COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

BULLETIN No. 50

ORDOVICIAN, SILURIAN, AND DEVONIAN BRYOZOA OF AUSTRALIA

BY

JUNE PHILLIPS ROSS

Issued under the Authority of Senator the Hon. W. H. Spooner,
Minister for National Development
1961

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

Minister: SENATOR THE HON. W. H. SPOONER, M.M.

Secretary: H. G. RAGGATT, C.B.E.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Director: J. M. RAYNER

Assistant Director (Mineral Resources): M. A. CONDON

Assistant Director (Operations): D. F. O'DRISCOLL

This Bulletin was prepared for the Geological Branch

Chief Geologist: N. H. FISHER

Issued 30th June, 1961

CONTENTS

	Page
SUMMARY	7
INTRODUCTION	9
PREVIOUS INVESTIGATIONS	10
STRATIGRAPHIC DISTRIBUTION OF BRYOZOAN LOCALITIES	12
INTERPRETATION OF SKELETAL MICROSTRUCTURES AND FAUNAL ASSOCIATIONS	19
SYSTEMATIC PALAEONTOLOGY	22
Taxonomic considerations	22
Morphological Terminology	23
Order TREPOSTOMATA Ulrich, 1882	23
Family MONTICULIPORIDAE Nicholson, 1881	24
Genus *Homotrypa* Ulrich, 1882	24
Homotrypa fenestrata sp. nov.	24
Homotrypa sp. cf. *H. fenestrata*	26
Homotrypa sp. *A.*	27
Homotrypa? sp. *B.*	27
Genus *Orbignyella* Ulrich & Bassler, 1905	29
Orbignyella boonderensis sp. nov.	29
Genus *Mesotrypa* Ulrich, 1893	30
Mesotrypa sp. *A*	30
Family TREMATOPORIDAE Miller, 1889	31
Genus *Batostoma* Ulrich, 1882	31
Batostoma tubuliferum sp. nov.	31
Batostoma sp. *A.*	33
Batostoma sp. *B.*	34
Batostoma sp. *C.*	35
Family AMPLEXOPORIDAE Miller, 1889	36
Genus *Amplexopora* Ulrich, 1882	36
Amplexopora queenstownensis sp. nov.	37
Genus *Discotrypa* Ulrich, 1882	37
Discotrypa? sp. *A.*	38
Family HETEROTRYPIDAE Ulrich, 1890	38
Genus *Heterotrypa* Nicholson, 1879	39
Heterotrypa humensis sp. nov.	39
Heterotrypa pontensis sp. nov.	40
Genus *Cyphotrypa* Ulrich & Bassler, 1905	41
Cyphotrypa lamellosa sp. nov.	41
Cyphotrypa murrumbidgensis sp. nov.	42
Genus *Leptotrypa* Ulrich, 1883	43
Leptotrypa sp. *A.*	43
Family STENOPORIDAE Waagen & Wentzel, 1886	44
Genus *Percyopora* nov.	45
Percyopora tubulata sp. nov.	46
Percyopora occidentalis sp. nov.	47
Genus *Fitzroyopora* nov.	48
Fitzroyopora oscarensis sp. nov.	49
Genus *Granivallum* nov.	51
Granivallum fistulosum sp. nov.	52
Genus *Stereotoechus* Duncan, 1939	53
Stereotoechus shearsbyi (Crockford), 1941	54

	Page
Family CALOPORIDAE Ulrich, 1890	55
Genus *Calopora* Hall, 1851	55
Calopora hattonensis sp. nov.	56
Family PHYLLOPORINIDAE Ulrich, 1890	57
Genus *Austraphylloporina* nov.	58
Austraphylloporina cliefdenensis sp. nov.	58
Order CYCLOSTOMATA Busk, 1852	59
Family FISTULIPORIDAE Ulrich, 1882	59
Genus *Fistulipora* McCoy, 1849	60
Fistulipora norensis sp. nov.	61
Fistulipora pillarensis sp. nov.	62
Fistulipora sadlerensis sp. nov.	63
Fistulipora victoriae Chapman, 1914	64
Genus *Cheilotrypa* Ulrich, 1884	65
Cheilotrypa sp. *A*.	65
Genus *Coelocaulis* Hall & Simpson, 1887	66
Coelocaulis maculosa sp. nov.	66
Order CRYPTOSTOMATA Vine, 1883	68
Family FENESTELLIDAE King, 1849	68
Genus *Fenestella* Lonsdale, 1839	68
Fenestella australis Chapman, 1903	68
Fenestella emanuelana sp. nov.	69
Fenestella pikerensis sp. nov.	70
Fenestella westralis sp. nov.	71
Fenestella yassensis sp. nov.	72
Fenestella margaritifera Chapman, 1903	73
Genus *Hemitrypa* Phillips, 1841	73
Hemitrypa sp. *A*.	73
Hemitrypa sp. *B*.	74
Genus *Ikelarchimedes* nov.	74
Ikelarchimedes warooensis sp. nov.	75
Family RHINIDICTYIDAE Ulrich, 1893	76
Genus *Stictopora* Hall, 1847	76
Stictopora belubulensis sp. nov.	77
Stictopora bowanensis sp. nov.	78
Stictopora quandongensis sp. nov.	80
Stictopora zeehanensis sp. nov.	81
Stictopora sp. *A*.	83
Stictopora sp. *B*.	83
Stictopora sp. *C*.	84
Stictopora sp. *D*.	84
Family RHABDOMESONIDAE Vine, 1883	85
Genus *Nicklesopora* Bassler, 1952	89
Nicklesopora crenulata sp. nov.	89
Nicklesopora fitzroyensis sp. nov.	90
Nicklesopora? flexuosa (Chapman)	91
Nicklesopora geuriensis sp. nov.	91
Nicklesopora leopoldensis sp. nov.	92
Nicklesopora westralis sp. nov.	93
Genus *Saffordotaxis* Bassler, 1952	94
Saffordotaxis? sp. *A*.	94
Genus *Rhombopora* Meek, 1872	95
Rhombopora? gippslandica Chapman	95

	Page
BRYOZOAN LOCALITIES AND SPECIES	96
APPENDIX: REASSIGNMENT OF SPECIES FORMERLY PLACED IN THE PHYLUM BRYOZOA	105
SELECTED BIBLIOGRAPHY	107
PLATES 1-28	112
INDEX	169

TEXT-FIGURES

		Page
1.	Localities from which Bryozoa were studied	11
2.	Longitudinal section of *Homotrypa fenestrata* sp. nov.	25
3.	Tangential section of *Batostoma tubuliferum* sp. nov.	32
4.	Part of oblique longitudinal section of *B. tubuliferum*	32
5.	Part of longitudinal section of *Percyopora tubulata* sp. nov., showing structure of zooecial walls in subperipheral and peripheral regions	46
6.	Tangential section of *Granivallum fistulosum* sp. nov.	52
7.	Part of longitudinal section of *G. fistulosum*	52
8.	Skeletal microstructures in part of a longitudinal section of *Stereotoechus shearsbyi* (Crockford)	54
9.	Bryozoan localities in central New South Wales	100
10.	Bryozoan localities in the Yass District, New South Wales	101
11.	Bryozoan localities in Victoria	102
12.	Bryozoan localities in Tasmania	103
13.	Bryozoan localities in the Fitzroy Basin, Western Australia	104

SUMMARY

A bryozoan fauna from the Middle Ordovician shelly facies of Cliefden Caves, N.S.W., has an abundance of *Homotrypa fenestrata* sp. nov., *Batostoma tubuliferum* sp. nov., species of *Stictopora*, and a new genus *Austraphylloporina* belonging to the Family Phylloporinidae. A Middle to Upper Ordovician bryozoan fauna from the Bowan Park Limestone, north-north-west of Cliefden Caves, contains species of *Homotrypa* and *Stictopora*. Fragmentary bryozoan material from the Gordon Limestone, Tasmania, Middle to Upper Ordovician, has species of *Stictopora, Batostoma*, and *Amplexopora*.

Bryozoan genera in the Silurian and Devonian succession of the Yass-Taemas area, although poorly represented, include *Cheilotrypa, Fenestella, Calopora, Heterotrypa*, and *Pesnastylus* from the Silurian, and *Cyphotrypa, Stereotoechus, Leptotrypa*, and a new genus, *Ikelarchimedes*, from the Devonian. Scattered localities in the Lower and Middle Devonian of the Lake Bathurst area and Molong and Wellington districts have yielded species of *Hemitrypa, Heterotrypa, Fistulipora*, and *Nicklesopora*.

A Middle and Upper Devonian bryozoan fauna from the Fitzroy Basin has an abundance of stenoporids belonging to three new genera, *Percyopora, Fitzroyopora*, and *Granivallum*. Fistuliporids belonging to the genera *Fistulipora* and *Coelocaulis*, species of *Fenestella*, and species of the rhomboporid genus *Nicklesopora* are well represented. The Middle Devonian has yielded a species of *Fistulipora* in the Pillara Formation; the lower part of the Upper Devonian has yielded species of *Fenestella* and *Nicklesopora;* and the upper part of the Upper Devonian contains species of *Nicklesopora, Fenestella, Coelocaulis, Crenella, Granivallum*, and *Fitzroyopora*.

The small group of Silurian or Devonian species described from Victoria by Chapman has been re-examined and revised. It includes *Fenestella margaritifera, F. australis*, and *Fistulipora victoriae*.

INTRODUCTION

The Carboniferous and Permian Bryozoa of Australia have provided interesting palaeontological and historical data; the abundant Stenoporidae with their distinctive skeletal structures and the unusual family Hexagonellidae are but two examples. These families pose questions on the nature and relations of their earlier representatives that, like early Palaeozoic bryozoan assemblages in other parts of the world, have received limited study in some areas. Comparison with these previously described species is extremely difficult, because generally the early workers emphasized the external features of the zoaria and did not describe the skeletal microstructures which are used in modern systematics for differentiation of species and genera.

The original aim of this study was to investigate some of the early Palaeozoic Bryozoa of Australia so as to study the development of skeletal structures in the zoaria and the significance of distribution of species in the different stratigraphic successions. It was found that areas with abundant bryozoan faunas were not readily located; in many areas such as the Yass-Taemas and Tamworth districts, New South Wales, where Silurian and Devonian marine faunas are abundant, Bryozoa were poorly represented. Thus the work became an investigation of areas where Bryozoa were located. The Middle and Upper Ordovician exposures in parts of central-western New South Wales and the Middle and Upper Devonian sequence of the Fitzroy Basin (collected by the field parties of the Bureau of Mineral Resources) contained abundant bryozoan faunas at certain horizons; but they were not distributed continuously through any considerable thickness of succession. Many samples from which Bryozoa are described in the text are isolated occurrences from which two, sometimes three, species have been collected.

Acknowledgments

This study has been aided by the loan of material from the Bureau of Mineral Resources, Canberra; the National Museum of Victoria, Melbourne; the Australian Museum, Sydney; and the Department of Geology, The University of Tasmania. To the heads of these institutions I express my sincere thanks. Further, the Bureau of Mineral Resources has been most helpful in providing access to unpublished maps and data on the Fitzroy Basin from which excellent bryozoan material was collected. I am deeply appreciative of this generous help, and in particular wish to thank Dr. N. H. Fisher, Mr. L. C. Noakes, Mr. J. M. Dickins, and Dr. J. J. Veevers.

I am indebted to Professor C. E. Marshall, Department of Geology, The University of Sydney, in whose department the study was carried out during 1953 to 1957 as partial fulfilment of the requirements of the degree of Doctor of Philosophy; to Miss Helen Duncan, United States Geological Survey, Washington, for helpful comments and criticism of the manuscript; to Prof. D. A. Brown, Australian National University, who critically read the manuscript; to Mr. E. D. Gill, National Museum of Victoria, and to Mr. H. O. Fletcher, Australian Museum, Sydney, who facilitated the examination of material; to the Western Australian

Petroleum Company for the loan of maps; and to the University of Sydney for research grants received during 1955, 1956, and 1957.

Present location of specimens, with abbreviations of repositories

A.M.F. Australian Museum, Sydney, Fossil Collection.
C.P.C. Commonwealth Palaeontological Collection, Canberra.
N.M.V.P. National Museum of Victoria, Palaeontological Collection.
U.S.G.D. University of Sydney, Geology Department.
U.T.G.D. University of Tasmania, Geology Department.
V.M.D. Victorian Mines Department, Victoria.

Methods of Study

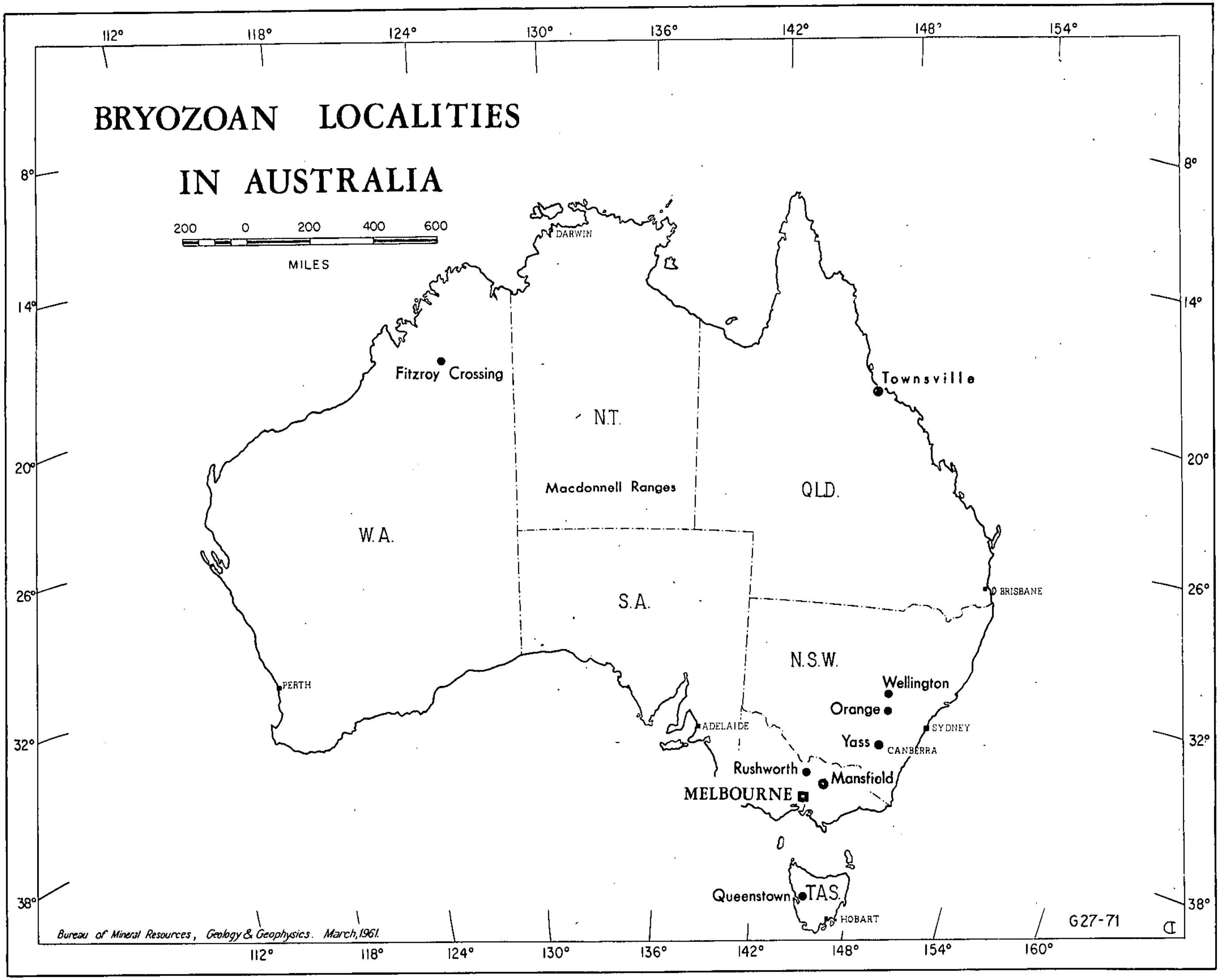
Thin sections proved to be by far the most satisfactory method for studying bryozoan skeletal structures, and both Bryozoa and tabulate corals were sectioned, because some taxa in the tabulates are somewhat similar to Bryozoa.

Silicified limestone from the Ordovician of Bowan Park and the Devonian of Taemas, New South Wales, was etched with acetic acid, but generally silicification was found to be restricted to the outer region of the zoaria, so that the skeletal microstructures were removed during the etching process. Nevertheless this process did provide numerous basal fragments of stictoporid and fenestellid colonies which otherwise were not visible in the rock. Cellulose films, prepared on undulating straps of stictoporids by the method outlined by Koenig (1954), produced disappointing results. The finer structures, including acanthopores, were not readily observable, being too fine for recording. Incrusting zoaria and thin sections were stained with malachite green in an endeavour to create contrast between, and to emphasize, particular structures, such as diaphragms. In hand specimens the staining emphasized the presence of acanthopores. In thin sections of well-preserved material, where the structures are usually readily discernible, contrast between structures was created; but in thin sections of recrystallized specimens, where identification of structures is commonly difficult, the poor contrast created did not aid examination.

PREVIOUS INVESTIGATIONS

The first bryozoan to be described from early Palaeozoic rocks of Australia was an incrustation, *Heterotrypa australis* Etheridge 1899, observed in a thin section of *Diphyphyllum porteri* var. *mitchellensis* Etheridge from the Yeringian (Lower Devonian) of Sandy's Creek, Victoria. In the succeeding two decades Chapman, in several papers, described bryozoan fragments, most of which were found in the Yeringian succession of Victoria. These forms are discussed and revised in the section on Systematic Palaeontology.

In 1941 Crockford described five new bryozoan species from New South Wales: three from the Middle Silurian of Yass, one from the ?Middle Devonian of Taemas and one from the Middle Devonian of Tamworth. Bassler (1939)



TEXT-FIGURE 1.

described a new species, *Hederella browni*, from the ?Middle Devonian of Taemas. Crockford (1943b) described an Ordovician bryozoan in strata from the Larapintine Series of the Northern Territory, and Öpik (in Stevens, 1952, p. 115) listed four genera as occurring in Ordovician limestone at Cliefden Caves, New South Wales.

Until this present study was undertaken, no Ordovician, Silurian, or Devonian bryozoa had been specifically recorded from Queensland, Western Australia, or Tasmania. Two forms from Queensland strata alleged to be Bryozoa, *Amplexopora? konincki* Etheridge Jnr. (1884), and *Vetofistula mirabilis* Etheridge Jnr. (1917), are tabulates.

STRATIGRAPHICAL DISTRIBUTION OF BRYOZOAN LOCALITIES

ORDOVICIAN*

Central-western New South Wales

The Ordovician limestone deposits in central-western New South Wales form part of a broad meridional band of sediments which, according to Stevens (1956), accumulated on a rising submarine ridge in the Tasman geosyncline. The small relatively open folds trend roughly north-south and are sharply truncated by faults. The Ordovician bryozoan assemblages of this region possess nine species of typical Ordovician genera belonging to *Homotrypa, Mesotrypa, Orbignyella, Batostoma, Stictopora,* and *Austraphylloporina.* Specimens of *Stictopora* and *Homotrypa* are abundant and occur at Bowan Park, Cliefden Caves, Reedy Creek, and Cargo.

Cliefden Caves. The limestone cropping out at Cliefden Caves, previously considered Silurian, was shown by Stevens (1950) to be Middle Ordovician. The gently dipping limestone belt stretches for about four and one half miles between the Belubula River and the Mandurama-Canowindra Road. Bryozoa occur in the lower part of the Cliefden Caves Limestone at Fossil Hill and the hill on the east side of Large Flat, in richly fossiliferous shaly limestone estimated by Stevens (1952) to be 480 feet thick. This is succeeded by about 2,000 feet of massive limestone. The rich assemblages of brachiopods, trilobites, gastropods, coelenterates, bryozoans, nautiloids, and ostracods form distinct horizons on Fossil Hill, but as yet no detailed faunal studies have been made.

At Fossil Hill above the basal *Trimerella* bed and ten feet from the base of the formation, *Homotrypa fenestrata* sp. nov. is associated with corals, including *Tetradium.* This is succeeded by a bed composed essentially of tabulates and some stromatoporoids. Above this the brachiopod *Spanodonta* sp. appears, associated with corals. This faunal association extends vertically for some distance and is interrupted at about sixty to seventy feet from the base of the limestone by a narrow horizon of *Batostoma tubuliferum* sp. nov. Stictoporids are more abundant in the upper part of the shaly limestone.

* The terms Middle and Upper Ordovician as used in the text correspond approximately to the Champlainian and Cincinnatian Series of the North American Ordovician system.

In the Cliefden Caves Limestone, collected through a distance of 70 feet above the base of the *Trimerella* horizon, the species *Austraphylloporina cliefdenensis* and *Batostoma tubuliferum* may be compared with North American Black River species. *Homotrypa fenestrata* has features similar to Black River and Maysville species, and *Stictopora belubulensis* may be compared with Black River and Trenton species. Only one or two species have been described from rocks of Chazyan age in North America so that the North American Black River species provide the only extensive published data on early Middle Ordovician species. These limitations restrict and bias comparison at the present time.

Corals, identified by Hill (Stevens, 1956) and described by Hill (1958), which occur at a level below the intertonguing Malongulli Formation in the Cliefden Caves Limestone, are considered to be similar to Black River and Trenton faunas of North America. Mostly new species are present, so that specific comparison with other material is difficult. The intertonguing Malongulli Formation, an arenite-siltstone (in the usage of Pettijohn, 1949), contains graptolites which are comparable with species in the Zone of *Nemagraptus gracilis* of Great Britain. Tentatively the age of the Cliefden Caves Limestone is Middle Ordovician.

Bowan Park. The Bowan Park Limestone crops out twenty miles north-north-west of Cliefden Caves. Brown (1952) first suggested an Ordovician age for this limestone, which had previously been considered Silurian. Stevens (1956) described the succession in more detail. Bryozoa occur in the lower and middle part of the formation, which is about 60 feet thick. The lower, calcarenite horizons, cropping out in Portions 36 and 55, Parish of Bowan, are richly fossiliferous, containing brachiopods, corals, and bryozoans. The limestone cropping out in Portion 289, Parish of Bowan, which contains numerous siliceous beds, may represent slightly higher horizons; the lower part of this section is rich in tabulates, and is succeeded by horizons containing numerous brachiopods, corals, gastropods, ostracods, bryozoans, nautiloids, stromatoporoids, algae, and trilobites. The bryozoan species *Homotrypa* sp. cf. *H. fenestrata* sp. nov. and *Stictopora bowanensis* sp. nov., from the Bowan Park Limestone, may be compared with Black River and Trenton, and also a Maysville, species.

The coral fauna described by Hill (1958) from Portion 289, Parish of Bowan, suggests correlation with late Middle or Upper Ordovician species of North America. When carefully collected material is examined in detail from this thick calcareous succession, the age of the strata will perhaps be found to extend from Middle to Upper Ordovician.

Reedy Creek, Molong. The Reedy Creek Limestone crops out east of Molong in a narrow belt about 31 miles long. It is about 600 feet thick (Adrian, 1956). The lower and middle calcarenite members are richly fossiliferous, containing brachiopods, corals, cephalopods, gastropods, trilobites, bryozoans, and algae. They pass upwards into massive, rarely fossiliferous limestone. At present the age of this formation is tentatively regarded as Middle Ordovician, inferred from the occurrence of brachiopods, including *Spanodonta*, identical with species from Cliefden Caves and Bowan Park. Fragments of Bryozoa include *Homotrypa* sp. *A* and *Stictopora* sp. *A*.

Regan's Creek area. Three miles south-east of Cargo a small outcrop of fossiliferous limestone, termed Regan's Creek Limestone (Stevens, 1956), is faulted against Ordovician slate. So far only a small coral assemblage has been studied (Hill, 1958), and this is indicative of either a Middle or Upper Ordovician or early Silurian age. Fragments of *Stictopora* sp. *B*. occur in the limestone.

Western Tasmania

In Carey's (1953) outline of the regional geological structure of Tasmania, Ordovician rocks are shown to crop out in the west and to fringe the main Precambrian belt. These sediments accumulated in troughs and were folded into anticlinoria and synclinoria with a north-south trend. The axis of the Zeehan Syncline, which is the trough of the Zeehan-Magnet Synclinorium, extends for at least 30 miles. The localities mentioned lie within the synclinorium.

Smelters Quarry, Zeehan. Teichert & Glenister (1953) summarize the geology of this locality, which is two miles south of Zeehan. From a consideration of the described coral assemblage (Hill, 1955), and cephalopod and gastropod assemblage (Teichert & Glenister, 1953) from part of the Gordon Limestone, its age appears to be Middle to Upper Ordovician. Stictoporids are abundant in the argillaceous arenaceous sediments and the species *Stictopora zeehanensis* sp. nov. and *Batostoma* sp. *C*. from Smelter's Quarry may be compared with species from the Black River Series of North America.

Ridge beside Railway line, near Oval, Queenstown. Hill & Edwards (1941) and Hill (1955) suggest that the corals at the old flux quarry, Queenstown, indicate an Upper Ordovician age for this outcrop of the Gordon Limestone. *Amplexopora queenstownensis* sp. nov. from this locality may be compared with the Richmondian species *A. pustulosa* Ulrich in the Waynesville member of Indiana and Ohio, U.S.A.

