. 12-14) have been examined by the writer. They are well preserved and undoubtedly belong to *F. allani*. The corallites have a slightly greater diameter than those of the holotype, and the tabulæ are a little more distant, but the septa, most important structures, are exactly similar, as are the two species in all other respects. The other specimens referred to *F. gothlandica* by Chapman (1907, p. 72, pl. ii, fig. 5; 1914b, p. 303, pl. liii, fig. 20; 1920, p. 173, pl. xiv, fig. 12) are badly preserved, but very probably belong here also. Chapman (1921b, p. 214, pl. xi, fig. 21) described a form as *Favosites (Emmonsia) spinigera*, sp. nov.; the description and sole figure were "based on slice of a coral, the original specimen of which has been mislaid". The name *Favosites spinigera* is preoccupied by Hall (1879, p. 108, pl. 4, figs. 1-5). Judging from the only figure which Chapman gives, it belongs to *F. allani*; but the

description does not agree so well. Thus the tabulæ are less numerous than in *F. allani* and the mural pores, though in a single line, are, according to Chapman, large and rare. Chapman mistakes what are obviously spinose septa for squamulæ ("incomplete and spine-like tabulæ"). He further compares these to "spiniform tabulæ" in *F. grandipora* Eth. fil., to which in another place (1914b, p. 309) he refers as spine-like septa. These structures in *F. grandipora* were considered, correctly, by Etheridge to be due to the breaking down of the weathered walls between the large, close mural pores. *Favosites (Emmonsia) spinigera* is here doubtfully referred to *Favosites allani*.

F. basaltica (Gold.) is a form with only one row of mural pores, but differs from *F. allani* in having no septa.

Description of Holotype.—The holotype, a specimen from Derrengullen Creek, Yass, is in the Geological Museum of the University of Queensland. It is an incomplete corallum with the corallites radiating from a point, five cm. across and eight cm. high. The corallites are masked by matrix on one side, but on the other, where the weathered surface has broken away the small corallites with one row of mural pores on each face, are well displayed. One slice has been cut from the top of the corallum.

Localities.—Derrengullen Creek, Yass, N. S. Wales; Limestone Creek, Yass, N. S. Wales; Barrandella shales, Hatton's Corner, Yass, N. S. Wales; Scarp, Yass River, N. S. Wales. (Age: Upper Silurian.) Native Dog Creek and Cowombat Creek (Limestone Creek Series, Eastern Victoria); Gibbo River and Benambra (Mitta River Series, Eastern Victoria). (Age: Yeringian.)

Specimens from the following localities are placed with reserve in this species: Markham's Caves, Chillagoe, Queensland; Wellington, N. S. Wales (Upper Silurian). Middle Crossing, Deep Creek, Walhalla, Victoria; Deep Creek, Thomson River, Gippsland, Victoria; Rushworth, near Heathcote, Victoria; Tyers River, Gippsland, Victoria. (Yeringian).

Favosites regularis, sp. nov.

(Plate xii, fig. 6; and Plate xiii, fig. 1.)

Description.—Corallum massive, in large masses or flattened expanses. Corallites apparently radiating from a point, prismatic, polygonal and markedly regular in size, 0.75 to 1 mm. in diameter; four- to seven-sided, but with the five-sided much predominating. Walls slightly thickened. Septa numerous and more than usually regular in number and spacing; in the form of spines, as many as fifteen in a cycle; rather variable in length, sometimes reaching half-way to the centres of the corallites. In form conical, sharply pointed, horizontal or almost so, usually at the same level in contiguous corallites. The mural pores are small, circular and typically in two alternating rows on each corallite face, but sometimes in only one; they are about twice their diameter apart vertically. Tabulæ very numerous, usually complete, but occasionally incomplete and inosculating, horizontal but often somewhat flexuous, regularly spaced, ten to twelve in a space of three millimetres.

Remarks.—The regularity of its structures, uniformity of size and constant number of septa are a feature of this species. It is common in the Bowspring limestone at Yass, and most of the specimens have been obtained from there. Unfortunately, nearly all the specimens from that locality are completely silicified and it is exceedingly difficult to get satisfactory sections from them.

The writer was in some doubt as to whether this species should be regarded as a distinct species or only a variety of *F. allani*. The fact that *F. regularis* is not only a slightly smaller form, but in spite of this has usually two rows, instead of one row, of mural pores, seems to be sufficient ground for their complete separation. The two species agree closely in their septa, but the tabulæ are rather more numerous in *F. regularis*.

Description of Holotype.—The holotype, a specimen from Hatton's Corner, Yass, is in the Australian Museum (F.8748). It is a flat incomplete colony of irregular shape, seven cm. across, but only one cm. thick. The corallites are masked by matrix over most of the under side, but are well displayed on top. Sections have been cut from the under surface and one side.

Localities.—Lower Scarp north of Hatton's Corner, Yass, N. S. Wales; Barrandella shales, Hatton's Corner, Yass, N. S. Wales; Bowspring limestone, Hatton's Corner, Yass, N. S. Wales; Derrengullen Creek, Yass, N. S. Wales; Black Dog Creek, Hatton's Corner, Yass, N. S. Wales. One specimen from a limestone on the Molong-Cumnock Road, about 20 miles north of Molong, is doubtfully included in this species.

Age.—Upper Silurian.

Favosites yassensis, sp. nov.

(Plate xiii, figs. 2-3.)

Description.—Corallum massive, hemispherical or globular. Corallites prismatic, polygonal, small, 0.75 to 1 mm. in diameter. Many young corallites are present in the coralla and give a rounded appearance to the many-sided larger ones. Walls moderately thin. Septal spines, very short, sharp with an upward inclination, numerous. About fifteen in a cycle. Mural pores small, circular, typically in three rows, sometimes only in two; the rows usually opposite, but the centre one may alternate with the other two. Tabulæ very numerous, thin, complete and horizontal; usually evenly spaced, but the number varies a little from specimen to specimen; fourteen to twenty in a space of three millimetres.

Remarks.—This species presents likenesses to both *F. allani* and *F. regularis*, but the extremely short upwardly inclined septa serve to distinguish it from both of these. Being inclined upwards and also very short, the septa appear in transverse sections as little more than notches on the corallite walls; their character is better seen in longitudinal sections. The mural pores have not been seen in any of the hand specimens, but appear in most of the sections and seem to be most commonly in three rows.

Description of Holotype.—The holotype is a specimen from the Barrandella shales, Hatton's Corner, Yass, N. S. Wales, and is in the Geological Museum of the University of Queensland. It is an incomplete corallum which was probably originally globular in form. It is six cm. long, three cm. wide and four cm. high, and is entirely free of matrix. Sections have been cut from the under surface and one end.

Localities.—Barrandella shales, Hatton's Corner, Yass, N. S. Wales; limestone scarp, N.E. of first bend in river, Hatton's Corner, Yass, N. S. Wales; Limestone Creek, Yass, N. S. Wales.

