

COMMONWEALTH OF AUSTRALIA.
DEPARTMENT OF NATIONAL DEVELOPMENT.
BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

BULLETIN No. 23.

CORAL FAUNAS FROM THE SILURIAN
OF NEW SOUTH WALES AND THE
DEVONIAN OF WESTERN AUSTRALIA.

BY

DOROTHY HILL
University of Queensland.

*Issued under the Authority of Senator the Hon. W. H. Spooner,
Minister for National Development.*

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Secretary : H. G. RAGGATT.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

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CONTENTS.

| | PAGE. |
|---------------------------------------------------------------------------------------------------------------------------------|-------|
| SUMMARY | 6 |
| DEVONIAN CORALS FROM WESTERN AUSTRALIA | 7 |
| <i>West Kimberleys : Givetian, Frasnian, and Famennian</i> | 7 |
| <i>East Kimberleys : Upper Devonian</i> | 8 |
| <i>Carnarvon Basin : Givetian and possibly Frasnian</i> | 8 |
| SYSTEMATIC DESCRIPTIONS | 8 |
| RUGOSA | 8 |
| <i>Syringaxonidae</i> | 8 |
| <i>Hapsiphyllidae</i> | 12 |
| <i>Zaphrentidae</i> | 13 |
| <i>Phillipsastreidae</i> | 14 |
| <i>Aulophyllidae</i> | 27 |
| <i>Caniniidae</i> | 28 |
| <i>Spongophyllidae</i> | 29 |
| <i>Cystiphyllina</i> | 29 |
| TABULATA | 30 |
| <i>Favositidae</i> | 30 |
| <i>Auloporidae</i> | 34 |
| CORALS FROM THE SILURIAN LIMESTONES OF YARRANGOBILLY, LONG PLAIN, AND COOLEMAN PLAINS, SOUTH-EASTERN NEW SOUTH WALES | 36 |
| RUGOSA | 36 |
| <i>Tryplasmataidae</i> | 36 |
| <i>Spongophyllidae</i> | 37 |
| TABULATA | 37 |
| <i>Halysitidae</i> | 37 |
| <i>Helolitidae</i> | 40 |
| <i>Favositidae</i> | 42 |
| REFERENCES | 45 |
| EXPLANATION OF PLATES | 46 |

SUMMARY.

Part I. deals with Devonian coral faunas from the West Kimberleys, the East Kimberleys, and the Carnarvon Basin of Western Australia.

Of the 30 species described and illustrated from the West Kimberleys, 22 are from the Pillara Limestone, and of these fifteen are from the main (lower) part of the Limestone of Givetian age, but there are five from the *Atrypa* beds of Teichert which the Bureau of Mineral Resources equates with the upper part of the Pillara Limestone and which may be late Givetian or possibly Frasnian; one *Disphyllum* occurs in *Atrypa* beds referred by Teichert to Oberdevonstufe I (Frasnian). This Pillara Limestone fauna (lower and upper) is dominated by *Disphyllum* with *Hexagonaria*, *Thamnopora*, and *Alveolites* also important. The overlying Mount Pierre Group, of Frasnian (Oberdevonstufe I) and early Famennian (II and III) age, and the Bugle Gap Limestone (IV), have a strikingly different fauna mostly of small slender solitary corals. A new genus of Rugosa, *Catactotoechus*, type species *C. irregularis* sp. nov., is described and figured.

The East Kimberley corals are the Upper Devonian *Palaeosmilia contexta* sp. nov. and *Syringopora patula* Hinde.

From the Carnarvon Basin only four species are known, all from the Gneudna Formation; the genera to which they belong are those dominant and characteristic in the Pillara Limestone of the West Kimberleys, and in upper Givetian and early Frasnian faunas elsewhere, so that the Gneudna Formation is probably of this age; the lack of identical species between the Carnarvon and Kimberley Basins may be due to differences of province rather than time.

The Western Australian Givetian coral faunas contain no species in common with those of eastern Australia, and many of the genera characteristic in eastern Australia, such as *Endophyllum*, *Sanidophyllum*, and *Heliolites*, are absent in Western Australia.

Part II. deals with fragmentary coral material from the Silurian limestones near Kiandra, southern New South Wales, including *Halysites brevicatenatus* sp. nov.; only two species are identified with previously described Australian forms, but the age indicated is probably Wenlockian, possibly Ludlovian.

DEVONIAN CORALS FROM WESTERN AUSTRALIA.

WEST KIMBERLEYS: GIVETIAN, FRASNIAN, AND FAMENNIAN.

The PILLARA LIMESTONE coral fauna is dominated by the Phillipsastreidae, by *Thamnopora*, and by *Alveolites*. It may suitably be considered in two parts; the lower, which is probably everywhere earlier than the first appearance of the goniatite *Manticoceras*, contains *Hexagonaria brevilamellata* (Hill), *H. hullensis* sp. nov., *Disphyllum depressum* (Hinde), *D. goldfussi* (Geinitz), *D. virgatum* (Hinde), *D. virgatum* var. *densum* nov., *D. curtum* sp. nov., *D. spp.*, *Temnophyllum* sp., *T.?* *turbinatum* sp. nov., *Spongophyllum?* sp., *Thamnopora angusta* Lecompte, *T. boloniensis* (Gosselet), *Alveolites tumidus* (Hinde), and *A. suborbicularis* Lamarek. Of these, *H. petalliformis*, *D. curtum*, *Spongophyllum?*, and *Thamnopora angusta* are known only from the basal parts, and *T.?* *turbinatum* is only known from just below the first appearance of *Manticoceras*. This fauna appears to be Givetian.

From the Bureau of Mineral Resources collections made at or above the first appearance of *Manticoceras* in the Pillara Limestones, I have no corals. But from the *Atrypa* beds of Teichert, which the Bureau of Mineral Resources regards as upper Pillara Limestone, I have a fauna which is distinct from that listed above. It contains *Catactotoechus obliquus* sp. nov., *Disphyllum goldfussi* (Geinitz), *D. sp.* (possibly a variety of *D. virgatum*), *Peneckiella teichert* sp. nov., and *Thamnopora boloniensis* (Gosselet).

From horizons ascribed by the Bureau of Mineral Resources to unknown levels in the Pillara Limestone, we have *Phillipsastrea delicatula* Hill and *Temnophyllum?* *floriforme* sp. nov.

From Teichert's collection from Oberdevonstufe I (Frasnian) *Disphyllum intertextum* sp. nov. is described.

The Bureau of Mineral Resources include Oberdevonstufe I of Teichert with his Famennian Oberdevonstufe II and III in the MOUNT PIERRE GROUP as Stages I, II, and III of the Upper Devonian. The general coral fauna of the Mount Pierre Group has a very different appearance from that of the Pillara Limestone, being dominated by small, solitary coralla. From beds referred to Oberdevonstufe I, *Barrandeophyllum* sp., *Zaphrentoides?* *excavatus* sp. nov., and *Catactotoechus* sp. are known; from those placed in Stage II we have *Barrandeophyllum cavum*, *B. sp.*, *B.?* sp., and *Caninia rudis* sp. nov.; from Stage III, *Barrandeophyllum cavum*, *B. sp.*, *Caninia rudis*, "*Cystiphyllum*" *kimberleyense* Hill, and *Aulopora recta* sp. nov.; in beds probably III occur *Barrandeophyllum* sp. and *Phillipsastrea* sp.; in beds doubtfully III, *Barrandeophyllum rubrum* Hill and *Metriophyllum* sp. It is possible that *Phillipsastrea delicatula*, in all three of its known occurrences, is of early Upper Devonian age.

The BUGLE GAP LIMESTONE has a very meagre coral fauna; the dominant genus is *Catactotoechus* gen. nov., the type species *C. irregularis* sp. nov. occurring with *C. tenuis* sp. nov., *C. sp.*, and *Zaphrentis iocosa* sp. nov., in Oberdevonstufe IV; a single specimen of *Phacellophyllum* sp. is known, but so

far this promisingly situated limestone has provided us with no clue to the origin of the early Carboniferous faunas, which we must seek in Famennian horizons.

EAST KIMBERLEYS: UPPER DEVONIAN.

Only two coral species are known, *Syringopora patula* Hinde, which is common, and *Palaeosmilia contexta* sp. nov. *P. contexta* differs considerably from the known Lower Carboniferous species, but it seems better placed in *Palaeosmilia* than in any other genus. The horizon of the corals, in the Burt Range Limestone, is below the horizon with *Clymenia* and the large nautiloids which are common in the Devonian of Fitzroy River in Stages III and IV (fide Öpik and Traves).

CARNARVON BASIN: GIVETIAN AND POSSIBLY IN PART FRASNIAN.

The GNEUDNA FORMATION has yielded only four species of corals:—*Disphyllum virgatum* (Hinde) var. *variabile* nov., *Hexagonaria gneudnensis* sp. nov., *Thamnopora* cf. *polyforata* (Schlotheim), and *Alveolites caudatus* sp. nov. The association of these four genera is characteristic of the Pillara Limestone in the East Kimberleys, and of both Givetian and Frasnian elsewhere; *D. virgatum* is common in the lower part of the Pillara Limestone of Givetian age, and it may be that the Gneudna Formation is of this age also—differences in species between the two limestones may be due to differences in province between the Carnarvon and Kimberley regions.

SYSTEMATIC DESCRIPTIONS.

Order RUGOSA.

Suborder STREPTELASMATINA.

Superfamily METRIOPHYLLICAE.

Family SYRINGAXONIDAE.

Genus *BARRANDEOPHYLLUM* Pošta, 1902; Hill, 1939, page 142.

Barrandeophyllum is moderately common in the Mount Pierre Group. One species, *B. rubrum* Hill (1940), has already been described from a red limestone at the south-east entrance of Mountain Home, Spring Valley, Home Range (i.e. Rough Range of Wade), and from Napier Range, though Dr. Wade, the collector, regarded the red limestone as below the massive grey limestone which is probably the Pillara Limestone of the Bureau.

BARRANDEOPHYLLUM CAVUM sp. nov.

Plate III, Figures 3-9.

Holotype: C.P.C.* 548; Mount Pierre Group, Upper Devonian Stage II; Old Bohemia Homestead vicinity, Margaret River area, West Kimberleys.

* C.P.C. = Commonwealth Palaeontological Collection, housed in the Bureau of Mineral Resources, Canberra.

Diagnosis: Suberect, attaining a diameter of 8 mm. at base of calice, with eighteen major and eighteen contratingent minor septa, an aulos one-third to one-half the diameter of the corallite, and an occasional dissepiment.

Description: The corallum is suberect, the slight curvature being not regular; the epitheca shows growth wrinklins but no longitudinal ridges or furrows. There is considerable variation in diameter at the upper edge of the calice—6 to 11 mm., and some of the corallites are thinner than others. The average diameter is 7 to 8 mm. at the base of the calice where there are eighteen thin major and eighteen thin minor septa, the latter leaning on their neighbouring major septa on the counter side, except those on either side of the counter septum, which are longer and free axially; the cardinal septum is typically the shortest, and the aulos is broken or produced at the cardinal fossula; the aulos is about one-third the diameter of the corallite; the tabulae outside the aulos are declined, and there is an occasional dissepiment, either between major and minor septa, or lonsdaleoid and causing discontinuity in the septa.

Remarks: This species differs from *B. rubrum* in the presence of long contratingent minor septa and of an occasional dissepiment. The specimens from Stages II and III of Mount Pierre as well as topotypes from Old Bohemia show the characters described above. Some specimens differ in the slightly greater thickness of the septa and in the irregular and flange-like manner in which the minor septa lean on the major, but are provisionally included in the species; they are C.P.C. 551 from Stage II of Bugle Gap and U.W.A.* 33541-2 from the *Sporadoceras* zone (Stage III) of the grey limestone with stromatoporoid reef about 100 yards north of Teichert's Little Goniatite Hill south-east of Emanuel ("Rough") Range, i.e. probably a hill on south side of the Virgin Hills, West Kimberleys.

BARRANDEOPHYLLUM spp.

Plate III, Figures 10-12.

There are several individuals from the Mount Pierre Group which do not fall within the above limits of variability. One is C.P.C. 552 (figure 10) from Old Bohemia Homestead area (probably Stage III); this is larger, with an aulos of 1 mm. at a diameter of 9 mm., and 22 or 23 septa of each order, both being very long and somewhat thickened; there are numerous dissepiments, including some large lonsdaleoid plates. Two others from Stage III of different localities are Figures 11 and 12.

From the top of the Pillara Limestone at Bugle Gap, C.P.C. 547 (Plate II, figure 34) has eighteen very short major septa and, as in *B. rubrum*, there are neither minor septa nor dissepiments, but the aulos is very wide, two-thirds the width of the corallum.

Genus CATACTOTOECHUS nov.

Type species (here designated): *Catactotoechus irregularis* sp. nov.; Bugle Gap Limestone, Upper Devonian Stage IV; Oscar Hill, 1 mile south of Oscar Homestead, West Kimberleys, Western Australia.

* U.W.A. = University of Western Australia.

Diagnosis: Solitary coralla with a tabulate aulos which is breached in late stages, with no minor septa and with a single incomplete series of dissepiments, each dissepiment connecting two neighbouring major septa.

Remarks: The genus appears related to *Barrandeophyllum* Pošta, differing from those species without minor septa only in the appearance of sporadic dissepiments of characteristic shape, in the thickness of the septa, and in the impersistence of the aulos. In its epithecal characters as well as in the type of tabulae developed in late stages, the genus resembles the Lower Carboniferous *Amplexus*, while in the type of dissepiments developed it resembles the Lower Carboniferous *Caninia cornucopiae*.

Of the three new Western Australian species, the oldest, *C. obliquus* from the *Atrypa* beds, is the most like *Barrandeophyllum* in the relatively greater persistence of its aulos; of the two species from the Upper Devonian Stage IV, one, the type species, has a perfect aulos only in the youngest stages; the second, *tenuis*, has extremely slender corallites and the aulos is imperfect throughout. *Nalivkinella* Soshkina, 1939, from the Famennian of the Urals, differs in having no dissepiments.

CATACTOTOECHUS IRREGULARIS sp. nov.

Plate III, Figures 31-36.

Holotype: U.W.A. 33,535; Oscar Hill 1 mile south of Oscar Homestead, West Kimberleys; Bugle Gap Limestone, Upper Devonian Stage IV (identification of horizon by C. Teichert based on goniatite faunas of the region).

Diagnosis: Solitary corallites with irregular expansions and contractions, maximum diameter 12 mm.; with sporadic dissepiments and occasional very short minor septa; major septa dilated almost to contiguity in apical region; aulos perfect only in apical regions, later represented only by sharp marginal geniculation of the tabulae.

Description: The corallum is solitary and of irregular growth, usually expanding rapidly from the apex to a maximum diameter of 12 mm. and then contracting and expanding irregularly, sometimes with slight changes in direction of growth. The epitheca shows growth striation, but longitudinal septal grooves are seldom and faintly seen; slightly weathered specimens show the bases of the major septa about 1 mm. apart.

In the apical regions the major septa may be so dilated as to be contiguous and their inner edges unite or are turned aside to form an aulos. Above the first contraction in diameter the septa are usually thinner, and the aulos loses definition and may be represented only by a marginal geniculation in the tabulae, the outer parts of which are sharply downturned with few if any traces of a vertical wall connecting the successive geniculations. The septa usually extend only one-third to one-half the radius in these upper parts of the corallite; they usually stop at the geniculation in the tabulae, but very occasionally may be traced along the upper surfaces of the latter. The major septa are 23 to 27 in number and in transverse section dissepiments may appear parallel to the

epitheca connecting one major septum to another; in vertical section these dissepiments are seen to be sporadically developed and highly inclined. Occasionally extremely short minor septa appear. In the apical parts of the corallite the tabulae are in two series; in the axial series they are flat or sagging and in the periaxial series downwardly and outwardly inclined; but in the upper parts each tabula is complete, with the strong marginal geniculation described above.