Northern Territory

Macdonnell Range area. There is much stratigraphical and geographical uncertainty concerning the Larapintine "Series", which crops out mainly in the James Range, in an anticlinal fold. The Horn Expedition made a somewhat serious geographical error on their map and in their descriptions, as they extended their Horn Valley, in which they found fossils, far beyond its geographical boundary (Madigan, 1932). The fossils collected on this early expedition came from various localities in the Ordovician succession, and they indicate an age ranging from the upper part of the Lower Ordovician to Upper Ordovician. *Batostoma* sp. *A*. serves as a record of Bryozoa in Central Australian Ordovician rocks.

SILURIAN

Yass District, New South Wales

The geology of the Yass Basin, which lies 198 miles by rail south-west of Sydney, has been described by Brown (1941). It is a broad synclinal structure containing a Silurian succession which was laid down on the western flank of a geanticline in the Tasman geosyncline. The upper 800 feet of the succession, of total thickness 8,300 feet, is dominantly calcarenite.

Black Bog Creek, Hatton's Corner. At this locality on the eastern side of the Yass syncline and two miles west of Yass, the Barrandella Shale is well exposed. The rich fauna of this bioclastic shale has not been described in detail, but Hill (1941) examined the Rugosa and suggested that the material had affinities with Wenlock and Ludlow material. This age determination is supported by overlying graptolite-bearing horizons containing species which have been compared with Wenlock and Ludlow species (Sherrard, 1952, 1954). As the richly fossiliferous Hume Limestone forms scree slopes over the underlying Barrandella Shale, the assemblages so far examined probably represent a mixed assemblage from the two formations. Since the published data on Silurian bryozoan species is so very limited the scatter of species in the genera *Cheilotrypa, Fenestella, Calopora, Pesnastylus,* and *Heterotrypa,* from the Silurian of Yass provides a record of occurrence. Fragments of *Cheilotrypa* sp. *A*. and *Calopora hattonensis* sp. nov. are found in outcrops at Hatton's Corner.

Limestone Creek, north of Silverdale. The exact locality along the creek section from which the fragments of *Fenestella yassensis* sp. nov. were collected is not known. The bryozoan fragments are preserved in green-weathering shale, lithologically characteristic of the Barrandella Shale. This bed extends for one and a half miles along Limestone Creek and just south of the Wargeilo road crossing. The age of the unit is Middle Silurian: the succession of shale and limestone contains fossils which are comparable with Wenlock and Ludlow material.

Silurian or Devonian

Victoria

The age and local correlation of calcareous lithofacies of Silurian and Devonian rocks in many parts of Victoria is still an unresolved and thorny problem, owing to lack of known fossiliferous strata (in many instances) and lack of reliable palaeontological data. The structure of many areas is not known.

In the Melbourne region Gregory (1902) proposed a subdivision of the sequence into two series, a lower (Melbournian) and an upper (Yeringian) series. Since then the lowest of the beds have been separated as the Keilorian Series. On re-examination of the fauna from the type Yeringian section of the Lilydale district Gill (1940) placed the Yeringian series in the Lower Devonian, "the fauna revealing affinities with European and North American Lower Devonian faunas". This determination of a Devonian age is supported by Ripper's studies (1933, 1936, 1937) of the stromatoporoids, and Hill's study (1939) of the coral fauna, of Lilydale, near Melbourne.

Gill's study of the Lilydale district does not give a basis for regarding as Devonian all strata previously mapped as Yeringian. Each outcrop and its associated fauna must be separately assessed.

Gibbo River. This somewhat inaccessible locality in east Gippsland was placed in the Silurian (Yeringian Series) by Chapman (1920) on the basis of two rugose corals and one bryozoan. In Whitelaw's report, written in 1913 and published posthumously in 1954, Thomas asserts in the foreword that the outcrop of Gibbo

River is basal Middle Devonian, without offering any palaeontological data. Until reliable evidence is published this outcrop must be regarded as Silurian or Devonian. Chapman described *Nicklesopora? flexuosa* from this locality.

Cowombat, north-eastern Victoria. From a small isolated outcrop of limestone, Chapman (1920) recorded Rugosa and Tabulata. Although his list suggests affinities with Australian material of proved Silurian age, Chapman (1920) also recorded from apparently the same locality "*Spirifer yassensis*", a ?Middle Devonian species. Chapman described a species of *Cystiphyllum* as *Fistulipora cowombatensis* from this locality.

Wombat Creek, tributary of the Mitta Mitta River. Specimens collected by early workers from this locality were regarded as indicating a Yeringian age, and as a consequence David (1950) suggested that this limestone outcrop may be Devonian. As yet there is no positive evidence. The bryozoan *Rhombopora? gippslandica* is recorded from this locality.

Central-eastern Victoria. In central-eastern Victoria, in a region difficult of access, a thick succession of sediments with an estimated maximum thickness of about 20,000 feet is folded into what is termed the Walhalla Synclinorium. It is believed that the sequence ranges in age from Silurian to Devonian. In this region material has been described from:

Deep Creek, a tributary of the Thomson River. The limestone outcrop in Deep Creek has been correlated with the Yeringian series and this led later workers to consider the deposit as Devonian. *Fenestella australis* is recorded from this locality.

Tyers River, a tributary of the Latrobe River. This limestone lens south-east of Walhalla has been included in the Panenka beds of the Jordon River "Series". Although Chapman's list of fossils (1907) has been regarded as indicating that the material has affinities with Silurian material from other Eastern Australian occurrences, the list provides no confirming data and the outcrop may be Silurian or Devonian in age. *Rhombopora? gippslandica* is recorded from this locality.

Rushworth, Heathcote District. Thomas (1939) discusses the structure of the Rushworth area, where the limestone trends eastwards. Although no palaeontological data are published Thomas regards the fossils in this area as Yeringian in age, the Yeringian in this instance being considered as either the top of the Silurian or else extending into the Devonian. The species *Heterotrypa rushworthensis* Chapman described from this locality proved to be inorganic material.

Devonian

Western Australia

Fitzroy Basin. The Fitzroy Basin, 180 miles long and 20 miles wide, contains rocks of Proterozoic, Devonian, Carboniferous, Permian, Tertiary, and Quaternary age.

In revising Teichert's (1949) zonal schemes of the Devonian succession of the Fitzroy Basin, Veevers (1959) recognised twelve fossil zones — five based on the stratigraphic distribution of goniatites, six on brachiopods, and one on stromatoporoids.

The oldest zone, the *Stringocephalus fontanus* zône, is considered to be equivalent to the Givetian; it is known only from the Pillara Formation of the Mountain Home Spring area. No Bryozoa have so far been located in this lower part of the Pillara Formation. The succeeding *Amphipora ramosa* zone contains, besides the nominate species, a variety of corals, stromatoporoids, some brachiopods, and a species of *Fistulipora, F. pillarensis* sp. nov. The *A. ramosa* zone extends through most of the lower one-third of the Pillara Formation and is considered equivalent to part of the Givetian and the lower Frasnian.

The *Crurithyris apena* zone (Veevers, 1959) and the "Lower *Manticoceras*" zone (Teichert, 1949) are correlated with the basal part of the Frasnian. The succeeding *Ladjia saltica* zone (Veevers, 1959) contains at least 21 species of brachiopods, nine species of corals, one species of *Fistulipora, F. sadlerensis* sp. nov., and one species of *Fenestella, F. emanuelana* sp. nov. The lower two-thirds of the *L. saltica* zone is equivalent to the "Upper *Manticoceras*" zone (Teichert, 1949). In the type section of the Sadler Formation, the *L. saltica* zone is overlain by another brachiopod-rich zone, the *Emanuella torrida* zone (Veevers, 1959), which extends from beds equivalent to the top of the Frasnian into the basal part of the Famennian. *Nicklesopora westralis* sp. nov. from the Fossil Downs Formation and *N. fitzroyensis* and *N. leopoldensis* sp. nov. from the Oscar Formation may lie in the *L. saltica* or *E. torrida* zone.

The *"Cheiloceras"* zone, which has an abundance of cephalopods, lies in beds equivalent to those at the base of the Famennian, and, according to Teichert (1949), corresponds to Stufe II of the German Upper Devonian succession. The "Lower and Upper *Sporadoceras*" zones (Teichert, 1949), equivalent to the *Nyege scopimus* zone (Veevers, 1959), is, according to Teichert (1949), equivalent to the Stufe III.

The youngest zone so far recognised in the Devonian of the Fitzroy Basin is the *Avonia proteus* zone (i.e., *"Productella"* zone, Teichert, 1949), which is correlated with the upper part of the Famennian. Corals, nautiloids, brachiopods, and Bryozoa are abundantly represented in this *A. proteus* zone. Bryozoa found in this zone in the Fairfield Beds include an interesting stenoporid element represented by *Percyopora tubulata* sp. nov., *P. occidentalis* sp. nov., *Fitzroyopora oscarensis* sp. nov., and *Granivallum fistulosum* sp. nov. Other bryozoan species in this zone include *Coelocaulis maculosa* sp. nov., *Nicklesopora crenulata* sp. nov., and *Fenestella pikerensis* sp. nov.

Many of the rock units in the Fitzroy Basin designated by Guppy *et al.* (1957) are diachronous. Of those from which Bryozoa were collected, the Pillara Formation ranges through the *Stringocephalus fontanus, Amphipora ramosa, Crurithyris apena,* and *Ladjia saltica* zones; the Sadler Formation ranges through *C. apena, L. saltica,* "Upper *Manticoceras*", and *E. torrida* zones; the Oscar Formation may lie in the *L. saltica* or *E. torrida* zones; the Fossil Downs Formation ranges through the *Nyege scopimus* zone and possibly the *A. proteus* zone; and the Fairfield Beds are confined to the *A. proteus* zone.

New South Wales

Taemas District. A general outline of the geology of this area, investigated by Harper (1909) and situated 200 miles south-west of Sydney, has been given by Browne (1955). The sequence consists of a thick succession of lavas and tuffs, probably some 2,500 feet thick, overlain by a thick succession of limestones intercalated with lutitic sediment, possibly 2,000 feet thick. The limestone succession is well exposed along the Murrumbidgee River in the Taemas district and forms the more easterly of the two much faulted synclinoria.

In this Devonian sequence cropping out along the Murrumbidgee River, the limestone sequence contains *Cyphotrypa murrumbidgensis* sp. nov., *Stereotoechus shearsbyi* (Crockford), *Ikelarchimedes warooensis* sp. nov., and *Homotrypa?* sp. *B*.

Lake Bathurst area. The geology of this area, 155 miles south-south-west of Sydney, was described by Garretty (1936a and 1936b). At Lake Bathurst Railway Station a thin band of bioclastic limestone occurs in a sequence of conglomerate, sandstone, quartzite, and felsitic rocks. As yet the faunal assemblages from this area remain undescribed, but Garretty regarded these beds as similar in age to a sequence of limestone cropping out five miles to the south at Tarago. The presence of *Receptaculites australis* in this southern outcrop, at Tarago, has been taken to indicate a Middle Devonian age for the sediments. In the limestone at Lake Bathurst Railway Station, tabulates of alveolitid and thamnoporid types predominate, together with *Syringopora* sp. A few Rugosa, including *Disphyllum* sp., brachiopods, and bryozoans (*Hemitrypa* sp. *A*) are also present. The fauna has elements — particularly the corals — similar to ?Middle Devonian material from Taemas and Fernbrook Creek, New South Wales. The structure of the region is not known; Garretty suggested that the Lake Bathurst area lies along the axis of a major synclinal structure which embodies Ordovician, Silurian, and Devonian units.

Molong District. The town of Molong lies 224 miles by rail north-west of Sydney. The thick sequence of closely folded Ordovician, Silurian, and Devonian rocks trends north-south. The fossiliferous limestone and marl cropping out three to four miles west of Molong is considered by Joplin & Culey (1938) and Adrian (1956) to be Middle Devonian, but as yet the stratigraphic succession has not been precisely defined and units of both Lower and Middle Devonian age may be present. Hill & Jones (1940) believed that the rugose and tabulate corals from this area indicated a Lower Devonian age. *Fistulipora norensis* sp. nov. and *Cyphotrypa lamellosa* sp. nov. occur in this Devonian succession.

Wellington District. Basnett & Colditz (1945) discussed the general geology of an area of some 500 square miles, including the area around Wellington, which lies 256 miles by rail north-west of Sydney. Carne & Jones (1919) indicated the distribution of limestone beds in the tightly folded Silurian and Devonian rocks which trend northwards in the region of Wellington township. The age of the sequence of limestone and shale cropping out to the west and north of Wellington, and through the Parishes of Ponto and Geurie, is considered to be Lower and Middle Devonian. This tentative estimation of the age is based on Hill's determination (1942c) of corals from a number of localities. Bryozoa present include

Heterotrypa pontensis sp. nov., *Nicklesopora geuriensis* sp. nov. and *Hemitrypa* sp. *B*.

Victoria

Lilydale and Killara District. This region, in which the type section of the Yeringian Series of about 17,000 feet of calcarenite is exposed, has been carefully examined by Gill, but hitherto little has been published. Gill (1949, 1951a, 1951b), on the basis of a study of brachiopods, gastropods, and trilobites, regards the Lilydale limestone as representing the upper part of the Lower Devonian. Hill (1939 and 1943), in her studies of the Rugosa from the Lilydale district, concluded that the coral fauna is probably Middle Devonian. Chapman found *Fenestella margaritifera* at this locality.

Junction of Woori-Yallock Creek and Yarra River, south-east of Lilydale. This locality, recorded in early Geological Survey reports, is believed to be the same as Fossil Locality 34 of Gill (1942) ("Symes Tunnel"). Gill considered that the beds reappearing to the south-east of Lilydale in the Woori-Yallock Basin from beneath Upper Devonian lavas belong to the Yeringian (Devonian) Series of Lilydale. Chapman found *Fenestella margaritifera* at this locality.

Loyola, near Mansfield. The Devonian age of the Loyola limestone was shown by Ripper (1937) and Hill (1939). The stromatoporoids indicated a Lower? Devonian age, and the Rugosa, which include the typical Devonian genera *Phillipsastraea* (Devonian of Europe, Asia, and Australia) and *Thamnophyllum* (Lower and Middle Devonian of Europe and Australia), are interpreted by Hill (1939, and 1954b, p. 113) as indicating a Lower Devonian age. Gill (1951) records *Notanoplia loyolensis* Gill 1951 as of Lower Devonian age from Loyola. Chapman described *Fistulipora victoriae* from this locality.

INTERPRETATION OF SKELETAL MICROSTRUCTURES AND FAUNAL ASSOCIATIONS

Since the extensive studies undertaken by Ulrich towards the end of the nineteenth century and later work by Ulrich and Bassler at the beginning of and during the twentieth century, the taxonomy of the Palaeozoic Bryozoa, except for a number of spasmodic studies, has received little attention. Cumings (1905a, 1905b) presented a very interesting approach to the study of fenestellids in tracing the development of the zooecia from the proximal basal region distally, but few workers have used this approach in the study of the trepostomes and cryptostomes. No recent synopsis of the bryozoan families and genera was available until Bassler's Treatise (1953) was published.

In the generally accepted classification (Bassler, 1953) the trepostomatous genera *Homotrypa, Mesotrypa, Batostoma, Amplexopora, Orbignyella, Stereotoechus, Calopora, Heterotrypa,* and *Discotrypa* were placed in one or other of the two suborders Integrata and Amalgamata. The suborder Integrata was erected for genera possessing a dark median line in the outer part of the zooecial walls and the suborder Amalgamata was erected for genera lacking this structure in the outer part of the zooecial walls. Lee (1912) and Cumings & Galloway (1915) showed in their studies that this subdivision of the Order Trepostomata was not tenable. Cumings & Galloway showed that the zooecial walls may appear both amalgamate and integrate in different longitudinal sections of a single specimen, and noted that the amount of pitch of the laminae of the zooecial walls made the zooecial walls appear either amalgamate or integrate.

In *Homotrypa fenestrata* sp. nov. the zooecial walls are composed of a wide inner part of long, steeply inclined wavy laminae and a narrow outer part where the laminae of adjacent walls intertongue abruptly in a narrow irregular band and thus the walls might be considered integrate. The laminae of the cystiphragms extend into the zooecial walls and form a considerable part of the laminae of the zooecial walls. In tangential sections the outer part of the zooecial walls appears amalgamate, is crowded with acanthopores, and is lined on both sides by the laminae of the inner part of the zooecial walls. Likewise in *Orbignyella boonderensis* sp. nov. the zooecial walls although narrower are structurally similar to those in *H. fenestrata*. *Batostoma tubuliferum* sp. nov. has relatively wide zooecial walls; long steeply inclined laminae in their inner part curve convexly into the outer part, where laminae of adjacent zooecial walls commonly intertongue in an irregular dark band. In this respect its wall structure is similar to that in *Homotrypa fenestrata*, but *B. tubuliferum* lacks cystiphragms and has sparsely distributed diaphragms, and the laminae of these structures do not contribute greatly to the laminae of the zooecial walls.

In *Heterotrypa pontensis* sp. nov. the zooecial walls have long steeply inclined laminae in the inner part and distally convex laminae in the outer part, and are partly constructed from the laminae extending from the numerous diaphragms that cross the zooecial tubes and mesopores into the zooecial walls.

Cyphotrypa lamellosa sp. nov. has narrow dark granular walls in which the skeletal microstructure is not discernible.

The zooecial walls of species of the new stenoporid genera *Percyopora* and *Fitzroyopora* have laminae in the inner part of the zooecial walls inclined at 40° and 45° respectively to the direction of the zooecial tube. These laminae curve distally in a broad arc in the outer part of the zooecial walls, so that laminae of adjacent zooecial walls intertongue. Numerous acanthopores with finely laminate, distally convex walls ripple the otherwise smooth laminae of the zooecial walls.

The stenoporid *Stereotoechus shearsbyi* (Crockford) has a wall structure similar to *Percyopora;* but the laminae of the inner part of the zooecial walls are steeply inclined for only a very short distance before they curve into broad distally convex laminae, where adjacent zooecial walls intertongue to form an amalgamate wall structure (Pl. 13, fig. 5). Acanthopores with steeply inclined laminate walls pierce the outer amalgamate part of the walls.

Granivallum fistulosum sp. nov., tentatively placed in the Family Stenoporidae, possesses a markedly different zooecial wall structure. The zooecial walls are very slender in both the proximal and distal regions and, generally throughout their length, they are composed of numerous, exceptionally fine, short beads joined by equally short non-beaded segments. The short beads are composed of broad, distally convex laminae. These structures are commonly obscured by large acanthopores that extend throughout the length of the zooecial walls of the colonies and have clear calcite axes enclosed by walls of steeply inclined laminae.

The Family Phylloporinidae, although placed in the Order Trepostomata (Bassler, 1953), has few zooecial structures which suggest relation with this order. The broadly curved calcitic material of the zooecial walls is pierced by rod-like or tube-like structures, which are generally regarded as acanthopores. In this study insufficient Australian species and genera belonging to the phylloporinids are available to compare the anatomy of the colonies of the various genera.

In the cryptostomatous Bryozoa the small number of species of *Fenestella* examined from the Silurian and Devonian supports the findings of Nekhoroshev (1933) on the phylogenetic change in the shape of the basal zooecial sections. In the Silurian species *Fenestella yassensis* sp. nov. from Yass, New South Wales, the basal zooecial sections are quadrangular; and in the Middle and Upper Devonian species of *Fenestella* from the Fitzroy Basin, Western Australia, they are pentagonal. Nekhoroshev considered that the succession of changes continued into the Carboniferous and Permian, basal zooecial sections becoming first polygonal and then triangular and crescentic.

The discovery of spirally fenestrate zoaria with a superstructure covering the zooecial openings arouses further interest in the Silurian-Devonian genus *Semicoscinium,* and the Carboniferous-Permian? genus *Archimedes*. The new Middle? Devonian genus *Ikelarchimedes* has a fenestrate zoarium and superstructure, as in *Semicoscinium,* but is spirally coiled, as in *Archimedes*. *Ikelarchimedes* occurs in a dark grey calcilutite which has been selectively silicified.

Several species of *Stictopora* represent the stictoporid group of the cryptostomatous Bryozoa in Middle and Upper Ordovician bioclastic calcarenite and coquina in central-western New South Wales and Middle to Upper Ordovician calcareous siltstone in western Tasmania. The zooecial structures of this group have been outlined by Phillips (1960).

Cryptostomatous Bryozoa of the Family Rhabdomesonidae are well represented by species of the small stick-like genus *Nicklesopora*. The laminate zooecial-wall structure of this genus is somewhat similar to that of trepostome genera such as *Stereotoechus, Percyopora,* and *Fitzroyopora*. The sharply differentiated peripheral and axial regions and the development of hemisepta are taxonomic structures used to separate different genera, but many species in which hemisepta are lacking appear to lie in an intermediate position between the trepostomatous and cryptostomatous orders. In *Nicklesopora* the laminae of the very narrow inner part of the zooecial walls are steeply inclined distally and intertongue with the broad distally-convex laminae of the amalgamate outer part of adjacent zooecial walls.

The Middle and Upper Ordovician assemblages of central-western New South Wales contain only a few trepostome and cryptostome genera, although colonies of a species are abundant in some localities.

In the Fitzroy Basin, Western Australia, an interesting succession of bryozoan species and genera is found. *Fistulipora pillarensis* sp. nov., in a bioclastic limestone, is the only bryozoan so far found in the Middle Devonian part of the succession.

In the lower part of the Upper Devonian *Fistulipora sadlerensis* sp. nov. and *Fenestella emanuelana* sp. nov. occur in calcarenite in the Zone of *Ladjia saltica* in the Sadler Formation. *Fenestella westralis* sp. nov. occurs in a calcarenite possibly in the overlying Zone of *Emanuella torrida* in the Sadler Formation. In the Oscar Formation, *Nicklesopora fitzroyensis* sp. nov. and *N. leopoldensis* sp. nov. also accur in a calcarenite. Higher in the succession, in the Fossil Downs Formation, *N. westralis* sp. nov. occurs in calcarenite. Still higher in the sequence, in the upper part of the Upper Devonian, *N. crenulata* sp. nov., *Fenestella pikerensis* sp. nov., and *Fitzroyopora oscarensis* sp. nov. (in calcarenite), *Granivallum fistulosum* sp. (in calcareous siltstone), and *Percyopora occidentalis* sp. nov., *P. tubulata* sp. nov., and *Coelocaulis maculosa* sp. nov. (in calcarenite) are found in the zone of *Avonia proteus*, Fairfield Beds. *Granivallum fistulosum* sp. nov. is abundant in several outcrops. These occurrences suggest a faunal progression from a poorly represented species of *Fistulipora* in the Middle Devonian to the occurrence of another species of *Fistulipora, F. sadlerensis* sp. nov., and two species of *Nicklesopora* in the lower part of the Upper Devonian. This is succeeded by another species of *Fenestella.*

In the upper part of the Upper Devonian a strong new element of stenoporids, *Fitzroyopora, Percyopora,* and *Granivallum,* appears along with new species of *Fenestella* and *Nicklesopora* and a new, abundant fistuliporid, *Coelocaulis maculosa* sp. nov. As the Bryozoa occur mainly in calcarenite, except for *Granivallum fistulosum,* which is present in a calcareous siltstone, it seems that this succession of genera may be interpreted as an influx of new faunal elements into slightly changing near-shore environments.

SYSTEMATIC PALAEONTOLOGY

Taxonomic Considerations

In the study of colonial organisms, such as Bryozoa, the zoarium may represent the skeletons of hundreds, if not thousands, of individuals. Consequently by examining large fragments of zoaria the growth stages in the zoarium and the variability in the zoarial structures can be determined without the need for as many specimens as are necessary in the study of solitary organisms. One of the essential requirements for the identification of the material, particularly in the study of new forms, is caution in making oriented thin sections. Oblique sections frequently create difficulties in identification by the elimination of critical structures such as acanthopores or hemisepta.

The material described represents species of many genera, widely distributed in both space and time. With such material the existing classification, although it requires extensive revision, provides the only framework in which the species can be described.

Morphological Terminology

The glossaries of morphological terms in Crockford (1957) and Bassler (1953) provide a convenient form of reference. A few terms are used in the text in a different sense from Crockford and Bassler. They are:

Axial region: The region of the zoarium marking the early and adolescent stages of growth of the zooecia. It is generally characterized by thin zooecial walls, sparse development of transverse structures, mesopores, and acanthopores.

Bifoliate: A form of zoarial growth in some trepostomes and cryptostomes (Rhinidictyidae), in which two unilaminar series of zooecia grow back to back to form the mesotheca.

Brood Chamber: In cyclostomes, an area of the zoarium including several zooid cavities which are continuous with the cavity of the fertile zooid.

Carina: A median ridge on the celluliferous surface of many fenestrate zoaria (Fenestellidae), which is usually a thin vertical median wall coinciding with planes of division between adjacent zooecia.

Median tubuli: Small tubules enclosed in the mesotheca of some bifoliate zoaria (Rhinidictyidae).

Mesopore: A small tube enclosed in the zooecial walls in the peripheral region; most tubes are polygonal and smaller than the adjoining zooecia, and contain numerous diaphragms.

Mesotheca: A structure in the axial region of the zoarium of some trepostomes and cryptostomes (Ptilodictyidae), which is composed of two calcareous laminae produced by two unilaminar series of zooecia growing back to back.

Moniliform: Of the form of a necklace, with contractions at regular intervals, used in respect of the structure of the zooecial walls in some cryptostome and trepostome genera (particularly genera belonging to the Stenoporidae).

Peripheral region: The region of the zoarium marking the mature stages of development of the zooecia. It is characterized by thickened zooecial walls, zooecia with abundant diaphragms, the common occurrence of mesopores and acanthopores, and dense vesicular tissue.