Age.—Upper Silurian.

Comparative Table Showing the Characters of *F. allani*, *F. regularis* and *F. yassensis*.

	<i>F. allani.</i>	<i>F. regularis.</i>	<i>F. yassensis.</i>
Size of corallites ..	1 to 2 mm.	0.75 to 1 mm.	0.75 to 1 mm.
Septa	Numerous short, horizontal spines with a broad base.	Horizontal spines with broad base, longer than those of <i>F. allani</i> , variable in length, may reach half-way to centre of corallite.	Very short upwardly inclined spines with broad bases.
Mural pores	Small, circular, typically in one row.	Small, circular, typically in two rows.	Small, circular, typically in three rows.
Tabulæ	Thin, horizontal, usually complete. 7-10 in 3 mm.	Thin, horizontal, complete. 10-12 in 3 mm.	Thin, horizontal, complete. 14-20 in 3 mm.

Favosites nitida Chapman.

(Plate xiii, figs. 4-5.)

Favosites nitida F. Chapman, 1914*b*, p. 309, pl. liv, figs. 21-23; pl. iv, figs. 24, 25.

? *Favosites forbesi* E. and H.; F. Chapman, 1914*b*, p. 308, pl. liii, fig. 19; pl. lvi, fig. 27.

Original Description.—"Corallum of moderate size; largest specimens measuring about 7 or 8 cms. Corallites slender, radiating, with moderately thick walls; normally hexagonal but sometimes pentagonal or sub-rectangular, with two of the sides reduced by crowding of contiguous corallites. Diameter of corallites 0.5 to 0.75 mm. In transverse section showing traces of spiny septa; maximum number 12, two on each corallite face when fully developed. In vertical section the mural pores are seen to be placed in a single row, sometimes sinuous, down the centre of each corallite face, and are of large size (0.17 mm. in diameter); smaller dark dots are visible on the corallite walls, and are the bases of septal spines. Tabulæ numerous, 3 or 4 in the space of 1 mm., somewhat irregular, horizontal, concave or oblique."

Remarks.—Chapman observes (p. 309) that some specimens of this species are very like *F. salebrosa* Eth. fil., but that this last species has no septa. The writer has found¹⁰ septal spines in *F. salebrosa*, but they are not so numerous as in *F. nitida*, and they are rather shorter in the only specimen (a paratype) of *F. nitida* which he has had the opportunity to examine. The tabulæ are also more numerous in *F. nitida*.

The two species are much alike, and possibly should be united, but the writer is reluctant to do so until he has examined more material of *F. nitida*.

The uniting of these two species would extend the range of *F. salebrosa* from the M. Devonian to the Yeringian; Chapman (1912*b*, p. 232) has already suggested the presence of *F. moonbiensis* Eth. fil., another M. Devonian form, in the Yeringian of Eastern Victoria.

Chapman compared *F. nitida* with *F. grandipora* Eth. fil., but the latter is a ramose species with extremely large mural pores.¹¹

The writer has examined the specimen figured (pl. liii, fig. 19) by Chapman as "*F. forbesi*; E. & H."; in common with many writers, Chapman has not under-

¹⁰ See p. 95.

¹¹ Chapman stated that *F. grandipora* has "slender septal spines". The appearance of spines in the longitudinal section is caused by the breaking down of the wall where the large mural pores almost meet.

stood the characters of that species and the form in question cannot be referred to it. In external appearance it is very similar to *F. nitida*; the calyces have a very slightly greater diameter and no definite septa have been seen, but they may be present. Chapman states that the mural pores are like those of the form he called *F. gothlandica* Lam.¹²

The specimen should possibly be referred to *F. nitida*.

Localities.—Middle crossing, Deep Creek; and Cooper's Creek, Walhalla, Victoria.

Age.—Yeringian (Upper Silurian).

Favosites sp.

Favosites forbesi E. & H.; F. Chapman, 1920a, p. 186, pl. xxii, figs. 16, 17.

The writer has examined the specimen figured by Chapman (pl. xxii, fig. 17). It may represent a new species, but enough material has not been obtained to justify a new name. The corallites are about 1.5 mm. in diameter; the walls are moderately thin; septa are very numerous in the form of short sharp spines, inclined upwards. They appear in Chapman's figure, which is a good illustration, both as spines and cross sections of spines. The tabulæ are complete and numerous, six to eight in a space of 3 mm. The mural pores have not been observed by the writer, and Chapman makes no statement concerning them.

Locality.—Gibbo River, Benambra, Victoria.

Age.—Yeringian (Upper Silurian).

Favosites goldfussi d'Orbigny.

(Plate xiii, fig. 6; and Plate xiv, fig. 1.)

Calamopora gothlandica; Goldfuss, 1829, tab. xxvi, fig. 3b (*cat. exclusis*).

Favosites goldfussi (pars); A. d'Orbigny, 1850, p. 107 (fig. 3b of Goldfuss only).

Id. McCoy, 1876, p. 15, t. 35, figs. 1a-d.

Favosites gothlandica var. *goldfussi*; H. A. Nicholson and R. Etheridge, junr., 1879, p. 219. *Id.* R. Etheridge, junr., 1892, p. 51, pl. 3, figs. 1-3.

Favosites gothlandica; W. S. Dun, 1898, pp. 81-2, pl. iii, fig. 9. *Id.* R. Etheridge, junr., 1899, p. 162, pls. xxii, xxiii. *Id.* W. N. Benson, 1922, pp. 73-74.

Favosites goldfussi d'Orb.; O. A. Jones, 1936, pp. 19-21, pl. 11, figs. 8-10.

Description.—Corallum compound, either in spheroidal or hemispherical masses. Corallites prismatic, polygonal—triangular to heptagonal—the pentagonal and hexagonal forms predominating, from 2 to 2.5 mm. in diameter; young corallites triangular and quadrangular. Walls moderately thick; "dark line" usually visible in the centre of the walls. Septa numerous and well developed, but irregularly disposed; in the form of rather blunt spines with a slight upward inclination. Mural pores round, of medium size, typically two, sometimes three, alternating rows on each corallite face. Tabulæ numerous, usually complete, but occasionally incomplete and inosculating; generally horizontal, sometimes slightly oblique, three or four in a space of 3 mm.

Remarks.—The above description differs only in a few minor details from that given by Etheridge (1899, p. 162). Etheridge referred the form to *F. gothlandica*, regarding *F. goldfussi* as at least not more than a variety of the former.

¹²This has one row of mural pores and is referred by the writer to *F. allani*, q.v.

The writer has discussed these two species elsewhere¹³ and shown them to be distinct.

Etheridge (1899, pl. xxii, fig. 2) gives a figure of a transverse section which he described as “. . . horizontal section without septa”; even if a few septa do not appear in the figure, which in the writer's opinion is a doubtful point, they are plentiful elsewhere in the section. Septa do not appear in all the corallites at the level at which the section was cut; this is due in part to the irregular distribution of the septa and possibly in part to the crystalline preservation of the specimen.