CATACTOTOECHUS OBLIQUUS sp. nov.

Plate II, Figures 30-33.

Material: Holotype is U.W.A. 33,520; *Atrypa* beds; north side of Emanuel Range, east of Gap Creek Gap, West Kimberleys. Other specimens are:—U.W.A. 33,522, completely weathered out from the rock, occurring with the type, and three (U.W.A. D.12) from the *Atrypa* beds between Emanuel Range and Virgin Hills, $\frac{1}{4}$ mile from junction of fire-plough road and No. 10 bore road towards Long's Well, West Kimberleys.

Diagnosis: Solitary, with 21-24 major septa and no minor septa at the average diameter of 9-10 mm., with an impersistent and imperfect aulos and with sporadic dissepiments.

Description: The corallum is solitary, increasing rather rapidly to a diameter of 9 or 10 mm., and with attachment talons projecting from the apex suggesting that it was held upright. The growth lines are slightly oblique and though the degree and direction of obliquity changes rapidly many times in the corallum, each change being accompanied by a more or less marked change in diameter, yet the corallum is irregularly upright. The epitheca usually shows no trace of longitudinal rugae, but there are occasional faint indications of furrows representing both major and minor septa; where the epitheca is worn off, only major septal edges are seen distant about 1 mm.

There are from 21 to 24 major septa of an average diameter of 9 or 10 mm., and minor septa are entirely absent or represented merely by low ridges. The major septa are a little dilated, and may be somewhat wavy; in those parts of the corallites where an aulos is present, the major septa are longer, up to 3.5 mm., and are then dominantly radial in course; but where the aulos is absent or poorly developed the septa are shorter, and may be somewhat curved. The aulos is an imperfect inner wall, varying in width; it is made in part of septal tissue, the septa being turned aside or expanded to contiguity, and possibly in part of tabular tissue. It is usually broken at the cardinal septum, which is shorter than the remainder. Dissepiments are sparsely developed in a single incomplete series, and are broad plates parallel to the outer wall in transverse section and slightly inclined in vertical section. Tabulae are sparse, and where an aulos is present have their continuity broken at it; the parts outside the aulos are usually inclined outwards and downwards but those inside the aulos are flat or slightly saucered.

Remarks: The species differs from *C. irregularis* in the more rapid changes in obliquity and in having fewer septa and a better developed aulos.

CATACTOTOECHUS TENUIS sp. nov.

Plate III, Figures 37, 38.

Holotype: U.W.A. 33,529; Bugle Gap Limestone, Upper Devonian Stage IV; Oscar Hill, 1 mile south of Oscar Homestead, West Kimberleys.

Diagnosis: Scolecoïd, very slender corallites with small nodule-like processes, without a distinct aulos but tabulae with strong marginal geniculation; major septa short and thin.

Description: The corallites are very slender, maximum diameter 5 mm., but many specimens are only 3 mm. wide; they are scolecoïd and each shows two or three variously placed small nodular outgrowths suggesting broken-off radiceform processes. The epithecal characters are as described above for the other two species of the genus. The major septa are eighteen in number at 4.5 mm. diameter and rather thin; extremely short minor septa may occur between them. No perfect aulos has been noted, but the tabulae are more or less sharply geniculate near their margins, and an occasional trace of a vertical wall may be seen running from one geniculation to another. Dissepiments are extremely few. The small size of this species, known only from the one locality, and its radiceform processes distinguish it from the others.

Family HAPSIPHYLLIDAE.

Genus ZAPHRENTOIDES Stuckenberg, 1895.

Type species (chosen Schindewolf, 1938, page 449): *Zaphrentis griffithsi* Edwards & Haime, 1851, page 333; 1852, page 109, Plate 34, figures 3, 3A; Lower Carboniferous; Clifton, near Bristol, England.

Unfortunately the type specimens of *Z. griffithsi* are known only from calical view and a natural vertical section, so that there is much uncertainty as to the generic characters of *Zaphrentoides*; from Edwards & Haime's figures the type species appears to be similar to *Zaphrentis bowerbanki* Edwards & Haime of Thomson, 1883, which is the lectotype (chosen Lang, Smith and Thomas, 1940) of *Amplexi-Zaphrentis* Vaughan, 1906.

In *Z. griffithsi* the fossula is on the convex side of the corallum and the cardinal and alar fossulae are marked.

ZAPHRENTOIDES? EXCAVATUS sp. nov.

Plate III, Figures 18, 19.

Holotype: C.P.C. 556 from the Upper Devonian (Stage I) of the Mount Pierre Group of Bugle Gap, West Kimberleys.

Diagnosis: Corallum trochoid, slightly curved, with the cardinal fossula on the convex side; calice so deep as to occupy practically the whole corallum.

Description: The corallum is trochoid and slightly curved, attaining a diameter of 16 mm. at the edge of the calice and 3 mm. at the base of the calice, which is so deep as to occupy practically the whole corallum. The epitheca shows growth striations and, faintly, broad flat interseptal ridges and narrow septal furrows, one to each major and minor septum. In a transverse section of 3 mm. diameter, the major septa unite in groups in quadrants, so that the

cardinal and alar fossulae are apparent, the cardinal fossula being on the convex (longer) side of the corallum wide and parallel-sided. Minor septa appear as low ridges on the sides of the calice. The cardinal septum is larger than the remainder. No dissepiments occur.

Remarks: Having no dissepiments, this species may not be referred to *Zaphrentis* Rafinesque and Clifford. As it has its fossula on the convex side, it may be referable to *Zaphrentoides*, but this must remain in doubt until the type specimen of *Z. griffithsi* is restudied. No similar coralla are known to me from the Devonian elsewhere.

Superfamily STREPTELASMATICAE.

Family ZAPHRENTIDAE.

Genus ZAPHRENTIS Rafinesque and Clifford, 1820.

This genus has been discussed recently by Stewart (1938), Schindewolf (1938), and Lang, Smith and Thomas (1940). It is characteristic of late Lower and Middle Devonian beds in North America, and occurs also in the Upper Devonian of Canada. Contrary to usual belief it has a narrow dissepimentarium, particularly in the calical margins.

ZAPHRENTIS IOCOSA sp. nov.

Plate III, Figures 27-30.

Holotype: U.W.A. 33,509; Bugle Gap Limestone, Upper Devonian Stage IV; Tennis Court, Fossil Downs Homestead, West Kimberleys.

Diagnosis: Nearly erect *Zaphrentis* with apical talons, with dissepiments only in the calical margins and septa apparently without cross-bar carinae in the dissepimentarium; the septa thin axially and withdraw a little from the axis in adult stages.

Description: The corallites are subtrochoid and up to 40 mm. high with a diameter at the base of the deep calice of 18 mm., though one almost ceratoid individual is known; they have epithecal talons proceeding from the apex, to act as anchor and supports; their growth is erect or slightly and irregularly curved. The epitheca is longitudinally grooved at the positions of the major and minor septa and crossed by growth striation. Rejuvenescence may occur. The calice is deep with a marked small axial depression and a cardinal fossula, but whether this is on the convex side of the corallite as in the type species cannot be ascertained on the few specimens available owing to their irregular and slight curvature. Cross-bar septal carinae have not been observed.

At a diameter of 18 mm. there are 32 to 34 septa of each order; these are dilated and contiguous in a zone as wide as or nearly as wide as the length of the short minor septa, this stereozone being occasionally broken below the calical margin by interseptal dissepiments not lonsdaleoid, in the calical margin dissepiments are common and may be in two vertical series. In the apical parts of the corallum the major septa are moderately dilated throughout their length, and are contiguous in a wide axial zone; but as the adult stages are reached this axial dilatation decreases, disappearing last in the cardinal quadrants, and the septa

withdraw rather unequally from the axis, leaving a small space. The cardinal septum is usually shorter and the counter septum usually longer than the remainder. There are more septa in the cardinal than in the counter quadrants. The tabulae are domed in adult stages with an axial depression and are complete or incomplete.

Remarks: This resembles the type species in having more septa in the cardinal than in the counter quadrants, but differs in the absence of cross-bar carinae on the septa in the dissepimentarium. It differs from *Z. aff. phrygia* figured by Smith (1945, Plate 1) from the Frasnian of Canada, which also lacks carinae, chiefly in its less regular growth and in possessing talons.

Family PHILLIPSASTREIDAE Roemer.

Genus PHILLIPSASTREA d'Orbigny; Lang & Smith, 1935, page 556.

PHILLIPSASTREA DELICATULA Hill, 1936, page 30.

Plate I, Figure 19.

Diagnosis: Thamnastraeoid *Phillipsastrea* of extremely fine texture, with no horse-shoe dissepiments.

Remarks: The only specimen of this species previously known came from Barker Gorge, Napier Range, West Kimberleys. Two specimens, C.P.C. 539 and R.225B* in the present collection, are from the Sparke Range, Margaret River, West Kimberleys, and are referred by the Bureau of Mineral Resources to the Pillara Limestone. In Europe similar fine-textured species are characteristic of the Upper Devonian.

PHILLIPSASTREA sp.

Plate III, Figure 2.

Material: One specimen only, C.P.C. 553, from which a transverse section only was obtainable, so that not all characters are known; Mount Pierre Group, Upper Devonian Stage III probably; Old Bohemia Homestead, West Kimberleys.

Description: The corallum is massive, the corallites large, 13 mm. in diameter, without dividing walls between them, so that septa of neighbouring corallites are confluent or alternating. There are 20 to 22 long major septa and an equal number of minor septa all radially arranged and much dilated in the dissepimentarium, the major more so than the minor; all are of compound trabeculae which may form cross-bar (yard-arm) or sometimes zig-zag carinae; in the tabularium the major septa are thin, and interfinger unequally at the axis. The dissepimentarium is about 4 mm. wide and the dissepiments as seen in transverse section are thin, small, and numerous, none being horse-shoe shaped.

Remarks: The individual corallites of this species, apart from their lack of a wall, are very like those of *Temnophyllum? floriforme* Hill, though the latter has more septa, which are more dilated; they are also very like those of *Hallia prolifera* Roemer of Frech (1885, Plate VIII, figure 5) from the lower Upper Devonian of Kleiner Winterburg near Grund, in Germany.

* Numbers prefixed by the letters ND, NH, and R, refer to field localities of the Kimberley Party of the Bureau of Mineral Resources.

Genus HEXAGONARIA Gürich, 1896, page 171.

Genolectotype (chosen Lang, Smith and Thomas, 1940, page 69): *Cyathophyllum hexagonum* Goldfuss, *partim*, 1826, page 61, Plate xix, figures 5e, f, Plate xx, figures 1a, b (but excluding Plate xix, figures 5a, d); Middle Devonian; Eifel district and Bensberg, Germany.

Lang and Smith in 1935 (page 550) in revising the corals related to *Disphyllum caespitosum* (Goldfuss) (i.e. the family Phillipsastreidae) used for cerioid types *Prismatophyllum* Simpson, 1900, page 218. The genotype by original designation of *Prismatophyllum* is *Cyathophyllum rugosum* (Hall) (Edwards and Haime, 1851, page 387, Plate xii, figures 1, 1a-b, *partim*, excluding most, if not all, the synonymy) from the [Lower] Devonian Onondaga ("Jeffersonville") Limestone, Falls of the Ohio, Charlestown Landing, Kentucky, 30 miles below Madison, Ohio, United States of America; this species was renamed *Prismatophyllum prisma* Lang and Smith 1935, page 558. They placed *Hexagoniophyllum* Gürich (1909, page 102) in the synonymy of *Prismatophyllum* on the grounds that their type species are congeneric. The genotype (by monotypy) of *Hexagoniophyllum* Gürich is the same as that cited above for *Hexagonaria* Gürich, 1896, which genus Lang and Smith (1935) unfortunately overlooked. Lang, Smith and Thomas (1940, page 19), however, noted Gürich's earlier name, and, by selecting *C. hexagonum* Goldfuss *partim* as lectotype for *Hexagonaria*, have caused *Prismatophyllum* to be merged in *Hexagonaria* as a synonym. Thin sections of the lectotype of *C. hexagonum* Goldfuss (i.e. the specimen figured by Goldfuss, 1826, Plate xx, figures 1a, b, chosen Lang and Smith, 1935, page 550) have never been illustrated, so that one cannot regard the generic identity of *Hexagonaria* and *Prismatophyllum* as safely proved, but I follow Lang, Smith and Thomas (1940) and Stumm (1949) in equating them.

The genus first occurs in the Onondagan of North America, is cosmopolitan in the Middle and Upper Devonian, and lasts into the Lower Carboniferous in China.

HEXAGONARIA BREVILAMELLATA (Hill).

Plate I, Figures 12, 13; Plate II, Figure 1.

Prismatophyllum breviamellatum Hill, 1936, page 32, text-figures 6-8, Price's Creek, Emanuel ("Rough") Range, Kimberley, in pure, white, coarsely crystalline limestone. *Holotype*: U.W.A. 2515.

Diagnosis: *Hexagonaria* with short major septa, with minor septa reduced to septal ridges, and with flat or sagging complete tabulae.

Description of new material: Only the holotype was known previously, but two West Kimberley specimens, C.P.C. 518 from the Pillara Limestone of Mountain Home Springs, Pillara Range, 130 feet above its contact with the Pre-Cambrian, and C.P.C. 537 from the Limestone Billy Hills, Margaret River area, from a crush breccia involving basal Pillara Limestone and the lower part of the Upper Devonian Mount Pierre Group, sufficiently resemble the holotype to suggest that they are conspecific with it; there are minor differences, but these could well be within the limits of variation of the species.

In the new specimens the corallum is cerioid, the corallites being four- to six-sided, usually hexagonal, with an average adult diameter of 8 mm., when there are sixteen major septa present (there are eighteen at a similar diameter in the holotype). The major septa are stout and equally dilated, though the dilatation may decrease a little towards the periphery and is absent in the short axial edges which project a little into the tabularium; the minor septa are represented only by very short peripheral bases (in the holotype the septa are thickest at the periphery). The tabularium is about 4 mm. in diameter in the average adult, and the tabulae are generally complete and horizontal though some may be incomplete or slightly concave. The dissepimentarium consists either of one series of large plates with broad flattened outer edges and short steeply or vertically inclined inner edges (a condition not noted in the holotype), or of two or even three unequal series which together may give either the same flat calical border, or a sloping border as in the holotype; some of the dissepiments may be thickened, but no regular stereozone is formed.

The species differs from *H. hullensis* in the shortness of its septa, and from *H. gneudnensis* in the absence of the minor septa. It is similar to the lower Givetian *H. simplex* Yoh (1937) from the Tungkanling Limestone of Kwangsi Province, south China. It is rare, and the new material suggests it characterizes the basal parts only of the Pillara Limestone.

HEXAGONARIA BREVILAMELLATA? (Hill).

Plate II, Figure 2.

C.P.C. 534 from 300-400 feet up in a section approximately 3 miles south of Spring, Fossil Downs, Margaret River, West Kimberleys, which is believed to be in the lower part of the Pillara Limestone, may be *H. brevilmellata*. It is associated with *H. hullensis*, but has the short, slightly and regularly thickened septa of *brevilmellata*, while the tabulae are intermediate between the concave forms of *brevilmellata* and the marginally upturned domes of *hullensis*.

HEXAGONARIA HULLENSIS sp. nov.

Plate I, Figures 20-23.

Holotype: C.P.C. 501; from grey, massive limestone in the Pillara Limestone 850-870 feet above the base, which rests on Pre-Cambrian; Hull Range, 2 miles south of Shady Creek Gap, West Kimberleys. (Plate 1, figure 20.)

Diagnosis: Septa attenuate in tabularium and reaching to axis, dilated in irregular zones, one at the periphery and one at the inner margin of the dissepimentarium; tabulae incomplete, tall narrow domes with wide upturned edges.