Tubercles: Small rounded projections, commonly present in a single series along the carina, of fenestrata zoaria (Fenestellidae). This term is preferred to "node", which refers to the place of articulation in jointed zoaria, as in some cryptostomes, cyclostomes, and cheilostomes.

Order TREPOSTOMATA Ulrich, 1882

Zoaria mostly massive, lamellate, bifoliate, or ramose. In the ramose trepostomes, the zooecia are long prismatic or cylindrical tubes clearly separable into two regions, an axial region in which the diaphragms are widely spaced and the walls thin and prismatic, and a peripheral region in which the walls thicken and other structures (such as mesopores or acanthopores) are added and the diaphragms are more closely spaced. Monticules or maculae are a characteristic feature of the zoarial surface. In the lamellate zoaria differentiation between the axial and peripheral regions is less distinct. As currently defined, the Order Trepostomata also includes zoaria that are similar in external form to the cryptostomes, with slender anastomosing branches, and celluliferous on one side only. The internal structures simulate ramose trepostomes.

This diagnosis is based upon diagnoses given by Nickles & Bassler (1900) and Bassler (1953).

Family MONTICULIPORIDAE Nicholson, 1881

Diagnosis: Zoarium incrusting, ramose, bifoliate or massive; monticules usually present. Zooecial orifices polygonal or rounded and zooecia with cystiphragms (always present) and straight diaphragms. Acanthopores, and angular mesopores with numerous diaphragms, common. Thin granular zooecial walls.

This diagnosis embraces the diagnoses by Ulrich (1886), Nickles & Bassler (1900), and Bassler (1953).

Genus HOMOTRYPA Ulrich, 1882

Type species (by original designation): *Homotrypa curvata* Ulrich 1882, p. 242, pl. 10, figs. 7-7d.

Diagnosis: Zoarium ramose to subfrondescent; zoarial surface smooth, or with inconspicuous monticules. Thin zooecial walls in the axial region where diaphragms occasionally occur, thickened zooecial walls in the peripheral region, pierced by numerous acanthopores. Peripheral region of the zooecial tube lined with abundant cystiphragms linked by numerous diaphragms. A few mesopores present only in clusters.

This diagnosis is based upon diagnoses by Ulrich (1882) and Bassler (1903 and 1953).

Remarks: The species included in the genus *Homotrypa* may be divided into two groups: one with numerous diaphragms and cystiphragms in the peripheral region and the other with these structures poorly developed. The differences between several described species are very slight, and variability seems to have been restricted to very narrow limits.

HOMOTRYPA FENESTRATA sp. nov.

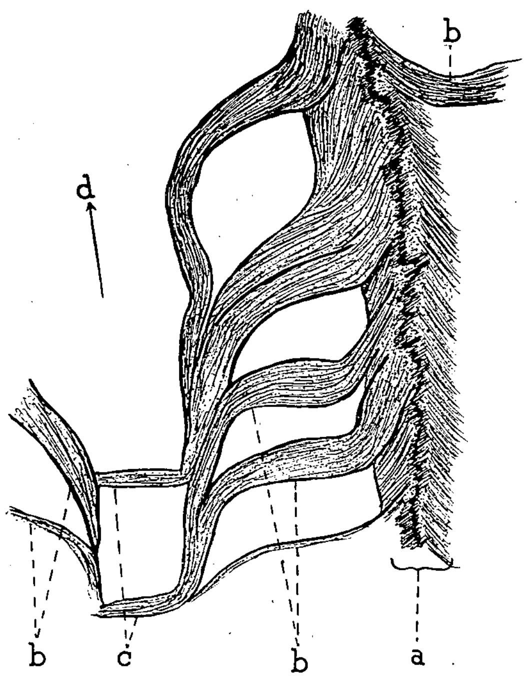
(Pl. 1, figs. 1-5; pl. 2, figs. 1, 2, 5; text-fig. 2.)

Holotype: U.S.G.D. 10410. Fossil Hill, Cliefden Caves; samples are in calcarenite about 60 feet above base of Cliefden Caves Limestone. Middle Ordovician.

Diagnosis: H. fenestrata has very abundant cystiphragms and diaphragms in the peripheral region and 15-16 distinct acanthopores forming knurled polygons around the zooecial orifices.

Description: Zoaria bifurcate at irregular intervals, and the branches re-unite to form macrofenestrules, 6 mm. long and 4 mm. wide. In addition, overgrowths of later branches on earlier branches are common. The circular branches range in diameter from 3.5 mm. to 7 mm. and fragments of colonies in cubic blocks 8 cm. long are numerous in the outcrops. No maculae or monticules were observed.

The circular or oval zooecial openings are outlined by low polygonal elevations bearing numerous acanthopore spines. Longitudinally there are 7-8½ zooecia per 2 mm. The narrow zooecial openings are commonly 0.13 mm. x 0.08 mm.; smaller zooecial openings have diameters between 0.08 mm. and 0.11 mm. In the axial regions, the zooecial tubes are 0.26 mm. in diameter. In tangential sections the zooecial tubes are crossed by numerous laminate diaphragms and cystiphragms. The zooecial walls consist of broad amalgamate outer parts of clear granular calcite, pierced by numerous large granular acanthopores. This outer part is lined by the inner parts of adjacent zooecial walls, which consist of irregular wavy bands of concentric laminae. The thick amalgamate zooecial walls measure 0.03 mm. to 0.05 mm. at the periphery. The acanthopores, about 0.02 mm. in diameter, are commonly arranged in a single series of 15-16 around a zooecial opening. Many of the acanthopores lack clear calcite axes and appear as dark granular spots of concentric material which impinge one on the other. Mesopores were not observed (Pl. 1, fig. 4).



TEXT-FIGURE 2.

Part of longitudinal section of *H. fenestrata* sp. nov., U.S.G.D. 10414, showing microstructure of zooecial walls in peripheral region; *a*, steeply curved laminae of inner part of zooecial walls intertonguing in a very irregular dark band in outer part of zooecial walls; *b*, cystiphragms abutting one upon the other and linked by *c*, diaphragms; *d*, direction of zooecial orifice. X220.

In longitudinal sections the zooecial walls are very slender and tenuous in the axial region, and the zooecial tubes are crossed by sparsely distributed diaphragms which are separated by a distance four times the diameter of a zooecial tube. The steeply sloping zooecial tubes pass into the peripheral region with abrupt curvature laterally; this change in the direction of growth is marked by considerable thickening of the zooecial walls. Zooecia are direct at the periphery. The peripheral region is narrow, having a radius of 0.8 mm. in a zoarial branch of radius 2 mm.; the radius of the axial region is 1.2 mm. The zooecial walls consist of steeply inclined wavy laminae along the inner part of the zooecial walls, and laminae of adjacent zooecia intertongue abruptly in a narrow dark zig-zag band that forms the outer part of the zooecial wall. Diaphragms and cystiphragms are laminate, and thicken as they curve steeply along the sides of the zooecial tubes before curving steeply into the zooecial walls where they become part of the laminae of the inner part of the zooecial walls (text-fig. 2; Pl. 2, fig. 2). Cystiphragms occur in the subperipheral region and are well developed in the peripheral region, where these globose structures rest one upon the other in a single series and number 6-18 in 1 mm. The cystiphragms generally occur only on the distal wall, but not uncommonly they line both sides of a zooecial tube and are linked by straight diaphragms. Diaphragms are abundant and number approximately 6 in 0.4 mm. (Pl. 1, fig. 3; Pl. 2, fig. 1).

Discussion: Homotrypa fenestrata resembles *H. curvata* Ulrich, 1882, Fairmont member, Maysvillian, Cincinnati, Ohio, and *H. multitabulata* Loeblich, 1942, Bromide formation, Middle Ordovician, Arbuckle Mountains, Oklahoma (the only comparable species) in possessing similar skeletal microstructures in the zooecial tubes, and particularly in the great abundance of cystiphragms and diaphragms in the peripheral region and the occurrence of diaphragms in the axial region. In both American species, acanthopores are very sparsely developed and very few in comparison with the Australian species, which is characterized by knurled polygons of acanthopores outlining the zooecial openings.

Remarks: The new species takes its name from the Latin *fenester*, window, referring to the fenestrate form of the zoaria. The species is common throughout the lower 70 feet of the Cliefden Caves Limestone at Fossil Hill. The greatest variability in the skeletal microstructures of the colonies is found in the abundance of the acanthopores.

The characteristic features of the species are seen in a tangential section of Specimen U.S.G.D. 10413, but in addition, rarely, a small cell occurs in the outer part of the zooecial walls. In one instance an area, equal to that of a zooecial opening, is closed by granular material pierced by numerous acanthopores. As the area is very small it is difficult to regard it as a macula; its true nature is not understood.

Other material: U.S.G.D. 10414, basal *Trimerella* horizon, Fossil Hill; U.S.G.D. 10411 and U.S.G.D. 10412, approximately thirty feet above the *Trimerella* horizon, Fossil Hill; U.S.G.D. 10413, seventy feet above the *Trimerella* horizon, with *Batostoma tubuliferum* sp. nov., Fossil Hill.

HOMOTRYPA sp. cf. H. FENESTRATA

Material: U.S.G.D. 11422. Locality 2, Portion 36, Parish of Bowan. Bowan Park Limestone. Middle or Upper Ordovician. Sample is a calcarenite.

Description: Zoarium ramose; the subpolygonal zooecial orifices, 0.17 mm. in diameter, possess narrow zooecial walls 0.03 mm.-0.05 mm. thick. These are interspersed with a single series of acanthopores, 0.03 mm. in diameter, about 7 acanthopores per zooecium. An occasional smaller cell, 0.05 mm. in diameter, occurs at the junction of the zooecial walls. Some of the acanthopores indent the zooecial walls.

Lack of material prevented the determination of the nature of the zooecia in the axial region. In the subperipheral region the zooecial walls are thin, less than 0.01 mm. in thickness, and they gradually thicken as they curve distally outwards. Diaphragms and cystiphragms are well developed in the early peripheral region and fill the zooecial tubes in the peripheral region. Three cystiphragms occur in 0.46 mm., and diaphragms are one-third to one-quarter a tube diameter apart.

Discussion: This species is similar to *Homotrypa fenestrata* sp. nov. in possessing abundant cystiphragms, diaphragms, and acanthopores in the peripheral region of the zooecia.

Only deep tangential sections are available and these show zooecia with thinner zooecial walls and fewer acanthopores than *H. fenestrata;* but these differences may result from the elimination at depth of shallow acanthopores and more intensely thickened walls. Insufficient material does not permit specific identification.

Other material: Specimens U.S.G.D. 10402, 11430, and 11431, collected from Portion 55, Parish of Bowan, possess similar structures to those described above. In Specimen U.S.G.D. 11430, the cystiphragms and diaphragms are more closely arranged; there are 6 cystiphragms in 0.8 mm. and 5 diaphragms in 0.50 mm. Other fragmentary material has been collected from Locality 11, Portion 289, Parish Bowan (Specimens U.S.G.D. 10405 and U.S.G.D. 11424) and Locality 8, Portion 289, Parish Bowan (Specimens U.S.G.D. 10406, U.S.G.D. 11425-9, and U.S.G.D. 11432).

HOMOTRYPA sp. A.

Material: A specimen from Reedy Creek, Molong, New South Wales. Reedy Creek Limestone. Middle Ordovician; sample is a calcarenite.

Description: An oblique transverse section of the material shows the peripheral region of a ramose zoarium made up of numerous acanthopores, cystiphragms, and diaphragms. Although the thin-walled axial region was removed during grinding of the section the characteristic features of *Homotrypa* are readily recognisable. This fragmentary material does not permit specific identification.

HOMOTRYPA? sp. B.

(Pl. 2, figs. 3, 4.)

Figured specimen: A.M. F286. Cave Flat, three and a half miles above the Burrinjuck Dam, Murrumbidgee River, New South Wales. Murrumbidgee "Series". ?Middle Devonian. Calcilutite.

Diagnosis: ?Homotrypa with a very narrow peripheral region, average width 0.52 mm. on a branch 3.64 mm. in diameter. Acanthopores very abundant, at least 16 per zooecium; mesopores rare.

Description: Ramose zoarium, interval of branching not known. Subcylindrical stems, ranging in diameter from 3.64 mm. to 4.0 mm. The zoarial fragments examined are 2 cm. long. Monticules may be present.

The zooecial orifices are subpolygonal, ranging from 0.15 mm. by 0.20 mm. to 0.24 mm. by 0.26 mm.; 4 zooecia in 1 mm. The thin zooecial walls, 0.32 mm. thick in the peripheral region, are pierced by small acanthopores, 0.02 mm. in diameter; at least 16 acanthopores per zooecium. Mesopores are rare but may develop at the junctions of zooecial walls (Pl. 2, fig. 3).

In longitudinal section the zooecia grow steeply inclined from the axis of growth of the branch. The zooecial tubes of the axial region curve abruptly into the narrow peripheral region, and the zooecia are oblique at the periphery. In the axial region, radius 0.65 mm., the zooecial walls are thin, 0.06 mm., and broadly flexuous; they thicken to 0.4 mm. in the peripheral region, which has a radius of 0.52 mm. The zooecial walls of the peripheral region are finely granular. Sparsely distributed straight diaphragms occur in the axial region 2 to 3 tube diameters apart, in a zooecium 0.13 mm. diameter. In the narrow peripheral region diaphragms are more abundant, 5-6 per zooecium, and are placed two-thirds of a tube diameter apart. In addition globose cystiphragms generally line the zooecial walls and form single overlapping series along the sides of the zooecial tubes and are linked by straight diaphragms; there are 4-5 cystiphragms per zooecium (Pl. 2, fig. 4).

Discussion: Homotrypa? sp. *B*. most closely resembles *H. minnesotensis* Ulrich, 1886, *Phylloporina* beds, St. Paul, Minnesota, Black River age. However, examination of the type material of *H. minnesotensis* reveals that the periphery of the zoarium is lacking, and that the peripheral region is wider than originally described, and possibly in this incomplete specimen not all the structures were observed. The Australian species differs in possessing smaller zoarial branches, more numerous acanthopores, and sparsely distributed diaphragms in the axial region. The two species are similar in possessing long zooecial tubes in the axial region, numerous diaphragms and cystiphragms in the peripheral region, and oblique zooecial openings at the periphery.

Remarks: Homotrypa? sp. *B*. occurs in limestone mapped by early workers as part of the ?Middle Devonian Murrumbidgee "Series". Because this thick sequence of limestone and fine-grained siliceous rocks has not been defined in accordance with the Australian Code of Stratigraphical Nomenclature, and has been correlated by lithology, the Middle Devonian age for the limestone outcropping along the Goodradigbee River is only tentative.

No formal name is given to the species until more material is available for study of the microstructure of the zooecial walls in the peripheral region. The granular structure of the zooecial walls in the peripheral region may result from silicification of the outer zoarial surface of the specimen examined. *Homotrypa?* sp. *B*. is questionably referred to the genus *Homotrypa*, but it is doubtful if the range of this genus, known only from the Ordovician and Silurian, should be extended to the Devonian.

Genus ORBIGNYELLA Ulrich & Bassler, 1905

Type species (by original designation): *Orbignyella sublamellosa* Ulrich & Bassler, p. 19, pl. 6, figs. 7-9.

Diagnosis: Lamellar zoarium with polygonal thin-walled zooecia with distinct acanthopores, and straight and curved diaphragms.

Range: Ordovician, Silurian, ?Devonian.

This diagnosis embraces discussions by Ulrich & Bassler (1905), and Bassler (1953).

ORBIGNYELLA BOONDERENSIS sp. nov.

(Pl. 3, figs. 1, 3, 6.)

Holotype: U.S.G.D. 9245. South-east corner of Large Flat, fifty feet above the base of the shale and limestone at Cliefden Caves. Cliefden Caves Limestone. Middle Ordovician. Sample is a calcarenite.

Diagnosis: A species of *Orbignyella* with small zooecia, 0.30 mm. diameter, thin zooecial walls, small distinct acanthopores, and 8 or more closely spaced diaphragms in the outer peripheral region.

Description: Subhemispherical laminar zoarium attached to a tabulate coral; thickness of laminae variable, average 6 mm. The zoarial fragment is 2 cm. across and 1 cm. high.

In tangential sections the subpolygonal zooecial orifices, 0.30 mm. in diameter, are enclosed by narrow zooecial walls, which are pierced by small distinct acanthopores, 0.01 mm. in diameter; 6½ zooecia occur in 1.0 mm. The laminate zooecial walls appear divided by fine granular lines under low magnification, but this division is not distinct under high magnification. The width of zooecial walls is 0.04 to 0.06 mm. Acanthopores number about eight per zooecium and occur at the junctions and in the outer part of the zooecial walls. An occasional small oblong cell occurs at the junction of the zooecial walls. Slightly larger zooecia, 0.39 mm. diameter, form small clusters which possess slightly wider zooecial walls, 0.05 mm. wide, with acanthopores 0.04 mm. in diameter.

In longitudinal section the zooecia initially possess only slight curvature, but as they pass upwards they quickly swing at right angles to the original direction of growth. The slightly tenuous zooecial tubes of the axial region, diameter 0.03 mm., are crossed by straight diaphragms 0.07 to 0.10 mm. apart. In the more distal region of the zoarium the zooecial walls thicken and the zooecial tubes widen slightly. Straight diaphragms are more abundant where the zooecia curve laterally with respect to the original direction of growth, and near the zooecial openings. In this region some oblique convex or concave diaphragms, 4 in 0.13 mm., also occur. Convexly curved incomplete diaphragms, simulating cystiphragms, also occur in the peripheral region and in places form a herring-bone pattern by the interlocking of two vertical series. Overgrowths with narrow proximal regions and numerous diaphragms in the peripheral regions are present. In the peripheral region, the inner parts of the zooecial walls consist of steeply inclined laminae. The laminae of adjacent walls abut abruptly in the narrow irregular outer part of the zooecial walls.

Discussion: Orbignyella boonderensis has a zooecial wall structure and other skeletal microstructures similar to those of the type species of *Orbignyella, O. sublamellosa* Ulrich & Bassler. In both species both complete and incomplete diaphragms occur. However, in *O. sublamellosa* these structures are very sparsely developed. In *O. sublamellosa* the diaphragms are commonly convex distally if they possess any curvature. Small cystose structures appear to be eccentrically placed on the diaphragms of *O. sublamellosa,* but their relation to the diaphragms is not known. The Australian species is not comparable with any previously described species.

Orbignyella boonderensis derives its specific name from the property "Boonderoo" where the type material was collected.

Genus Mesotrypa Ulrich, 1893

Mesotrypa Ulrich, 1893, Geology of Minnesota, 3, 257.

Type species (by original designation): *Diplotrypa infida* Ulrich, 1886, *14th Ann. Rep. geol. nat. Hist. Surv. Minnesota,* p. 88.

Diagnosis: "Zoaria hemispheric, conical, or discoidal, generally free, with the lower surface covered by an epitheca. Zooecial tubes prismatic or cylindrical, more or less separated from each other by angular mesopores; internally with oblique and sometimes funnel-shaped diaphragms, that often simulate and probably are to be regarded as peculiarly modified cystiphragms. Mesopores becoming smaller with age, intersected by numerous diaphragms. Acanthopores generally present, sometimes of large size." (Ulrich, 1893.)

Range: Ordovician.

Mesotrypa sp. a
(Pl. 3, fig. 2.)

Material: U.S.G.D. 11405 and U.S.G.D. 11441. Locality 7, Portion 289, Parish of Bowan. Bowan Park Limestone. Middle or Upper Ordovician. Specimens in a coquina.

Description: Small zoarial fragments 4 mm. long. In deep tangential sections, circular zooecial orifices, 0.16 mm. to 0.22 mm. in diameter, are seen to be separated by thin zooecial walls. Approximately 4 acanthopores per zooecium occur either at the junctions or in the outer part of the zooecial walls. A single series of mesopores occurs between the zooecia but does not completely isolate them. Both the zooecia and mesopores are crossed by diaphragms in the peripheral region. The diaphragms in the zooecia may in some specimens be strongly curved.

Discussion: The skeletal miscrostructures of the axial region could not be determined, and hence the species could not be identified, from the small amount of material available.

Family TREMATOPORIDAE Miller, 1889

The numerous and different diagnoses proposed for this family indicate its uncertain taxonomic status. It is generally characterized by the absence of particular structures of other families and provides a haven for a number of genera possessing a wide variety of structures.

Genus BATOSTOMA Ulrich, 1882

Batostoma Ulrich, 1882, *J. Cincinnati Soc. nat. Hist.*, 5 (1), 154.

Type species (designated by Ulrich, 1890, p. 379): *Monticulipora implicata* Nicholson, 1881, p. 147, pl. 2, figs. 7-7e.

The characters of this genus are enumerated by Ulrich (1893, p. 288).

"Zoaria irregularly ramose, with a large basal expansion. Zooecial walls thin, and irregularly flexuous in the axial region, more or less thickened in the peripheral. In the most typical species the walls are irregularly ovate, thick and ring-like in tangential sections, with neighbouring zooecia in contact only at limited points, the mesopores numerous, closed at the surface and irregular in shape and size, and the acanthopores abundant and with a larger central cavity than usual. Species vary from these to forms having polygonal, thin-walled zooecia and very few mesopores and acanthopores. Diaphragms strong, horizontal, complete, few or wanting in the axial, more or less abundant in the peripheral region. In the axial region of transverse sections the tubes are divisible into 2 sets, one larger than the other."

Range: Ordovician.

BATOSTOMA TUBULIFERUM sp. nov.

(Pl. 3, figs. 4, 5, 7; Pl. 4, figs. 1, 2; text-figs. 3, 4.)

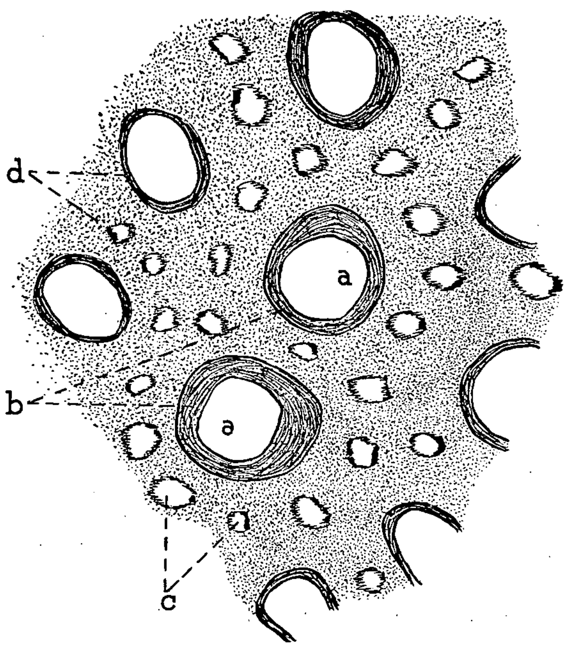
Holotype: U.S.G.D. 10415. Fossil Hill, Portion 3, Parish of Malongulli, New South Wales; specimens occur 60 to 70 feet above the *Trimerella* horizon. Cliefden Caves Limestone. Middle Ordovician. Samples are calcarenite having bryozoan colonies as the dominant component, occasional disarticulated brachiopod shells, and algae; lutite matrix, well sorted, composed of calcite, chlorite, and a little quartz.

Paratypes: Paratype A, U.S.G.D. 10416; Paratype B, U.S.G.D. 10417. Same locality and horizon as holotype. Cliefden Caves Limestone. Middle Ordovician. Samples are calcarenite.

Diagnosis: A species of *Batostoma* having 10 to 16 distinct acanthopores encircling small zooecial orifices. Restricted development of 2-4 diaphragms in the peripheral region.

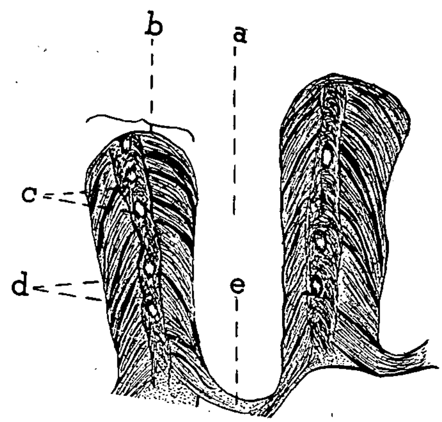
Description: Zoarial fragments, up to 1.5 cm. long, possess subcylindrical bifurcating branches, which range from 2.3 mm. to 4.0 mm. diameter. Maculae and monticules were not observed.

The sub-circular zooecial orifices lack orientation along the zoarial branch and are surrounded by numerous acanthopores; lengthwise 12 zooecia occupy 2.5 mm. The diameter of the zooecial orifice averages 0.14 mm. by 0.10 mm., and the inner part of the zooecial wall is lined with dark concentric laminae. Acanthopores are very prominent at the periphery, occuping the full width of the outer part of the zooecial walls but not encroaching upon the inner part. Adjacent zooecial walls are completely amalgamate and lack dark median lines. 10-16 acanthopores encircle a zooecium and in very shallow tangential sections form polygons around the zooecial orifices. In such shallow tangential sections the diameter of the acanthopore is 0.04 mm., which decreases to less than 0.03 mm. in deeper tangential sections. The tubular nature of the acanthopores is well-defined. A few mesopores are present (Text-fig. 3).



TEXT-FIGURE 3.

Tangential section of *Batostoma tubuliferum* sp. nov., U.S.G.D. 10415; *a*, zooecial orifice; *b*, inner part of zooecial wall composed of concentric laminae; *c*, acanthopore. X120.