Neither of the specimens figured by Etheridge, one of which is also figured by the writer, shows the mural pores, but these appear in sections of other specimens in the Australian Museum.

Localities.—Parish of Woolmol, Tamworth, N. S. Wales; Moore Creek, Tamworth, N. S. Wales; Nemingha, Tamworth, N. S. Wales; foot of Mt. Etha, Rockhampton, Queensland; Broken River, Burdekin Downs, North Queensland.

Age.—Middle Devonian.

Favosites salebrosa Eth. fil.

(Plate xiv, figs. 2-6.)

Favosites basaltica (Gold.) var. *salebrosa*; R. Etheridge, junr., 1899, p. 167, pls. xxi, figs. 3-5; xxvii figs. 1, 2.

Favosites salebrosa Eth. fil.; W. N. Benson, 1922, p. 75.

Syntypes.—Specimens in the Australian Museum from the Parish of Woolmol, near Tamworth, N. S. Wales (Woolmol limestone).

Lectotype.—The specimen figured by Etheridge (1899, pl. xxvii, figs. 1, 2) (Australian Museum, F.4288) is here selected as lectotype.

Emended Description.—Corallum compound, massive, with rough hackly appearance. Corallites small, prismatic, and polygonal—quadrangular to hexagonal—pentagonal predominating; often rendered irregular in outline in consequence of thickening, then becoming somewhat cylindrical, one-half millimetre in maximum diameter. Walls moderately thick, particularly at the angles of junction of the corallites. Septa in the form of rather blunt short spines, not very numerous, and irregularly distributed. Mural pores large, uniserial, in the centre of each prismatic face of a corallite, about three-quarters of a millimetre apart, margins depressed, without elevated rim. Tabulæ complete, unthickened, distant about three-quarters of a millimetre apart, or two in the space of one and a half millimetres; usually horizontal, occasionally oblique, seldom curved, never inosculating, opposite or sub-opposite. Old visceral chambers nearly square as a rule, the vertical diameter perhaps a little greater than the transverse.

Remarks.—Etheridge (1899, p. 166) for some reason failed to recognise septa; the writer has, however, found them in several undoubted specimens of this species, including some of Etheridge's sections. They are very short and might easily be masked by recrystallisation.

Compared with *F. basaltica* var. *moonbiensis*, this is a much smaller form and the tabulæ are much further apart.

In size of corallites, thickness of walls, a tendency to a cylindrical shape of the corallites, and in having one row of mural pores, this species is like *F. basaltica* (Gold.). The presence of septa and fewer tabulæ are, however, a sufficient distinction from the latter.

¹³ See Jones, 1936, pp. 2-12, pp. 21-22.

Description of Lectotype (Pl. xiv, figs. 2-3).—Australian Museum specimen (F.4288) from Portion 38, Parish of Woolomol, Tamworth, N. S. Wales. It is an irregular wedge-shaped mass of maximum length 8 cm., maximum width 7 cm. and maximum thickness 5 cm. The corallites are in part silicified, and, standing out above the matrix, give the specimen a rough hackly appearance; they are very irregular and run in all directions, cutting the surface at all angles. A section has been cut from one end.

Localities.—Portion 38, Parish of Woolomol, Tamworth, N. S. Wales; Moore Creek, Tamworth, N. S. Wales; Nundle Road, Moonbi, near Tamworth, N. S. Wales; Clear Hill, Taemas, Yass district, N. S. Wales.

Age.—Middle Devonian.

***Favosites basaltica* (Gold.) var. *moonbiensis* Eth. fil.**

(Plate xv, figs. 1-2.)

Favosites basaltica (Gold.) var. *moonbiensis*; R. Etheridge, junr., 1899, pp. 164-5, pl. xxiv, figs. 1, 2; pl. xxix, fig. 2. *Id.* F. Chapman, 1912*b*, p. 219, t. 33, fig. 12; t. 35, fig. 7. *Id.* F. Chapman, 1920*b*, p. 187, t. 22, fig. 15; t. 24, fig. 21. *Id.* W. N. Benson, 1922, p. 72.

Description.—Corallum compound, large, oval, compressed. Corallites prismatic and polygonal, quadrangular to heptagonal, but the pentagonal and hexagonal forms predominating, one millimetre in diameter, and in the mature state very constant in size. Walls moderately thick; "dark line" visible here and there. Mural pores of medium size, in one row on each prismatic face of a corallite, continuous in one line, not alternating or zig-zag, depressed, and without elevated rims or margins. Septa absent. Tabulæ numerous, generally complete, horizontal, or slightly oblique, at times a trifle convex; at rare intervals incomplete and inosculating, four or five in a space of one millimetre, opposite or sub-opposite in contiguous corallites.

Remarks.—In the main this description follows that of Etheridge. The form is closely allied to *F. basaltica* (Gold.), differing from it only in having very slightly thinner walls and no tendency to a cylindrical form of the corallites, and in having more tabulæ.

Chapman (1912*c*, p. 232) records this species from the Thomson River beds of Yeringian (Upper Silurian) age. He does not give a description or a figure, and the writer has not been able to examine the specimen, so that he cannot express any opinion.

The writer has not been able to examine the specimen figured by Chapman (1920*b*), but from his remarks it appears to be correctly referred to this variety.

Localities.—Beedle's freehold, near Moonbi, N.E. of Tamworth, N. S. Wales; Moore Creek, Tamworth, N. S. Wales; pass on road between Moonbi Range and Newgate Flat, Nundle Road, near Tamworth, N. S. Wales. (Middle Devonian.) A doubtful record from Limestone Creek opposite the junction of Painters Creek, Eastern Victoria. (Probably Middle Devonian.)

***Favosites bryani*, sp. nov.**

(Plate xv, figs. 3-6.)

Description.—Corallum compound, massive. Corallites prismatic, polygonal, hexagonal much predominating; rather irregular in shape, 1 mm. in diameter. Walls moderately thick, with the "dark line" visible in the centre. Septa in

the form of slender, sharply pointed spines of considerable length, often reaching one-third to one-half way to the centre of the corallites; not very numerous, usually two rows on each fully developed corallite face, regularly spaced vertically and usually at the same level in contiguous corallites. Mural pores of medium size, in one row on each prismatic face of a corallite. Tabulæ numerous, generally complete, occasionally incomplete and inosculating, horizontal or slightly oblique, about ten in a space of 3 mm.; usually opposite or sub-opposite in contiguous corallites.

Remarks.—This species has close resemblances to *F. basaltica* var. *moonbiensis*, but is easily distinguished from it by the possession of septa. Apart from this difference, the likenesses are so great that the writer at first thought that septa were in reality a structure of *F. basaltica moonbiensis*, but obscured by recrystallisation. But the septa are so long and regular in *F. bryani* that it is very unlikely that they could be completely obscured in all the numerous specimens examined.