Description: The corallites are four- to eight-sided, commonly hexagonal. Increase is peripheral, and in the four coralla from the type locality and horizon the average adult diameter just before increase is 9 mm., though since all these coralla had actively increased, most corallites were smaller, in any given transverse section. The septa vary in number from 18 to 22 of each order at a

diameter of 6 mm. In most of the corallites of three of these coralla, including the holotype, the septa are dilated at the periphery and again at the inner margin of the dissepimentarium, though in parts of these corallites the thickening is persistent right across the dissepimentarium; in a few corallites or parts of corallites, the septa shows no such zones of thickening; in the fourth corallum the septa of nearly all corallites are dilated at the periphery only, so that their dissepimentaria resemble those of *H. brevilamellata*. In the tabularium the major septa of all individuals of all four coralla are attenuate and extend unequally to the axis without leaving an axial space. The minor septa are practically all fully developed. The dissepiments are normal or angulate, in one to four globose series, of which the outermost may be peripherally flattened (as seen in vertical section) and the innermost thickened, the thickening being continuous with that of the septa. The tabularium is 5.5 mm. in diameter in a corallite of 9 mm. diameter. The tabulae are incomplete, and the tabellae are small, the tabular floors forming rather flat-topped tall domes with wide upturned margins. Many of the corallites show an irregular vertical passage in the axial region due to damage, possibly by worms.

A corallum (Plate I, figure 24) lower in the same section as the holotype, at 730-750 feet, possessed larger corallites (up to 13 mm. diameter) with the same number of septa, which, however, were thicker and more widely spaced in the dissepimentarium. Specimens from higher in this section than the holotype, from 980-1,020 feet, at 1,020-1,040 feet, and from 1,180 feet did not differ from the type.

Remarks: This species is distinct from other Western Australian *Hexagonaria* in that its major septa reach to the axis and its tabular floors are flat-topped narrow domes with wide upturned margins. Elsewhere than in the Hull Range section, where the type occurs, it is found in the Pillara Limestone of the West Kimberleys in the following sections, the heights given being those above the base of the particular section or partial section. Menyoun's Gap sections, Pillara and Home Ranges NH8F, 1,586-1,691 feet, NH9A, 6-110 feet; Emanuel Range section NH133, where practically all the corallites have unthickened septa, and NH135E between 425 and 589 feet; Guppy Hills section R121C, 195 feet above the base of the Limestone, where the septa are a little withdrawn from the axis; Spring section, Fossil Downs (Plate I, figure 22) and R73F, both thought to be in the lower part of the Pillara Limestone; section at the south end of the Hull Range, R180E, 280-335 feet (Plate I, figure 21); Minnie Pool sections R191D, 406-704 feet and R198A at the base of a partial section. All the localities are in the lower part of the Pillara Limestone.

Specimens with a little septal thickening are perhaps closest to *H. quadrigemina* (Goldfuss, Ma, 1937, Plate II, figures 3a, b) from the Middle Devonian of Refrath, Cologne, Germany; but *H. hullensis* combines the axial characters of this form with the septal thickening characteristic of *H. bompasi* (Smith, 1945, Plate 17, figures 2-5) from the Upper Devonian (Frasnian?) of Canada and China. *H. bompasi*, however, has axially sunken, not axially domed, tabulae.

HEXAGONARIA GNEUDNENSIS sp. nov.

Plate I, Figures 1a, b.

Holotype: C.P.C. 766; Carnarvon Basin between 2,574 and 2,600 feet on the traverse south of Gneudna Well, i.e. 1,010 to 1,020 feet above the base of the Gneudna Formation.

Diagnosis: *Hexagonaria* with the major septa extending unequally about halfway from dissepimentarium to axis, minor septa extending to inner margin of dissepimentarium or withdrawn a little towards the periphery; septa thin or thinning from peripheral to axial edges, no thickening of the dissepiments.

Description: The corallum is cerioid, the corallites being four- to six-sided, usually five-sided, with sixteen or seventeen septa of each order at the average adult diagonal diameter of 10 mm. The septa are thin, or they thin from a slightly thickened peripheral edge to the axial edge, and are slightly wavy though not curved; the major septa are withdrawn unequally to positions about midway between the axis and the dissepimentarium, and the minor septa similarly withdrawn unequally to positions a little inside the inner edge of the dissepimentarium. The peripheral edges of the septa are sub-opposite in neighbouring corallites. The dissepiments are somewhat unequal in size and in curvature, and are concentric or angulo-concentric; the outermost series is usually small and globose, the inner series being steeply inclined and less globose; they are unthickened, so that no stereozones develop in the dissepimentarium. The tabulae are complete or incomplete and horizontal or more frequently slightly concave.

Remarks: The species is known so far only from the Gneudna Formation, from a zone met about 2,700-2,820 feet along the traverse north of Gneudna Well, and about 2,574-2,600 feet along the traverse south of the Well (i.e. 1,010 to 1,020 feet above the base of the formation). It differs from *H. brevilamellata* Hill (1936, page 32) in the extension of its major septa farther beyond the inner edge of the dissepimentarium, and of its minor septa farther into the dissepimentarium, in the smaller rigidity of the septa, and in the septa being sub-opposite instead of opposite in the neighbouring corallites. Also but few of the dissepiments of the outer series in *H. brevilamellata* are globose. Nevertheless, the characters of this new species do not preclude varietal relationship with *H. brevilamellata*. *H. gneudnensis* differs from the dominant *Hexagonaria* of the Pillara Limestone of the Kimberley district chiefly in having no zones of thickening in the dissepimentaria, but also in having shorter septa.

Of foreign species it is perhaps closest morphologically to *H. quadrigemina* var. *arctica* Meek, Smith (1945, Plate 14, figures 4a-c) from the (Middle?) Devonian, Porcupine River, Alaska.

Genus DISPHYLLUM de Fromentel, 1861; Hill 1936, page 217.

DISPHYLLUM GOLDFUSSI (Geinitz).

Plate II, Figures 11, 12, 28.

Specimens indistinguishable specifically from this, the type species of *Disphyllum*, which has been fully described by Lang and Smith (1935, page 568) and Smith (1940, page 21), have been collected from the Pillara Limestone of

the West Kimberleys as follows:—Long's Well, 425-589 feet up in the section (C.P.C. 525, 526); 0-110 feet above base of section at Menyau's Gap (NH9A); *Atrypa* beds between Emanuel Range and Virgin Hills, $\frac{1}{4}$ mile from junction of fire-plough road and No. 10 Bore road towards Long's Well; *Atrypa* beds of the north side of Emanuel Range, east of Gap Creek Gap (U.W.A. 33,519). Lang and Smith record this species from the Givetian and Frasnian of the Rhine, the Boulonnais, and North Devon.

DISPHYLLUM VIRGATUM (Hinde); Hill, 1936, page 29.

Plate II, Figures 3-5.

Phaceloid coralla with the same size and internal structure as the type specimens of this species occur at the following localities in the Pillara Limestone of the West Kimberleys:—Minnie Pool 406-704 feet above the base of the section R191, which is a possibly faulted contact with the Pre-Cambrian; in the Hull Range in section R157, 540-640 feet above the contact with the Pre-Cambrian, and less certainly from 730-750 feet; in the Guppy Hills, 7 miles south-west of Mount Elma, Margaret River, R121D at 300-360 feet above the base of the section which rests on Pre-Cambrian; a specimen from NH34 from the Limestone Billy Hills is doubtfully referred to the species.

DISPHYLLUM VIRGATUM var. DENSUM nov.

Plate II, Figure 7.

Holotype: C.P.C. 497 from the Pillara Limestone of the Hull Range section 2 miles south of Shady Creek Gap, north of Margaret River, West Kimberleys, 540-640 feet above the basal contact with Pre-Cambrian.

Diagnosis: The corallites are cylindrical and vermiform, not parallel; the septa are dilated to form an almost continuous stereozone in the dissepimentarium; the dissepiments and tabellae are very small, the axial tabellae forming a low dome.

Description: The corallum is dendroid; the corallites are cylindrical, of diameter 8 to 11 mm., and of irregular not parallel course sometimes three or more being in contact. The septa vary in number from 22 to 24 of each order; the major septa reach the axis and are attenuate in the tabularium, but in the dissepimentarium all the septa may be so dilated as to form an almost compact stereozone, though in parts of some corallites the thickening is much less; the minor septa are developed in a dissepimentarium 1.5 to 3 mm. wide. Most of the dissepiments are small and globose, but occasionally one larger, more flatly curved plate is developed which extends right across the dissepimentarium.

Remarks: This variety is known so far from only one locality other than the type locality, and this (R121C) is 195 feet above the base of the section of Pillara Limestone which rests on Pre-Cambrian in the Guppy Hills, 7 miles south-west of Mount Elma, north of Margaret River, West Kimberleys. B.M.R. R121C (4) from the same locality is doubtfully referred to this variety, as it shows very little septal thickening.

DISPHYLLUM VIRGATUM (Hinde, 1891) var. VARIABLE nov.

Plate I, Figures 2-6.

Holotype: C.P.C. 767; Gneudna Formation 2,936-2,950 feet along traverse south of Gneudna Well, near Williambury Station, Carnarvon Basin, Western Australia, i.e. 1,180 feet above the base of the formation. Plate I, figure 2.

Diagnosis: Corallum dendroid or phaceloid, corallites 5-8 mm. in diameter, dissepimentarium narrow, septa dilated in dissepimentarium, short and attenuate in tabularium; dissepiments small, thickened; tabulae complete or incomplete, flat or sagging.

Description: The holotype is a corallum in which new corallites diverge widely from the old and are 5 to 8 mm. in diameter. The septa number from 17 to 22 of each order, the smaller number tending to be found in specimens from towards the top of the limestone; they are nearly always dilated in the dissepimentarium, but their axial edges are attenuate in the tabularium and withdrawn from the axis, the amount of withdrawal being greatest in forms from the highest horizons in the limestone; the dilatation of the septa often spreads over the upper surface of the dissepiments, particularly of the innermost series, but it may form an almost perfect stereozone by contiguity of the septa. The dissepimentarium is narrow with only one series of dissepiments in specimens from the top of the limestone, and wider at lower horizons, where there are usually two or more series. The tabulae are flat or sagging, complete or incomplete.

Remarks: The variety differs from *D. virgatum* in having more slender corallites with septa withdrawn from the axis. Small *Disphyllum* coralla with widely and irregularly spaced corallites, and fragments of single corallites, occur in the Gneudna Formation at various horizons and all appear to belong to this variety. One specimen, C.P.C. 771 from the top of the limestone, about 1 mile north of Gneudna Well, differs in being regularly phaceloid, with closely spaced corallites, and in having only one series of dissepiments, with short major septa (Plate I, figures 6a, b). Of the *Disphyllum* from the West Kimberleys, only specimen C.P.C. 540 (Plate II, figure 6) doubtfully from the Pillara Limestone of the Pillara Range, closely resembles it. Of foreign forms, this variety is perhaps closest morphologically to *D. goldfussi* var. *hsianghsiensis*, Yoh (1937, Plate VIII, figures 1a, 1b) from the upper Middle Devonian of Kwangsi, south China.

DISPHYLLUM sp. (*D. VIRGATUM* var.?).

Plate II, Figure 27.

Material: Three cylindrical fragments of corallites, including U.W.A. 33,521, *Atrypa* beds, north side of Emanuel Range, east of Gap Creek Gap, West Kimberleys, Western Australia.

Description: The corallites are about 10 mm. in diameter, with 22 septa of each order. The dissepimentarium is about 2 mm. wide, and the septa are so dilated therein as to be mostly contiguous except near its inner edge where

they are thinner; the dissepiments are in three or four series of small rather globose plates, steeply inclined from the periphery. The major septa reach almost to the axis, leaving an axial space and being thin but not attenuate in the tabularium. All the septa are of compound trabeculae directed perpendicularly to the curvature of the dissepiments. The tabulae are incomplete, sub-horizontal.

Remarks: These fragments differ from typical *D. virgatum* in that the thickening swells the septa into fairly general contiguity, not merely connecting neighbours by spreading over the surface of particular zones of dissepiments. They are given separate descriptions since they may form a variety or species characteristic of the *Atrypa* beds; more material is required.

DISPHYLLUM DEPRESSUM (Hinde); Hill, 1936, page 28.

Plate II, Figure 9.

In this species the corallites of the dendroid corallum are trochoid, attaining an average adult diameter of 15 mm. in a length of 20 mm. with 26 septa of each order, the major withdrawn slightly from the axis and attenuate in the tabularium; both orders are typically dilated and form an almost compact stereozone in the dissepimentarium; the tabulae are incomplete, inclined peripherally, and flat or slightly domed axially.

In the present collections from the West Kimberleys only one specimen, C.P.C. 511 from 737-1,124 feet above the base of the section in the Pillara Limestone in Menyau's Gap, Pillara Range, Margaret River, is referred with any confidence to this species; C.P.C. 522 (Plate II, figure 10) from 425-589 feet up in the section in the Emanuel Range, at Long's Well, is doubtfully referred to it, being a cylindrical, not trochoid, fragment.

DISPHYLLUM DEPRESSUM (Hinde) or TEMNOPHYLLUM sp.

Plate I, Figure 16.

One specimen, C.P.C. 541, from near the base of the Pillara Limestone, with *Stringocephalus* sp., in the Home Range, about 0.8 miles north-west of Mountain Home Spring, West Kimberleys, is an erect, solitary, slenderly trochoid individual, with marked growth swellings, attaining a diameter of 18 mm. in a length of 45 mm. In a cross section of 17 mm. diameter there are 26 septa of each order, so dilated in the dissepimentarium that on one side of the section they are contiguous; the major septa thin rapidly in the tabularium and are withdrawn from an axial space of moderate width. The dissepiments are small and when the septa are not contiguous are developed in several series; the dissepimentarium is 3.5-4 mm. wide. The tabulae are sagging and incomplete.

It will be seen that the internal characters of this corallite very closely resemble those of individual corallites of *D. depressum*, and since one side of the tip is broken away, I cannot be certain whether it is a single individual from *D. depressum* or is truly solitary, when it might be referred to *Temnophyllum*.

Other fragments of West Kimberley corallites with similar characters are C.P.C. R191C (a and b) from the Pillara Limestone of Minnie Pool, 265-406 feet above base of section, and NH8C, from 410 feet above the base of the section in Menyau's Gap, Pillara Range.

DISPHYLLUM INTERTEXTUM sp. nov.

Plate III, Figure 1.

Holotype: U.W.A. 38,517; Oberdevonstufe I; Paddy's Spring, north side of Emanuel Range, West Kimberleys. No other specimen known.

Diagnosis: Slender *Disphyllum* with long major septa much dilated in the outer parts of the tabularium, attenuate and inter-fingering axially.

Description: The corallum is fasciculate, the corallites being 3.5 to 4 mm. in diameter, rather widely spaced and somewhat curving and divergent. The dissepimentarium is narrow, about 0.5 mm., and consists usually of two series of highly inclined dissepiments, or of one series of rather globose plates. The septa, eighteen of each order, are moderately thick in the dissepimentarium, but the major septa are more dilated in the outer parts of the tabularium, thinning rapidly towards the axis where they inter-finger with those from the opposite side of the corallite and may curve. The tabulae are incomplete, tending to be domed, with additional tabellae axially.

Remarks: This species is remarkably similar to *D. fasciculare* (Soshkina, 1939, page 34) from the Frasnian of the Urals, Union of Soviet Socialist Republics.

DISPHYLLUM sp.

Plate I, Figure 14.

A fragment of a cylindrical corallite, C.P.C. 495 from 0-50 feet above the base of the Pillara Limestone on the Hull Range section 2 miles south of Shady Creek Gap, north of Margaret River, West Kimberleys, is 12.5 mm. in diameter, with 30 regularly and radially arranged septa of each order, dilated at the periphery and gradually decreasing in thickness towards the inner end of the regular dissepimentarium, which is 2.5 mm. wide; the major septa are attenuate in the tabularium but reach the axis, though not uniformly. The tabulae are sagging, and incomplete with rather large tabellae; the dissepiments are all small and steeply inclined. This specimen bears some resemblance to *Acanthophyllum* and more specimens are required for its proper understanding.