TEXT-FIGURE 4.

Part of oblique longitudinal section of *B. tubuliferum* U.S.G.D. 10415; *a*, zooecial tube cut obliquely; *b*, zooecial wall; *c*, steeply curved laminae; *d*, acanthopore cut obliquely; *e*, diaphragm. X115.

The thin zooecial walls are slightly crenulate in the axial region, gently sloping from the axis of growth and curving gently into a narrow peripheral region, where they are considerably thickened. The peripheral region is 1/6th the diameter of the zoarium. The ratio of the radius of the peripheral region to that of the axial region is 1/2 where the zoarial branch diameter is 3.1 mm. Zooecial orifices are direct or slightly oblique. Zooecial walls are 0.1 mm. thick in the peripheral region, and 0.005 mm. thick in the axial region. Walls of the peripheral region possess a laminated structure which is crossed by acanthopores. Diaphragms are absent in the axial region and very sparse in the subperipheral region. They are generally lacking towards the orifice and so occupy a restricted area near the beginning of the peripheral region. There are 2-4 diaphragms per zooecium, and each diaphragm is separated by about 0.2 mm., that is 1½ times the zooecial diameter (Text-fig. 4).

Discussion: Batostoma tubuliferum is most similar to the American species *Batostoma minnesotense* Ulrich in possessing crenulate zooecial walls in the axial region, in the sparse distribution of diaphragms, and in the abundance of acanthopores. It differs from *B. minnesotense* in possessing less crenulate walls in the axial region, in the restriction of the few diaphragms to the early part of the peripheral region, and in the greater abundance of distinct acanthopores surrounding smaller zooecia on more slender branches.

Remarks: The name of this new species is derived from the Latin diminutive for pipe, *tubulus*, and refers to the numerous acanthopores surrounding the zooecial orifices. *Batostoma tubuliferum* occurs in a narrow band, composed almost entirely of this bryozoan species, on Fossil Hill, approximately sixty-five feet above the *Trimerella* horizon.

BATOSTOMA sp. A.

(Pl. 5, fig. 2.)

Batostoma sp. nov., Crockford, 1943b, *Proc. Linn. Soc. N.S.W.*, 68, 149.

Material: U.S.G.D. 494, figured by Crockford (1943). The locality is not accurately recorded but is believed to be either Middle Valley or George Gill Range, Macdonnell Ranges, Central Australia. Larapintine "Series". ?Upper Ordovician.

Description: A slender cylindrical branch, 1 cm. long and 1.33 mm. wide, expanding to 2.3 mm. in the region of bifurcation.

Zooecial orifices are subpolygonal, 0.22 mm. longitudinally and 0.11 mm. laterally. They are enclosed by narrow zooecial walls measuring 0.04 mm. longitudinally and 0.03 mm. laterally. These zooecial walls are pierced by small acanthopores 0.015 mm. in diameter and about 9 per zooecium. Occasional small tabulate mesopores, 0.06 mm. in diameter, occur in the zooecial walls. Approximately 3 diaphragms occur in each short mesopore.

The long zooecial tubes, diameter 0.13 mm. in the axial region, grow steeply from the axis of growth of the branch and are rarely crossed by a straight complete diaphragm. Towards the peripheral region the zooecia curve gradually towards the horizontal, bending more abruptly in the outer 0.02 mm., which forms an unusually narrow peripheral region. It is in this narrow outer region that the zooecial walls thicken (Pl. 5, fig. 2).

The zooecia expand gradually from 0.13 mm. in the axial region to 0.22 by 0.11 mm. in the peripheral region. One to three diaphragms occur in the very distal peripheral region and seal the oblique orifices; diaphragms are approximately 0.5 mm. apart.

Discussion: Batostoma sp. *A*. possesses an unusually narrow peripheral region; nevertheless all the features of the peripheral region of *Batostoma* are developed. The narrow peripheral region, the few short mesopores, the small acanthopores situated in thin zooecial walls, and the sparse distribution of diaphragms likens it to *Batostoma magnoporum* Ulrich, Middle Ordovician, Minneapolis, Minnesota, as described in the literature. But thin sections of the holotype of *B. magnoporum* reveal that the very restricted peripheral region has resulted from abrasion of the specimen, and this is particularly noticeable in the longitudinal section.

Remarks: As the exact locality for this Central Australian material is not known, the description serves only as a record of bryozoan occurrence in Central Australia. Hence the species is not given a formal name, although it is a distinct species.

BATOSTOMA sp. B.

(Pl. 5, figs. 1, 4.)

Material: U.S.G.D. 11421 and U.S.G.D. 11423. Locality 8, Portion 289, Parish of Bowan. Bowan Park Limestone. Middle or Upper Ordovician. Coquina.

Description: The oblique longitudinal section of a cylindrical zoarial fragment, U.S.G.D. 11421, is 8 mm. long and 2.5 mm. in diameter. The zooecial tubes curve gently to the periphery, where the zooecial walls are slightly thickened. Acanthopores extend into the peripheral region and average at least 4 per zooecium. A few mesopores are present. Diaphragms, sparsely distributed in the subperipheral region and about 0.26 mm. apart (approximately 5 diaphragms per zooecium), are more abundant in the peripheral region, being 0.06 to 0.13 mm. apart (5-6 diaphragms per zooecium). The diameter of the zooecial tube is 0.16 mm. (Pl. 5, fig. 4).

A transverse section, U.S.G.D. 11423, indicates similar features (Pl. 5. fig. 1).

Discussion: This species, although it has all the features of *Batostoma,* does not appear closely comparable with any described species. It is similar to *Batostoma fertile* Ulrich, Middle Ordovician, Minneapolis, Minnesota, in possessing subcircular openings, restricted development of mesopores and acanthopores, and slender zooecial walls in the peripheral region. It differs from *B. fertile* in possessing very small zooecia situated on slender branches and sparse distribution of mesopores and diaphragms. When more material is found this form will probably prove to be a new species.

Remarks: Batostoma sp. *B.* is not abundant in the Bowan Park Limestone; the two specimens noted above are the only fragments so far found in extensive collections.

BATOSTOMA sp. C.

(Pl. 6, fig. 1.)

Material: U.T.G.D. 24796. Smelter's Quarry, Zeehan, Tasmania. Gordon Limestone. Middle to Upper Ordovician. Specimens in a calcareous shale.

Diagnosis: A species of *Batostoma* with small acanthopores sparsely distributed (maximum 6 per zooecium) around subcircular zooecial openings. Long gently curved incomplete diaphragms common in peripheral region.

Description: Subcylindrical zoarium; irregularly conical fragment with a diameter varying from 5 mm. to 8 mm. Monticules not observed.

The zooecial openings vary from polygonal to subcircular and lack orientation; 8 zooecial openings are present in 3 mm. Zooecial openings average 0.26 x 0.34 mm. in diameter. In thick tangential sections the walls of adjacent zooecia are separated by dark median lines. Acanthopores vary in number, as many as 6 per zooecium, and occupy the junctions of zooecial walls; they are also sparsely distributed along the sides of the zooecial walls. All appear as small dark circular bands enclosing clear calcite axes. Concentric laminae lining the inner parts of the zooecial tubes are very sparse. Mesopores are few, smaller than the zooecial tubes, and are located in the outer part of the zooecial walls. In tangential sections an incomplete diaphragm is occasionally seen curving across part of a zooecial orifice.

The zooecial tubes gently curve outward from the axis of growth and the zooecial walls thicken gradually from the subperipheral region towards the periphery. The walls are 0.005 mm. to 0.01 mm. thick in the axial region, increasing to 0.04 mm. in the peripheral region. Diaphragms, which are present in the outer part of the axial and peripheral regions, are abundant and are straight or slightly curved, convex to the periphery. In the subperipheral region the diaphragms are about 0.26 mm. apart, and in the peripheral region 0.05 to 0.07 mm. apart. Incomplete diaphragms are relatively abundant in the peripheral region and bend convexly downwards from the walls on to the preceding diaphragm. The peripheral region is not as wide as the axial region: the ratio of their radii is 2/3 to 7/10. In transverse sections with a radius of 3.4 mm. the radius of the peripheral region is 1.4 mm. and the radius of the axial region is 2 mm.

Discussion: *Batostoma* sp. *C.* differs from *B. winchelli* (Ulrich) (the only comparable species), of the Bromide formation, Arbuckle Mountains, and the Decorah district, Minnesota, in possessing larger zooecia, and acanthopores distributed only sparsely around the zooecial orifices. In all features the two species are very similar, particularly with respect to the spacing of the diaphragms in both the axial and peripheral regions and the presence of incomplete diaphragms in the peripheral region.

Remarks: Ulrich (1893) discussed variation in the species *Batostoma winchelli* and indicated the development of the zooecial tubes at various growth stages. Thus the young forms possess thin polygonal walls with acanthopores at the junctions of the walls; mesopores are not abundant. The zooecial walls are thin in the axial region and pass into the peripheral region without marked thickening. Complete diaphragms are present in both the axial and peripheral regions.

In mature specimens the zooecial walls thicken in the peripheral region and tangential sections show well developed bands of concentric laminae forming the inner part of the zooecial walls. Curved incomplete diaphragms are well developed in the peripheral region, and although this feature is not specifically recorded in discussions regarding the genus or type species, it does appear in a number of illustrations of species attributed to the genus. In senile forms the restricted zooecial orifices are subcircular, as a result of increased thickening of the zooecial walls. In *Batostoma* sp. *C.* the presence of abundant diaphragms, complete and incomplete, and subcircular zooecia, rarely adjoined by mesopores, suggests that this material is part of the early mature growth stage of a colony. The absence of strongly thickened zooecial walls in the peripheral region supports this observation.

Ulrich (1893, p. 299) erected the genus *Hemiphragma* to contain species of *Batostoma* in which diaphragms are short, incomplete structures. But he retained *B. winchelli* in the genus *Batostoma*, although it possesses long curved incomplete diaphragms at some stages of zoarial growth. The taxonomic characters that distinguish *Hemiphragma* from *Batostoma* require more complete definition.

Insufficient illustrations of the species do not permit specific designation at this time.

Family AMPLEXOPORIDAE Miller, 1889

Diagnosis: Zoarium ramose or discoidal or rarely bifoliate; zooecia simple prismatic tubes with a well-marked divisional line between the adjacent zooecial walls; diaphragms present; mesopores absent; acanthopores abundant.

This diagnosis comprises diagnoses by Ulrich (1886), Nickles & Bassler (1900), and Bassler (1953).

Genus AMPLEXOPORA Ulrich, 1882

Amplexopora Ulrich 1882, *J. Cincinnati Soc. nat. Hist.*, 5 (1), 154.

Type species (designated by Ulrich, 1882, p. 255): *Amplexopora cingulata* Ulrich, 1882, p. 254-256, pl. 11, figs. 5-5c.

Diagnosis: Zoarium ramose or subramose with a smooth or monticulose surface. Thin-walled zooecial walls in the axial region, considerably thickened zooecial walls in the peripheral region. Acanthopores present, sometimes strongly indenting the inner part of the zooecial walls. Diaphragms complete, occurring in the axial and peripheral regions, commonly straight but occasionally broadly convex so as to simulate cystiphragms.

Range: Ordovician.

This diagnosis embraces the diagnoses and descriptions of Ulrich (1882) and Cumings (1908).

Amplexopora queenstownensis sp. nov.

(Pl. 4, fig. 4; Pl. 5, figs. 3, 5.)

Holotype: U.T.G.D. 24110-9. Ridge beside railway line near the Oval, Queenstown, Tasmania. Gordon Limestone. Middle or Upper Ordovician. Specimens in a calcareous shale.

Diagnosis: Species of *Amplexopora* with small zooecial openings, 0.26 to 0.29 mm. in diameter, at least 8 small acanthopores per zooecium, and 6 to 7 diaphragms in the peripheral region of the zooecial tubes.

Description: The zoaria are cylindrical stems, curving irregularly and enclosing a stictoporid; diameter 5 mm., and length of a fragment 16 mm. Polygonal zooecial openings, 0.26 to 0.29 mm. in diameter, appear to cluster into small groups of larger and smaller zooecia suggestive of monticules; in the clusters of larger zooecia there are 4 zooecia in 1.0 mm. At the periphery the narrow zooecial walls are pierced by slender acanthopores, at least 8 per zooecium, whose outline may be indefinite. An occasional smaller rectangular cell occurs at the junction of the zooecial walls (Pl. 5, fig. 5).

The zooecia curve steeply from the axis of growth and pass into the peripheral region with lateral curvature. The zooecial walls are slightly flexuous, and thicken gradually from 0.01 mm. in the axial region to a maximum of 0.10 mm. in the peripheral region. Diaphragms are $1\frac{1}{2}$ tube diameters apart in the subperipheral region, and half a tube diameter (i.e., 0.13 mm.) apart in the peripheral region. The diaphragms are straight or slightly concave in the peripheral region, and, rarely, strongly convex in the subperipheral region (Pl. 5, fig. 3).

Discussion: Amplexopora queenstownensis most closely resembles *A. pustulosa* Ulrich, 1890, Waynesville member, Richmondian, Ohio, the only comparable species. It differs in possessing zooecia with more variable diameters, and more diaphragms and acanthopores. In the general arrangement of the skeletal microstructures the two species are similar.

Remarks: A. queenstownensis takes its name from Queenstown, Tasmania, where the type material was collected.

Other material: This includes fragmentary material (U.T.G.D. 20334-5) from the Gordon Limestone, Smelters Quarry, Zeehan, Tasmania. Middle to Upper Ordovician.

Genus Discotrypa Ulrich, 1882

Discotrypa Ulrich, 1882, *J. Cincinnati Soc. nat. Hist.*, 5, 155.

Type species (designated by Ulrich, 1883, p. 163, 164): *Chaetetes elegans* Ulrich, 1879, p. 130, pl. 12, figs. 12, 12a.

Diagnosis: "Zoarium a thin, free, or parasitic circular expansion; surface smooth, or with low, broad monticules; zooecia thin-walled, direct; apertures hexagonal or rhomboidal, very regular in their arrangement, decreasing in size from the centres of the monticules outward; neither mesopores nor acanthopores present." (Nickles & Bassler, 1900, p. 30.)

DISCOTRYPA? sp. A.
(Pl. 6, fig. 4.)

Material: C.P.C. 969. One mile at 104° from Mount Percy, Leopold Downs Station, Fitzroy Basin, Western Australia. Fairfield Beds. Upper Devonian, Zone of *Avonia proteus.*

Description: This multilaminar incrustation, consisting of at least two laminae, envelopes a hollow ramose zoarium of *Coelocaulis maculosa* sp. nov.; the zoarial fragment is 3.5 mm. to 4.5 mm. across, and laminae are approximately 0.5 mm. thick (Pl. 6, fig. 4). Slightly elevated monticules have unusually thickened zooecial walls, and two, or possibly three, smaller zooecia occur toward the apex of the monticule. The monticules appear to be arranged in an alternating linear series with approximately 12 zooecia between adjacent monticules; the longitudinal distance between monticules is 2.1 mm. and the lateral distance 2.0 mm.

Small polygonal zooecial openings are 0.17 x 0.13 mm. in the intramonticular areas and increase to 0.17 x 0.17 mm. in monticules; 8-9 zooecia occur in 2 mm. in the intramonticular areas. In tangential sections the granular zooecial walls, 0.03 to 0.04 mm. wide, appear to have light granular outer parts lined on each side by dark granular inner parts. Acanthopores are absent.

Remarks: As the nature of the longitudinal section of the species is not known, not all zoarial features are available for comparison with other described material. The unusual occurrence of smaller zooecia at the apex of the monticule differentiates this species from most other species attributed to the genus *Discotrypa* Ulrich, 1882. Generally the zooecial openings decrease in size from the centres of the monticules outward. But Duncan (1939) notes that a few small tubes occur in monticules in the Devonian species *D. vera* Duncan, 1939, which possesses larger zooecia than the Australian species.

Family HETEROTRYPIDAE Ulrich, 1890

Diagnosis: Zoarium frondescent, ramose, incrusting or massive; moderately thin-walled polygonal zooecia, with diaphragms and no cystiphragms; tabulate mesopores commonly present; clearly defined acanthopores, sometimes of large size.

This diagnosis embraces the diagnoses of Ulrich (1890), Nickles & Bassler (1900), Ulrich & Bassler (1905), Duncan (1939), and Bassler (1953).

Many authors have regarded the microstructure of the zooecial wall in the Heterotrypidae as a characteristic feature. But the moderately wide, laminate outer amalgamate part of the zooecial walls, bordered on each side by concentric laminae of the inner part of the zooecial walls, is a basic structure of many trepostomes, and is also present in certain cryptostome genera of the Rhabdomesonidae. The Family Heterotrypidae as it is now composed contains genera with many types of wall structure.

Genus HETEROTRYPA Nicholson, 1879

Type species (designated by Nicholson, 1879, p. 291): *Monticulipora mammulata* d'Orbigny, 1850, p. 25.

Diagnosis: Zoarium frondescent, or ramose; zooecia prismatic, sometimes subcylindrical. Zooecial openings angular, subcircular or slightly petaloid. Zooecial walls moderately thin. Tabulate mesopores vary in number, commonly abundant. Acanthopores small, generally numerous. Diaphragms well developed, generally straight; occasionally the diaphragms are concave or recurved and are more abundant in the peripheral region than in the axial region.

This diagnosis embraces descriptions by Ulrich (1883 and 1890), and Nickles & Bassler (1900). The generic concept of *Heterotrypa* is greatly confused as the skeletal microstructures of the type material of *Monticulipora mammulata* are not known and the concept of the genus *Heterotrypa* has been based on material other than the type material.

HETEROTRYPA HUMENSIS sp. nov.

(Pl. 4, fig. 3.)

Holotype: A.M. F46926. Black Bog Creek, Hatton's Corner, Yass, New South Wales. ?Barrandella Shale. Middle Silurian.

Diagnosis: Species of *Heterotrypa* having numerous mesopores almost isolating the zooecial openings; thin zooecial walls separating zooecial tubes which have diaphragms in both the axial and peripheral regions; few but distinct acanthopores.

Description: The zoaria are broad and laminar; a zoarial fragment 2 cm. high is 2 cm. wide. Monticules are present and consist of aggregations of large zooecia and a great abundance of mesopores.

In tangential sections zooecial openings are subcircular, 0.14 mm. x 0.18 mm., to 0.18 mm. x 0.18 mm.; the large zooecia in the monticules have a maximum diameter of 0.26 mm. Six zooecia occur in 1.44 mm. Angular mesopores are numerous and almost isolate the zooecia, which are in contact at three or four points around a zooecial orifice (Pl. 4, fig. 3). The mesopores range in width from 0.04 to 0.09 mm. in shallow tangential sections; in deeper sections the mesopores are slightly wider. Acanthopores, 0.03 mm. to 0.04 mm., possess wide clear calcite axes and dark walls, and commonly indent the narrow zooecial walls. They occur at the junctions of zooecial walls separating zooecia and mesopores. The width of the zooecial walls in the peripheral region is 0.01 mm.

In longitudinal sections the zooecia are directed parallel to the axis of growth in both the axial and peripheral regions, which are not sharply differentiated. The narrow, broadly flexuous zooecial walls are 0.01 mm. wide. Straight complete diaphragms occur in the late axial and peripheral regions of the zooecia, and in the mesopores. In the outer part of the axial region, the diaphragms are three tube diameters apart; they increase in abundance towards the periphery, being two tube diameters apart for a distance of 1 mm., and less than one diameter apart in the outer 1.6 mm. of the peripheral region, which is occupied by 9 closely spaced diaphragms. The mesopores also contain abundant closely spaced diaphragms.

Discussion: Heterotrypa humensis most closely resembles the Ordovician species *H. lobata* (Cumings, 1902), from the Fairmont member, Maysvillian, Indiana, in possessing circular zooecial orifices of similar arrangement and dimensions, numerous mesopores, and few acanthopores. *H. humensis* differs from *H. lobata* in the absence of slightly beaded zooecial walls and in possessing monticules with zooecia larger than average.

Remarks: The specific name is taken from the Parish of Hume. where the type material was collected.

HETEROTRYPA PONTENSIS sp. nov.

(Pl. 6, figs. 2, 5, 6; Pl. 7, fig. 1, 3.)

Holotype: U.S.G.D. 10440. Locality WR33680, Parish of Ponto, Terrabella Road, 4½ miles west of Wellington. Lower or Middle Devonian. Specimens in a calcarenite.

Diagnosis: Species of *Heterotrypa* having circular zooecia, 1-2 tabulate mesopores per zooecium, 5-6 acanthopores per zooecium, and abundant diaphragms throughout the zooecia and mesopores. The diaphragms inflect the zooecial and mesopore walls.

Description: A broadly ramose zoarial fragment is 4 cm. long, 1 cm. wide, and at least 4 cm. high. Monticules occur as aggregations of four or more large zooecia with slightly thicker zooecial walls. The arrangement of monticules is not determinable as the zoarium is embedded in sediment.

In tangential sections zooecial orifices are subcircular to subpolygonal; their size ranges from 0.15 mm. x 0.20 mm., to 0.16 mm. x 0.20 mm.; there are 6 zooecia in 1.46 mm. The diameter of zooecia in the monticules is 0.22 mm. The zooecial orifices are separated by zooecial walls, averaging 0.03 mm. in width, and increasing to 0.05 mm. or 0.06 mm. in the monticules. Generally one or two mesopores, diameter 0.05 mm. to 0.08 mm., occur between adjacent zooecia, but they may be absent over small areas. The acanthopores have dark concentric laminae around granular calcite axes and are located at the junctions of the zooecial walls. The acanthopores average 0.03 mm. in diameter and only a few possess distinctly clear calcite axes. Rarely a large acanthopore 0.06 mm. in diameter occurs at the junctions of the mesopore and zooecial walls (Pl. 6, fig. 6; Pl. 7, fig. 1).

In longitudinal sections the axial and peripheral regions are not markedly different. The zooecia grow from the basal lamina almost parallel to the axis of growth of the zoarial branches and retain this upright direction for about 3 mm. before broadly curving laterally for another 3 mm. The zooecial openings are slightly oblique at the periphery. In the peripheral region the zooecial walls are composed of distally convex laminae and the walls thicken intermittently (Pl. 6, fig. 5).

In the axial region the zooecial walls are less than 0.01 mm. thick. The steeply inclined laminae of the acanthopore walls enclose granular calcitic axes and pierce the zooecial walls so as to obscure their skeletal microstructures. Flat, complete diaphragms are numerous throughout the zooecial tubes; in the axial region diaphragms are separated by a distance of three tube diameters, and in the peripheral region the diaphragms are separated by one to two, rarely three, tube diameters. In the mesopores the diaphragms are one tube diameter apart. The mesopores appear to rise from the basal lamina, and their diaphragms indent the zooecial walls (Pl. 6, figs. 2, 5).

Discussion: Heterotrypa pontensis most closely resembles the Ordovician species *H. solitaria* Ulrich, 1883, from the Fairmont member, Maysvillian, Covington, Kentucky. Both species possess monticules consisting of aggregations of large zooecia, few mesopores, acanthopores at the junctions of the zooecial walls, gently curved zooecia, and slightly thickened zooecial walls in the peripheral region. The Australian species differs from *H. solitaria* in possessing a ramose zoarium, smaller zooecial openings in both monticule and intramonticule spaces, and diaphragms in the axial region.

Remarks: The species takes its name from the Parish of Ponto, where the type material was collected.

Other material: Specimen U.S.G.D. 10448 from the same locality and horizon possesses features similar to *H. pontensis;* diaphragms are slightly more numerous, 9-10 per zooecium, and an occasional diaphragm is convexly curved.

Genus Cyphotrypa Ulrich & Bassler, 1905

Cyphotrypa Ulrich & Bassler, 1905, 47, p. 24, 29.

Type species (designated by Ulrich & Bassler, 1905): *Leptotrypa acervulosa* Ulrich, 1893, p. 318, pl. 27, figs. 24, 25.

Diagnosis: Massive Heterotrypidae. Zooecial walls thin; zooecia prismatic with numerous well-developed diaphragms; mesopores wanting, acanthopores well developed.

The diagnosis is based on the discussion by Ulrich & Bassler (1905).

Cyphotrypa lamellosa sp. nov.

(Pl. 6, fig. 3; Pl. 7, fig. 2.)

Holotype: U.S.G.D. 10444. 7½ miles at 325° from Molong Railway Station, New South Wales. ?Garra Beds. ?Middle Devonian.

Diagnosis: Species of *Cyphotrypa* having an incrusting zoarium, small zooecial orifices, 0.17 to 0.23 mm. in diameter, acanthopores at the junctions of the zooecial walls, and 4 to 5 diaphragms per zooecium.

Description: Incrusting sub-hemispherical zoaria, approximately 5 mm. in diameter. The polygonal zooecial openings vary in diameter, the larger zooecia forming indistinct monticules. The larger zooecia are 0.28 mm. to 0.39 mm. in diameter, and the smaller zooecia 0.17 mm. to 0.23 mm. Mesopores are absent, but an occasional smaller cell, 0.05 mm. to 0.08 mm. in diameter, is present. Acanthopores occur as small dark granular masses, 0.03 mm. diameter, with indistinct walls and lacking clear calcite axes; they are situated at the junctions of the zooecial walls (Pl. 7, fig. 2).