The species has been found only in the Murrumbidgee area, and no complete coralla have been seen by the writer. One corallum, however, measures 12 by 11 by 6 cm.

Description of Holotype (Pl. xv, figs. 3-4).—The holotype is the Australian Museum specimen F.5550, from Good Hope, near Yass. It is only a small fragment of a corallum, but has been chosen in preference to larger, as sections from it show the structures very clearly. The specimen is in two pieces, the larger of which has a maximum length of 6 cm., maximum breadth of 5 cm. and thickness of 2 cm. The smaller measures 2 by 1 cm., and two sections (A.M.93) have been cut from it. The matrix is a white limestone, throwing the black coral structures into strong relief. The corallites originally radiated from a point, but the lower portion of the corallum is not preserved.

The other specimen (F.8273, Australian Museum) figured (Pl. xv, figs. 5, 6) is larger, measuring 10 by 6.5 by 5 cm. It is apparently a portion of a hemispherical corallum, and has a similar preservation to the holotype. Sections have been cut from one end.

Localities.—Good Hope, near Yass, N. S. Wales; first limestone on Taemas Bridge Road from Yass, N. S. Wales; limestone at Yass end of Taemas Bridge, N. S. Wales.

Age.—Middle Devonian.

Favosites multitabulata Eth. fil.

(Plate xvi, figs. 1-2.)

Favosites multitabulata; R. Etheridge, junr., 1899, p. 168, pl. xviii, fig. 6; pl. xxvi.

Favosites multitabulata Eth fil.; F. Chapman, 1912a, p. 218, pl. xxxv, fig. 6. *Id.*

W. N. Benson, 1922, p. 74.

Description.—Corallum compound, massive. Corallites prismatic, polygonal, quadrangular to heptagonal, but principally hexagonal, from 0.75 to 1.5 mm. in diameter. Walls moderately thick; "dark line" usually visible. Septa spiniform, short, numerous. Mural pores in two alternating series on each corallite face, moderately large, impressed. Tabulæ very numerous and close, from five to eight in one millimetre, complete, horizontal, opposite or sub-opposite in contiguous corallites.

Remarks.—Only one other Australian species, *F. yassensis*, has tabulæ as numerous as this species, and it differs considerably in other respects.

Tabulæ are often very variable in number in different parts of the same specimen, but in this case the great number of tabulæ is so constant both in the same and in different specimens that it probably has some specific significance.

Chapman (1912*a*, p. 216, t. 30, figs. 4, 5) recorded and figured this species from the Middle Devonian limestone of Buchan. He gave no description, but there is little doubt from his figure, that his reference to this species is correct. The writer has obtained other specimens of the species from the same locality.

Localities.—Beedle's freehold, near Moonbi, N. S. Wales; Nemingha, near Tamworth, N. S. Wales; Toongabie, near Buchan, Victoria.

Age.—Middle Devonian.

Favosites murrumbidgeensis, sp. nov.

(Plate xvi, figs. 3-4.)

Description.—Corallum massive, spherical or irregular in shape, with the corallites radiating from a point in the base. Corallites contiguous, polygonal, trigonal to octagonal, rather irregular in shape, small diameter, 0.75 to 1 mm. Walls moderately thick. Septa spiniform, few in number, irregularly spaced horizontally, but fairly regularly vertically, of variable length, sometimes reaching almost to the centre of the corallites, but usually only one-third to one-half of the distance; they are sharply pointed and inclined slightly upward. The mural pores are circular, or slightly elongated along the corallites, of medium size, in one row on each corallite face. The tabulæ are thin, often flexuous, complete and incomplete; the latter join on to another tabula or on to a septal spine, six to twelve in a space of 3 mm.

Remarks.—This species shows more incomplete tabulæ than any other Australian species belonging to genus. Complete and incomplete tabulæ are about equal in number.

Description of Holotype.—The specimen in the Australian Museum (F.9576), from Clear Hill, west of Boambolo Crossing, Murrumbidgee River. It is small and almost spherical in shape, but slightly elongated in one direction. It measures 6 by 5 by 4 cm. The corallites radiate from a point, but open on to almost all the surface. They are preserved in black in a bluish-grey matrix. Two slices have been cut from it.

Localities.—Clear Hill, west of Boambolo Crossing, Murrumbidgee River, N. S. Wales; Taemas, near Yass, N. S. Wales; foot of Mt. Etna, Rockhampton, Queensland.

Age.—Middle Devonian.

Favosites sp., sp. nov.?

(Plate xvi, figs. 5-6.)

Favosites gothlandica; H. A. Nicholson and R. Etheridge, junr., 1879, p. 219. *Id.* R. Etheridge, junr., 1892, p. 50, pl. 3, figs. 4, 5.

The specimen described by Nicholson and Etheridge in 1879 and figured by Etheridge in 1892¹⁴ is in the British Museum (Natural History), and has been examined by the writer. As the preservation is very bad, excessive recrystallisation having taken place, the writer is reluctant to give it a new name, though it probably does not belong to any of the foregoing species. Two other badly

¹⁴ Etheridge simply quoted his and Nicholson's description (1879).

preserved specimens, one from Nemingha and the other from the foot of Mt. Etna, Rockhampton, are probably conspecific with it.

The form is possibly a small variety of *F. goldfussi*. Indeed, Nicholson and Etheridge stated that they had intermediate forms between it and what they called *F. gothlandica* var. *goldfussi* (referred by the writer to *F. goldfussi*, q.v.), but the writer has not been able to trace these specimens and has observed no intermediate forms. The corallites are about 2 mm. in diameter, and have moderately thick walls. Septa are numerous, strong and short. The tabulæ are complete, horizontal, regularly spaced, three or four in a space of 3 mm. The mural pores have not been observed.

Localities.—Broken River, a tributary of the Burdekin River, Queensland; foot of Mt. Etna, Rockhampton, Queensland; Nemingha, near Tamworth, N. S. Wales.

Age.—Middle Devonian.

Emmonsia squamulifera (Eth. fl.).

Favosites squamulifera; R. Etheridge, junr., 1899, pp. 166-7, pl. xxxviii, figs. 4, 5.
Id. W. N. Benson, 1922, p. 75.

For description and figures, see Etheridge, 1899.

Remarks.—Etheridge did not recognise the genus *Emmonsia* as distinct from *Favosites*, but Smith and Gullick (1925, p. 119) have shown it to be distinguished from the latter by having the tabulæ wholly or almost wholly replaced by squamulæ. This is certainly the case in this species; in fact, Etheridge (1899, p. 167) pointed out its resemblance to the genotype of *Emmonsia*, *E. hemispherica* (Yandell and Shumard). From that species it differs in having only one row of mural pores. It is also closely allied to *F. epidermata* Rominger (1876, p. 29, pl. 8, figs. 1, 2, 3), which has only one row of pores.