DISPHYLLUM CURTUM sp. nov.

Plate II, Figure 8.

Holotype: U.W.A. 33,518; section south of Mount Wilson, West Kimberleys in the lower part of the (Pillara) *Amphipora* Limestone, lowest *Disphyllum* horizon of Mount Wilson.

Diagnosis: Phaceloid *Disphyllum* with septa not carinate and not or only slightly thickened, with major septa withdrawn from axis and with tabulae complete and sagging.

Description: The corallum is large and phaceloid, the individual corallites varying in diameter from 6 to 10 mm.; there are 21 to 23 septa of each order, not so greatly thickened as to become contiguous in the dissepimentarium, though slight thickening may occur therein; the major septa are attenuate in the tabularium and proceed therein only one-third or one-half the distance to the axis. The dissepimentarium is only 1 or 2 mm. wide and the dissepiments are in one to three vertical series, the outermost of rather large almost horizontally based plates and the inner of small, globose plates. The tabulae are complete, flat or sagging with upturned margins, occasionally with additional tabellae peripherally.

Genus TEMNOPHYLLUM Walther, 1928.

Temnophyllum Walther, 1928, page 120.

Temeniophyllum Lang, Smith and Thomas, 1940, page 131.

Type species (chosen by Lang, Smith and Thomas, 1940, page 132): *T. latum* Walther, 1928, page 123, figure 14, page 124.

Diagnosis: Small solitary corals, with the septa dilated in the dissepimentarium, particularly in the outer half where they are typically contiguous; trabeculae compound, directed inwards and upwards from the periphery, the components curving outwards from the median plane of the septum; dissepiments small and globose, none horseshoe-shaped, merging with the outer tabulae; tabellae incomplete, sagging. Upper Middle Devonian; Germany, China.

Remarks: This genus comprises those solitary corals of the Phillipsastreidae which lack the vertical series of horseshoe-shaped plates in the dissepimentarium that is typical of solitary *Macgeea* of the Upper Devonian, but which have septa dilated in the dissepimentarium. It differs from *Charactophyllum* Simpson from the Upper Devonian (Frasnian) of North America in having its septa always attenuate in the tabularium whereas in *Charactophyllum* the septa tend to be dilated therein; *Charactophyllum* also tends to have very broad flat axial tabellae and a relatively narrow dissepimentarium.

Wang (1948, page 13) referred *D. depressum* (Hinde) to *Temnophyllum*, but it seems better to retain that phaceloid species in *Disphyllum* than to remove it to a genus founded for solitary corals.

TEMNOPHYLLUM TURBINATUM sp. nov.

Plate II, Figures 13-14.

Holotype: C.P.C. 523, from the Pillara Limestone 425-589 feet above the base of the partial section at Long's Well, West Kimberleys. Three other specimens are known from the same locality.

Diagnosis: Solitary, turbinate corallites with septa much dilated in the dissepimentarium and with the major septa long and somewhat dilated in the tabularium; the minor septa are fully developed and there are no horse-shoe dissepiments.

Description: The corallum is broadly trochoid, and may attain a diameter of 22 mm. or more at the base of the calice, though the holotype attains only 15 mm. there. One corallum showed traces of a talon at the top. As far as can be ascertained, the epitheca is developed from calical margin to tip, not absent distally as in *Macgeea*.

There are 33 septa of each order at a diameter of 22 mm. and both orders are so dilated as to be in contact in the middle and inner parts of the dissepimentarium, the dilatation showing compound trabeculae as in *Temnophyllum*. The minor septa are not so much dilated as the major septa, and are less than half the length of the latter, which extend unequally almost to the axis; the major septa do not become attenuate in the tabularium as in typical *Temnophyllum* and thin axial edges may turn aside to contact neighbours as in *Mictophyllum*. There may be a zone of small angulate plates between the major septa just inside the zone of minor septa, and it is doubtful whether these are to be regarded as dissepiments or tabellae. Dissepiments are small and globose; the tabularium is wide and the tabulae are horizontal or slightly domed but incomplete.

Remarks: This species resembles some individuals of the Frasnian Canadian *Mictophyllum modicum* Smith (particularly that figured Smith 1945, Plate 5, figure 3) but this Canadian individual is unlike *Mictophyllum* in the full development of its minor septa, in which character it most closely resembles *Temnophyllum*. It is difficult to determine whether our species should be referred to *Temnophyllum* or to *Mictophyllum*, but for the present I place it in the former. *Temnophyllum* elsewhere is dominantly upper Middle Devonian, while *Mictophyllum* is dominantly Frasnian.

One specimen NH 135F(1) doubtfully referred to this species occurs a little higher (589-800 feet) in the Long's Well section of the Pillara Limestone.

TEMNOPHYLLUM? FLORIFORME sp. nov.

Plate II, Figure 26.

Holotype: C.P.C. 543 from the Pillara Limestone in an outcrop projecting from the J.8 Conglomerate, 1½ miles south of Mount Elma, north of Margaret River, West Kimberleys.

Diagnosis: Dissepimentarium very wide, everted, minor septa very long; all septa dilated but not in contact, the trabeculae diverging from the median plane and separated from their neighbours in the peripheral parts of the septa; major septa long, unequal, some reaching axis; tabularium narrow, tabulae incomplete, infundibuliform; dissepiments small, globose.

Description: Only one worn fragment is known, a corallite about 22 mm. in diameter; probably sub-cylindrical; dissepimentarium 8 mm. wide, dissepiments small, numerous and regular, those of inner series steeply inclined inwards, those of outer series less steeply inclined outwards, so that there is an area of divergence about 2 mm. in from the periphery, which is epithecate. The septa number 27 of each order; the major septa extend unequally to the axis and

are thin in the tabularium, some being slightly curved or broadly waved axially; the minor septa extend to the inner margin of the dissepimentarium; in the dissepimentarium both orders are dilated but not in contact and the dilatation decreases from the periphery inwards; in the outer parts of a septum the trabeculae may separate from one another, so that irregular spaces occur within the septa; the trabeculae diverge from the medial plane of the septum and also from the area of divergence of the dissepiments. Some of the minor septa lean on their neighbours on the counter side, and those on either side of the counter septum (which is the longest septum) are longer than the others. The tabulae are sagging with a median notch and are incomplete.

Remarks: I am doubtful whether this species is correctly referred to *Temnophyllum*, in which as a rule the tabularium is relatively wider and many of the dilated septa are contiguous; also the infundibuliform tabulae are only occasionally seen in this genus; no other species of *Temnophyllum* known to me has an area of divergence in the inclination of the dissepiments as seen in vertical section, a condition due to an eversion of the marginalial floor in the calice. Possibly the species is related to *Acanthophyllum* rather than to *Temnophyllum*, but its septal structure seems phillipsastreoid rather than acanthophylloid. I know of no foreign species which is closely comparable. *Cyathophyllum heterophylloides* Frech, 1885, from the lower Upper Devonian of Grund, Germany, appears to have similar septal structure and arrangement and area of dissepimental divergence, but its tabulae are domed, not sagging.

Subfamily PHACELLOPHYLLINAE Wedekind, 1921.

Genus PENECKIELLA Soshkina, 1939, page 23.

Type species (by original designation): *Diphyphyllum minus* Roemer, 1855, page 29, plate VI, figures 12a-c; Iberg Limestone, Upper Devonian [Frasnian]; the Harz, Germany.

Diagnosis: Phaceloid or cerioid; septa short, tabulae commonly in one series and complete; one series only of dissepiments, horseshoe-shaped but flattened above. Upper Devonian, Europe, North America, and Western Australia.

Remarks: This genus may be synonymous with *Synaptophyllum* Simpson, 1900, page 212, but the type specimens of the type species, *Diphyphyllum arundinaceum* Billings, 1859, page 134, from the Onondagan (Lower Devonian) of Canada, are lost.

PENECKIELLA TEICHERTI sp. nov.

Plate II, Figure 29.

Holotype: U.W.A. 33,515, *Atrypa* beds in the reef about 6.6 miles from Mount Pierre Well on Old Bohemia road, West Kimberleys. upper Givetian or Frasnian. This is the only specimen known.

Diagnosis: Phaceloid *Peneckiella* with mesa-shaped tabulae and nineteen or twenty septa of each order at a diameter of 4.5 mm.

Description: The corallum is of epithecate corallites 4 to 5 mm. in diameter, straight, cylindrical, and parallel and spaced about their own width apart, connected one to another by cylindrical processes, outgrowths of the dissepimentarium. The dissepimentarium is 0.5 to 0.8 mm. wide and consists of one series only of horseshoe-shaped plates or globose plates flattened peripherally, though occasional smaller plates may appear near the tabularium; the dissepiments may be dilated by tissue continuous with septal tissue. The septa are nineteen or twenty of each order; they are carinate and dilated in the dissepimentarium and the major septa are dilated for about 0.2 or 0.3 mm. in the tabularium, then attenuating axially and stopping short of the axis sub-equally; each consists of compound trabeculae directed perpendicularly to the curvature of the dissepiments. The tabulae are mesa-shaped and mostly complete with a broad flat inner portion and a narrow outer down-turned margin; they are unthickened.

Remarks: In its transverse section this species much resembles the type species, differing in having more septa (twenty against sixteen). Of foreign species it is perhaps closest to *Synaptophyllum arundinaceum* Simpson (Smith, 1945, Plate 12, figures 1-2) from the Frasnian of the Hay River, Canada.

Genus PHACELLOPHYLLUM Gürich, 1909, page 102; Lang and Smith, 1935, page 547.

Type species (by original designation): *P. caespitosum* Goldfuss, Gürich, 1909 = *Lithodendron caespitosum* Goldfuss, 1826.

Diagnosis: Dendroid or phaceloid; the branches may be united in their axils by dissepimental tissue; dissepiments in two series, an outer of flat plates and an inner vertical series of horseshoe-shaped plates; major and minor septa may be dilated in the dissepimentarium, the trabeculae diverging from the middles of the horseshoe-shaped dissepiments, and from the mid-planes of the septa; tabularium in two regions separated at the axial edges of the major septa which are somewhat withdrawn from the axis; in the axial series the tabellae are horizontal and in the periaxial inclined either inwards or outwards. Middle Devonian of Europe.

Lang and Smith (1935, page 547) regarded this as a genomorph of *Disphyllum* but it seems to me to be a good genus.

PHACELLOPHYLLUM sp.

Plate III, Figure 26.

Material: One specimen, C.P.C. 567 from the Bugle Gap Limestone; Upper Devonian Stage IV; 6½ miles east of Mount Elma, west of Horse Creek, north of Margaret River.

Description: The cylindrical corallites, sometimes in contact, show greater or lesser dilatation of the septa, in some cases so great that the septa are contiguous; at a diameter of 10 mm there are 22 septa of each order, the major extending unequally in to the tabularium, thinning as they do so, but not

reaching the axis. The dissepiments are very small and numerous as seen in transverse section, but appear in the single incomplete vertical section obtainable to consist of an inner series of horseshoe-shaped plates surrounded by others, possibly not flat plates as is typical of *Phacellophyllum*. The tabellae are in two series, the axial flat, and the periaxial inclined.

Since there is doubt whether the dissepiments outside the inner horse-shoe series are in single series and flat as in *Phacellophyllum*, or numerous and inclined as in the solitary *Macgeea*, the species, being compound, is referred doubtfully to *Phacellophyllum*. The septal dilatation of this form is as great as that of *Peneckiella* but *Peneckiella* has its outermost series of dissepiments horseshoe-shaped.

Family AULOPHYLLIDAE.

Genus PALAEOSMILIA Edwards and Haime, 1848.

PALAEOSMILIA CONTEXTA sp. nov.

Plate III, Figures 40, 41.

Holotype: C.P.C. 569; Upper Devonian, below horizon with nautiloids of Stages III and IV; Ord River, East Kimberleys, Western Australia.

Diagnosis: Large solitary coralla with numerous but uncrowded septa, the major running together curving irregularly and unequally to form an axial structure with a short medial bar; dissepimental border to calice steeply sloping, dissepiments normal, small; tabulae incomplete, low domes.

Description: The corallum is solitary, cylindrical, and large, attaining a diameter of more than 20 mm.; the calice has a low axial dome, and steeply sloping dissepimental borders. At a diameter of 20 mm. there are 45 major and 45 minor septa, all a little dilated and all very straight, except at the axial edges of the major septa. which turn aside irregularly to join with one another and to abut onto a medial bar which is possibly the axial end of the counter septum. The cardinal fossula is large and expanded a little axially in the median zone of the tabularium as in *P. murchisoni*. The minor septa are a little more than half the radius of the corallum, but very few are contratingent. The dissepimentarium is as wide as the minor septa are long, regular except for an occasional lonsdaleoid plate at the periphery, and may be dilated; the dissepiments are variable in size and their bases slope at an angle of 45 degrees to the epitheca. The tabulae are low domes and incomplete.

Remarks: The septal and fossular characters of the species are those of *Palaeosmilium* as are the incomplete domed tabulae, but the steep and regular slope of the dissepiments is more like that of *Tortophyllum* and *Diversophyllum* from the Middle Devonian Traverse group of Michigan, United States of America. *Palaeosmilium* is known from the Zone D'Etroungt to the Namurian in Eurasia. The present species is somewhat doubtfully referred to *Palaeosmilium* because of the difference between its dissepimentarium and that of the genotype, *P. murchisoni* Edwards and Haime.

Family CANINIIDAE.

Genus CANINIA Michelin in Gervais, 1840.

CANINIA RUDIS sp. nov.

Plate III, Figures 13-16.

Holotype: C.P.C. 562 from the Upper Devonian, base of Stage III, Mount Pierre Group of Bugle Gap, West Kimberleys, Western Australia.

Diagnosis: Solitary coralla without trace of aulos, with a narrow dissepimentarium of wide, flattish, and close dissepiments and a tabularium in which the septa form only a marginal fringe and the tabulae are flat and complete or incomplete.

Description: The corallum is slightly curved, trochoid, with somewhat distant rejuvenescence, attaining a diameter of 20 mm., though the average is about 16 mm.; weathered specimens have a rough appearance due to the large dissepiments. Where epitheca is visible it is smooth except for growth ribbing, and in the apical parts of the corallum septa are visible through it, about 0.5 mm. apart.

In all save the apical parts, a narrow dissepimentarium is present, consisting of one to four series of plates extending either from one major septum to another or across two, three, or even four such interseptal spaces, when the intervening septa are discontinuous through them; in transverse section the dissepiments are nearly parallel to the epitheca and close to one another, in vertical section they are steeply inclined and rather elongate. The tabulae are complete or incomplete, horizontal or very slightly domed and inequidistant. Only major septa are developed, minor septa being represented only by low striations inside the wall; they vary in number from 21 to 26 and extend up to half-way across the tabularium, being continuous vertically except in the dissepimentarium where they may become discontinuous at the dissepiments. They are not regularly radial and are thin or a little distant; and irregular plates abut against them, continuous with the thickening of the septa, looking as if split off from the septa.

Remarks: This species is referred for the time being to *Caninia*, since it resembles the variety *vesicularis* of the type of that genus, *C. cornucopiae*, in its adult characters. The ontogenetic stages are not yet known and may show significant divergences from those of *Caninia*. In all its features save in the absence of an aulos and in the greater development of dissepiments, this species resembles *Catactotoechus* which was co-existent in the West Kimberleys region, and it may be referable to or at least descended from that genus. The possibility that "*Cystiphyllum*" *kimberleyense* is descended from this species requires investigation.

The species is known from the Mount Pierre Group, Stages II and III of several localities in Bugle Gap, and also from Stage III, possibly Stage II of Mount Pierre (B.M.R. ND52G).

Suborder COLUMNARIINA.

Family SPONGOPHYLLIDAE Dybowski, 1873.

Genus SPONGOPHYLLUM Edwards and Haime, 1851.

SPONGOPHYLLUM? sp.

Plate I, Figure 17.