In longitudinal sections the zooecia extend in an upright direction from the basal lamina for a distance of 2.6 mm. Diaphragms are flat and are separated by a distance greater than the diameter of a zooecial tube; they tend to crowd together in a narrow region, 0.07 mm. from a zooecial orifice. In a zooecium 2.34 mm. long, and 0.26 mm. in diameter, there are no diaphragms for the first 0.91 mm., 4 diaphragms within the next 0.78 mm., and none in the remaining 0.65 mm. The thickness of the zooecial walls is uniform (0.03 mm.) throughout their length; they consist of dark granular material in which skeletal microstructure is not discernible (Pl. 6, fig. 3).

Discussion: Cyphotrypa lamellosa most closely resembles the Silurian species *C. expanda* Bassler, 1923, Tonololoway limestone, Silurian, Maryland. Both species are slender incrustations having zooecial openings of similar measurements and arrangement, and possessing acanthopores situated at the junction of the zooecial walls. *C. lamellosa* differs from *C. expanda* in possessing fewer diaphragms and a thicker zoarium.

Remarks: The species name refers to the narrow incrusting zoarium; *lamella*, Latin, thin plate.

CYPHOTRYPA MURRUMBIDGENSIS sp. nov.

(Pl. 7, fig. 5; Pl. 8, figs. 1, 4.)

Holotype: U.S.G.D. 11436. Devil's Elbow, above the Burrinjuck Dam, Murrumbidgee River, New South Wales. Murrumbidgee Series. ?Middle Devonian. Specimens in a calcilutite.

Diagnosis: Species of *Cyphotrypa* having large zooecia in the monticules, zooecial walls gently curved, and diaphragms developed in arcuate rows across the subperipheral and peripheral regions of the zoaria.

Description: Broad hemispherical zoaria; a zoarial fragment 3.5 cm. in diameter is 2.3 cm. high. Monticules consist of large zooecia, but their arrangement and spacing is not determinable from the material available.

Polygonal zooecial orifices vary in diameter, averaging 0.26 mm. x 0.22 mm., with an occasional larger zooecium of 0.26 mm. x 0.35 mm.; the monticules possess zooecia 0.45 x 0.35 mm. to 0.44 x 0.41 mm. 7 to 8 zooecia occur in 2 mm. The exceptionally narrow zooecial walls vary slightly in thickness in the peripheral region, and range from 0.005 mm. to 0.01 mm. Small indistinct acanthopores, 0.01 mm. in diameter and 5-6 per zooecium, occur at the junctions of the zooecial walls, and commonly possess clear calcite axes; mesopores are absent (Pl. 8, fig. 1).

In longitudinal sections the slender zooecia grow upright in the proximal region of the zoarium and gently curve in a broad arc to the periphery. The zooecia are almost uniform in diameter throughout their length, measuring 0.20 mm. in the axial region and 0.22 mm. in the peripheral region. The thin flexuous zooecial walls are 0.005 mm. to 0.01 mm. wide in the axial and peripheral regions. Diaphragms are lacking or sparsely distributed in the axial region, where an occasional diaphragm may be observed; in the subperipheral and peripheral regions the diaphragms tend to cluster at specific levels throughout the zoarium, producing an arcuate band across the zoarium. In some instances this band consists of only one diaphragm in each zooecium, and in others 2, or rarely 3, diaphragms cluster together. In the subperipheral region the levels are widely spaced, approximately 3.8 mm. apart, compacting to 2.4 mm. apart and then 0.5 mm. to 1.0 mm. apart in the distal part of the peripheral region. A few diaphragms occur between these levels in the axial region, and as the number increases in the peripheral region the distinctiveness of the levels is obscured. At the periphery 4-6 diaphragms cluster together in 1.3 mm. (Pl. 7, fig. 5).

Discussion: Cyphotrypa murrumbidgensis closely resembles *C. traversensis* Duncan, 1939, Genshaw Formation, Middle Devonian, Michigan, in possessing a sub-hemispherical zoarium, with acanthopores developed at the junction of the zooecial walls and abundant diaphragms in the peripheral region. It differs from *C. traversensis* as it lacks diaphragms in the axial region, and irregular thickening of the zooecial walls in the early peripheral region; and it has smaller, gently curving zooecia except in the monticules, where unusually large zooecia occur.

Remarks: The species takes its name from its type locality on the Murrumbidgee River, New South Wales.

Genus LEPTOTRYPA Ulrich, 1883

Leptotrypa Ulrich, 1883, p. 158, 159.

Type species (designated by Ulrich, 1883): *Leptotrypa minima* Ulrich, 1883, p. 159, pl. 6, figs. 2, 2a, 2b.

Diagnosis: Zoarium thin, incrusting, having thin-walled polygonal zooecia. No mesopores. Small acanthopores which generally occupy only the junctions of the zooecial walls. Zoarial surface with or without monticules, generally, however, showing more or less distinct groups of large zooecia. Diaphragms may be present but are not abundant.

This diagnosis draws on the diagnoses of Ulrich (1883), Ulrich & Bassler (1905), and Bassler (1911a).

LEPTOTRYPA sp. A.

(Pl. 7, fig. 4; Pl. 8, figs. 2, 3; Pl. 9, fig. 1.)

Material: U.S.G.D. 11435. Taemas; the exact locality is not known. ?Middle Devonian. Specimens in a calcilutite.

Diagnosis: Species of *Leptotrypa* having six to seven diaphragms per zooecium, and a grouping of two to three acanthopores at the junctions of the zooecial walls.

Description: An incrusting unilaminate zoarial expansion, 2 cm. long, 1 cm. wide, and 2.3 mm. high, occurring on a tabulate coral. Large and small zooecia appear to be selectively grouped.

The zooecial orifices are subpolygonal, 0.24 mm. to 0.32 mm. in diameter, and 6 in 1.5 mm. to 2.0 mm. (this measurement varies with the grouping of the zooecia). An occasional smaller cell, 0.03 mm. to 0.07 mm. wide and 0.21 mm. long, occurs at the junctions of zooecial walls. Acanthopores also occur at the junctions of zooecial walls and in tangential sections they appear as dark masses of concentric laminae. Six to eight acanthopores of variable diameter, 0.03 mm. to 0.04 mm., surround each zooecium, and two to three acanthopores may occur near the junction of the zooecial walls and encroach for a short distance along the sides of the zooecial walls (Pl. 8, fig. 3).

In longitudinal sections, zooecia initially are recumbent on the basal lamina and are inclined at 45° to the basal lamina for a distance of 0.47 mm. Then the zooecia curve gently to become upright at 1.90 mm. The zooecia expand and contract, slightly and irregularly, varying from 0.20 mm. to 0.24 mm. in diameter. Zooecial walls are 0.03 mm. thick in the axial region and 0.03 mm. to 0.06 mm. thick in the distal part of the peripheral region. They are composed of broadly curved, distally convex laminae in the peripheral region. Generally six to seven flat or slightly curved diaphragms occur in each zooecium, distributed at different levels in the zooecial tubes. They are three-quarters of a tube diameter apart in the recumbent region, half a tube diameter apart in the curved region, and one or one and one-third diameter apart in the upright section of a zooecial tube. In the distal region, 0.71 mm. from the periphery, two or rarely three diaphragms are very closely spaced at one-third of a tube diameter apart (Pl. 8, fig. 2).

Discussion: Leptotrypa sp. *A* may be compared with the imperfectly known species *L. calceola* (Miller & Dyer), 1878, Corryville member, Maysvillian, Cincinnati, Ohio, the only comparable species. It differs from *L. calceola* in possessing an incrusting zoarium and slightly smaller zooecia. The two species are similar in the development of diaphragms which increase in abundance from the proximal to the distal regions, and in the slight irregular expansion and contraction of the zooecial tube. The arrangement of acanthopores in *L. calceola* is not known.

Remarks: The exact locality of this material containing *Leptotrypa* sp. *A* is not known, and therefore no formal name has been given to this distinctive species.

Family STENOPORIDAE Waagen & Wentzel, 1886, rev. and emend. Duncan, 1949

Diagnosis: "Trepostomatous Bryozoa characterized by distinctly laminated, generally amalgamate zooecial walls. Zoaria of variable habit — ramose, incrusting, frondescent, and bifoliate.

"Stenoporoid genera distinguished typically by irregularly thickened walls in the mature region, the thickening being intermittent in primitive types and trending to conspicuous beading in advanced forms. Mesopores not abundant in most genera. Acanthopores commonly very abundant and conspicuous. Diaphragms generally complete in primitive forms; commonly perforated, incomplete, or lacking in more advanced genera.

"Leioclemoid genera characterized typically by rather uniformly thickened and comparatively thin zooecial walls in the mature region. Mesopores abundant, generally completely isolating the zooecia. Acanthopores generally abundant but, owing to the excessive number of mesopores, usually less conspicuous than in the stenoporoids. Diaphragms variable in occurrence and type; complete or absent in the mesopores; typically complete in the zooecia, but perforated or lacking in some genera and species." (Duncan, 1949, p. 130.)

The inclusion in the Stenoporidae by Duncan of many genera previously assigned to the Batostomellidae provides a more satisfactory classification of these Palaeozoic genera. The Batostomellidae contain many incompletely known genera, and the family occupies an uncertain taxonomic position.

Genus Percyopora nov.

Type species: Percyopora tubulata sp. nov.

Definition: Solid cylindrical stems having slender, strongly crenulate zooecial walls in the axial region, walls thickening irregularly in the subperipheral and peripheral regions. Broad curvature of the zooecial walls from the axial to the peripheral region. Acanthopores numerous and distinct piercing the zooecial walls. Laminae of the inner part of the zooecial walls are steeply inclined at 40° to the zooecial tube, and broad, distally convex laminae of adjacent zooecia intertongue in a broad amalgamate outer part.

Discussion: The new genus *Percyopora* is characterized by thin strongly crenulate walls which in the peripheral region thicken irregularly, as shown by small rounded beads in the zooecial walls. It occupies an intermediate position between *Rhombopora* and *Eostenopora.*

The broad curvature of the zooecia from the axial to the peripheral regions is similar to one of the two groups of the genus *Rhombopora.* In one group, which includes the type species of *Rhombopora* and the present genus, the zooecia do not abruptly change their direction of growth upon passing into the peripheral region; the other group is characterized by an abrupt angular change in direction of the zooecia in the peripheral region. However, the irregular moniliform wall structure developed in the subperipheral and peripheral regions of *Percyopora,* together with the slender, crenulate walls in the axial region, are features which are not recorded in descriptions of the genus *Rhombopora,* so far as can be determined from the literature. The lack of a vestibule does not really ally the form to the Cryptostomata, but several species placed in the genus *Rhombopora* also lack vestibules. No considerable wall thickening in the peripheral region in species of *Percyopora* is yet another distinct difference.

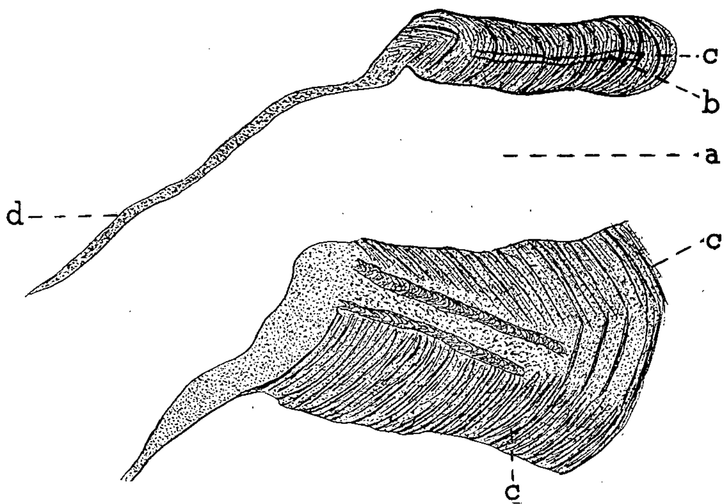
Percyopora is similar to *Eostenopora* in possessing similar zooecial wall structures, but differs from it in lacking complete, generally numerous diaphragms.

PERCYOPORA TUBULATA sp. nov.
(Pl. 7, fig. 6; Pl. 9, figs. 2-8; Pl. 10, figs. 1-6; text-fig. 5.)

Holotype: C.P.C. 950. One mile at 104° from Mount Percy, Leopold Downs Station, Fitzroy Basin, Western Australia. Fairfield Beds. Upper Devonian, Zone of *Avonia proteus.*

Paratypes: Paratype A, C.P.C. 958; Paratype B, C.P.C. 959; Paratype C, C.P.C. 960; Paratype D, C.P.C. 961; Paratype E, C.P.C. 962; Paratype F, C.P.C. 963. Same locality and horizon as the holotype.

Diagnosis: Species of *Percyopora* with abundant acanthopores, 13-14 per zooecium, and an occasional diaphragm in the outer peripheral region.



TEXT-FIGURE 5.

Part of longitudinal section of *Percyopora tubulata* sp. nov., showing structure of zooecial walls in subperipheral and peripheral regions: *a,* zooecium; *c,* zooecial wall composed of curved laminae; *b,* acanthopore with laminate wall structure; *d,* slender zooecial wall of axial region. X115.

Description: The zoaria are strap-shaped in the more proximal parts, becoming solid subcylindrical stems in the more mature growth-stages; a stem 2.5 cm. long has a cross-section 5 mm. by 3-4 mm., with smaller cylindrical branches, 1 mm. in diameter, developed irregularly along the main stem. The zoaria in the more proximal regions are flattened and elliptical and they gradually become cylindrical with maturity. The distal portions of zoaria form prominent knobs. Macroscopically the zooecia are subhexagonal, and in the mature part of the zoarium some thicker-walled zooecia are slightly elevated.

Thin sections cut in the proximal part of the zoarium, which is strap-shaped, exhibit regularly arranged zooecial orifices surrounded by numerous acanthopores. The diameter of the subpolygonal zooecial orifices ranges from 0.23 mm. to 0.18 mm. longitudinally and 0.12 to 0.13 mm. laterally; longitudinally 6 zooecia occur in 1.5 mm. and laterally 4 zooecia in 0.8 mm. (Pl. 9, figs. 3, 4; Pl. 10, fig. 3). The narrow zooecial walls range from 0.05 mm. to 0.06 mm. transversely and 0.05 mm. to 0.08 mm. longitudinally. Fine laminae compose the zooecial wall, which is pierced by a single closely packed series of acanthopores arranged in polygons around the zooecial orifices. Many acanthopores possess clear calcite axes and are lined by steeply curved laminae; their diameter is 0.01 mm. and 13-14 occur per zooecium (Pl. 9, fig. 3; Pl. 10, fig. 6).

In longitudinal section the walls are thin and strongly crenulate throughout the axial region, and gently curve from the direction of growth of the zoarium to the periphery. The peripheral region is very restricted and not strongly differentiated from the axial region. The zooecia are oblique and bend laterally in the outer peripheral region. The zooecial walls thicken irregularly in the outer axial and subperipheral region and progressively thicken from the subperipheral region. The few irregular thickenings along the zooecial tube in the axial region appear as laminate beads, and emphasize the crenulate nature of the zooecial walls. Diaphragms are virtually absent: only one complete diaphragm is present in a zooecial tube near the periphery of the zooecium (Pl. 9, fig. 8; Pl. 10, fig. 4).

The acanthopores extend to the full depth of the short peripheral region and occur as distinct tubules with finely laminate walls. The radius of the axial region is 0.65 mm., and that of the peripheral region 0.35 mm. (Pl. 9, fig. 6).

Discussion: P. tubulata differs from *P. occidentalis* sp. nov. in possessing slightly wider zooecial walls, one or two additional acanthopores per zooecium (the acanthopores are very uniform in size and abundance, but they are slightly smaller in diameter), and fewer diaphragms in the peripheral region. The two species are similar in possessing gently curving zooecia, and numerous acanthopores embedded in narrow zooecial walls which thicken irregularly in the subperipheral and peripheral regions.

Remarks: The species derives its name from the Latin *tubulatus,* meaning formed like a pipe or tube, and refers to the numerous acanthopores.

Other Material: Specimens C.P.C. 975 and C.P.C. 976 (Pl. 9, fig. 3; Pl. 10, fig. 1) from the same locality and horizon as the type material of *P. tubulata* possess similar features to this species, but differ in possessing zooecia which are oblique at the periphery, and slender zooecial walls in the peripheral region. In C.P.C. 975 two to three diaphragms occur in the peripheral region of 6 or 7 zooecia, approximately one tube diameter apart, and occasionally a small zooecium occurs. It is doubtful if such differences are specifically significant and both C.P.C. 975 and 976 have been placed in *P. tubulata.*

PERCYOPORA OCCIDENTALIS sp. nov.
(Pl. 10, fig. 7; Pl. 11, figs. 1, 3.)

Holotype: C.P.C. 951. Locality R40, eight miles at 74° from Horse Springs, Fossil Downs Station, Fitzroy Basin, Western Australia. Fairfield Beds. Upper Devonian.

Diagnosis: Species of *Percyopora* having 10 to 12 acanthopores per zooecium, acanthopores slightly variable in diameter; diaphragms absent.

Description: The zoaria are solid cylindrical stems with a diameter of 3.8 to 4.2 mm. The length of zoarial fragments is about 1 cm. Macroscopically the subpolygonal, elongate zooecial orifices are outlined by abundant acanthopores.

In shallow tangential sections the subpolygonal zooecial orifices are irregularly arranged. In deeper tangential sections a little removed from the intense calcitic deposits of the peripheral region, the cross-sections of the zooecial tubes are polygonal. The average dimensions of the zooecial orifices are 0.17 mm. long x 0.20 mm. wide; longitudinally 12 zooecia occur in 0.3 mm., and laterally about 8 zooecia in 0.3 mm. The narrow zooecial walls are composed of fine amalgamate laminae in the outer part and consist of concentric laminae lining the zooecial tubes in the inner part; longitudinally the walls are 0.06 to 0.07 mm. wide, and laterally 0.06 mm. wide. These narrow walls possess a single, closely packed series of acanthopores, about 0.02 mm. in diameter, having clear calcite axes; generally 10 to 12 acanthopores surround each zooecium. The acanthopores are slightly variable in diameter and one acanthopore per zooecium may be slightly larger than the others. However, the distinction in size of acanthopores is not sufficient to warrant the use of the term megacanthopore for the slightly larger forms (Pl. 11, fig. 1).

In longitudinal sections the zooecial walls are slender and crenulate throughout the axial region and they curve gently from the axis of growth of the branch to the periphery, where they are almost lateral. The walls thicken irregularly intermittently (simulating an irregular moniliform structure) in the subperipheral and peripheral regions. The zooecial tubes have a diameter of 0.16 mm., and lack diaphragms. The acanthopores extend the complete depth of the peripheral region and have clear calcite axes and laminate wall structures. The zooecial walls are composed of fine laminae, but the laminate structure of the acanthopore walls obscures the zooecial wall structure. The outer part of adjacent zooecial walls are amalgamate (Pl. 11, fig. 3).

Discussion: Percyopora occidentalis is compared with *P. tubulata* under discussion of that species.

Remarks: The species derives its name from the Latin, *occidentalis,* of the west, and refers to the occurrence of the species in Western Australia.

Genus Fitzroyopora nov.

Type species: Fitzroyopora oscarensis sp. nov.

Definition: Frondescent zoaria. Monticules poorly developed. Zooecial walls slightly crenulate in the axial region. Intermittent thickening of the zooecial walls in the peripheral region. In tangential sections the zooecial walls consist of an outer amalgamate part crowded with numerous distinct acanthopores and lined by laminae of the narrow inner part of the zooecial walls. In longitudinal sections the zooecia have gentle curvature from the axial to the peripheral region. The zooecial walls thicken abruptly in the peripheral region where their wall structure consists of curved laminae inclined at 45° to the direction of growth of the zooecial tubes. Zooecial orifices are direct at the periphery. Acanthopores possess clear calcite axes and laminate walls. Diaphragms are generally absent.

Discussion: Fitzroyopora is similar to *Eostenopora* in possessing intermittently thickened zooecial walls, and abundant acanthopores, but differs in lacking diaphragms, and in the absence of larger acanthopores at the junctions of the zooecial walls.

FITZROYOPORA OSCARENSIS sp. nov.

(Pl. 11, figs. 2, 4-7; Pl. 12, fig. 3.)

Holotype: C.P.C. 947. Locality K. 283; Oscar Hill, ten miles north-west of Fitzroy Crossing, Fitzroy Basin, Western Australia. Fairfield Beds. Upper Devonian.

Paratype A: C.P.C. 948. Same locality and horizon as the holotype.

Diagnosis: Species of *Fitzroyopora* having thick zoarial branches, small zooecial openings, narrow zooecial walls, and numerous and distinct acanthopores, 11 to 15 per zooecium.

Description: Solid cylindrical stems with slightly irregularly nodose surfaces that suggest the initiation of branches. The branches growing from the main stem are considerably narrower; a main stem 5.5 cm. long has a diameter of 1 cm. Small clusters of zooecia with slightly thicker walls form inconspicuous elevations and depressions on the zoarial surfaces, giving them an irregular appearance.

In shallow tangential sections the zooecia are circular or subpolygonal and in deep tangential sections they are polygonal. Zooecial orifices are elongated longitudinally; the diameter of these orifices averages 0.09 by 0.12 mm.; in the clusters of larger zooecia the diameter ranges from 0.10 by 0.14 mm. to 0.14 by 0.17 mm.; 8 to 10 zooecia occur in 2 mm. longitudinally. The zooecial walls are generally narrower than the diameter of the zooecia, and the outer part of the zooecial walls is composed of fine laminate material which is pierced by acanthopores. The inner part of the zooecial walls is a narrow band, 0.01 mm. wide, of concentric laminae. The zooecial walls range from 0.07 to 0.09 mm. in thickness. In the monticules, the zooecial walls vary from 0.06 to 0.10 mm. in width and contain numerous well-developed acanthopores, about 0.02 to 0.03 mm. in diameter, situated in the outer part of the zooecial walls and forming a single series around the zooecial orifices. There are 11 to 15 acanthopores per zooecium, and they extend the complete depth of the peripheral region. They possess clear calcite axes surrounded by indistinct walls (Pl. 11, fig. 6).

In longitudinal sections the zooecial tubes are broadly curved from the axis of growth of the branch and bend laterally in the narrow peripheral region. Zooecia are almost direct to the surface of the zoarium. The radius of the axial region is 2.8 mm. and that of the peripheral region 1.4 mm. Zooecial walls are slightly crenulate and are characterized by narrow bands of thickening which appear in longitudinal sections as distinct arcuate bands across the zoarium. In a zoarial fragment there are 10 distinct bands and another 3 very vague bands. In the axial region the zooecial walls under X150 magnification appear as fine dark lines, 0.005 mm. thick, bordered by a wide zone of secondary calcite, 0.03 mm. thick. In the subperipheral region the zooecial walls thicken abruptly and display a fine amalgamate laminate structure. Diaphragms are sparsely distributed, only rarely occurring in a zooecium in the peripheral region. Such structures may occur in the subperipheral region together with an incomplete diaphragm.

Discussion: Fitzroyopora oscarensis is not closely comparable with any described species.

Remarks: F. oscarensis displays many interesting features in relation to the development of the zoarium. Borg (1933), in an illuminating discussion on the Recent cyclostomes of the Family Heteroporidae, described the development of the zoarium of the genus *Heteropora* from the pro-ancestrula. He found that the zoaria of the Heteroporidae are subject to repeated processes of degeneration and regeneration. Similar significant growth-features, already mentioned in the description of *F. oscarensis,* have been observed in Palaeozoic trepostomes belonging to a number of families, including the Halloporidae, Heterotrypidae, and Stenoporidae.

Borg considered that distinct arcuate lines following the outline of the zoarial stem, but now situated some fraction of a millimetre within the periphery, indicated the outer surface of the zoarium at an earlier growth stage. In *F. oscarensis* the intermittent thickenings of the zooecial walls appear as distinct arcuate bands across the zoarium, and approximate to the zoarial outline. In a longitudinal section of only part of the large cylindrical zoarial stem ten bands are readily distinguishable, and there may be as many as thirteen, but these additional bands are very indistinct. Along the lateral margins of the zoarium these bands are more closely spaced and tend to converge into a single line: this contrasts with the growing tip, where the bands are more widely separated. Borg noted similar features of seasonal growth in *Heteropora pelliculata* Waters, and suggested that this lateral compaction of the bands resulted from a period of degeneration of the zooecial walls between two successive periods of growth. The outer surface of the zoarium during the period of degeneration was absorbed for a certain distance, to the position now indicated by the curved bands. When growth was renewed the zoarium lengthened more considerably at the growing tip than along the lateral margins so that the bands are more widely spaced in the broadly curved distal region. In transverse section these bands of demarcation are observable but not so readily correlated with the growth of the zoarium. In the transverse section of C.P.C. 947 there are possibly two bands present.

In the longitudinal section of C.P.C. 947 (Pl. 11, fig. 5), in the axial region of the zoarial stem at band 7, the zooecial walls develop as slender dark lines directly inside the earlier zooecial wall. Calcitic material fills the narrow space between the old and the new wall but in places the distinct break between the walls is clearly visible. The zooecia divide just before thickening of the walls, and it seems that these two features are intimately related.

The zoarium buds across the top of the arcuate bands, and apparently branches when budding becomes selective and dominant about two centres.

The zoarial stem gradually increases in width by means of the process of regeneration and degeneration, and in the mature stage of the zoarium the walls thicken with specialized structures such as acanthopores developing.

The very occasional diaphragm which occurs in the very peripheral region of the zoarium of C.P.C. 947 (Pl. 11, fig. 5, lower right hand corner) develops at the beginning of a constriction of the zooecial wall, and the outer part of the diaphragm curves upwards and along the zooecial wall. Borg found that in the zoarium of *Heteropora pelliculata* the diaphragms appear to cut across and through the zooecial walls, and he suggested that the development of diaphragms was a feature more related to the overall growth of the zoarium than to growth stages in the individual zooecia. The different arrangement of the diaphragms in *F. oscarensis* appears to be the result of growth development in the individual zooecia.