Locality.—Tamworth, N. S. Wales.

Age.—Middle Devonian.

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EXPLANATIONS OF PLATES.

PLATE XI.

(In this and succeeding plates all photomicrographs are untouched and magnified $4\frac{2}{3}$ diameters.)

Favosites gothlandica Lam. var. *gothlandica* Lam.

Fig. 1.—Transverse section of a specimen from Derrengullen Creek, Yass, showing the thin walls. University of Queensland, No. F.226. O. A. Jones collection. Section No. T1.

Fig. 2.—Longitudinal section of the same specimen, showing the complete regularly spaced tabulæ. Section No. T2.

Favosites librata, sp nov.

Fig. 3.—Transverse section of the holotype. University of Queensland, No. A.8. O. A. Jones collection. Section No. S46.

Fig. 4.—Longitudinal section of the holotype, showing the peculiar septa. Section No. S47.

Fig. 5.—Transverse section of the holotype. University of Queensland, No. A.95. O. A. Jones collection. Section No. T83.

Fig. 6.—Longitudinal section of the holotype. Section No. T84.

PLATE XII.

Favosites tripora Walkom.

Fig. 1.—Transverse section of a specimen from Derrengullen Creek, Yass, showing the regular septa. University of Queensland, No. F.210. O. A. Jones collection. Section No. S14.

Favosites richardsi, sp. nov.

Fig. 2.—Transverse section of the holotype. University of Queensland, No. A.13. O. A. Jones collection. Section No. S59.

Fig. 3.—Longitudinal section of the holotype. Section No. S58.

Favosites allani, sp. nov.

Fig. 4.—Transverse section of the holotype. University of Queensland, No. A.1. O. A. Jones collection. Section No. S33.

Fig. 5.—Longitudinal section of the holotype. Section No. S34.

Favosites regularis, sp. nov.

Fig. 6.—Transverse section of the holotype. Australian Museum, No. F.8748.

PLATE XIII.

* *Favosites regularis*, sp. nov.

Fig. 1.—Longitudinal section of the holotype. Australian Museum, No. F.8748.

Favosites yassensis, sp. nov.

Fig. 2.—Transverse section of the holotype. University of Queensland, No. A.14. O. A. Jones collection. Section No. S60.

Fig. 3.—Longitudinal section of the holotype. University of Queensland, No. A.14. O. A. Jones collection. Section No. S61.

Favosites nitida Chapman.

Fig. 4.—Transverse section of a paratype. National Museum, No. R.12921.

Fig. 5.—Longitudinal section of the same.

Favosites goldfussi d'Orbigny.

Fig. 6.—Transverse section of the specimen figured by Etheridge (1899, pl. xxxiii, figs. 1, 2). Australian Museum, No. F.4291.

PLATE XIV.

Favosites goldfussi d'Orbigny.

Fig. 1.—Longitudinal section of the specimen figured by Etheridge (1899, pl. xxxiii, figs. 1, 2).

Favosites salebrosa Etheridge fil.

Fig. 2.—Transverse section of the lectotype. Australian Museum, No. F.4288.

Fig. 3.—Longitudinal section of the lectotype.

Fig. 4.—Transverse section of a specimen from Moore Creek. Australian Museum, No. F.6772.

Fig. 5.—Longitudinal section of the same.

Fig. 6.—Longitudinal section of a specimen from Clear Hill, Taemas. University of Queensland, No. F.334. O. A. Jones collection. Section No. Q38.

PLATE XV.

Favosites basaltica (Gold.) var. *moonbiensis* Eth. fil.

Fig. 1.—Transverse section of a specimen from Beedle's Farm, near Moonbi. Australian Museum, No. M.575.

Fig. 2.—Longitudinal section of the same.

Favosites bryani, sp. nov.

- Fig. 3.—Transverse section of the holotype. Australian Museum, No. F.5550.
Fig. 4.—Longitudinal section of the holotype.
Fig. 5.—Transverse section of a specimen from Taemas. University of Queensland, No. F.336. O. A. Jones collection. Section No. Q41.
Fig. 6.—Longitudinal section of the same. Section No. Q42.

PLATE XVI.

Favosites multitalulata Eth. fil.

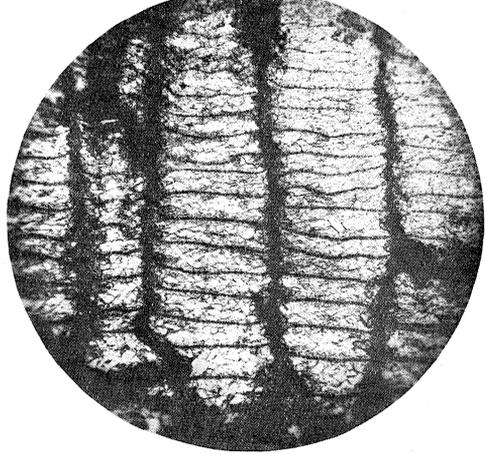
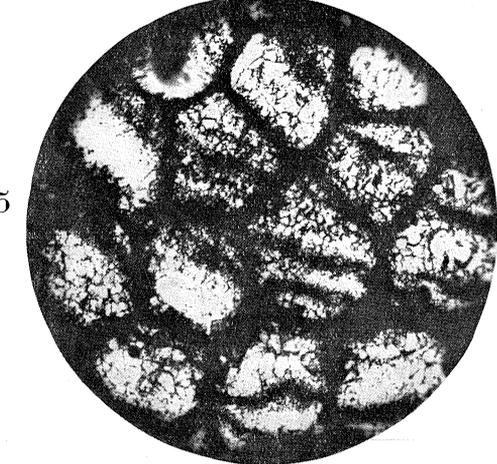
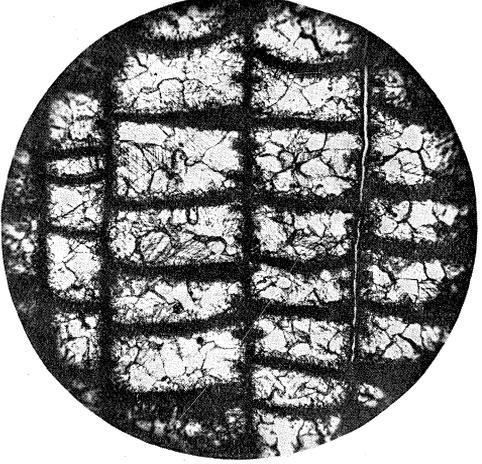
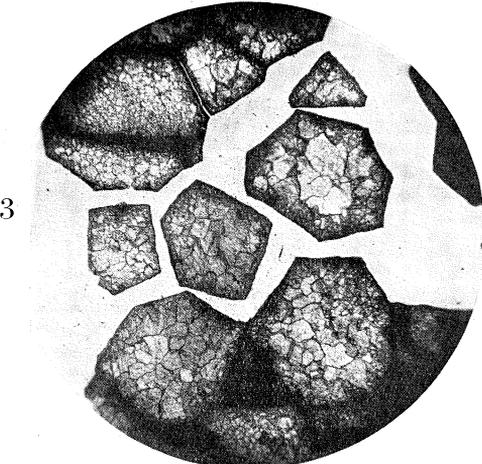
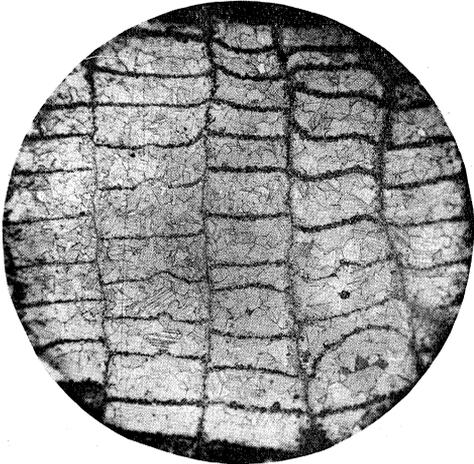
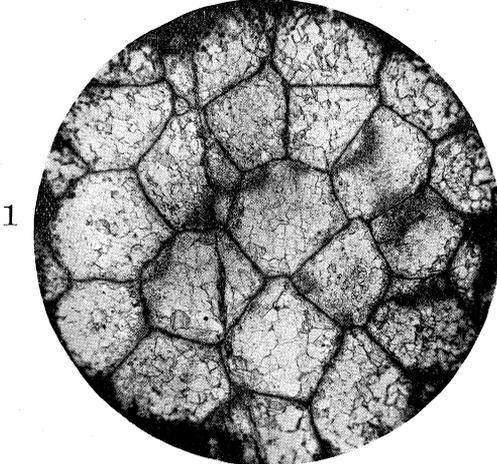
- Fig. 1.—Transverse section of a specimen from Nemingha. University of Queensland, No. F.333. O. A. Jones collection. Section No. Q23.
Fig. 2.—Longitudinal section of the same. Section No. Q24.