C.P.C. 542 from near the base of the Pillara Limestone (with *Stringocephalus*) in the Home Range, about 0.8 miles north-west of Mountain Home Springs, is a small cylindrical fragment of slightly oval section, greater diameter 9 mm., smaller 8 mm. The major septa are 26 in number and unequal, reaching a median plane not an axis; they are cut off from the periphery by a narrow zone of lonsdaleoid dissepiments, and no minor septa are seen. The tubulae are horizontal or anomalously tilted. There is little or no thickening.

There is a possibility that this fragment is *Stringophyllum* rather than *Spongophyllum*, but the individual trabeculae of the septa are not distinguishable in vertical section as is characteristic of the stringophyllids. The age indicated is Givetian.

Suborder CYSTIPHYLLINA.

"CYSTIPHYLLUM" KIMBERLEYENSE Hill, 1936.

Plate III, Figures 21-24.

Although considerably more work has been done on Devonian cystimorphs since this Famennian species was provisionally placed in "*Cystiphyllum*", which is a Silurian genus, we still have insufficient information to place it with confidence either in the Zonophyllinae characteristic mainly of the Middle Devonian, or in *Diplochone* Frech (1885) from the boundary between the Middle and Upper Devonian of Germany, or to create a new genus for it. I have several specimens U.W.A. 33,503, 33,505 from the east side of Mount Pierre, 26 feet above the flat, in Stage III, which agree with the type specimen previously described (Hill, 1936, page 27) in having a wide dissepimentarium of large, gently sloping, domed dissepiments and flat tabulae and in showing frequent rejuvenescence, usually with change in direction of growth; some of these specimens show occasional traces of lamellar septa around the outer edge of the tabularium.

Specimens U.W.A. 33,511, 33,513, and others from Stage III, 21-36 feet below base of limestone conglomerate, south-east corner of Needle Eye Rocks, West Kimberleys, differ in their continuously oblique growth and in having the large domed gently inclined dissepiments developed on the shorter side of the corallum only, the tabulae being flat and complete or incomplete, impinging on the wall on the longer side of the corallum. In the calice, traces of lamellar septa may be seen rising from the outer parts of the tabulae. I am in doubt whether these specimens, with their obliquely placed calices and tabulae, are the same species as "*C. kimberleyense*", but provisionally include them.

Order TABULATA.

Family FAVOSITIDAE Dana, 1846.

Subfamily THAMNOPORINAE.

Genus THAMNOPORA Steininger, 1831; Hill, 1939, page 146.

In the Pillara Limestone of the West Kimberleys two species are recognizable, both of which fall within the variation limits of European species; these are *T. angusta* Lecompte, a Givetian species in Europe, and *T. boloniensis* Gosselet, Frasnian in Europe. In each case the Australian specimens appear to have less wide variation limits than the European and it may be that they should be given varietal names. This is not done for the present, as the amount of material available for study is relatively small. The *Thamnopora* of the Gneudna Formation of Carnarvon Basin is closest to the cosmopolitan *T. polyforata* (Schlotheim).

THAMNOPORA ANGUSTA Lecompte, 1939, page 815.

Plate II, Figure 15.

Cylindrical stems 8 to 10 mm. in diameter, simple or forked, with calices opening perpendicularly or with slight obliquity 0.75 to 1 mm. in diameter; corallites widening very little in their course with walls moderately thick throughout, pores 0.2 mm. in diameter.

The Pillara Limestone specimens are U.W.A. 33,539 from its lower part—the *Amphipora* Limestone—from the Pillara Range (= Rough Range of Teichert), about 0.2 miles east of southern entrance to Menyau's Gap;—and U.W.A. 33,502 from the escarpments south of No. 10 Bore, about one-third of a mile north of main reef limestone east of Gap Creek Gap.

THAMNOPORA BOLONIENSIS (Gosselet).

Plate II, Figures 16-18.

Thamnopora boloniensis (Gosselet) Lecompte, 1939, page 122.

Thamnopora cf. *dubia* (de Blainville) Hill, 1939, page 146.

Description: Corallum branched in one plane, branches generally compressed; most calices oblique, rounded, oval, some alveoloid, a few sub-polygonal, 1.8 to 2.5 mm. in diameter, somewhat unequal. Corallites polygonal, rounded interiorly, widening progressively, oblique throughout or turning outwards more strongly towards the surface; walls thick throughout or swelling slightly peripherally; tabulae very irregular, especially axially; mural pores 0.15 to 0.20 mm. in diameter; occasional spiniform outgrowths from the wall.

Remarks: The Pillara Limestone specimens show a growth banding in the wall, which is parallel to the calical surface; the calices seldom exceed 2 mm. in greatest diagonal; spiniform processes are not observed. These small differences from *T. boloniensis* are probably not of specific value. Lecompte (1939) has given full descriptions of *T. dubia* (de Blainville) (= *T. polyforata*

Schlotheim sp., Smith, 1945, page 63) and of *T. boloniensis*, and indicates that morphologically *T. polyforata* grades into *T. boloniensis*, having more slender branches (only 6-8 mm.) with slightly smaller corallites (1-2 mm. diameter) with alveolitoid calices. *T. polyforata* occurs in the Middle Devonian and Frasnian of Europe, where *T. boloniensis* is Frasnian.

Pillara Limestone specimens are from Hull Range, R157H, J, K, L, and M (between 540 and 1,040 feet above base); Menyau's Gap, NH8F (1,124-1,327 feet above base of section) and NH9A (10-110 feet above base of partial section); Long's Well, NH137B (37-84 feet above base of section) and NH135F (589-800 feet above base of section); and B92 (Wade Collection, Trig. Station J). Specimens U.W.A. 33,500-1 are from the base of the *Atrypa* limestone between small hills near Long's Well, West Kimberleys.

THAMNOPORA cf. POLYFORATA (Schlotheim); Smith, 1945, page 63.

Plate I, Figures 7-9.

The characters of *T. polyforata* are:—Corallum branched with delicate branches 6 to 8 mm. in diameter, corallites enlarging progressively and opening very obliquely to the surface. Calice alveolitoid, from 1 to 2 mm. wide, with lower lip projecting, rounded or transversely oval. Walls thick throughout the colony, more or less swollen distally. Septal spines very strong, irregular in occurrence, extending beyond the axis and disposed alternately from one wall to the other. Tabulae few. Mural pores 0.12 to 0.15 mm. in diameter, infrequent.

Smith (1945, page 63) has recently equated *T. dubia* (de Blainville, 1830), described by Lecompte (1939, page 120), with *T. polyforata* (Schlotheim, 1820). Smith's description of *T. polyforata* indicates that the walls thicken very much as the corallite increases in length, whereas Lecompte described the progressive thickening as slow in some cases, rapid in others.

Numerous fragments of slender branches from the Gneudna Formation differ from the type specimens of *T. polyforata* and *T. dubia* only in the slightly smaller average diameter of the corallites, caused by their rather thinner walls with less progressive thickening; Lecompte mentions in his description of *T. dubia* that the thickness of the common wall between two calices is equal to slightly more than the diameter of the opening; in the Gneudna specimens the thickness of the common wall is invariably less than this. Horizons are:—2,352 feet-2,370 feet, 2,708 feet-2,721 feet (i.e. 1,080 feet above base), 2,936 feet-2,950 feet (i.e. 1,180 feet above base), and 3,278 feet in traverse south of Gneudna Well, and near and at the top of the Gneudna Formation in the traverse north of Gneudna Well. Thus it appears just earlier than *Hexagonaria gneudnensis* and *Alveolites caudatus* and extends on to the top of the formation. In Belgium *T. polyforata* is known from upper Givetian and lower Frasnian horizons.

Subfamily ALVEOLITINAE Duncan, 1873.

Genus ALVEOLITES Lamarck, 1801; Hill, 1936, page 33.

ALVEOLITES CAUDATUS sp. nov.

Plate I, Figures 10, 11.

Material: Holotype is C.P.C. 765 from near top of (about 1,200 to 1,300 feet up in) the Gneudna Formation, 1 mile north of traverse north of Gneudna Well. Several other small pieces of slender cylindrical branches about 5 mm. in diameter occur in the upper part of the Gneudna Formation at the following horizons:—C.P.C. 776 between 2,708 feet-2,721 feet in traverse south of Gneudna Well, i.e., 1,080 feet above the base; C.P.C. 775 between 2,936 feet and 2,950 feet on traverse south of Gneudna Well, i.e., 1,180 feet above the base; and C.P.C. 774 at the top of the Gneudna Formation on the traverse north of Gneudna Well.

Diagnosis: Corallum ramose with slender cylindrical but not regular branches 5 mm. in diameter; calices transversely elongate, up to 1 mm., polygonal rather than alveolitoid. Communication between corallites by mural pores and also, just below the surface, by large irregular gaps in the walls. Wall structure alveolitoid.

Description: The fragments are not regular. Each branch consists of small corallites 0.5 mm. in maximum diameter, nearly parallel to the branch in the axial region, but turning outwards to open obliquely or almost at right angles to the surface.

The thickness of the walls of the corallites is only very little greater at the surface of the branch than in the axial region, the average being about 0.2 mm. The walls show a median dark line; in the calical parts of the corallites a fibrosity is apparent, the fibres being arranged in groups directed upwards and inwards from the wall; this oblique direction of growth is different from the strictly perpendicular direction noted in *Thamnopora*, but is seen in other *Alveolites*. Tangential sections taken immediately at the surface of the branches show calices transversely elongated up to 1 mm., but irregularly polygonal rather than alveolitoid, though alveolitoid types are not completely lacking. In these calices the fibres are equally long on either side of the median dark line, whereas in nearly all other *Alveolites* the fibres are longer in the convex floor than in the concave roof of the corallites. In tangential sections just below the periphery of the branch, the corallites open irregularly into one another, as they do right at the surface in the *Scoliopora*, the openings suggesting irregular enlargements of mural pores. Mural pores of the circular type of the Favositidae are occasionally visible in vertical sections, but communication between corallites is mostly by the above-mentioned large irregular gaps in the walls. Tabulae are infrequent and thin. Septal spines projecting inwards from the fibrous stereozone are not observed.

Remarks: The generic position of these fragments is doubtful, though they are morphologically closer to *Alveolites* and *Scoliopora* than to *Thamnopora*. In placing them somewhat doubtfully in *Alveolites*, I am influenced by the alveolitoid obliquity of the fibres in the calices rather than by the scolioporoid meandriform canals between corallites, since there is always the possibility that the latter were induced by parasites.

ALVEOLITES TUMIDUS (Hinde); Hill, 1936, page 35.

Plate II, Figures 19-21, 23, 24.

This species is characteristic of the Pillara Limestone of the West Kimberleys; it occurs between 540 and 1,040 feet above the base in the Hull Range section; in the Menyau's Gap section it is found in typical forms between 1,124 and 1,327 feet, and also in partial section NH9 at 10-110 feet (i.e., approximately 2,015 and 2,125 feet above the base of the composite section); in the Long's Well partial section NH135 typical specimens occur between 589 and 800 feet above the base of the section. Other characteristic specimens are from NH34, Limestone Billy Hills, and from the Minnie Pool section.

In its typical development the species is of branches 15 mm. or more wide; the corallites are moderately thin-walled in the axial part of the branches but in the peripheral parts their walls are much thickened, so that two zones appear in transverse sections of the branch; axially the corallites are more or less parallel to the axis but peripherally they curve to open obliquely, the mouths being arranged obliquely round the branch in successive irregular series; this accounts for the general absence of radial arrangement in the peripheral parts of transverse sections. The calices are notably alveolitoid and are about 1 mm. along their longest diameter. In the axial part of the branch most of the corallites are polygonal or somewhat rounded in transverse section though some are alevolitoid; in the peripheral region they are triangular with a geniculate upper wall or alveolitoid with an arched upper wall; or some may be polygonal. The walls in the peripheral region are nearly twice as thick as those in the axial region. Mural pores are rather large (0.02 mm.) and circular; septal spines are rare and tabulae are thin and complete. The branches may be sheathed in a thin laminar growth, wherein the corallites are identical in character with those of the peripheral parts of the branch.

In Belgium ramosc *Alveolites* occur in the Frasnian, and our species is perhaps closest to the F₂ *A. densatus* Lecompte, 1939.

Slender branches of *Alveolites*, which are doubtfully referred to *A. tumidus*, occur particularly in the lower third of the Pillara Limestone. Their corallites are on the average a little smaller than is typical and the corallites of the peripheral thickened zone often run at right angles to the axis; in horizons near 737 feet up in the Menyau's Gap section, these branches, NH8D (20) and C.P.C. 510, appear to have been bored by organisms which cause channels in the walls, circular in section and sometimes spirally coiling around through the wall dividing neighbouring corallites.

Similar coralla are found 0-58 feet above the base of the Pillara Limestone section at Shady Camp, Minnie Pool. Should such coralla prove characteristic of the lower third of the Pillara Limestone a new name would be an advantage.

ALVEOLITES SUBORBICULARIS Lamarek.

Plate II, Figure 25.

This widespread and polymorphic species already described in detail by Lecompte (1939) and Hill (1939, page 145) occurs in the Pillara Limestone of the West Kimberleys 1,938-2,045 feet above the base of the section in the Pillara Limestone of Menyau's Gap (NH8J), and again between 589 and 800 feet in partial section NH135 in the Pillara Limestone at Long's Well.

Family AULOPORIDAE.

Genus AULOPORA Goldfuss, 1829; Smith, 1945, page 14.

AULOPORA RECTA sp. nov.

Plate III, Figure 20.

Holotype: C.P.C. 559; Mount Pierre Group, Upper Devonian, Stage III; Bugle Gap, West Kimberleys, Western Australia.

Diagnosis: Corallum a prostrate linear series of long curved trumpet-shaped corallites with vesicular tissue in the expanded calical ends.

Description: Fragments of several prostrate linear series, roughly parallel and occurring on more than one bedding plane, occur in algal? limestone. No evidence of branching of these linear series was observed, nor any contact between two series. The series are generally unidirectional but are not perfectly straight, and lie with their lower surfaces on the original calcareous ooze. The longest series observed was 8.5 mm., but this was incomplete at both ends. Each corallite arises from the preceding by an opening through the upper part of the under surface of the older calice, and is at first an open tube, which runs sharply downward and then horizontally in the same direction as the previous one; when about 3 mm. long, this tube expands and opens upwards almost at right angles to its course, the expanded part being about 3 mm. in diameter, and the edge of the calice being no more than 1 mm. above the tubular part. The outer wall of the expanded calice is no thicker than the wall of the connecting tube, but the expanded part has numerous tabellae; tabellae may also be seen lining the edges of the distal parts of the tubes. Small dots seen in the thin sections suggest the presence on these tabellae of septal spines.

Remarks: In its growth form, prostrate, linear uniserial and with perpendicularly opening calices, this species resembles the upper Devonian forms placed in Fenton and Fenton's (1937, page 119) genus *Aulocaulis*. But *Aulocaulis* is described as having few or no tabulae, whereas our species has

numerous tabellae forming flat calical floors or lining the tubular parts. It seems best therefore to retain this species in *Aulopora*, which has tubulae but whose calices are usually oblique, not perpendicular as in our coralla.

AULOPORA sp. cf. *FOORDI* (Etheridge).

Plate I, Figure 18.

Material: C.P.C. 519 from the Pillara Limestone, Mountain Home Spring, Pillara Range, West Kimberleys, 130 feet above contact between Pillara Limestone and Pre-Cambrian; Givetian.

Diagnosis: Corallum consisting of rigid dichotomizing branches, each of several linear series of corallites coalescent by their backs.

Description: The corallum is branching at least distally, the proximal parts being unknown. The branches, which may be up to 5 mm. in diameter, each consist of more than four series of corallites, the series backed against one another; each series consists of a row of corallites, each with a circular calice turning to open nearly at right angles; new corallites arise from the back of the parent. Each corallite is a little over 1 mm. in diameter, with a thick wall; the round calices may be 1.5 mm. in diameter. The calices of neighbouring series are sub-alternate. Tabulae are unequally spaced, thin, and either highly domed or highly saucered. No traces of septal spines have been noted.