The species *F. oscarensis* takes its name from the type locality, Oscar Hill, Fitzroy Basin, Western Australia.

Genus GRANIVALLUM nov.

Type species: Granivallum fistulosum sp. nov.

Diagnosis: Zoaria laminar and hemispherical. Zooecial walls laminate, granular, and amalgamate.

In longitudinal sections the zooecial walls are very slender in both the proximal and distal regions and generally throughout their length they are composed of numerous exceptionally fine and short beads joined by equally short granular lines. The fine, short beads are composed of broad, distally convex laminae. Large acanthopores, extending from the proximal to the distal regions of zoaria, pierce the zooecial walls, in many instances obscuring the zooecial wall structure. The acanthopores have clear calcite axes enclosed by walls of steeply inclined laminae. Diaphragms are thin and complete, being present in all parts of the zooecial tubes but more closely spaced in the distal parts of the tubes.

In tangential sections the very narrow zooecial walls appear granular and acanthopores are present at the junctions of the polygonal zooecia. An occasional acanthopore is located along the side of the zooecial wall and projects into the zooecial cavity. Mesopores are absent.

Discussion: Granivallum resembles *Chondraulus* Duncan, 1939, Devonian, Michigan, in possessing narrow granular, laminate zooecial walls, numerous acanthopores, and numerous diaphragms. It differs from both *Chondraulus* and *Eostenopora* Duncan, 1939, in possessing finely beaded walls, whereas the two genera from the Devonian of Michigan have only intermittently thickened walls. In *Granivallum* the acanthopores are fewer, more distinct, and indent the zooecial walls, and mesopores are absent. The genus derives its name from the Latin, *granum*, grain, *vallum*, wall.

The genus is placed in the Family Stenoporidae as its finely beaded walls and the broadly curved laminae composing the beads suggest affinities with this family. However, the strongly granular laminate structure of the walls is not characteristic of typical stenoporoids.

GRANIVALLUM FISTULOSUM sp. nov.

(Pl. 12, figs. 1, 2, 4, 5; Pl. 13, fig. 6; text-figs. 6, 7.)

Holotype: C.P.C. 949. Locality K 325, stratigraphical section DF 5, Fossil Downs, 7 miles east of Bullock Paddock Bore, Fitzroy Basin, Western Australia; specimen occurs 37 feet from the base of a measured section 150 feet thick in the Fairfield Beds. Upper Devonian. Calcareous siltstone.

Diagnosis: Species of *Granivallum* having large acanthopores, 0.04 mm. diameter, indenting the zooecial walls.

Description: The zoaria are laminar and hemispherical, possessing at least six superimposed zooecial layers which range in depth from 2 mm. to more than 7 mm. The diameter of a weathered base of a colony, which is slightly concave and lacks a basal lamina, is 3.3 cm. and the height of the colony is 1.7 cm.

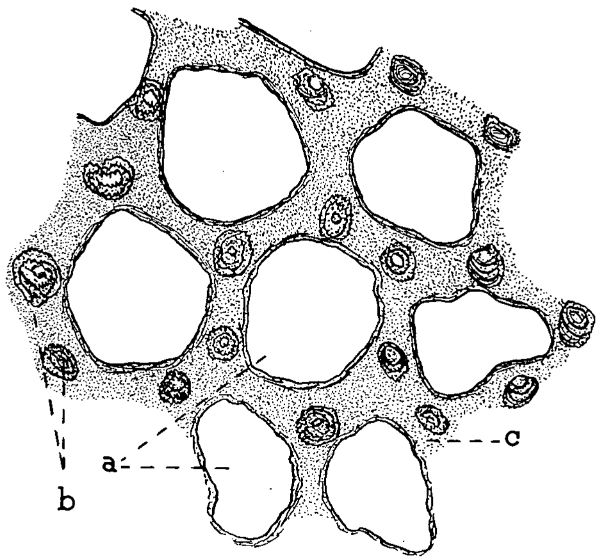


Figure 6.

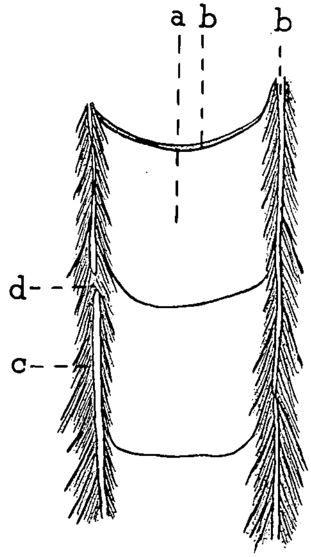


Figure 7.

TEXT-FIGURE 6.

Tangential section of *G. fistulosum* sp. nov., U.S.G.D. 10430; *a*, zooecial orifice; *b*, acanthopore; *c*, zooecial wall; X100.

TEXT-FIGURE 7.

Part of longitudinal section of *G. fistulosum*, U.S.G.D. 10430, showing section of peripheral region; *a*, zooecium; *b*, acanthopore; *c*, steeply inclined laminae of zooecial walls; *d*, very slender part of zooecial and acanthopore walls. X100.

In tangential sections the zooecia are polygonal, with diameters ranging from 0.19 to 0.26 mm. and 7 zooecia in 2.0 mm. Zooecia of slightly greater diameter tend to form clusters and possibly represent monticules. The zooecial walls are slender, 0.01 mm. in the prostrate axial region, and thicken to 0.03 to 0.04 mm. in the mid-distal region. The large acanthopores are distinctive and number 8 to

9 per zooecium; those about 0.04 mm. in diameter are generally developed at the junctions of the zooecial walls, and smaller acanthopores, 0.03 mm. in diameter, occur along the zooecial walls (Pl. 12, figs. 1, 2).

In longitudinal sections zooecia grow from a wrinkled basal lamina and bend into an upright position from a short, prostrate proximal region, 0.13 mm. wide. The zooecial tubes are slightly tortuous in their growth but are direct at the periphery. The diameter of zooecial tubes remains relatively constant along their length; a zooecial tube of diameter 0.19 mm. in the proximal region expands to a diameter of 0.23 mm. in the distal region (Pl. 12, fig. 4). In some places a narrow layer of detritus fills the space between succeeding laminae; elsewhere it is difficult to detect the distal portion of the earlier zooecia and the proximal portion of the later zooecia. The zooecial walls display the characteristic structures outlined in the diagnosis of *Granivallum.* Large acanthopores which develop above the prostrate region of a zoarium pierce the zooecial walls and extend their complete length; they have clear calcite axes about 0.01 mm. in diameter. Under very high magnification of about X200 the zooecial walls appear discontinuous and cut by minute perforations. Diaphragms are abundant, flat or slightly curved, and occur above the prostrate region of the zooecial tubes. Near the sides of the zooecial tubes the diaphragms curve upwards and pass into the zooecial walls. Some diaphragms appear to be continuous from one zooecial tube to the next across the zooecial walls. They are a tube diameter apart in the proximal region and half a tube diameter apart in the distal part of the zooecial tube. In a zooecial tube of 3.5 mm. in length, 23 diaphragms occur. Many small brown granules are present, but they do not appear to be related to the tabulation (Pl. 12, fig. 5).

Discussion: Granivallum fistulosum differs from *Chondraulus densus* Duncan, 1939, and *C. granosus* Duncan, 1939, in lacking intermittently thickened walls and aggregations of distinctly large zooecia, and in possessing fewer acanthopores and more abundant diaphragms. It is similar to *C. granosus* in possessing large acanthopores at the junction of the zooecial walls.

Remarks: The species derives its name from the Latin *fistulosus,* full of pipes, and refers to the distinctive large acanthopores penetrating the thin zooecial walls.

Other Material: C.P.C. 974. Locality K 292, stratigraphic section DF 2, south of Burramundi Range, 190 feet from the base of the section, which is 640 feet thick. Fairfield Beds. Upper Devonian. T 25 (Teichert collection, west Kimberley, 1940-1941), "Top of Mt. Pierre", Fairfield Beds. Upper Devonian, Zone of *Avonia proteus.* T 29 (Teichert collection), on road to Mount Pierre, Tinbilly Spring. Fairfield Beds. Upper Devonian.

Genus STEREOTOECHUS Duncan, 1939

Stereotoechus Duncan, 1939, p. 260.

Type species (designated Duncan, 1939): *Stereotoechus typicus* Duncan, 1939, p. 260, pl. 13, figs. 10-13.

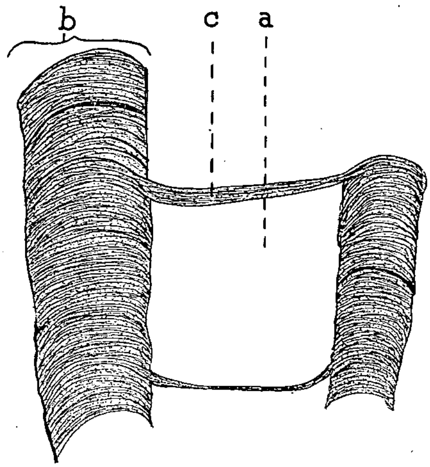
Diagnosis: "Zoarium laminar, superimposed layers may form small masses. Groups of larger zooecia present. Walls thick, finely laminate, irregularly thickened at frequent intervals, occasionally slightly beaded. Diaphragms complete and numerous. Mesopores absent. Acanthopores well defined, laminated, located at or near junctions of zooecial walls." (Duncan, 1939.)

STEREOTOECHUS SHEARSBYI (Crockford), 1941
(Pl. 13, figs. 1, 3, 5; text-fig. 8.)

Cyphotrypa? shearsbyi Crockford, 1941, p. 105, 106, text-fig. 1A-B.

Holotype: U.S.G.D. 1439. Portion 229, Parish of Waroo, near road about 200 yards north of the old Taemas Bridge, Murrumbidgee River, New South Wales. Murrumbidgee "Series". ?Middle Devonian.

Diagnosis: Species of *Stereotoechus* having two to three acanthopores per zooecium and wide, broadly laminate zooecial walls in a wide peripheral region.



TEXT-FIGURE 8.
Part of longitudinal section showing zooecial wall structure in *S. shearsbyi*, U.S.G.D. 2416; *a*, zooecial tube; *b*, zooecial wall composed of broadly curved laminae; *c*, slender laminate diaphragm. X125.

Description: The zoaria are broad and laminate, 2.5 cm. to 3.8 cm. across and 1.4 cm. high. Two laminae can be seen, one lamina 1.5 cm. high and the other 8 mm. high. The basal zoarial surface incrusts a tabulate coral. Although the celluliferous surface of the zoarium is enclosed by matrix, tangential sections show aggregations, 1.5 mm. to 1.8 mm. across, of zooecia, thicker walled and larger than usual, which suggest the presence of monticules. The centres of most of these aggregations are filled with sediment, and an occasional unweathered cluster possesses a few thin-walled tubes simulating mesopores. The distance apart of the centres of aggregations, as determined in thin section, ranges from 3.5 mm. to 5.0 mm. (Pl. 13, fig. 1).

In tangential section the subpolygonal zooecia, diameter 0.13 mm. to 0.21 mm. (the maximum measured in the aggregation of thicker-walled zooecia) are occasionally penetrated by a smaller cell of 0.08 mm. diameter. Mesopores are absent.

The thick zooecial walls, 0.05 mm. to 0.07 mm. wide, increasing to 0.08 mm. in the monticules, are pierced by acanthopores which generally occur at the junctions of the zooecial walls, two to three acanthopores per zooecium. The dark tube- or rod-like acanthopores, diameter 0.03 mm. to 0.05 mm., possess clear calcite axes and dark laminate walls, some of which indent the inner part of the zooecial walls (Pl. 13, fig. 3).

In longitudinal section the proximal region of the zooecia is not observable; but it seems from the features observed in oblique longitudinal section that the zooecial walls are thin and crenulate for at least 0.78 mm. of the short proximal region, whereafter they are thickened for the greater part of their length. Zooecia are direct at the periphery. In the distal region the thickened zooecial walls vary in thickness from 0.03 mm. to 0.06 mm. These walls have broadly curved, distally convex laminae. Acanthopores with steeply inclined laminate walls are located in the outer part of the laminate zooecial walls (Text-fig. 8; Pl. 13, fig. 5).

Complete flat or inclined diaphragms, at least ten or more per zooecium, are distributed throughout the zooecia; they are generally one to two tube diameters apart and vary in their placement along the zooecial tubes. The diaphragms do not cluster at the periphery. Small brown granules are numerous in the zooecial tubes, but they do not appear to be related to the tabulation.

Discussion: Stereotoechus shearsbyi differs from *S. typicus* Duncan, 1939, Middle Devonian, Michigan, in possessing fewer acanthopores, slightly larger zooecia, and fewer diaphragms. Both species possess similar zooecial arrangement, zooecial wall structure, an occasional smaller cell, and slight constriction of the zooecial walls.

Family CALOPORIDAE Ulrich, 1890

Calloporidae Ulrich, 1890, p. 372.

Halloporidae Bassler, 1911, p. 178, 324, 325.

Non Calloporidae Norman, 1903, p. 588.

Diagnosis: Zoarium generally ramose. Thin-walled subcylindrical zooecia which develop slowly; generally having diaphragms which may be more numerous and closely spaced in the axial region than the peripheral region. Mesopores common, closely tabulate. Acanthopores virtually absent.

The diagnosis is based on discussions by Ulrich (1890), Nickles & Bassler (1900), and Bassler (1911a and 1953).

Genus CALOPORA Hall, 1851

Calopora Hall, 1851, p. 400.

Callopora Hall, 1852, p. 144.

Non *Callopora* Gray, 1848, p. 109, 146.

Type species (designated by Ulrich, 1882, p. 251): *Calopora elegantula* Hall, 1852, p. 144, pl. 40, figs. la-m.

Diagnosis: Zoarium generally ramose, rarely subfrondescent, or discoidal. Zooecial tubes have thin walls in the axial region but generally the walls are thickened in the peripheral region. Zooecial openings may be closed by perforated, often ornamented plates. Closely tabulate mesopores are angular or rounded, more or less numerous, sometimes surrounding the zooecia. Zooecial tubes have closely arranged diaphragms in the axial region and diaphragms are more distant or absent in the subperipheral region and are commonly more abundant again in the peripheral region. Acanthopores generally absent.

The diagnosis is based upon the diagnoses of Ulrich (1890 and 1893), Nickles & Bassler (1900), and Cumings (1908).

CALOPORA HATTONENSIS sp. nov.
(Pl. 15, figs. 1, 2, 4.)

Holotype: A.M. F8852. Black Bog Creek, near Hatton's Corner, Yass Basin, New South Wales. Black Bog Beds. Middle Silurian.

Diagnosis: Species of *Calopora* having small zooecial openings, 0.20 mm. by 0.13 mm. diameter, diaphragms more abundant towards the periphery, slender zooecial walls occasionally pierced by a small acanthopore, and numerous tabulate mesopores.

Description: The zoarial fragment is a solid cylindrical stem 5 cm. long, and 5.5 mm. to 6.0 mm. in diameter. The stem bifurcates, but the interval of bifurcation is unknown. Low elevations indicate the presence of monticules, consisting of clusters of slightly larger zooecia, 0.23 mm. to 0.26 mm. in diameter. The diameter of the monticule is about 0.9 mm., and its elevation 0.26 mm. Mesopores may be more numerous in the monticules.

The zooecial orifices are circular to oval, 0.2 mm. long and 0.12 mm. to 0.14 mm. wide; 8 zooecia in 2 mm. The slightly larger zooecia, grouping to form monticules, are 0.26 mm. to 0.23 mm. in diameter. Thin zooecial walls, 0.03 mm. thick, are in contact for part of their circumference with a single series of small angular mesopores filling the intrazooecial spaces, but nowhere isolating the zooecia completely. The mesopores measure 0.05 mm. longitudinally, and 0.03 mm. to 0.05 mm. laterally. The inner part of the zooecial walls is a thick band of concentric laminae. A few small acanthopores, diameter 0.01 mm., occur at the junction of zooecial walls. Their granular walls enclose clear calcite axes. Rarely an acanthopore occurs in the zooecial wall between adjacent mesopores (Pl. 15, fig. 4).

Long zooecial tubes with thin slightly flexuous zooecial walls grow steeply from the axis of the branch. Curving in a wide arc, they pass into the peripheral region, where they are horizontal. Zooecia are of uniform diameter throughout their length and direct at the periphery. In the axial region the walls are approximately 0.01 mm. thick, thickening in the subperipheral region so that in the outer peripheral region they are 0.02 mm. thick. The thin dark lines of the zooecial wall in the axial region are not resolvable under X200 magnification. In the peripheral region the wall is granular and laminate. Mesopores develop in the subperipheral region; and their diameter of 0.05 mm. varies within narrow limits. Thin straight diaphragms occur in the axial region of the zooecial tubes and are separated by a distance twice to three times the diameter of the zooecial tube; the distance between diaphragms ranges from 0.28 mm. to 0.60 mm. In the peripheral region the diaphragms are more abundant and concave, 15 diaphragms occurring in 1 mm. An occasional incomplete convex diaphragm which curves back to touch the preceding diaphragms occurs in the outer part of the peripheral region. Diaphragms are more abundant in the mesopores, 15 diaphragms occurring in 0.34 mm. (Pl. 15, fig. 1, 2).

The radius of the peripheral region is 0.31 mm. and the radius of the axial region is 0.36 mm.

Discussion: This distinct species may be compared with four species of *Calopora,* each of which has some similarities with it. *C. macrostoma* (Loeblich), 1942, Middle Ordovician, Arbuckle Mountains, Oklahoma, is the only other species of *Calopora,* other than *C. hattonensis,* that possesses an occasional acanthopore in the zooecial wall. But *C. hattonensis* differs from *C. macrostoma* in possessing slightly thicker zoarial branches having smaller zooecial openings, and a markedly different tabulation pattern. It lacks a concentrated grouping of diaphragms in the axial region and possesses a greater abundance of diaphragms in the peripheral region. Both species possess numerous tabulate angular mesopores. *Calopora hattonensis* is similar in the dimensions and shape of its zooecia and mesopores to *C. pulchella* (Ulrich), 1893, Trenton shales, St. Paul, Minnesota, and to a lesser extent to *C. dumalis* (Ulrich), 1893, Trenton shales, St. Paul, Minnesota, but it possesses considerably thicker branches and closer tabulation of the zooecial tubes. The tabulation of the Australian species is similar to that of *C. ramosa* (d'Orbigny), 1850, McMillan member, Maysvillian, Cincinnati, Ohio, in which diaphragms are slightly more widely spaced.

Remarks: This well preserved species takes its name from the type locality, Hatton's Corner, Yass, New South Wales. It exhibits distinct arcuate growth bands across the zoarial branches and this again suggests that the development of the zooecial walls results from a process of degeneration and regeneration.

Family PHYLLOPORINIDAE Ulrich, 1890

Diagnosis: Zoaria composed of anastomosing or reticulating slender branches attached at the base. Only one side of a zoarium is celluliferous having two to eight rows of zooecial orifices; the other non-celluliferous side is longitudinally striate. Gently curving zooecia in a long proximal region that may possess widely spaced diaphragms but hemisepta are lacking. Mesopores with closely spaced diaphragms, and acanthopores, surficially marked by spines, may be present in the peripheral region.

Range: Ordovician-Permian.

Diagnosis is based on descriptions given by Ulrich (1890 and 1893) and Bassler (1953).

Genus AUSTRAPHYLLOPORINA nov.

Type species: Austraphylloporina cliefdenensis sp. nov.

Diagnosis: Thin, undulate expansion of slender branches which unite at regular intervals to form a reticulate network. Branches semicircular in transverse section. Convex celluliferous surface bears four rows of zooecia — two on each side of a median carina; and at least four rows of fine acanthopores.

Remarks: The new genus *Austraphylloporina* is proposed for phylloporinoid species which have four rows of zooecia and interspersed longitudinal rows of tubules. *Austraphylloporina* resembles *Moorephylloporina* Bassler, 1952, in possessing an anastomosing zoarium with slender branches and a restricted number of rows of zooecia opening on the celluliferous surface. It differs from *Moorephylloporina* Bassler and *Chasmatoporella* Nekhoroshev, 1936, in possessing four and not two rows of zooecia, and numerous longitudinal rows of acanthopores. The genus takes its name from the Latin *australis*, south, *Phylloporina,* name of a bryozoan genus.

AUSTRAPHYLLOPORINA CLIEFDENENSIS. sp. nov.

(Pl. 13, figs. 2, 4; Pl. 14, figs. 3, 5.)

Holotype: U.S.G.D. 9262. South-east corner of Large Flat, at the foot of Fossil Hill, 50 feet above the shale and limestone. Cliefden Caves Limestone. Middle Ordovician. Specimens in a coquina.

Diagnosis: Species of *Austraphylloporina* having a fine reticulate meshwork and small zooecial openings and acanthopores.

Description: The zoaria are thin undulating expansions consisting of slender branches, 0.20 mm. to 0.23 mm. wide, which reunite at regular intervals to form a reticulate network (Pl. 13, fig. 1; Pl. 14, fig. 3).

The subpolygonal fenestrules are 1.1 mm. long and 0.35 mm. wide: 4 to 5 zooecia per fenestrule. The celluliferous surface, as seen in thin section, consists of two rows of alternating zooecia on each side of a median carina. It is semicircular in outline and covers a flat non-celluliferous lower surface. The two rows of zooecial orifices in the median part of the branch are directed upwards; the two lateral rows face into the fenestrules. Slight peristomes surround the circular orifices, 0.08 mm. to 0.11 mm. in diameter. Several longitudinal rows (at least four) of small tubules stretch along the branches. The regularly arranged acanthopores, 0.02 to 0.03 mm. in diameter, have clear calcite axes enclosed by distinct but fine walls, longitudinally four acanthopores in 0.26 mm.; the distance between rows of acanthopores laterally is 0.3 mm. The carina is marked by a central row of tubules.

In deep tangential sections the elongate zooecia grow from each side of the narrow carina, 0.01 mm. wide, which is formed by the coalescence of the proximal parts of succeeding zooecia. The long zooecia in the proximal region are steeply inclined to the carina at 30°, and in the peripheral region are strongly curved laterally so that they are direct at the periphery. Dense calcitic material fills the wide zooecial walls in the peripheral region. The acanthopores are present in the proximal region of the zooecial walls and appear to possess the same relation to the carina as that of the median tubuli to the mesotheca in the stictoporids. Lunaria and hemisepta were not observed.

The nature of the lower surface was not determinable.

Discussion: Austraphylloporina cliefdenensis differs from the monotypic species *Moorephylloporina typica* Bassler, 1952, in possessing numerous small tubules, longitudinally arranged along an elongate hemispherical branch which has four rows of zooecia.

The description of the species of *Chasmatoporella* Nekhoroshev, 1936, to which *Moorephylloporina typica* possesses some similarity, has not been available for purposes of comparison.

Remarks: The topotype U.S.G.D. 9263 (Pl. 13, fig. 2; Pl. 14, fig. 3) illustrates the external aspect of the zoaria: the 4 rows of zooecia across a branch are well displayed and the lower non-celluliferous surface consists of numerous fine granular longitudinal striae.

The species derives its name from the type locality, Cliefden Caves.

Order CYCLOSTOMATA Busk, 1852

Diagnosis: Zooecia of simple calcareous tubes, generally without diaphragms, having simple, rounded uncontracted orifices, not closed by opercula; walls thin, minutely porous, lacking the more complicated structures developed in the Cheilostomata and Trepostomata. Reproduction usually either in an ovicell, consisting of an enlarged single zooecium terminated externally by a peristome-like rim, or an inflation of the zoarial surface covering several orifices. (After Bassler, 1953.)

Family FISTULIPORIDAE Ulrich, 1882

Fistuliporidae Ulrich, 1882, p. 156.

Cheilotrypidae Moore & Dudley, 1944, p. 255.

Diagnosis: Zoarium massive, laminate or ramose with maculae composed of vesicular material and of zooecia slightly larger than the average. Lunarium commonly well developed, but sometimes wanting; zooecial tubes cylindrical, thin-walled, with diaphragms; zooecial walls minutely porous. Intrazooecial spaces filled with vesicular material. Zooecial orifices closed by perforate opercular covers.

This diagnosis is based on discussions by Ulrich (1882 and 1890), Nickles & Bassler (1900), and Moore & Dudley (1944).

Moore & Dudley gave a comprehensive discussion of the morphological characters and relations of genera within the Family Fistuliporidae and the newly erected Family Hexagonellidae Crockford (Bassler, 1953).

The acceptance in 1957 of the application by Duncan, Loeblich, & Moore, to the International Committee of Zoological Nomenclature, proposing the validation under the Plenary Powers of *Fistulipora* McCoy, 1849, enables the continued usage of the name Fistuliporidae in preference to the proposed revised name Cheilotrypidae (Moore & Dudley, 1944). The application requested that *Fistulipora* Rafinesque, 1831, be suppressed.

In their discussion on fistuliporoid structures Moore & Dudley considered that each genus of the family is characterized by a particular mode of growth. However, some genera — such as *Fistulipora* — having species with both laminate and ramose growth forms are represented by a number of different growth forms. Such growth forms are characteristic only at the species level and not at the generic level.