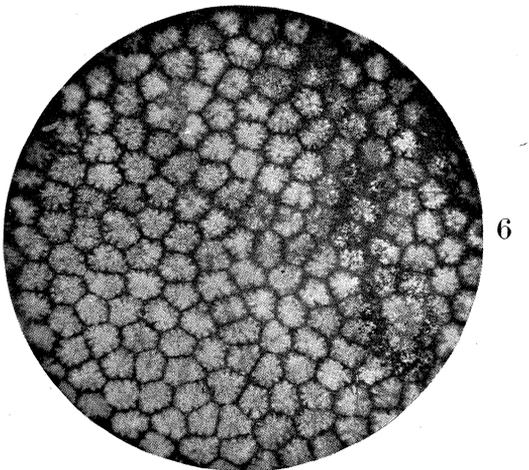
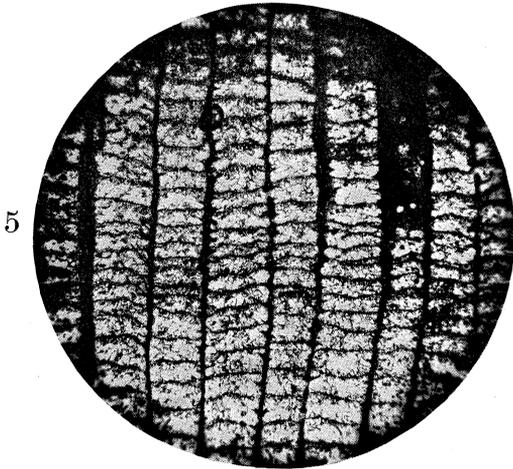
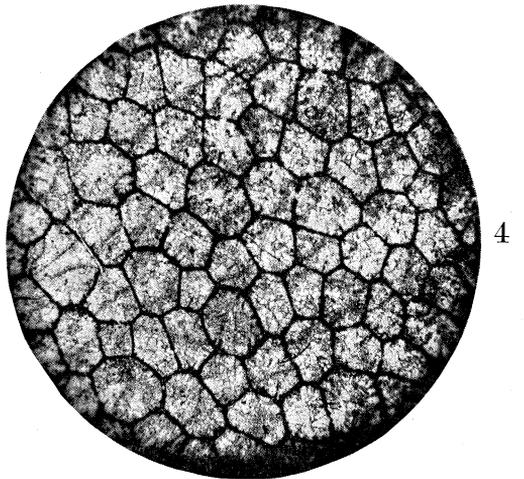
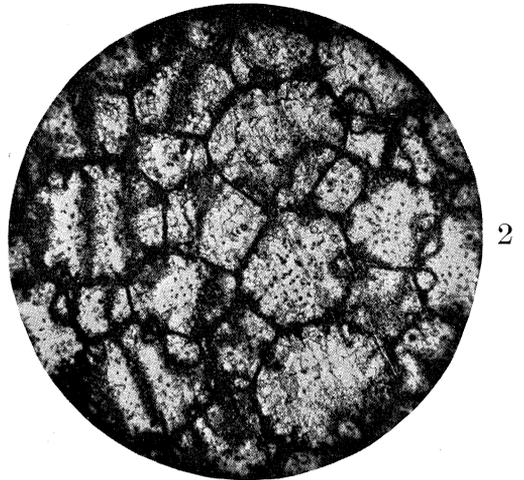
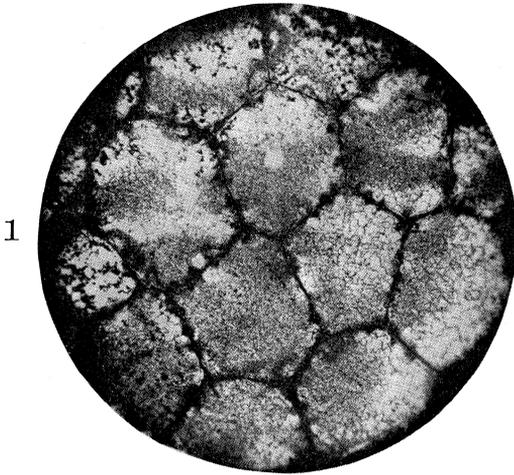
Favosites murrumbidgeensis, sp. nov.