Remarks: This specimen resembles *Romingeria? foordi* Etheridge (1892, page 56, Plate I, figure 18) from the Givetian of the Reid River, Queensland, in the rigid dichotomizing branches which consist of series of corallites adherent by their backs, and in the diameter of the individual corallites and their calices. But the Western Australian specimen has more series per branch (more than six as against four), and the branches are therefore thicker. The Queensland species is at yet insufficiently known for us to be certain that the Western Australian specimen is a member of a distinct species. This growth form is seen in *Aulopora confluens* Fenton (1927) from the early Upper Devonian (Hackberry) of Iowa. It differs from that of *Romingeria* Nicholson, 1879, in not having new corallites arising in umbellate whorls or verticils, all in each whorl simultaneously from the one parent.

Genus *SYRINGOPORA* Goldfuss, 1826; Hill, 1936, page 35.

SYRINGOPORA PATULA Hinde, 1890; Hill, 1936, page 36.

Plate III, Figures 42, 43.

This species has already been fully described (Hinde, 1890, page 198, Plate 8, figure 4; Hill, 1936, page 36, Plate I, figures 15, 16). I have specimens from the Ord River (C.P.C. 571) and from Button's Crossing of the Ord River, East Kimberleys, from the Upper Devonian Burt Range limestone, which differ from the holotype in no essential particulars, though their corallites attain a maximum diameter of 2.5 as against 2.15 mm.

CORALS FROM THE SILURIAN LIMESTONES OF YARRANGOBILLY, LONG PLAIN, AND COOLEMAN PLAINS, SOUTH-EASTERN NEW SOUTH WALES.

Forms identified from the different localities and the ages they indicate are—

- A. Western edge Yarrangobilly Limestone, on Yarrangobilly River, Yarrangobilly Caves, New South Wales. *Tryplasma delicatulum* Etheridge, *Rugosa* gen. et sp. indet., *Halysites* sp. cf. *lithostrotionoides* Eth., *H.* sp., *Heliolites daintreei*? Nicholson and Etheridge, *Propora*? sp., *Favosites gothlandicus* Lamarek, *F. forbesi* Edwards and Haime, *F.* sp., *F.* sp. cf. *tripora* Walkom, *F.* sp., *Striatopora* sp., *Alveolites* sp., *Coenites* cf. *seriatopora* (Edwards and Haime). Probably Wenlockian or possibly Ludlovian.
- B. Cooinbil Homestead, Long Plain, New South Wales. *Halysites* sp. cf. *australis* Eth., *Coenites* cf. *seriatopora* (Edwards and Haime). Wenlockian or Ludlovian.
- C. Three hundred yards north-west of Cooinbil Homestead, Long Plain, New South Wales. *Halysites brevicatenatus* sp. nov., *H.* sp. indet., *Diploepora* sp. cf. *grayi* (Edwards and Haime). Wenlockian or Ludlovian.
- D. Approximately 1 mile east of Harris' Hut, Cooleman Plains, New South Wales. *Neomphyma*? sp., a small solitary favistellid, *Striatopora*? sp., *Coenites* cf. *seriatopora* (Edwards and Haime), *Coenites*? sp. (stratiform), stromatoporoids, and a calcareous alga. Wenlockian or Ludlovian.
- E. Black Mountain mine, Cooleman Plains, New South Wales. Large coralla too recrystallized for determination, except one which can be referred to *Favosites* sp. cf. *gothlandicus* Lamarek. Silurian?

These localities are indicated below by their list letters.

Order RUGOSA.

SUBORDER CYSTIPHYLLINA.

Family TRYPLASMATIDAE.

Genus TRYPLASMA Lonsdale, 1845; Hill, 1940.

TRYPLASMA DELICATULUM Etheridge, 1907.

Plate IV, Figure 1.

C.P.C. 1029 from locality A contains a number of slender cylindrical fragments from 2-3 mm. in diameter, evidently from a fasciculate corallum; the septal spines are very short, in two orders, not more than 30 in each, and the tabulae are horizontal or sagging or with a medial notch. The species is previously known from the upper Middle Silurian of the Yass district.

Suborder COLUMNARIINA.

Family SPONGOPHYLLIDAE.

Genus NEOMPHYMA Soshkina, 1937.

NEOMPHYMA? sp.

Plate IV, Figures 2a, b.

Fragments of cylindrical or slightly compressed corallites 5 to 7 mm. in diameter occur in the limestone of locality D (C.P.C. 1030) with about twenty thin major septa almost reaching the axis; minor septa are suppressed, but a lonsdaleoid dissepimentarium is developed, although the large dissepiments only occasionally disrupt the major septa. In the narrow axial region flat tabulae occur.

The structure of these fragments is thus that of the family Spongophyllidae, and as they appear to be of solitary coralla they are doubtfully referred to *Neomphyma* Soshkina, which is based on a solitary spongophyllid type species. The range of *Neomphyma* in the Urals in Russia is given as Upper Silurian (Indlovian) and Lower Devonian.

RUGOSA gen. et sp. indet.

Plate IV, Figures 3a, b.

A fragment of a subcylindrical corallite 12 mm. in diameter from locality A (C.P.C. 1031) has attenuate, somewhat wavy, septa, the major septa being approximately 25 and about two-thirds of the radius, the minor half as long; the tabulae are complete or more commonly incomplete and slightly concave and the dissepimentarium, which is 2 to 3 mm. wide, consists of large plates frequently in one series only, flattened at the periphery, extending inwards for a greater distance than their height and then curving downwards with a swollen curve to meet the plate below; or the dissepiments are slightly inclined.

In its attenuate wavy septa and its dissepiments this fragment resembles *Disphyllum praecox* Hill (1940), but differs in its concave rather than domed tabulae. Its vertical section and appearances of discontinuity in the septa suggest *Nipponophyllum* Sugiyama (1940) (prior name for *Baeophyllum* Hill, 1940); but these appearances may be due to crushing on one side of the fragment. Both *D. praecox* Hill and *N. colligatum* (Hill) are from the upper Wenlockian of the Yass district, New South Wales.

Order TABULATA.

Family HALYSITIDAE.

Genus HALYSITES Fischer von Waldheim, 1813.

Type species (by monotypy): *Tubipora catenularia* Linnaeus 1767, page 1270 (Silurian), thrown up on the shores of the Baltic Sea = *Millepora* . . . *concatenatis* Linnaeus, 1745, page 34, figure xx. and 1749, page 103, Plate iv, figure xx.

Diagnosis: Compound coralla with slender corallites round or oval in section united in chains each chain typically of one row of corallites; occasionally when more than one such row develops the corallites become polygonal; the ends of the chain are connected to the sides of others; smaller tubules crossed by tabulae may occur between the corallites and at the junction of chains; walls imperforate, septa acanthine, twelve in number, equal; tabulae complete, sagging. M.Ord.-Sil.; Gedinnian in Asia Minor.

HALYSITES BREVICATENATUS SP. NOV.

Plate IV, Figures 5a, b.

Holotype (only specimen known): C.P.C. 1032, locality F, Wenlockian or Ludlovian, 300 yards north-west of Cocinbil Homestead, Long Plain.

Diagnosis: Each chain consists of one corallite only, oval in section, and each may be joined to three other chains by a tubule of irregular section; fenestrules smaller than corallites.

Description: The holotype is a fragment at least 40 mm. high and 50 mm. in diameter possibly from a hemispherical corallum. The individual corallites are oval in section, between 0.75 and 1 mm. in length and about two-thirds of a millimetre in width; each is very tall, the oldest probably as tall as the height of the corallum. The wall is only moderately thick and traces of septal spines occur. The tabulae are slightly sagging, two to four in one millimetre. Each corallite forms one side of a fenestrule smaller than the corallite; tubules of great height but of irregular section connect the corallites, usually at the ends of the longer diameters but occasionally between this point and their shorter diameters; these tubules are thinner walled, but are crossed by tabulae as in the normal corallites. Usually four corallites are connected by one such irregular tubule with their longer axes nearly at right angles.

With its one-corallite chains, this species recalls *Labyrinthites* Lambe from the Upper Ordovician of Arctic Canada, but its corallites are not angular in section as in that genus. Several of the Australian Silurian species of *Halysites* have parts of their coralla of one-corallite chains, but this new species is the only one known to me where this habit is invariable throughout.

HALYSITES spp.

Four other fragments of *Halysites* coralla, no two identical in dimensions or growth form, occur in the collections. These are—

- (1) *Halysites* sp. cf. *lithostrotionoides* Etheridge, Y8 from locality A (C.P.C. 1033; Plate IV, Figure 6). This fragment forms part of a cylindrical growth from the axis of which the fenestrules and corallites radiate like the corallites in a cylindrical *Thamnopora*. The fenestrules are not vertically corrugated, since the corallites

are rectangular and the chains are not constricted where two corallites join; small interstitial corallites are rare and are rectangular in cross section, their greatest width being across the chain. The corallites average about 0.75 mm. long and 0.33 mm. wide and show no septal spines. There are one to four corallites to a chain and the corallites at the junctions of chains are smaller and triangular in transverse section. The walls of the corallites are rather thin. *H. lithostrotionoides* is recorded by Etheridge (1904) from the Silurian beds a and d, Spring Creek, Pors. 98, 221 and 222, Par. Barton, Co. Ashburnham, near Molong, New South Wales.

- (2) *Halysites* sp. indet. (Plate IV, Figure 7). A second fragment, in Y11 from locality A (C.P.C. 1034), consists of one fenestrule only, which is five-sided, each side consisting of one corallite rectangular in cross section, which is 1 mm. or a little more by 0.75 mm., with a thin wall and apparently without septa; in only one angle of the fenestrule is an angle corallite observed, and this is very small and triangular in section. In view of the greater dimensions of the individual corallites it is doubtful whether this fragment is conspecific with the first.
- (3) *H. sp. cf. australis* Etheridge (Plate IV, Figures 8a, b). A third fragment, C.P.C. 1035 from locality B. is, like the first two, in a red and white limestone. Its dimensions are different, but the corallites are again rectangular in cross section. They are about 1 mm. by 0.75 mm. and the fenestrules often have only one corallite to a side, when they may be four or five-sided. The tabulae are horizontal, two or three to 1 mm. It seems likely that this fragment is conspecific with the second fragment described above. The corallites show suggestions of septal spines, and thus a relationship with *H. australis* from the Upper Silurian of the Wellington district, New South Wales, is suggested; but mesopores are not observed.
- (4) *H. sp. indet.* (Plate IV, Figure 9). The fourth fragment, C.P.C. 1036 from locality C, differs from the three preceding in having the chains constricted at the points of contact of the corallites, where, indeed, small tubules occur. The corallites are oval in cross section, about 1 mm. by 0.75 mm., with a thick wall and visible septal spines. The fenestrules are small, variable in shape, one to four corallites to a side. Three or four chains unite at points, and here angular tubules develop, with three or four sides according to the number of chains. It resembles *H. peristephesicus* Etheridge (1904) from the Silurian of Bed a, Quarry Creek, Por. 22, Par. Barton, Co. Ashburnham, New South Wales, in the size and roundness of the corallites, but is too small and broken to show whether it resembles this species in the arrangement of the corallites in their chains; the small size of the fenestrules is against this identity.

Family HELIOLITIDAE.

Massive coralla with slender tabularia separated by coenenchyme, each tabularium with twelve equal spinose septa and complete tabulae. M.Ord.—U.Dev.

Jones and Hill (1940) considered the heliolitids should be separated from the Tabulata and regarded as a separate section of the Madreporaria, because of the constant number of septa (twelve) as against the very variable number in Tabulata, the absence of mural pores or connecting processes, and the presence of coenenchyme. I now consider that we were in error in this conclusion, and that the Tabulata form a natural group consisting of the families Chaetetidae, Favositidae, Heliolitidae, Auloporidae, Halysitidae, and Sarcinulidae. Twelve equal septa are characteristic of some species and genera within the Favositidae and the Halysitidae; and a coenenchyme of various types may be developed in Favositidae, Auloporidae, and Sarcinulidae, while mural pores are absent in the Chaetetidae and the Halysitidae. It now seems, then, that the differences from the other Tabulata are matters of degree and are of family value rather than section value. I am therefore placing the Heliolitidae in the Tabulata.

Subfamily HELIOLITINAE.

The coenenchyme consists of thin-walled tubules, with more than twelve tubuli bounding the tabularium. L.Sil.—U.Dev.

Genus HELIOLITES Dana, 1846; Jones and Hill, 1940, page 198.

Type species: Astraea porosa Goldfuss, 1826, page 64, Plate XXI, figure 7; Dev.; Eifel district, Germany.

Diagnosis: Compound coralla with narrow cylindrical tabularia each defined by a wall usually ridged by twelve equal septa and separated by a reticulum of small tubules crossed by horizontal diaphragms. Sil.—Dev.

HELIOLITES DAINTREEI? Nicholson and Etheridge, 1879; Jones and Hill, 1940, page 199.

Plate IV, Figure 10.

One fragment, C.P.C. 1037 Y 5b (V) from locality A, has tabularia about 1.5 to 1.75 mm. in diameter and closely spaced, 0.5 to 1 mm. apart; their walls and those of the tubuli are somewhat thickened; the tubuli are small and numerous, twenty or more in the ring around the tabularium. The septa appear to be lamellar at their bases, but there is in the transverse sections of most tabularia an irregular and incomplete reticulation apparently of lamellar fragments, whereas in *H. daintreei* the inner ends of the septa are spinose and free; it is for this reason that the specimen, which otherwise resembles *H. daintreei*, is only doubtfully referred to that species.

Subfamily PLASMOPORINÆ.

Massive coralla with slender tubular corallites separated by a coenenchyme of domed plates and isolated trabeculae; septa 12, spinose, equal. M.Ord.—U.Sil.

Genus PROPORA Edwards and Haime, 1849.

Trabeculae of coenenchyme not so thickened as to fill the spaces. M.Ord.—U.Sil.

PROPORA? sp.

Plate IV, Figure 11.

One small fragment from locality A is doubtfully referred to this genus.

Genus DIPLOEPORA Quenstedt, 1879.

Type species: Heliolites grayi Edwards and Haime, 1851, page 217, and 1854, page 252, Plate lviii, figures 1, 1a. Silurian, Wenlock Limestone; Walsall Canal, Staffordshire, England.

Diagnosis: Corallum branching; axial part of branch with slender trabeculae peripheral part with all spaces between tabularia filled by thickening of the trabeculae. U.Ord.—Sil. of Europe.

DIPLOEPORA sp. cf. GRAYI (Edwards and Haime).

Plate IV, Figure 12.

So far as I am aware, only two species have been described which may be referred to *Diploepora*. These are *Plasmopora ramosa* Kiaer (1899) from the 5a (Upper Ordovician) beds of Ringerike, Stavnaestagen, Norway, and *Heliolites grayi* Ed. and H. from the Middle and Upper Silurian of Europe. *D. ramosa* differs from *D. grayi* in having wider tabularia (1.5 mm. as against 0.5-0.8 mm.) and a narrower zone of peripheral thickening of the branches (1.2 mm. to 3 mm.). The fragment (C.P.C. 1039) of a branch encountered in sectioning grey limestone from locality C is insufficient to determine the form of the corallum but it shows tabularia not more than 0.5 mm. in diameter crossed by complete horizontal tabulae, separated in the axial parts of the branch by very shallowly domed plates with occasional slender trabeculae at right angles to the plates. The peripheral thickened part of the branch is 2 to 3 mm. wide; it usually contains a very narrow zone of unthickened tissue, and consists of unthickened tabularia set in trabeculae so dilated as to be in contact. The fragment thus resembles the Silurian *D. grayi* rather than the U. Ordovician *D. ramosa*, but is insufficient for precise specific determination.

Family FAVOSITIDAE Dana, 1846.

Subfamily FAVOSITINAE Dana, 1846.