In comparing the taxonomic characters of the numerous genera placed in this family the limitations of identification resulting from inadequate description of type specimens are apparent. Consideration of the genus *Fistulipora* and related genera *Buskopora, Cheilotrypa, Coelocaulis, Dybowskiella, Fistuliporella, Lichenotrypa,* and *Pinacotrypa* bring forth many inconsistencies which can only be resolved by revision of a number of the type species.

The genus *Pinacotrypa* Ulrich (1890, p. 394), erected on a species originally attributed to *Fistulipora,* is not recognizable until the type species is re-examined. As many early workers mistakenly identified regular vesicular tissue for mesopores it is possible that such an error is present in the early generic description of *Pinacotrypa.*

Similarly, the taxonomic status of *Buskopora* Ulrich (1890, p. 22, pl. 2, figs. 5, 5a) (= *Odontotrypa* Hall, 1886, pl. 30) is at present uncertain. *Buskopora* appears similar to *Dybowskiella* Waagen & Wentzel in possessing strongly-developed lunaria, the ends of which project into the zooecial tubes, and longitudinal ridges formed by the projecting ends of the lunaria. Moore & Dudley (1944) suggest that the syntypes of the type species of *Buskopora* represent two modes of growth, a unilaminate mode and a bifoliate mode .

Genus Fistulipora McCoy, 1849

Fistulipora McCoy, 1849, p. 130, figs. a, b.
Fistulipora McCoy, Milne-Edwards & Haime, 1850, p. lix.
Fistulipora McCoy, 1854, p. 11.
Cyclotrypa Moore & Dudley, 1944, p. 254 (*non* Ulrich, 1896).
Fistulipora McCoy, Crockford, 1947, p. 4.
Non *Fistulipora* Rafinesque, 1831.

Type species (chosen by Edwards & Haime, 1850, p. lix): *Fistulipora minor* McCoy, 1849, p. 130.

Diagnosis: Zoarium incrusting, laminate or ramose. Zooecial orifices possess poorly developed lunaria manifested by a varying degree of thickening of part of the zooecial walls. Ends of lunaria do not indent zooecial walls. Diaphragms traverse cylindrical zooecial tubes. Vesicular material abundant in the intrazooecial spaces.

Based upon the diagnoses of Milne-Edwards & Haime (1850), McCoy (1854), Ulrich (1884), and Crockford (1947).

The type species of *Fistulipora, F. minor* McCoy, requires revision. The original description is composite, based upon features observed in two new species erected by McCoy, *F. minor* and *F. major*. Milne-Edwards & Haime (1850) designated *F. minor* as the type species. Although McCoy (1854) described other specimens of *F. minor*, and Bassler (1929) examined and figured (without describing) a specimen designated as a paratype of *F. minor* McCoy, in the Cambridge University Museum, the distinguishing features of the type species are unknown.

From McCoy's and Bassler's works it appears that in the type species the lunarium, when visible, is poorly developed.

FISTULIPORA NORENSIS sp. nov.

(Pl. 14, fig. 7; Pl. 19, fig. 7.)

Holotype: U.S.G.D. 10446. Nora Creek, 7¼ miles at 318° from Molong Railway Station, New South Wales. Garra Beds. ?Middle Devonian. Specimens in a calcarenite.

Diagnosis: Species of *Fistulipora* having thin incrusting multilaminate zoaria, poorly developed lunaria, and generally three upright series of vesicular material.

Description: A fragment of an incrusting multilaminate zoarium 2 cm. long, 1 cm. wide, and 3.0 mm. thick, incrusts the apertural region of a michelinoceratid nautiloid. Each of the two laminae is 1.5 mm. thick. Circular zooecial orifices, measuring 0.26 mm. by 0.29 mm., are marked by slight development of lunaria (Pl. 19, fig. 7), which do not noticeably penetrate the zooecial openings or indent the zooecial outlines. The peristome is slightly thickened in the region of the lunarium.

In longitudinal sections the zooecia are reclined in the short proximal region and upright in the peripheral region. They are uniform in diameter throughout their length. Slightly concave diaphragms occur in both the proximal and peripheral regions, being generally 0.01 mm. apart, or three to four diaphragms in 0.26 mm.; some are more closely spaced. Convex vesicular material, forming generally three upright series between adjacent zooecial tubes, impinge on the zooecial walls, commonly making small indentations along the zooecial walls which are 0.39 mm. thick in the peripheral region (Pl. 14, fig. 7).

Discussion: F. norensis differs from *F. mirari* Crockford, 1947, from the Lower Burindi "Series", Glen William, N.S.W., Lower Carboniferous, in possessing a multilaminate zoarium having smaller zooecial orifices and more abundant diaphragms and vesicular material. The species possess similar incrusting laminate zoaria with poorly developed lunaria around the zooecial orifices.

Remarks: The species takes its name from the type locality, Nora Creek. Fragments of *Fenestella* sp. are associated with it.

FISTULIPORA PILLARENSIS sp. nov.
(Pl. 16, figs. 2, 3, 5; Pl. 17, figs. 1, 5.)

Holotype: C.P.C. 931. Locality K.463; material occurs in Section DMP 1 at Menyous Gap, Pillara Range, Fitzroy Basin, Western Australia; 1,160 feet above the base of the Pillara Formation, which in this section is 1,400 feet thick and overlies the ?Archaean Lamboo Complex. Pillara Formation. Middle Devonian. Specimens associated with corals, brachiopods, and gastropods in a thin bed of calcilutite.

Diagnosis: Species of *Fistulipora* having thin variable laminae, poorly developed lunaria, distinct maculae, and fine vesicular material filling the intrazooecial spaces.

Description: The zoarial fragment, incrusting a thamnoporid, is multilaminar, 4 cm. long and about 1.8 cm. across. Small maculae, 1.0 mm. to 1.5 mm., occur level with, or slightly depressed beneath the level of, the zoarial surface. These clusters of vesicular material appear as dense calcareous areas on the zoarial surface, and the vesicular structure is only observable in thin sections. The maculae may have a linear arrangement along the zoarial branch, and in a specimen examined, the maculae are about 5.5 mm. apart longitudinally and ranges of maculae are 4 mm. apart laterally (Pl. 16, fig. 7).

On the weathered surface, the zooecia appear as polygons, but in thin sections they are cylindrical. Lunaria slightly indent the zooecial orifices and extend around one fifth of the circumference of each zooecial tube. They are not apparent on the weathered zoarial surface, and as seen in thin sections show little thickening along the zooecial walls.

Zooecia open directly at the surface and are 0.31 mm. to 0.39 mm. in diameter. Larger zooecia adjacent to maculae are about 0.45 mm. in diameter. In longitudinal section zooecia are prostrate for a very short distance along the basal lamina and then curve upwards at a height of 1.43 mm. to the surface. They are uniform in diameter throughout their length. The diaphragms are straight or slightly concave and occur mostly in the first half of the zooecial tubes; the spacing between diaphragms is 0.20 mm. to 0.26 mm.; diaphragms are absent from the upper 0.65 mm. (Pl. 16, fig. 3).

The laminae range in thickness from 0.6 mm. to 1.5 mm.; in the exceptionally narrow laminae, diaphragms are not present. The intrazooecial spaces are filled with vesicular tissue; one or two narrow vertical rows develop between adjacent zooecia.

In tangential section the vesicles are arranged polygonally and are much smaller than the zooecial orifices. Dense calcitic material develops in the intrazooecial spaces, masking the vesicles (Pl. 16, fig. 5; Pl. 17, fig. 5).

Discussion: F. pillarensis differs from *F. norensis* in possessing small maculae composed of vesicular material, larger zooecial orifices, fewer diaphragms, and less vesicular material in the intrazooecial space. The two species possess incrusting multilaminate zoaria having similar arrangement of orifices and vesicular material, and poor development of lunaria around the zooecial orifices.

FISTULIPORA SADLERENSIS sp. nov.

(Pl. 14, figs. 2, 4, 6; Pl. 16, fig. 6; Pl. 17, figs. 3, 4, 6; Pl. 19, fig. 1.)

Holotype: C.P.C. 932. Locality K. 236; Sadler Ridge, Emanuel Range, Fitzroy Basin, Western Australia; specimens occur in stratigraphic section DD2, 70 feet above the top of the Pillara Formation. Sadler Formation. Upper Devonian. Specimens in a calcarenite, richly fossiliferous.

Paratypes: Paratype A, C.P.C. 933; Paratype B, C.P.C. 934; Paratype C, C.P.C. 935; Paratype D, C.P.C. 936. Same locality and horizon as the holotype.

Diagnosis: Species of *Fistulipora* having solid ramose zoaria marked by distinct, closely spaced maculae, 1.5 mm. by 1.0 mm.

Description: The zoarial fragment C.P.C. 932 is a solid cylindrical branching stem, 1.5 cm. long and 0.4 mm. in diameter. The zoarial fragment C.P.C. 935 is a solid cylindrical stem, 2.5 cm. long and 0.6 mm. by 0.4 mm. across. Maculae are present as small, but distinct, low elevated cones composed of vesicular material and possibly arranged in a diagonal spiral pattern; the maculae are 1.1 to 1.5 mm. long, 1.0 to 1.1 mm. wide, and about 1 mm. high. In C.P.C. 935 the longitudinal distance between maculae ranges from 7 mm. to 9 mm. The lateral distance between any two, relatively regular, longitudinal rows is 3 mm. The diagonal distance between the centres of adjacent maculae varies from 4.0 to 5.5 mm. (Pl. 14, fig. 2).

In tangential sections the subcircular zooecial orifices are irregular in outline, varying from 0.32 mm. by 0.49 mm. to 0.26 mm. by 0.27 mm. In deeper tangential sections the outlines of the zooecia are more elongate. Lunaria occur as slight thickenings of the zooecial walls extending half-way round the zooecial tubes, and are rarely present either as projections over part of the zooecial orifices or indentations in the zooecial walls. The dense calcareous material which fills the intrazooecial walls in the peripheral region obscures structures associated with lunarial development. The thin orificial wall is 0.01 mm. thick. The intrazooecial spaces may be as wide as 0.13 to 0.18 mm. and 0.21 to 0.34 mm. in the maculae. One or two communication pores are present in the zooecial walls and are less than 0.01 mm. in diameter.

In longitudinal sections the zooecia grow from the axis of growth of the zoarial branch, passing with broad curvature into the subperipheral region, where they bend laterally into a narrow peripheral region. The zooecial tubes possess a uniform diameter throughout their length, and the walls are slightly indented by adjacent vesicular material. Diaphragms are absent in the axial region, but are well developed in the subperipheral and peripheral regions. The distance between diaphragms, which are straight or slightly concave, ranges from 0.26 mm. to 0.18 mm. The diaphragms are slightly crowded towards the peripheral region, the remaining 0.26 mm. below the zooecial orifice being devoid of diaphragms. Vesicular material appears to develop in the latter part of the axial region, filling the intrazooecial spaces. One, or more rarely two, rows of vesicles, which are regularly arranged in a close interlocking system, occupy the intrazooecial space, generally 0.13 mm. wide, at the periphery. The width of intrazooecial spaces adjacent to maculae ranges to 0.34 mm. In the narrow peripheral region dense structureless calcitic material fills the vesicles, obliterating the polygonal arrangement observable in deeper tangential sections. The maculae appear in longitudinal section as a mass of regularly arranged vesicles covering 3-4 zooecia and causing other zooecia nearby to bend obliquely to the periphery.

In C.P.C. 935 the radius of the axial region is 2.3 mm. and the radius of the peripheral region is 1.3 mm.

Discussion: Fistulipora sadlerensis may be compared with the Permian species *F. octonaria* Bassler, 1929, from Timor. The two species are similar in possessing solid ramose zoaria having small zoaria commonly separated in the axial region by one row of vesicles, and sparse development of diaphragms. *F. sadlerensis* differs from *F. octonaria* in possessing narrower zoarial branches, zooecial orifices with poorly developed lunaria, and dense calcitic material filling the vesicles at the periphery.

Remarks: Species of *Fistulipora* with ramose zoaria are particularly abundant in Permian assemblages, but are rare in the Devonian. Consequently the Australian species has been compared with a Permian species of *Fistulipora*. The species takes its name from the type locality, Sadler Ridge, Fitzroy Basin, Western Australia.

Other Material: C.P.C. 970. Locality K. 244. Stratigraphic section DD2, Sadler Ridge, Emanuel Range, Fitzroy Basin; located 82 to 83 feet above the top of the Pillara Formation. Sadler Formation. Upper Devonian. Specimens are in a calcarenite.

FISTULIPORA VICTORIAE Chapman, 1914

(Pl. 20, fig. 2; Pl. 21, figs. 1, 4, 7.)

Fistulipora victoriae Chapman, 1914, *Rec. geol. Surv. Vic.*, 3 (3), 301, 310, pl. 58, fig. 31; pl. 59, figs. 32-34.

Lectotype: N.M.V. P12929 (C. 2486) and thin sections N.M.V. P12930 (C. 1457) and N.M.V. P12931 (C. 1458), cut from the handspecimen N.M.V. P12929. Griffith's Quarry, Loyola, near Mansfield. Lower Devonian.

Diagnosis: Species of *Fistulipora* having branching zoaria, and vesicles filling the intrazooecial spaces, slightly larger than the diameter of the zooecial orifices.

Description: The narrow, subcylindrical, branching zoarium is 6.5 cm. long and 1.1 cm. across. Maculae may be present but were not observed in the thin sections.

The zooecia are subcylindrical, 0.18 mm. to 0.26 mm. in diameter; their orifices are indented by the development of lunaria which extend around one-third of the circumference of the zooecia. The moderately well-developed lunaria are marked by slight elevations at the surface, as a result of thickening of the peristome in this region. The peristome has a width of 0.03 mm. The zooecial orifice, opening direct at the surface, is 0.23 mm. long and 0.16 mm. wide, and the lunarium is 0.04 mm. long and 0.06 mm. wide. The zooecia possess a uniform diameter throughout their length, curving gently outwards from the axis of growth of the branch for a distance of 5.0 mm. In the axial region, diaphragms, which are complete and concavely curved towards the axis, are separated by a distance equal to the diameter of the zooecium. In the peripheral region, diaphragms are more abundant and, at a distance of 0.08 mm. from the periphery, the diaphragms are 0.05 mm. apart. In the tangential section the vesicles are polygonal and are generally slightly larger than the zooecial orifices, about 0.26 mm. to 0.39 mm. in length; they are convex to the periphery and intertongue to form generally one or two, and occasionally three, vertical series (Pl. 20, fig. 2; Pl. 21, figs. 4, 7).

Discussion: F. victoriae is similar *to F. octonaria* Bassler, 1929, from the Permian of Timor, in possessing solid cylindrical branches of similar diameter, moderately well developed lunaria, and one or two rows of vesicles filling the intrazooecial spaces. It differs from *F. octonaria* in possessing slightly narrower zooecia and more diaphragms.

It differs from *F. sadlerensis* in possessing thicker zoarial branches, slightly smaller zooecial orifices with greater development of lunaria, and more abundant diaphragms. The two species are similar in possessing solid cylindrical branches with one or two rows of vesicles filling the intrazooecial spaces.

Remarks: Chapman made reference to cotypes in his original description, but only the specimen N.M.V. P12929 and thin sections were figured by Chapman, and this specimen is here designated the lectotype. No other specimens have yet been located.

Chapman's reference (1907) of a specimen from the Thomson River, Victoria, to the genus *Fistulipora* cannot be verified until more material is collected.

Genus CHEILOTRYPA Ulrich, 1884

Type species (designated by Ulrich, 1884): *Cheilotrypa hispida* Ulrich, 1884, p. 50, pl. 3, figs. 6, 6a-6d.

Diagnosis: "Zoaria ramose, branches with a small irregularly expanding and contracting central tube, to which the lower or inner ends of the zooecia are attached. Zooecia with the posterior portion of the wall usually thickest, gradually thinning on the sides until it is linear at the front; cavity elliptical in tangential sections; aperture oblique, the lower portion strongly elevated. Interstitial spaces vesiculose; vesicles open except near the surface, where they are more or less filled and obscured, by a dense, apparently homogeneous deposit of sclerenchyma. Zooecial apertures sometimes closed by an operculum. Diaphragms wanting or few." (Ulrich, 1884.)

CHEILOTRYPA sp. A.

(Pl. 15, fig. 3.)

Material: U.S.G.D. 10436. Hatton's Corner, Yass, New South Wales. Hume Limestone or Barrandella Shale. Middle Silurian.

Description: The zoarium consists of a narrow cylindrical stem of variable diameter, ranging from 1.3 mm. to 2.0 mm. The zoarial fragment is 18 mm. long.

The slender cylindrical stem possesses a small axial tube which varies irregularly from 0.4 to 0.5 mm. in diameter. The zooecia grow steeply inclined on all sides of the axial tube and extend some distance before gently curving outwards to the periphery. The zooecia are oblique at the periphery. Thin flat diaphragms are abundant in the proximal and subperipheral regions; in the proximal region they are a half to one and a half times the tube diameter apart and in the peripheral region they are a quarter to one tube diameter apart. Vesicular material develops initially in the intrazooecial spaces of the subperipheral region. These intrazooecial spaces rapidly widen, and at the periphery are filled with at least three or four rows of large overlapping convex vesicles, and dense interstitial material fills the vesicles at the periphery.

Remarks: No tangential section could be cut from the limited material available, so that not all the skeletal microstructures of the species are completely known. Of the few species attributed to the genus *Cheilotrypa,* this Australian species may be compared with *C. hispida* Ulrich, 1884, which possesses small cylindrical branches of similar diameter, oblique zooecia separated by at least four rows of vesicles, and only a few diaphragms per zooecial tube.

An incrusting *Fistulipora* sp. is associated with *Cheilotrypa* sp. *A*.

Genus Coelocaulis Hall & Simpson, 1887

Type species (designated by Hall & Simpson, 1887): *Callopora venusta* Hall, 1874, p. 101.

Diagnosis: "Zoarium ramose, hollow, inner surface a thin epitheca with transverse wrinkles, and fine longitudinal striations; cell tubular, arising from the epitheca, and parallel with it for a short distance, then turning abruptly outward; apertures circular or oval, sometimes irregularly disposed, at other times in a more or less regular quincunx order; peristomes thin, distinctly and equally elevated, usually smooth, but sometimes with numerous minute nodes or spinules; intercellular space occupied by irregularly disposed vesicles, or by regularly superimposed vesicles, resembling tabulate mesopores; interapertural space occupied by minute angular pits." (Simpson, 1897.)

Coelocaulis maculosa sp. nov.

(Pl. 14, fig. 1; Pl. 15, fig. 5; Pl. 16, figs. 1, 4; Pl. 18, fig. 2.)

Holotype: C.P.C. 952. One mile at 104° from Mount Percy, Leopold Downs Station, Fitzroy Basin, Western Australia. Fairfield Beds. Upper Devonian, Zone of *Avonia proteus.*

Paratypes: Paratype A, C.P.C. 953; Paratype B, C.P.C. 954; Paratype C, C.P.C. 955; Paratype D, C.P.C. 956. Same locality and horizon as the holotype.

Diagnosis: Species of *Coelocaulis* having closely spaced distinct maculae, and generally three diaphragms in the recumbent region of the zoarial tubes.

Description: The holotype is a hollow, broadly ramose zoarial fragment 1.7 cm. long, and 3.5 mm. across, expanding to 0.9 cm. in one region. On the more flattened sides of the zoarium the surface is irregularly undulating. The maculae, slight depressions or, more rarely, elevations on the zoarium, are closely spaced, ranging from 0.91 mm. by 0.78 mm. to 1.04 mm. by 0.52 mm. in diameter, are elongate in form, and are not arranged in a regular pattern. The spacing between maculae transversely is 2.5 mm. to 3.0 mm. (See Pl. 16, fig. 1.)

The subcircular zooecial orifices possess distinct lunaria, occupying one-third to one-half the zooecial circumferences, and well developed in zooecia situated at the outer edge of maculae. The zooecial orifices range in diameter from 0.20 mm. to 0.23 mm., and the diameters of the more elongate orifices range from 0.18 mm. by 0.20 mm., to 0.26 mm. by 0.34 mm.; zooecia adjacent to the maculae are about 0.31 mm. in diameter. The lunaria do not extend far into the zooecia and only slightly indent the zooecial orifices extending around about one-third of the circumference of a zooecial opening. The zooecial walls thicken in this region and possess a sharper curvature in their outline. The zooecia are direct at the surface. Polygonal vesicles fill the intrazooecial spaces; longitudinally the distance between zooecia varies from 0.10 mm. to 0.16 mm., and laterally from 0.03 mm. to 0.13 mm. The smaller zooecia are more closely spaced longitudinally than the large ones.

In the proximal region the zooecia are initially recumbent for a very short distance above the basal lamina, and then they gently slope upwards so that half the length of a zooecial tube is vertical. The basal lamina is thin and undulating. The zooecial tubes are uniformly large above the recumbent zone. The thin zoaria are about 0.8 mm. to 0.9 mm. thick, and the upright parts of the zooecial tubes are 0.5 mm. long. Some zooecial walls are indented by vesicles (Pl. 15, fig. 5) which are regularly arranged in either one or two vertical series of convex overlapping plates. On the average, 3 diaphragms, more or less complete and flat, cross the recumbent portion of the zooecial tube, and diaphragms are rare in the upright part of the zooecial tube.

Discussion: Coelocaulis maculosa differs from *C. venusta* (Hall), 1874, from the New Scotland Formation, Lower Devonian, New York State, in possessing smaller zooecial orifices, more abundant vesicles filling the intrazooecial spaces, and sparsely distributed diaphragms in the zooecial tubes. The two species are similar in possessing thin wrinkled basal laminae and small zooecia separated by a limited amount of vesicular material.

Remarks: Few species have so far been attributed to the genus *Coelocaulis*, and diaphragms which are distinctly visible in the Western Australian species have so far not been noted in other species of the genus. The species derives its name from the Latin *maculosus*, spotted, and refers to the distinct maculae on the zoarial surfaces.

Other material: C.P.C. 968 and C.P.C. 957. Same locality and horizon as the holotype.

Order CRYPTOSTOMATA Vine, 1883

Diagnosis: Zoarium mostly delicate reticulate fronds or slender branching stems of cylindrical or ribbon-like form, all calcareous. Zooecia as in Trepostomata, with well-marked differentiation of axial and peripheral regions, but the boundary between them more abrupt and the tubes much shorter; the distal part of each zooecial tube is a vestibule that extends from the opening at the surface to the position of the orifice near the inner boundary of the peripheral region, defined in many forms by shelf-like hemisepta projecting from the walls. Intraspaces between adjacent vestibules commonly filled with vesicular material or dense calcareous material, which may be traversed by acanthopores. (After Bassler, 1953.)

Family FENESTELLIDAE King, 1849

Diagnosis: Zoarium a reticulate expansion composed of rigid branches, laterally joined by regularly spaced noncelluliferous dissepiments, or by coalescence at opposed sinuous bends so as to form fenestrules; branches rarely free. Zoarium celluliferous on one side only. Short recumbent zooecial tubes commonly divided at the outer proximal region by superior hemisepta. Secondary orifices rounded, and rimmed by a peristome and opening on the celluliferous surface. Non-celluliferous surface may be smooth, longitudinally striate, granulose or nodose. Acanthopores, represented by spines, may occur on the celluliferous surface and commonly are spaced along a carina. (After Bassler (1953), and Nickles & Bassler (1900).)

Genus FENESTELLA Lonsdale, 1839

Type species: Fenestella subantiqua D'Orbigny, 1850 (= *Fenestella antiqua* Lonsdale, 1839).

Diagnosis: Zoarium funnel- or fan-shaped with the celluliferous surface on the outside. Zooecial openings in two rows, commonly separated by a tuberculate carina.

The diagnosis is based on discussions by Nickles & Bassler (1900), Cumings (1904, 1905a, 1905b), and Bassler (1953).

FENESTELLA AUSTRALIS Chapman, 1903

(Pl. 20, fig. 7.)

Fenestella australis Chapman, 1903, *Proc. Roy. Soc. Vic.*, 16 (N.S.), 62, pl. 10, fig. 11.

Lectotype: N.M.V. P1205A (counterpart of this specimen is numbered N.M.V. P16418), in dark bluish grey limestone found in Deep Creek, seven miles to the south-east of Walhalla, Victoria. Silurian or Devonian.

Paratypes: N.M.V. P589-591 inclusive. Same locality as lectotype. Material presented to the National Museum of Victoria by the Rev. A. W. Creswell.

Diagnosis: Irregular branching zoarium forming a considerably variable mesh.

Description of lectotype: The zoarium is funnel-shaped and the surface undulate; height 1.3 cm., width 1.3 cm. The branches of the zoarium are strongly curved; there are 7 branches in 10 mm. and the average width of a branch is 0.26 mm. The oval fenestrules have variable dimensions as a result of a very irregular branching pattern; longitudinally about 7 fenestrules in 10 mm.; laterally 8 fenestrules in 10 mm. The fenestrules measure 1.04 mm. to 1.3 mm. longitudinally and 0.65 mm. (average) laterally. The width of a dissepiment is 0.13 mm. The celluliferous surface has two rows of zooecial openings laterally directed towards the fenestrules; they are arranged alternately along the sides of the median keel. The circular zooecial openings are in continuous series along the branches and their continuity is not broken near the junctions of dissepiments and branches. Generally there are four zooecia along the length of one fenestrule and they are so arranged that an interspace generally occurs at the junction of a dissepiment and branch; about 41 zooecia in 10 mm. The average zooecial diameter is 0.13 mm., with an average distance between successive zooecial openings of 0.20 mm. The non-celluliferous surface is smooth and round.