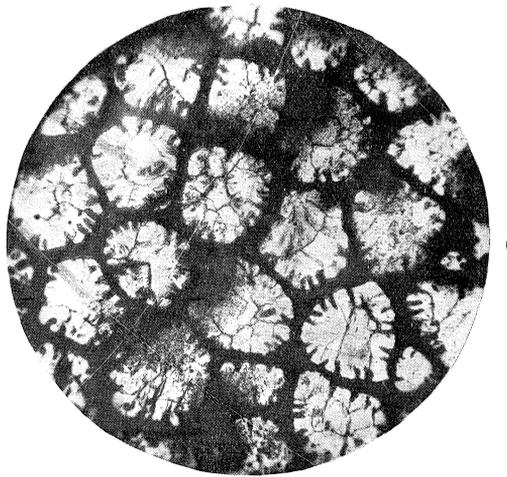
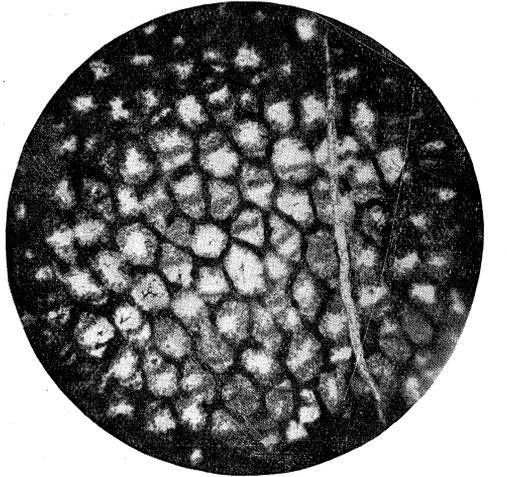
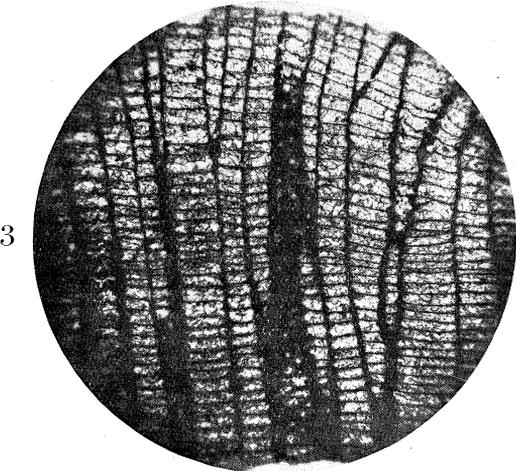
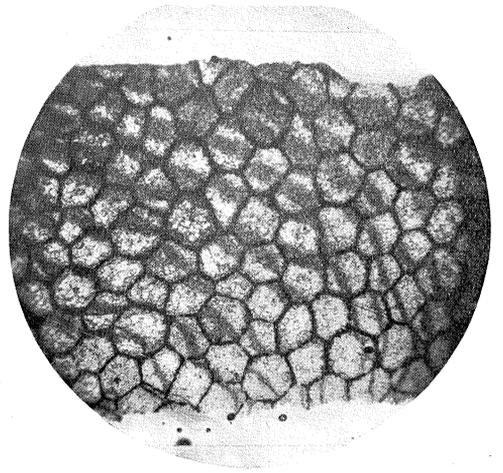
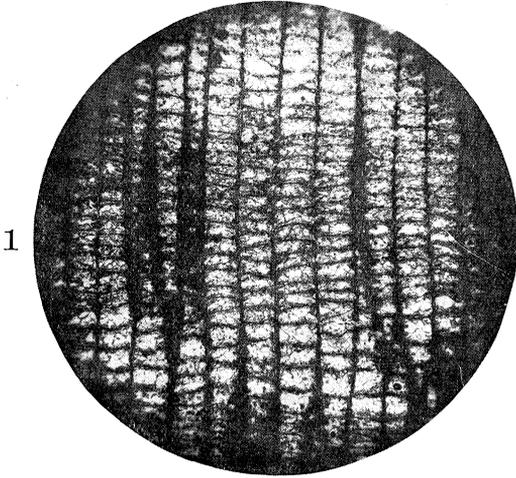
- Fig. 3.—Transverse section of the holotype. Australian Museum, No. F.9576.
Fig. 4.—Longitudinal section of the holotype.

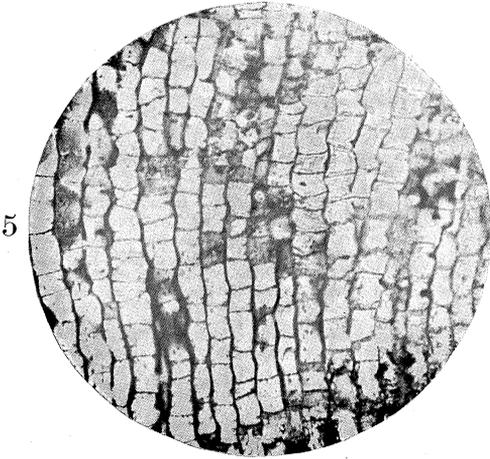
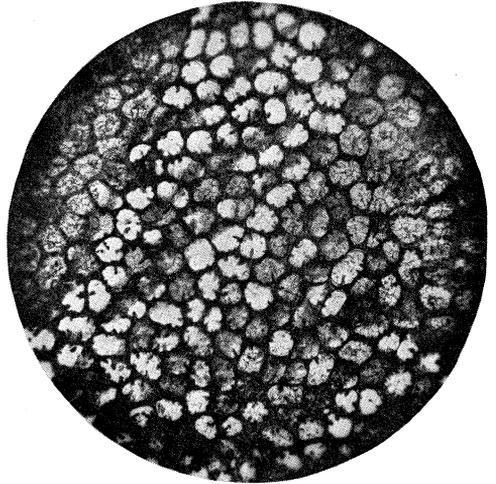
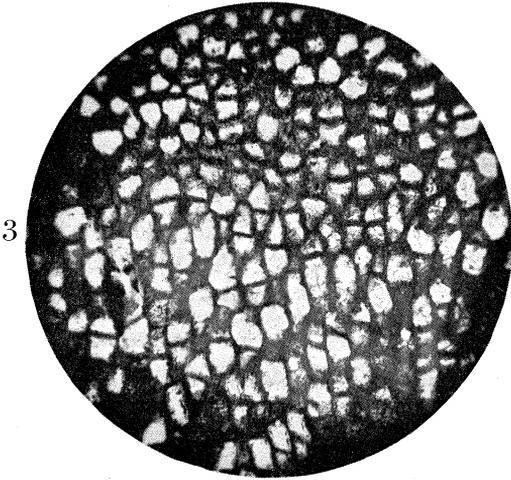
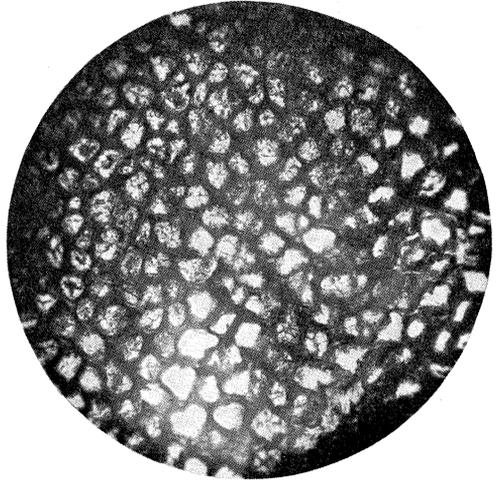
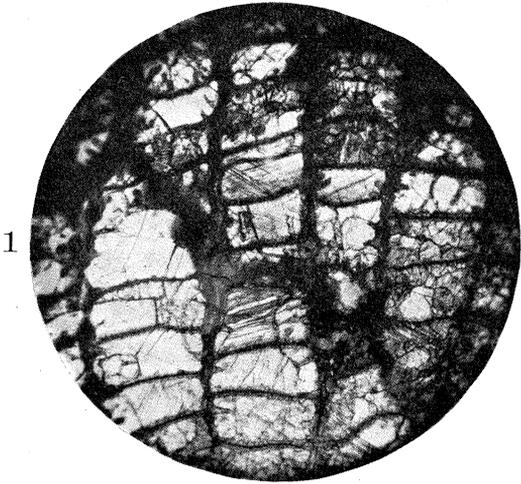
Favosites sp., sp. nov.?