Genus FAVOSITES Lamarck, 1816; Jones, 1936.

FAVOSITES GOTHLANDICUS GOTHLANDICUS Lamarck, 1816; Jones, 1936.

Plate IV, Figures 13a, b.

Several specimens from locality A probably belong to this cosmopolitan *forma* (C.P.C. 1041). The corallites are thin-walled, 2.5 to 4.5 mm. in diameter, average about 3 mm., and polygonal. Recrystallization is great and no trace of septal spines is visible. The tabulae are 3 in 5 mm., not very regularly spaced, but horizontal. The thin sections prepared do not show any mural pores, but an occasional circular pore is visible in the hand specimen, where also the walls show growth wrinkling.

FAVOSITES GOTHLANDICUS FORBESI Edwards and Haime, 1851; Jones, 1936.

Plate IV, Figure 14.

One specimen C.P.C. 1040 (Y 11a) from locality A has the characteristic globular form, the great range in diameter of the corallites, and the thin walls and absence of septal spines of this *forma*. Pores, however, have not been observed, owing, it is thought, rather to unfavorable sectioning than to absence.

Both the above *formae* are characteristic of the Silurian and Lower Devonian.

FAVOSITES sp. cf. TRIPORA Walkom, 1912.

Plate IV, Figures 15a, b.

One fragment, C.P.C. 1042 (Y6) from locality A, is part of a large and probably hemispherical corallum in which the corallites radiate upwards from more than one centre, new corallites arising frequently. The average diameter of the corallites is 1.5 to 2 mm.; the younger corallites tend to be four-sided. The walls are moderately thin, and there are two or three rows of pores in each face, in parallel or sub-alternating. The pores are circular, rather large, the spacing being less than their diameters; they occur between tabulae and the septal spines also project from the walls above or below the pores. The spines are rather large, almost horizontal, and are developed regularly, usually coinciding with the tabulae, which are very thin. The spines have broad bases curving around the upper and lower edges of the pores. The number of spines developed at the level of one tabula appears to be twelve.

The specimen may be *F. tripora* Walkom, but differs from the holotype of that species in having smaller corallites and in having two rows of pores on each face more frequently than three rows. In the way in which the septal spines

fit in short curves along the upper and lower edges of the pores, this specimen has a morphological resemblance to the Devonian *F. bryani* and *F. nitidus* with squamulae (Hill, 1950). But in these two Devonian species the number of rows of pores per face is one, and the corallites are smaller in diameter. The number of vertical rows of septa developed in the two Devonian species is not known.

FAVOSITES sp.

Plate IV, Figures 16a, b.

One specimen C.P.C. 1043 (Y4a) from locality A is somewhat distorted by lateral pressure: it has corallites of average diameter about 1.5 mm. with thin walls and distant tabulae, three in 3 mm., those of several neighbouring corallites frequently being on the same level. Mural pores are circular, about 0.3 mm. in diameter, and in one row in the middle of the face, being spaced at distances just a little greater than their diameter. Only an occasional short septal spine is visible in the sections prepared, which do not agree precisely with any of the descriptions of Australian *Favosites* (Jones, 1937).

FAVOSITES sp.

Plate IV, Figure 17.

C.P.C. 1044 (Y5c) from locality A has corallites 1 mm. in average diameter in vertical section, usually with one vertical row of small circular pores on each face; the septal spines are long, thick, cylindrical, with blunt ends projecting horizontally; the tabulae are numerous, close, six to eight in 2 mm., slightly but variably sagging; the corallum is hemispherical. This also does not agree with any of the descriptions of Australian *Favosites*.

Genus STRIATOPORA Hall, 1851; Jones, 1941.

STRIATOPORA sp.

Plate IV, Figures 18a, b.

Fragments (C.P.C. 1045 (Y5a)) of cylindrical branches of maximum diameter 7 mm. were found at locality A; each has a narrow axial portion 1.5 to 2 mm. wide in which the corallites grow almost vertically and are of relatively small diameter with relatively thin walls and an outer zone where the corallites run perpendicular to the surface of the branch with walls so thick that the corallites are almost completely filled; the septa have very thick laminar bases but their axial edges are profusely spinose. This type of structure is identical with that of *S. halli* Lindström from the Silurian of Gustavsvik, Gotland, and of *Striatopora* sp. Hill and Jones (1940) from the Lower Devonian of Crystal Springs, near Molong, New South Wales, though both these species have branches of greater diameter than the present fragment.

STRIATOPORA ? sp.

Plate IV, Figures 19a, b.

C.P.C. 1046 (HH1) from locality D is a form with cylindrical branches about 10 mm. in diameter in which the corallites of average diameter 1 mm. arch very gradually outwards in a axial zone about 4 mm. in diameter, and then curve over more sharply to open at right angles to the surface; the corallites are filled with a dense deposit in that part of their course where they run at right angles to the surface. Recrystallization prevents proof that this deposit is coralline in origin, but the texture suggests that it is. Tabulae are distant in the axial region, close together in the region of sharper curvature. Neither septal spines nor mural pores were observed for certain. Though very affected by recrystallization, the specimen seems identical specifically with one in the University of Queensland collection from Glenbower, Murrumbidgee River, New South Wales, which is thought to be U. Silurian. Even in the Glenbower specimen, however, it is impossible to be sure that the peripheral zone of thickening has the structure of *Striatopora*. It differs from *Striatopora* sp. Hill and Jones (1940) from the Lower Devonian of Crystal Springs, near Molong, in its smaller diameter (10 against 18 mm.) and the greater width of the peripheral zone of thickening.

Subfamily ALVEOLITINAE Duncan, 1873.

Genus ALVEOLITES Lamarck, 1801; Jones, 1941.

ALVEOLITES sp.

Plate IV, Figure 20.

A very small fragment (C.P.C. 1047 (Y11)) from locality A shows, in a section cut across the corallites, small thin-walled reptant corallites, fourteen or fifteen per 5 mm. in an irregular horizontal row, there being five or six such rows one above the other in 3 mm.; the upper wall of each corallite is semi-circular or even parabolic in cross section; septal spines are not observed and pores are infrequent at the edges of the upper walls. The corallites of this species are the smallest known to me.

Genus COENITES Eichwald, 1829; Oakley, 1936.

COENITES cf. SERIATOPORA (Edwards and Haime).

Plate IV, Figures 21a, b, c.

Small fragments which compare closely with this species as described by Oakley (1936) occur in the limestone from localities A, B, and D. (C.P.C. 1048, 1049, 1050.)

COENITES ? sp.

Plate IV, Figure 22.

A vertical section through a stratiform colony with the corallites growing and opening obliquely with thick walls was noted from locality D (C.P.C. 1051) and suggested *Coenites*, although the shape of the calical openings is unknown.

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EXPLANATION OF FIGURES.

PLATE I.

All figures natural size.

Givetian or Lower Frasnian Corals from the Gneudna Formation, Carnarvon Basin, Western Australia.

- Fig. 1.—*Hexagonaria gneudnenis* sp. nov. Holotype, C.P.C. 766 from 2,574 feet to 2,600 feet in traverse S. of Gneudna Well; i.e. 1,010 to 1,020 feet above base of formation. 1a, transverse, 1b, vertical section.
- Fig. 2.—*Disphyllum virgatum* (Hinde) var. *variabile* nov. Holotype, C.P.C. 767, traverse S. of Gneudna Well between 2,936 feet and 2,950 feet; i.e. 1,180 feet above base of formation. Polished section.
- Fig. 3.—*Disphyllum virgatum* (Hinde) var. *variabile* nov. C.P.C. 768, traverse N. of Gneudna Well, at 1,035 feet.
- Fig. 4.—*Disphyllum virgatum* (Hinde) var. *variabile* nov. C.P.C. 769, traverse S. of Gneudna Well, at 2,708 feet to 2,721 feet; 1,080 feet above base of formation.
- Fig. 5.—*Disphyllum virgatum* (Hinde) var. *variabile* nov. C.P.C. 770, just below top of formation, about 1 mile N. of Gneudna Well. 5a, 5c, 5e, transverse, and 5b, 5d., vertical sections.
- Fig. 6.—*Disphyllum virgatum* (Hinde) var. *variabile* nov. C.P.C. 771, top of formation, about 1 mile N. of Gneudna Well. 6a, transverse, 6b., vertical section.
- Fig. 7.—*Thamnopora* cf. *polyforata* (Schlotheim). C.P.C. 772, 2,708 feet to 2,721 feet in traverse S. of Gneudna Well; 1,080 feet above base of formation.

- Fig. 8.—*Thamnopora* cf. *polyforata* (Schlotheim). C.P.C. 773, at 2,936 feet to 2,950 feet in traverse S. of Gneudna Well; 1,180 feet above base of formation.
- Fig. 9.—*Thamnopora* cf. *polyforata* (Schlotheim). C.P.C. 774, top of formation, about 1 mile N. of Gneudna Well. Oblique section.
- Fig. 10.—*Alveolites caudatus* sp. nov. Sections from holotype, C.P.C. 765, from near top of Gneudna Formation, 1 mile N. of traverse N. of Gneudna Well; about 1,200 to 1,300 feet above base of formation.
- Fig. 11.—*Alveolites caudatus* sp. nov. Oblique section from C.P.C. 775, at 2,936 feet to 2,950 feet in traverse S. of Gneudna Well; 1,180 feet above base of formation.

Givetian Corals from the basal part of the Pillara Limestone of the West Kimberleys,
W. Australia.

- Fig. 12.—*Hexagonaria brevilamellata* (Hill). C.P.C. 518, 130 feet above the contact with the Pre-Cambrian, Mountain Home Spring, Pillara Range. 12a, transverse, and 12b, vertical sections.
- Fig. 13.—*Hexagonaria brevilamellata* (Hill). C.P.C. 537 from a crush breccia involving basal Pillara Limestone and the lower part of the Upper Devonian Mt. Pierre Group, Limestone Billy Hills, Margaret R. area. 13a, transverse, 13b, vertical sections.
- Fig. 14.—*Disphyllum* sp. C.P.C. 495, between 0 and 50 feet above base; Hull Range, 2 miles S. of Shady Ck. Gap, N. of Margaret R. 14a, transverse, 14b, vertical section.
- Fig. 15.—*Rugosa* gen. et sp. indet. C.P.C. 496, between 50 and 75 feet above base; Hull Range, 2 miles of Shady Ck. Gap.
- Fig. 16.—*Disphyllum depressum* (Hinde) or *Tennophyllum* sp. C.P.C. 541, from near base of Limestone, with *Stringocephalus* sp., in the Home Range, about 0.8 miles N.W. of Mountain Home Spring. 16a, transverse, 16b, vertical section.
- Fig. 17.—*Spongyphyllum* sp. C.P.C. 542, from near base of Limestone, with *Stringocephalus* sp., in the Home Range, about 0.8 miles N.W. of Mountain Home Spring. 17a, transverse, 17b, vertical section.
- Fig. 18.—*Aulopora* sp. cf. *foordi* (Etheridge). C.P.C. 519, 130 feet above the contact with the Pre-Cambrian, Mountain Home Spring, Pillara Range. 18a, weathered surface, 18b, c, oblique sections.

Givetian Corals from the Pillara Limestone.

- Fig. 19.—*Phillipsastrea delicatula* Hill. C.P.C. 539, Sparke Range, Margaret R. 19a, transverse, 19b, vertical section.
- Fig. 20.—*Hexagonaria hullensis* sp. nov. Holotype. C.P.C. 501 between 850 and 870 feet above base of Pillara Limestone, Hull Range, 2 miles S. of Shady Ck. Gap. 20a, transverse, 20b, vertical section.
- Fig. 21.—*Hexagonaria hullensis* sp. nov. C.P.C. 536, between 280 and 355 feet above base of section, believed to begin near Pillara Limestone—Pre-Cambrian contact, Hull Range, S. end. 21a, transverse, 21b, vertical section.
- Fig. 22.—*Hexagonaria hullensis* sp. nov. C.P.C. 535, between 350 and 450 feet above base of measured section which does not rest on Pre-Cambrian but is believed to be in the lower Pillara Limestone, Horse Spring Range, near Horse Spring, Fossil Downs. 22a, transverse, 22b, vertical section.
- Fig. 23.—*Hexagonaria hullensis* sp. nov. C.P.C. 500, between 850 and 870 feet above base of Pillara Limestone, Hull Range, S. of Shady Ck. Gap. 23a, transverse, 23b, vertical section.
- Fig. 24.—*H. hullensis?* sp. nov. C.P.C. 499, between 730 and 750 feet above base of Pillara Limestone, Hull Range, 2 miles S. of Shady Ck. Gap. 24a, transverse, 24b, vertical section.

PLATE II.

All figures natural size.

Givetian Corals from the Pillara Limestone, West Kimberleys.

- Fig. 1.—*Hexagonaria brevilamellata* (Hill). Holotype, UWA F2515, Price's Ck., Emanuel ("Rough") Range. 1a, UWA slide 40315, transverse section; 1b, UWA slide 20313, vertical section.
- Fig. 2.—*H. brevilamellata?* (Hill). C.P.C. 534, between 300 and 400 feet above base of measured section, approx. 3 miles S. of Spring, Fossil Downs. 2a, transverse, 2b, vertical section.
- Fig. 3.—*Disphyllum virgatum* (Hinde). C.P.C. 532, between 350 and 360 feet above base; Guppy Hills, 7 miles S.W. of Mt. Elma, Margaret R. 3a, c, transverse, 3b, vertical section.
- Fig. 4.—*Disphyllum virgatum* (Hinde). C.P.C. 533, same locality and horizon as preceding. 4a, transverse, 4b, vertical section.

- Fig. 5.—*Disphyllum virgatum* (Hinde). C.P.C. 545, between 406 and 704 feet above-base of section possibly faulted, Minnie Pool. 5a, transverse, 5b, vertical section.
- Fig. 6.—*Disphyllum* cf. *virgatum* var. *variabile* nov. C.P.C. 540, N. of Pillara Range. Doubtfully from Pillara Limestone. 6a, transverse, 6b, vertical section.
- Fig. 7.—*Disphyllum virgatum* var. *densum* nov. Holotype, C.P.C. 497, between 540 and 640 feet above base; Hull Range, 2 miles S. of Shady Ck. Gap. 7a, transverse, 7b, vertical section.
- Fig. 8.—*Disphyllum curtum* sp. nov. Holotype, U.W.A. 33518, lowest "*Thamnophyllum*" horizon of Mt. Wilson section, S. of Mt. Wilson. (Lower part of *Amphipora* Limestone of Teichert). 8a, transverse, 8b, vertical section.
- Fig. 9.—*Disphyllum depressum* (Hinde). C.P.C. 511, between 737 and 1,124 feet above base of section, Menyau's Gap, Pillara Range. Transverse section.
- Fig. 10.—*D. depressum?* (Hinde). C.P.C. 522, between 425 and 589 feet up in section in Emanuel Range, at Long's Well. Transverse section.
- Fig. 11.—*Disphyllum goldfussi* (Geinitz). C.P.C. 525, same locality and horizon as preceding. 11a, transverse, 11b, vertical section.
- Fig. 12.—*Disphyllum goldfussi* (Geinitz). C.P.C. 527, same locality and horizon as preceding. Transverse section.
- Fig. 13.—*Temnophyllum turbinatum* sp. nov. Holotype. C.P.C. 523, same locality and horizon as preceding. 13a, partial transverse, 13b, vertical section.
- Fig. 14.—*Temnophyllum turbinatum* sp. nov. C.P.C. 524, same locality and horizon as preceding. Transverse section.
- Fig. 15.—*Thamnopora angusta* Lecompte. U.W.A. 33502 *Amphipora* Limestone, beds immediately below the *Atrypa* limestone; limestone escarpment S. of No. 10 Bore, about one third mile N. of main reef limestone, east of Gap Ck. Gap.
- Fig. 16.—*Thamnopora boloniensis* (Gosselet). U.W.A. 33500, base of *Atrypa* limestone, between small hills near Long's Well and reef limestone.
- Fig. 17.—*Thamnopora boloniensis* (Gosselet). C.P.C. 508, between 1,020 and 1,040 feet above base; Hull Range, 2 miles S. of Shady Ck. Gap. 17a, transverse, 17b, vertical section.
- Fig. 18.—*Thamnopora boloniensis* (Gosselet). C.P.C. 514, between 1,124 and 1,327 feet above base of section; Menyau's Gap. Section.
- Fig. 19.—*Alveolites tumidus* (Hinde). C.P.C. 528, between 589 and 800 feet above base of section at Long's Well.
- Fig. 20.—*Alveolites tumidus* (Hinde). C.P.C. 515, between 1,124 and 1,327 feet above base of section, Menyau's Gap. Transverse section of branch.
- Fig. 21.—*Alveolites tumidus* (Hinde). C.P.C. 498, between 540 and 640 feet above base; Hull Range, 2 miles S. of Shady Ck. Gap. Sections.
- Fig. 22.—*Alveolites tumidus?* (Hinde). C.P.C. 510, between 737 and 1,124 feet above base of section, Menyau's Gap, Pillara Range. 22a, transverse, 22b, vertical, 22c, tangential section.
- Fig. 23.—*Alveolites tumidus* (Hinde). C.P.C. 544, between 95 and 265 feet above base of section which begins near probably faulted contact with Pre-Cambrian, Minnie Pool. 23a, transverse, 23b, tangential, 23c, vertical section of branch.
- Fig. 24.—*Alveolites tumidus* (Hinde). C.P.C. 504, between 980 and 1,020 feet above base; Hull Range section, 2 miles S. of Shady Ck. Gap. Vertical section.
- Fig. 25.—*Alveolites suborbicularis* Lamarek. C.P.C. 516, between 1,938 and 2,045 feet above base of section, Menyau's Gap. Sections.
- Fig. 26.—*Temnophyllum?* *floriforme* sp. nov. Holotype, C.P.C. 543, from outcrop of ? Pillara Limestone projecting from the J8 Conglomerate, 1½ miles S. of Mt. Elma, Margaret R. 26a, transverse, 26b, vertical section.