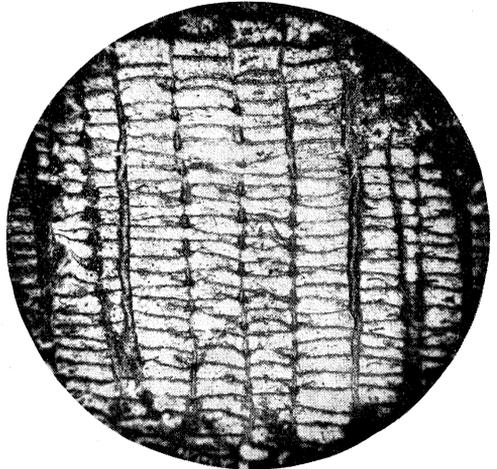
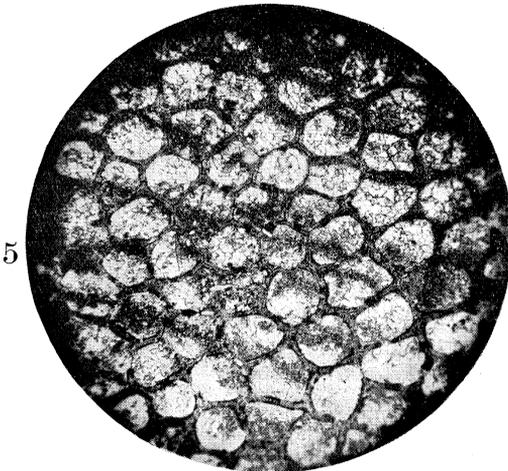
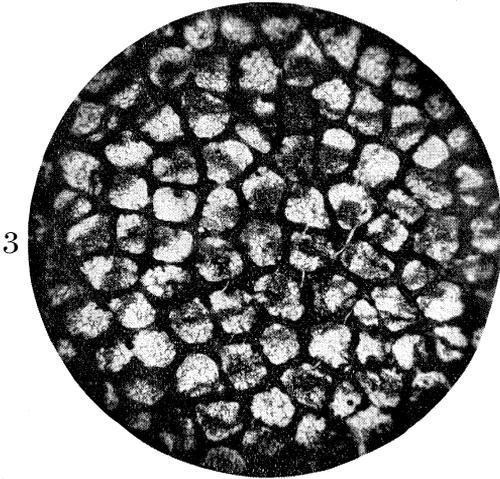
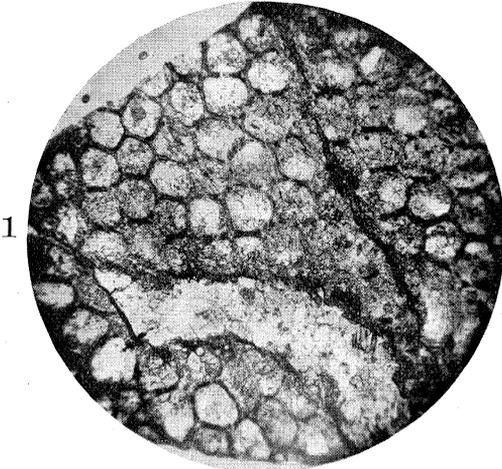
- Fig. 5.—Transverse section of the specimen in the British Museum, figured by Etheridge, junr., as *Favosites gothlandica*. Fossil No. R.25922.
Fig. 6.—Longitudinal section of same.
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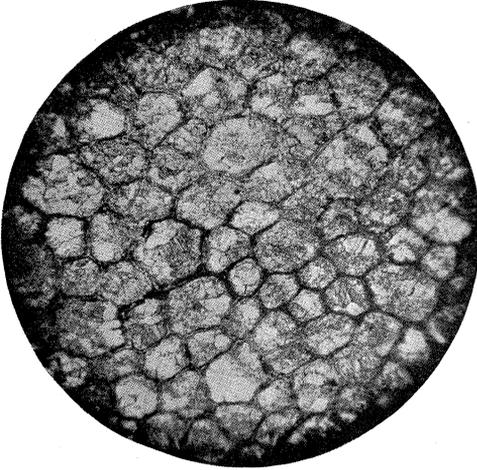








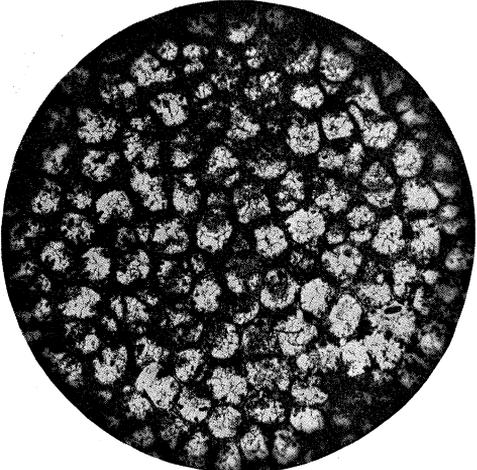
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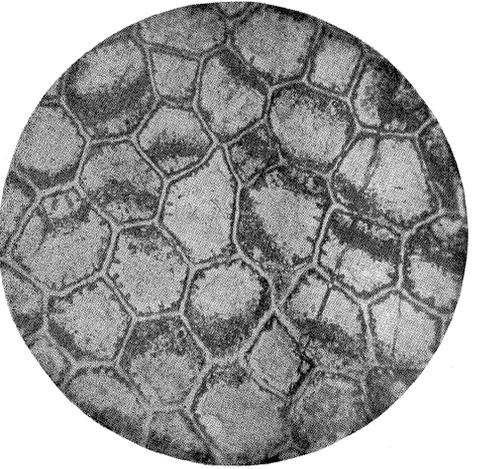
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[The following corrigendum was originally printed in the Table of Contents for Volume 20 Issue 6 [1940]—Sub-Editor, May, 2009.]

CORRIGENDUM.

Page 99, line 16. For *Favosties* read *Favosites*.

Page 302, line 18. For *Coptopterus decvoratus*, sp. nov. read
Coptopterus decoratus, sp. nov.