Corals from the Givetian or Frasnian *Atrypa* Beds (? = Upper part of Pillara Limestone).
West Kimberleys.

- Fig. 27.—*Disphyllum* sp., *virgatum* var.? U.W.A. 33521, N. side of Emanuel Range, E. of Gap Ck. Gap. 27a, transverse, 27b, vertical section.
- Fig. 28.—*Disphyllum goldfussi* (Geinitz). U.W.A. 33523, between Emanuel Range and Virgin Hills, W. Kimberleys, ¼ mile from junction of fire-plough road and No. 10 Bore road towards Long's Well. Transverse section.
- Fig. 29.—*Peneckiella teichertii* sp. nov. Holotype, U.W.A. 33515, reef about 6.6 miles from Mt. Pierre Well, on Old Bohemia road. 29a, transverse, 29b, vertical section.
- Fig. 30.—*Catactotoechus obliquus* sp. nov. U.W.A. 33527, between Emanuel and Virgin Hills, ¼ mile from junction of fire-plough road and No. 10 Bore road towards Long's Well.

- Fig. 31.—*Catactotoechus obliquus* sp. nov. U.W.A. 33524, same locality and horizon as preceding. Apical part showing talon.
- Fig. 32.—*Catactotoechus obliquus* sp. nov. Holotype, U.W.A. 33520, N. side of Emanuel Range, E. of Gap Ck. Gap. 32a, transverse, 32b, vertical section.
- Fig. 33.—*Catactotoechus obliquus* sp. nov. U.W.A. 33526, between Emanuel Range and Virgin Hills, ¼ mile from junction of fire-plough road and No. 10 Bore road towards Long's Well. 33a, transverse, 33b, vertical section.
- Fig. 34.—*Barrandeophyllum* sp. C.P.C. 547, bioherm at top of Pillara Limestone; U. Dev.? (Stage I?) Bugle Gap. 34a, transverse, 34b, vertical section.

PLATE III.

All figures natural size.

Upper Devonian Corals from the Mt. Pierre Group, West Kimberleys, Western Australia
(Upper Devonian Stages I, II, III).

- Fig. 1.—*Disphyllum intertextum* sp. nov. Holotype, U.W.A. 33517, Stage I, Paddy's Spring, N. side of Emanuel Range. 1a, transverse, 1b, vertical section.
- Fig. 2.—*Phillipsastrea* sp. C.P.C. 553, probably Stage III, Old Bohemia Homestead. Transverse section.
- Fig. 3.—*Barrandeophyllum cavum* sp. nov. Holotype, C.P.C. 548, Stage II, Old Bohemia Homestead. 3a, external view, transverse section.
- Fig. 4.—*Barrandeophyllum cavum* sp. nov. C.P.C. 549, Stage II, Old Bohemia Homestead. Transverse section.
- Fig. 5.—*Barrandeophyllum cavum* sp. nov. C.P.C. 550, Stage II, Old Bohemia Homestead. Transverse section.
- Fig. 6.—*Barrandeophyllum cavum* sp. nov. C.P.C. 555, Stage II, Mt. Pierre. Transverse section.
- Fig. 7.—*Barrandeophyllum cavum* sp. nov. C.P.C. 554, Stage II, Mt. Pierre. Transverse section.
- Fig. 8.—*Barrandeophyllum cavum* sp. nov. C.P.C. 551, Stage II, Bugle Gap. 8a, transverse, 8b, vertical section.
- Fig. 9.—*Barrandeophyllum cavum* sp. nov. U.W.A. 33544, *Sporadoceras* Zone (Stage III), grey limestone with stromatoporoid reef about 150 yards W. of Little Goniatile Hill, S.E. of Rough Range (of Teichert, i.e. probably a hill on S. side of the Virgin Hills). Transverse section.
- Fig. 10.—*Barrandeophyllum* sp. C.P.C. 552, probably Stage III, Old Bohemia Homestead area. 10a, transverse, 10b, vertical section.
- Fig. 11.—*Barrandeophyllum* sp. U.W.A. 33541, *Sporadoceras* Zone (Stage III), grey limestone with stromatoporoid reef about 150 yards W. of Little Goniatile Hill, S.E. of Rough Range (of Teichert, i.e. probably a hill on S. side of the Virgin Hills). Transverse section.
- Fig. 12.—*Barrandeophyllum* sp. C.P.C. 558, Stage III, Bugle Gap. Transverse section.
- Fig. 13.—*Caninia rudis* sp. nov. Holotype. C.P.C. 562, base of Stage III, Bugle Gap. 13a, transverse, 13b, vertical section.
- Fig. 14.—*Caninia rudis* sp. nov. C.P.C. 563, base of Stage III, Bugle Gap. Transverse section.
- Fig. 15.—*Caninia rudis* sp. nov. C.P.C. 564, base of Stage III, Bugle Gap.
- Fig. 16.—*Caninia rudis* sp. nov. C.P.C. 565, Stage II, Bugle Gap. 16a, transverse, 16b, vertical section.
- Fig. 17.—*Caninia rudis?* sp. nov. C.P.C. 561, Stage III, near base, Bugle Gap. Transverse section.
- Fig. 18.—*Zaphrentoides? excavatus* sp. nov. Holotype. C.P.C. 556, Stage I, Bugle Gap.
- Fig. 19.—*Zaphrentoides? excavatus* sp. nov. C.P.C. 557, Stage I, Bugle Gap. Transverse section.
- Fig. 20.—*Aulopora recta* sp. nov. Holotype. C.P.C. 559, Stage III, Bugle Gap. 20a, external view, 20b, c, sections.
- Fig. 21.—*Cystiphyllum "kimberleyense"* Hill. U.W.A. 33503, Stage III, E. side of Mt. Pierre, 26 feet above flat. 21a, c, transverse, 21b, vertical section.
- Fig. 22.—*Cystiphyllum "kimberleyense"* Hill. U.W.A. 33513, *Sporadoceras* Zone (Stage III), 21 to 36 feet below base of limestone conglomerate, S.E. corner of Needle Eye Rock, W. Kimberleys. 22a, transverse, 22b, vertical section.
- Fig. 23.—*Cystiphyllum "kimberleyense"* Hill. U.W.A. 33511, same horizon and locality as preceding. 23a, transverse, 23b, vertical section.
- Fig. 24.—*Cystiphyllum "kimberleyense"* Hill. U.W.A. 33505, Stage III, E. side of Mt. Pierre, 26 feet above flat. Transverse section.
- Fig. 25.—*Catactotoechus* sp. C.P.C. 560, low in Stage I?, S.E. Bugle Gap.

Upper Devonian (Stage IV) Corals from the Bugle Gap Limestone, West Kimberleys.

- Fig. 26.—*Phacellophyllum?* sp. C.P.C. 567, 6½ miles N. of Mt. Elma, W. of Horse Ck., N. of Margaret R. 26a, transverse, 26b, partial vertical section.
- Fig. 27.—*Zaphrentis iocosa* sp. nov. Holotype, U.W.A. 33509, Tennis Court, Fossil Downs Homestead. 27a, transverse, 27b, vertical section.
- Fig. 28.—*Zaphrentis iocosa* sp. nov. U.W.A. 33507, Tennis Court, Fossil Downs Homestead.
- Fig. 29.—*Zaphrentis iocosa* sp. nov. U.W.A. 33506, Tennis Court, Fossil Downs Homestead. Transverse sections.
- Fig. 30.—*Zaphrentis iocosa* sp. nov. U.W.A. 33516, Tennis Court, Fossil Downs Homestead. 30a, transverse, 30b, vertical section.
- Fig. 31.—*Catactotoechus irregularis* sp. nov. Holotype, U.W.A. 33535, Hill 1 mile S. of Oscar Homestead. 31a, transverse, 31b, vertical section.
- Fig. 32.—*Catactotoechus irregularis* sp. nov. C.P.C. 566, Oscar Hill, 1 mile S. of Oscar Homestead.
- Fig. 33.—*Catactotoechus irregularis* sp. nov. U.W.A. 33531, Hill 1 mile S. of Oscar Homestead. 33a, transverse, 33b, vertical section.
- Fig. 34.—*Catactotoechus irregularis* sp. nov. U.W.A. 33537, Hill 1 mile S. of Oscar Homestead. 34a, transverse, 34b, vertical section.
- Fig. 35.—*Catactotoechus irregularis* sp. nov. U.W.A. 33533, Hill 1 mile S. of Oscar Homestead. Transverse section.
- Fig. 36.—*Catactotoechus irregularis* sp. nov. U.W.A. 33534, Hill 1 mile S. of Oscar Homestead. Transverse section.
- Fig. 37.—*Catactotoechus tenuis* sp. nov. Holotype U.W.A. 33529, Hill 1 mile S. of Oscar Homestead. 37a, external; 37b, transverse, 37c, vertical section.
- Fig. 38.—*Catactotoechus tenuis* sp. nov. U.W.A. 33528, Hill 1 mile S. of Oscar Homestead. 38a, transverse, 38b, vertical section.
- Fig. 39.—*Catactotoechus* sp. C.P.C. 568, between Horse Spring and Horse Spring Range. Sections.

Upper Devonian Corals from the East Kimberleys.

- Fig. 40.—*Palaeosmilia contexta* sp. nov. Holotype. C.P.C. 569, Button's Crossing, Ord R., E. Kimberleys. 40a, transverse, 40b, vertical section.
- Fig. 41.—*Palaeosmilia contexta* sp. nov. C.P.C. 570, Button's Crossing, Ord R., E. Kimberleys. 41a, transverse, 41b, vertical section.
- Fig. 42.—*Syringopora patula* Hinde. C.P.C. 571, Button's Crossing, Ord R., E. Kimberleys. 42a, transverse, 42b, vertical sections.
- Fig. 43.—*Syringopora patula* Hinde. C.P.C. 572, Ord R., Button's Crossing. 43a, transverse, 43b, vertical section.

PLATE IV.

Silurian Corals from Yarrangobilly, Long Plain, and Cooleman Plains, near Kiandra, New South Wales.

All figures approximately natural size.

- Fig. 1.—*Tryplasma delicatulum* Etheridge. C.P.C. 1029 (B.M.R. Y7), locality A (= Western edge of the Yarrangobilly Limestone on Yarrangobilly R., Yarrangobilly Caves).
- Fig. 2.—*Neomphyma?* sp. C.P.C. 1030 (B.M.R. HH3a), locality D (approximately 1 mile E. of Harris' Hut, Cooleman Plains). 2a, transverse section, 2b, vertical section.
- Fig. 3.—*Rugosa* gen. et sp. indet. C.P.C. 1031 (B.M.R. Y4b), locality A. 3a, transverse, 3b, vertical section (Y19), showing an oblique section of *Tryplasma delicatulum* also.
- Fig. 4. Solitary favistellid? C.P.C. 1052 (B.M.R. HH2), locality D.
- Fig. 5.—*Halysites brevicatenatus* sp. nov. Holotype. C.P.C. 1032 (B.M.R. 1a) locality C (= 300 yards N.W. of Cooinbil Homestead, Long Plain). 5a, transverse, 5b, vertical section.
- Fig. 6.—*Halysites* sp. cf. *lithostrotionoides* Etheridge. C.P.C. 1033 (B.M.R. Y8) locality A. 6a, transverse section of cylindrical branch; 6b, external view of fractured branch.
- Fig. 7.—*Halysites* sp. indet. C.P.C. 1034 (B.M.R. Y11d), locality A.
- Fig. 8.—*Halysites* sp. cf. *australis* Etheridge. C.P.C. 1035 (B.M.R. CHLP/a), locality B (= Cooinbil Homestead, Long Plain).
- Fig. 9.—*Halysites* sp. indet. C.P.C. 1036 (B.M.R. 2a), locality C. Oblique section.
- Fig. 10.—*Heliolites daintreei?* Nicholson and Etheridge. C.P.C. 1037 (B.M.R. Y5b), locality A. Oblique section.

- Fig. 11.—*Propora?* sp. C.P.C. 1038 (B.M.R. Y11c), locality A. Oblique section.
- Fig. 12.—*Diploepora* sp. cf. *grayi* (Edwards and Haime). C.P.C. 1039 (B.M.R. 1b), locality C. Section.
- Fig. 13.—*Favosites gothlandicus* forma *gothlandicus* Lamarck. C.P.C. 1041 (B.M.R. Y1), locality A. 13a, transverse, 13b, vertical section.
- Fig. 14.—*F. gothlandicus* forma *forbesi* Edwards and Haime. C.P.C. 1040 (B.M.R. Y11a), locality A.
- Fig. 15.—*Favosites* sp. cf. *tripora* Walkom. C.P.C. 1042 (B.M.R. Y6), locality A. 15a, transverse, 15b, vertical section.
- Fig. 16.—*Favosites* sp. C.P.C. 1043 (B.M.R. Y4a), locality A. 16a, transverse, 16b, vertical section.
- Fig. 17.—*Favosites* sp. C.P.C. 1044 (B.M.R. Y5c), locality A. Section.
- Fig. 18.—*Striatopora* sp. C.P.C. 1045 (B.M.R. Y5a), locality A. 18a, transverse, 18b, vertical section.
- Fig. 19.—*Striatopora?* sp. C.P.C. 1046 (B.M.R. HH1), locality D. Fig. 19a, transverse, 19b, axial and tangential sections.
- Fig. 20.—*Alveolites* sp. C.P.C. 1047 (B.M.R. Y11b), locality A. Section.
- Fig. 21.—*Coenites* cf. *seriatopora* (Edwards and Haime). 21a, C.P.C. 1048 (B.M.R. CHLP1b), locality B; 21b, C.P.C. 1049 (B.M.R. Y11d), locality A; 21c, C.P.C. 1050 (B.M.R. HH3d), locality D.
- Fig. 22.—*Coenites?* sp. C.P.C. 1051 (B.M.R. HH3b), locality D. Section.