Discussion: F. australis differs from *F. emanuelana* sp. nov. in possessing more widely spaced branches, fewer zooecia per fenestrule, laterally directed zooecial openings and a carina with ornamentation. The two species possess similar branch diameters, zooecial openings of similar dimensions, and approximately the same number of zooecial openings per 10 mm.

Remarks: Examination of specimen N.M.V. P1205A showed that there is no distinct break in the zooecial series at the junction of dissepiment and branch as indicated diagrammatically in Chapman's sketch, pl. 10, fig. 11 (1903).

Chapman's original description (1903) is composite, based on a number of specimens. N.M.V. P1205A, the only specimen figured (diagrammatically), has been chosen as the lectotype because the measurements of the zoaria correspond to Chapman's data and the other specimens are so poorly preserved.

Specimens N.M.V. P589-591 are very fragmentary and the structures observed are very few; but in form and measurement they seem to agree with *Fenestella australis*. Chapman (1903) also recorded this species from the Thomson River, Victoria, but this material has not yet been located.

FENESTELLA EMANUELANA sp. nov.

(Pl. 18, fig. 7.)

Holotype: C.P.C. 937. Locality K. 246, stratigraphic section DD2, Sadler Ridge, Emanuel Range, Fitzroy Basin, Western Australia; specimens occur 90 feet above the top of the Pillara Formation. Sadler Formation. Upper Devonian, ?Zone of *Ladjia saltica*. The sample is a calcarenite.

Diagnosis: Species of *Fenestella* having slightly elevated granulose peristomes surrounding the zooecial orifices, and four to six zooecial openings in the length of one fenestrule.

Description: A broad zoarial fragment, 1 to 1.5 cm. long and 0.75 cm. wide, with a very delicate lattice-like network of branches and dissepiments. The form of the zoarium is not determinable.

There are about 16 branches in 10 mm. laterally and 8 fenestrules in 10 mm. longitudinally. The bifurcations of the straight, high branches are so close together that only two or three dissepiments are present between successive bifurcations; the branches are 0.26 mm. wide. The median ridge has granules 0.13 mm. apart, 5 to 6 in the length of one fenestrule. The zooecial openings are circular, 0.13 mm. in diameter, and surrounded by slightly elevated granulose peristomes which in part unite with the median ridge. Each side of the branches slopes steeply away from the median ridge, so that the zooecial openings are oblique both to the surface and the fenestrules. The distance between the centres of successive zooecial openings ranges from 0.25 mm. to 0.28 mm.; about 39 to 42 zooecial openings occur in 10 mm. and 4-6 zooecial openings lie along the length of one fenestrule. The fenestrules are sub-rectangular and the width of the dissepiment is 0.18 mm.-0.20 mm. The length of the fenestrule ranges from 0.73 mm. to 1.1 mm., and the width from 0.52 mm. to 0.39 mm. The non-celluliferous surface, observed obliquely, has a scalloped outline which suggests the development of very broad and round transverse ridges or nodes across the branch.

Discussion: F. emanuelana may be compared with *F. westralis* sp. nov. It differs from *F. westralis* in possessing more closely spaced branches and dissepiments, larger zooecial openings and more closely spaced smaller fenestrules. The two species are similar in possessing zooecial openings on the sides of branches, oblique both to the celluliferous surface and fenestrules; an ornamented median ridge; and a similar number of zooecial openings per fenestrule.

Remarks: The wide fenestrules and oblique position of zooecia suggest that the material may form the immature portion of a zoarium or represent a species in the early evolutionary stage of a lineage. The species takes its name from the type locality in Emanuel Range, Fitzroy Basin, Western Australia.

FENESTELLA PIKERENSIS sp. nov.
(Pl. 18, fig. 1.)

Holotype: C.P.C. 939. Piker Hills, 4½ miles at 164° from Long Hole, Fossil Downs Station, Fitzroy Basin, Western Australia. Fairfield Beds, Zone of *Avonia proteus*. Upper Devonian. Specimens in a calcarenite.

Diagnosis: Species of *Fenestella* having two rows of small circular zooecial openings, 0.08 mm. to 0.10 mm. diameter, divided by a narrow carina lined with tubercles, 0.01 mm. in diameter, and successive tubercles 0.13 mm. to 0.16 mm. apart.

Description: Fragments of zoaria occur throughout the sectioned rock. There are about 16 branches in 10 mm. (calculated) laterally, and about 8 fenestrules in 10 mm. longitudinally. The branches are straight; the interval of bifurcation is not determinable. The width of the branches ranges from 0.13 mm. to 0.26 mm.

The features of the celluliferous surface cannot be seen on weathered surfaces, but in thin section a carina with tubercles is discernible; these features are developed in the median part of the branch. The tubercles on the carina have a diameter of 0.01 mm. and are 0.13 mm. to 0.16 mm. apart. The circular zooecial openings, with a diameter ranging from 0.08 mm. to 0.1 mm., occur within the bounds of the branches. The zooecial openings are widely separated; centres lie 0.26 mm. to 0.32 mm. apart. About 40 zooecial openings occur in 10 mm., and 3 to 4 in the length of one fenestrule. The fenestrules are rectangular and sub-rectangular, and the dissepiments, width 0.13 mm. to 0.18 mm., broaden slightly at the junction with the branches. The length of the fenestrules ranges from 0.60 mm. to 0.83 mm., and the width from 0.23 mm. to 0.31 mm. In deep tangential sections a hemiseptum indents the subcircular zooecial outline; and in deeper tangential sections, in the proximal region of the zooecial tubes, the zooecia form an alternate series of polygons along the branch with two and a half polygons adjoining one fenestrule. On the non-celluliferous surface the branches are smooth and finely striated with longitudinal lines and fine granules which extend into nodes at the junction with dissepiments.

Discussion: Fenestella pikerensis has smaller and more widely spaced zooecial openings than *F. emanuelana*, so that there are fewer zooecia per fenestrule; its dissepiments are narrower and its fenestrules smaller. Both species possess similar branch and fenestrule spacing and about the same number of zooecia per 10 mm.

Remarks: The species takes its name from the type locality, Piker Hills, Fitzroy Basin, Western Australia.

FENESTELLA WESTRALIS sp. nov.

(Pl. 19, fig. 2.)

Holotype: C.P.C. 938. K 403, 1-2 miles south-east of Prices Hill, Emanuel Range, Fitzroy Basin, Western Australia. Sadler Formation. Upper Devonian. Specimens in a calcarenite.

Diagnosis: Species of *Fenestella* with high, narrow branches bearing oblique zooecia and a well-developed median ridge.

Description: A portion of a zoarium appears on a weathered surface as a flat, somewhat undulating fragment 1.5 cm. by 0.5 cm. The form of the zoarium is not determinable.

There are about 11 branches in 10 mm. laterally and 6 fenestrules in 10 mm. longitudinally. The branches are slender and straight, bifurcating at short variable intervals averaging 2.5 mm., corresponding to about 3 fenestrules longitudinally; the rows of zooecia increase to three immediately before branching. The width of the branches is 0.29 mm. A median high carina bears distinctive tubercles; the distance between the tubercles averages 0.39 mm. and there are about three and a half tubercles in the length of one fenestrule. The zooecial openings are subcircular, 0.09 mm. long by 0.08 mm. wide; they are surrounded by very slight peristomes. The zooecial openings are placed on the sides of the branches oblique both to the celluliferous surface and the fenestrules. The zooecial openings are separated by wide calcitic intrazooecial deposits. The distance between the centres of successive zooecial openings averages 0.28 mm.; about 34 zooecial openings occur in 10 mm. The number of zooecial openings to each fenestrule varies from 4 to 7 owing to the variable length of the fenestrules. The fenestrules are subrectangular; their average length is 1.69 mm. and their width from 0.4 mm. to 0.15 mm. The dissepiments have a diameter of 0.16 mm. On the celluliferous surface, fine striations on the dissepiments swing round on to the branches. The non-celluliferous surface is smooth and slightly curved.

Discussion: F. westralis has been compared with *F. emanuelana.*

FENESTELLA YASSENSIS sp. nov.

(Pl. 18, fig. 3.)

Holotype: N.M.V. P7057. Limestone Creek, Yass, New South Wales. Barrandella Shale. Middle Silurian. Specimen in a calcareous shale.

Diagnosis: Species of *Fenestella* with 3 to 4 circular zooecial openings per fenestrule, zooecial openings of 0.11 mm. diameter, and a finely granular median ridge.

Description: The specimen is a broad zoarial fragment; it is part of a funnel-shaped zoarium whose zooecia are situated on the outer surface. The greatest length measured radially from the proximal to the distal region is 6 cm.

In the proximal region there are about 20-22 branches in 10 mm. laterally, and in the more distal part of the zoarium there are 22-24 branches in 10 mm. laterally and 14 fenestrules in 10 mm. longitudinally. The fine straight branches bifurcate frequently; the first two bifurcations occur every third fenestrule and are succeeded by a bifurcation at the eighth fenestrule. The width of the branches is 0.24 mm. A median ridge possesses fine granules 0.1 mm. apart, and about 0.01 mm. in diameter. The zooecial openings are circular, 0.11 mm. in diameter; the distance between the centres of successive openings is 0.23 mm.; 3-4 openings occur in the length of one fenestrule. In thin section the basal zooecial sections are quadrangular. The fenestrules are rectangular; the width of the dissepiment is 0.15 mm. The length of the fenestrules ranges from 0.55 mm. to 0.78 mm. and the width lies between 0.16 mm. and 0.26 mm. The non-celluliferous surface is rounded and smooth.

Discussion: In *F. yassensis* fenestrules and branches are more closely spaced than in *F. pikerensis*, and the slightly larger and more widely spaced zooecial openings have quadrangular basal zooecial sections, whereas those of *pikerensis* are polygonal. The two species both have similar numbers of zooecial openings along the length of a fenestrule, and carinae with tubercles of similar diameter; but the tubercles are more closely spaced in *F. yassensis.*

Remarks: The species takes its name from its location in the Yass District The quadrangular basal zooecial sections are noteworthy, as this skeletal microstructure agrees with Nekhoroshev's suggestion (1932) on the evolutionary development of the zooecial outline of fenestellids in the Silurian.

FENESTELLA MARGARITIFERA Chapman, 1903
(Pl. 20, fig. 1.)

Fenestella margaritifera Chapman, 1903, *Proc. Roy. Soc. Vic.*, 16 (N.S.), 61, 62, pl. 10, figs. 1-3.

Remarks: Chapman gave a composite description based on material from Yering, Upper Yarra River, and the junction of Woori-Yallock Creek and the Yarra River, Victoria. Examination of the material indicates that Chapman's data are not referable to the specimens and that two and possibly three species are present; but the material is so fragmentary and poorly preserved that the species cannot be revised until more material is available. Specimen N.M.V. P593 is a mould of the celluliferous surface of a funnel-shaped zoarium, and some measurements could be made; but these are not sufficient to identify the species.

Genus HEMITRYPA Phillips, 1841

Type species (designated by Ulrich, 1890, p. 396): *Hemitrypa oculata* Phillips, 1841, p. 27, pl. 13, fig. 38.

Diagnosis: Zoarium with the same general appearance as *Fenestella;* funnel-shaped or undulating foliate expansions. Zooecial orifices arranged in two rows separated by a carina. Zoarium has a reticulate superstructure consisting of straight or zigzag longitudinal bars, of which one is placed over each branch and another, commonly somewhat thinner, suspended midway between the branches. These bars are connected by transverse structures and the resulting meshes correspond in number and position to the zooecial openings. The pillars develop from the elevation of the carina at regular intervals.

This diagnosis is based on the diagnoses of Simpson (1895) and Nickles & Bassler (1900).

HEMITRYPA sp. A.
(Pl. 19, figs. 3, 4; Pl. 21, fig. 10.)

Material: A.M. F30191, A.M. F30175, A.M. F30170, A.M. F30111, A.M. F30173. Western face of railway cutting, Lake Bathurst Railway Station, New South Wales. ?Middle Devonian.

Description: The material consists of fragments of flat undulating fenestrate zoaria, with well developed superstructure rising from the branches and dissepiments and duplicating the external zoarial arrangement. The complete form of a zoarium is not known. A prominent longitudinal ridge on the surface of the superstructure of every alternate branch is the distinguishing feature of this smooth fenestrate lamina. The usual narrow keels unite this upper lamina with the lower celluliferous surface. The zoarium is 0.52 mm. thick.

The celluliferous surface is obscured by the superstructure, but it was possible to measure the diameter of the zooecia, which ranges from 0.13 mm. to 0.17 mm. The number of zooecia in 10 mm. could not be measured, but there are two zooecia per fenestrule. Longitudinal section shows abundant angular zooecial tubes, and two rows occur on anastomosing branches. Dissepiments are greatly shortened, so that the zooecial structures overlap on to the small but very wide dissepiments. Dissepiments are usually wider than the zoarial branch, particularly on the non-celluliferous surface. On the non-celluliferous surface the width of the branch is 0.26 mm. to 0.30 mm., the length of the dissepiment 0.15 mm. to 0.20 mm., and the width of the dissepiment 0.29 mm. to 0.35 mm. The oval fenestrule is 0.34 mm. to 0.38 mm. long and 0.20 mm. to 0.23 mm. wide.

On the superstructure the longitudinal primary bar with the longitudinal ridge is 0.09 mm. to 0.11 mm. thick, and the alternating secondary bar is 0.05 mm. to 0.09 mm. thick. The length of the transverse bar that joins longitudinal bars is 0.13 mm. to 0.16 mm. The round to polygonal fenestrules in the superstructure are 0.13 mm. to 0.16 mm. in diameter.

Remarks: The available material is too fragmentary for such important features as the number of zooecia per 10 mm. to be measured. Until more material is available this species cannot be compared with previously described species.

HEMITRYPA sp. B.

(Pl. 17, fig. 2.)

Material: U.S.G.D. 10447. 12 miles north-west of Wellington on the Wellington and Dubbo road. Lower or Middle Devonian.

Remarks: Fragments of a fenestrate zoarium are scattered throughout a thin section containing *Striatopora* sp. The transverse sections show two rows of zooecia on each branch. The carina on the branch extends vertically to form a reticulate superstructure.

Genus IKELARCHIMEDES nov.

Type species: Ikelarchimedes warooensis sp. nov.

Diagnosis: Zoarium consists of a solid axis to which are attached spirally coiled fenestrate expansions, celluliferous on the outer surface. Two rows of zooecia open on to the celluliferous surface, and are separated by an expanded carina, which forms a superstructure of longitudinal bars.

Remarks: Ikelarchimedes resembles *Archimedes* Owen, 1838, in possessing a spirally coiled fenestrate zoarium with two rows of zooecia along the branches. Unlike *Archimedes,* it has a superstructure developed by the expansion of the carina like *Semicoscinium,* from which it differs in the development of a fenestrate zoarium with a spiral axis. The generic name is derived from the Greek *ikelos,* like; and *Archimedes,* a bryozoan genus.

IKELARCHIMEDES WAROOENSIS sp. nov.

(Pl. 18, figs. 4-6, 8, 9; Pl. 19, figs. 5, 6, 8, 9; Pl. 20, figs. 3-6, 8; Pl. 21, figs. 6, 8.)

Holotype: U.S.G.D. 11442. Portion 208, Parish Waroo. Murrumbidgee "Series." ?Middle Devonian.

Paratypes: Paratype A, U.S.G.D. 11443; Paratype B, U.S.G.D. 11444; Paratype C, U.S.G.D. 11445; Paratype D, U.S.G.D. 11446; Paratype E, U.S.G.D. 11447; Paratype F, U.S.G.D. 11448; Paratype G, U.S.G.D. 11449; Paratype H, U.S.G.D. 11450. Same locality and horizon as the holotype.

Diagnosis: Species of *Ikelarchimedes* with expanded carinae whose smooth flat summits conceal the zooecial orifices, and smooth regularly arranged non-celluliferous surface.

Description: The holotype is a broad funnel-shaped fenestrate zoarium growing from an axis. The reticulate branches rise spirally from a solid axis. Figured specimens measure 2.5 mm. by 4.0 mm., 2.5 mm. by 3.0 mm., 3 mm. by 3 mm.; the axial structure is 0.47 mm. in diameter. The celluliferous surface is on the outside of the funnel.

Measurement of the number of branches in 10 mm. is difficult as the zoarial fragments consist of close circular radiating branches with bifurcations at each successive level: about 3 branches in 1.1 mm. in the holotype. Measurements made on the paratypes give: 6 branches in 3 mm.; 5 branches in 2.3 mm. Similarly the number of fenestrules measured vertically is variable, ranging from 2 in 1.4 mm. to 1.8 mm. in the holotype, to 2 in 1.3 mm. and 3 in 2.3 mm. in paratypes B and C. Branch width is 0.20 mm. to 0.23 mm. in the holotype, 0.26 mm. to 0.28 mm. in paratype A, and 0.33 mm. to 0.39 mm. in paratype B. The carinae expand to form the superstructure, and no nodes develop on them. Zooecial orifices are circular, laterally situated on steep sloping celluliferous branches. In the holotype, the zooecial openings are 0.07 mm. by 0.11 mm.; in paratype A, 0.07 mm. by 0.09 mm.; and in paratype B, 0.09 mm. by 0.07 mm. to 0.13 mm. The distance between centres of successive orifices is 0.20 mm. in the holotype and paratypes B and D. There are 3 to 4, rarely 5, zooecial orifices per fenestrule, concealed by the carinae. The number of orifices in 5 mm. is about 27 (calculated) in the holotype, 23 in paratype B, and 28 in paratype D. Fenestrules, measured on the celluliferous surface, are of variable sizes; in the holotype measurements obtained were 0.23 mm. by 0.70 mm., 0.26 mm. by 0.65 mm., and 0.23 mm. by 1.17 mm.; in paratype A, the dimensions were 0.29 mm. by 0.59 mm. and 0.39 mm. by 0.89 mm.; in paratype B, the dimensions were 0.17 mm. by 0.55 mm., 0.20 mm. by 0.39 mm., and 0.21 mm. by 0.06 mm. The width of the dissepiment is considerably smaller than that of the branch and generally measures 0.08 to 0.11 mm. in the proximal region of the zoarium, increasing to 0.21 mm. to 0.39 mm. in the mature region (measurement on paratype B). The carinae expand to support long smooth flat bars which are not laterally joined; the expanded width of a carina is 0.18 mm. to 0.27 mm. The smooth rounded non-celluliferous surface possesses fenestrules slightly smaller than those on the celluliferous surface.

Discussion: This species resembles the Devonian species *Semicoscinium interruptum* (Hall), 1883, from the Devonian of New York State; both have fenestrate expansions with short dissepiments, expanded carinae bearing flat summits which conceal the zooecial orifices, small fenestrules opening on the celluliferous surface, and about the same number of zooecia in 5 mm. (24 in *S. interruptum* and 27 in *I. warooensis*). It differs from *S. interruptum* in possessing a spirally coiled fenestrate zoarium with narrower branches and regularly arranged fenestrules on the non-celluliferous surface.

Family RHINIDICTYIDAE Ulrich, 1893

Diagnosis: Zoarium bifoliate or rarely trifoliate, continuous or jointed compressed branches or erect expansions. Zooecia subquadrate proximally, arranged longitudinally, zooecial openings elliptical to subcircular; lunaria absent. Median tubuli pierce the mesotheca, and acanthopores occur in the zooecial walls. Mesopores absent but vesicular material occasionally present.

This diagnosis is essentially the same as that outlined by Bassler (1953), and Nickles & Bassler (1900).

Range: Ordovician to Carboniferous.

Stictoporid Group

Colonies are bifoliate and have a ribbon-shaped form of growth. Zooecia are aligned in longitudinal ranges. Acanthopores are abundant in the zooecial walls. Mesopores are absent.

Zooecia grow from the mesothecal plane at a low angle and form a narrow inner region of thin zooecial walls. The base of the superior hemisepta marks the beginning of the outer peripheral region of thickened zooecial walls. The inner part of the zooecial walls lining the zooecial tubes has laminae steeply inclined distally to the surface of the colony. These laminae pass into the broadly curved, distally convex intertonguing laminae of the outer amalgamate part of the zooecial walls.

The mesotheca is pierced by median tubuli.

Genus STICTOPORA Hall, 1847

Stictopora Hall, 1847, p. 73; Phillips, 1960, p. 7.

Sulcopora d'Orbigny, 1849, p. 499.

Rhinidictya Ulrich, 1882, p. 152.

Hemidictya Coryell, 1921, p. 303.

Type species (designated by Ulrich, 1886, p. 67): *Stictopora fenestrata* Hall, 1847, p. 16.

Emended definition: Bifoliate branching zoarium which grows from a circular basal attachment. The mesotheca extends the full width of the zoarium and possesses numerous median tubuli. Zooecia bud from the mesotheca in ranges and they alternate on opposite sides of the mesotheca with overlap of the proximal zooecial walls. Small acanthopores in the zooecial walls extend from the mesotheca to the periphery and have dark lamellate walls. Acanthopores multiply at the base of the peripheral region.

Thin longitudinal laminate zooecial walls in the mesothecal region thicken abruptly in the subperipheral region with a change in the direction of growth. The walls in the subperipheral and peripheral regions are composed of a narrow inner part having steeply inclined laminae that curve over abruptly to intertongue with the broad convex laminae of the outer part. The outer part of the zooecial walls consists of the amalgamate laminae of adjacent zooecial walls. Lamellate superior hemisepta are present on the proximal walls of the zooecial tubes. Inferior hemisepta and diaphragms are limited in their development.

STICTOPORA BELUBULENSIS sp. nov.

(Pl. 21, figs. 2, 3, 5, 9.)

Holotype: U.S.G.D. 9234. South-east corner of Large Flat, 50 feet above the base of the shale and limestone. Cliefden Caves Limestone. Middle Ordovician. Specimens in a coquina.

Paratypes: Paratype A, U.S.G.D. 9261; Paratype B, U.S.G.D. 11408. Locality and age the same as the holotype.

Diagnosis: Species of *Stictopora* with slender zoarial branches and narrow zooecial walls both longitudinally and laterally.

Description: Zoaria are narrow and bifoliate, with flat undulating surfaces. In the holotype successive branches are 2.5 mm. and 12 mm. apart, but part of the branching is obscured by matrix. The small zoarial fragments are about 15 mm. in length. The branches have straight margins and slender elliptical transverse sections, 0.71 mm. thick in the median portion of the branch. Laterally there are about 8 ranges in 1 mm. Near regions of branching inconspicuous monticules develop; they consist of slightly larger zooecial openings and thicker zooecial walls.

The zooecia are elongated longitudinally and are arranged in longitudinal ranges separated by low flexuous ridges bearing acanthopores. In tangential sections zooecial openings situated in the median portion of the branch are direct and those in the outer one, or two, lateral ranges are oblique, and the lateral margins, 0.15 mm. wide, lack zooecia. This lateral region is pierced by numerous small acanthopores. Acanthopores, 0.03 mm. in diameter, surround the zooecial openings, 22 acanthopores per zooecium. The longitudinal arrangement of the acanthopores is very distinct in the lateral zooecial walls.

In longitudinal sections the zooecia initially grow obliquely from the mesotheca at 45°, and then extend parallel to it for 0.10 mm. before curving for a short distance at 45°. After this they pass into the narrow peripheral region by an abrupt lateral bend. The zooecial walls are slender in the mesothecal region and thicken considerably in the peripheral region. The zooecial openings contract slightly in the mid-peripheral region. No hemisepta were observed (Pl. 21, fig. 3).

In transverse sections the mesotheca, 0.26 mm. thick, is pierced by numerous median tubuli (Pl. 21, fig. 9).

Measurements (in mm.):	Holotype USGD 9234	Paratype A USGD 9261
Zoarial branch width	1.3	1.5
Zoarial branch depth	0.71	Not det.
Ranges on one side of a branch	7-8	7
No. of zooecia per 2 mm.		
Longitudinally	7	8
Laterally	10	Not det.
Width of zooecial wall		
Longitudinally	0.11-0.15	0.09-0.11
Laterally	0.13-0.14	0.13-0.17
Zooecial opening	(.20) x (.11-.13)	(.20-.23) x (.09-.13)
Acanthopores per zooecium	22	about 20
Diameter of acanthopore	0.02-0.03	0.02-0.03
Depth of mesotheca	0.26	Not det.

Discussion: Stictopora belubulensis can be distinguished from *S. mutabilis* Ulrich, 1886, Trenton shales, Minneapolis, Minnesota, by its narrower branches, greater interval between successive bifurcations, and fewer ranges. Both species have zooecial openings of similar dimensions, and lateral ranges with oblique zooecia, and both lack hemisepta.

Remarks: The species takes its name from the Belubula River, which cuts through the Cliefden Caves Limestone at Cliefden Caves, the type locality.

STICTOPORA BOWANENSIS sp. nov.
(Pl. 22, figs. 1-5.)

Holotype: U.S.G.D. 11409. Locality 7, Portion 289, Parish of Bowan; four miles east-south-east of Cudal, Orange district, New South Wales. Bowan Park Limestone. Middle to Upper Ordovician. Specimens in a coquina.

Paratypes: Paratype A, U.S.G.D. 10409; Paratype B, U.S.G.D. 11410; Paratype C, U.S.G.D. 11411. Locality and horizon the same as the holotype.

Diagnosis: Species of *Stictopora* with fenestrate zoaria, long zooecial tubes in the mesothecal region, and well-developed superior hemisepta.

Description: The zoaria are thin, bifoliate, and fenestrate. A zoarial fragment 8 mm. long and 5 mm. wide has broad anastomosing branches interspersed with small circular fenestrules, 1.5 mm. long and 1.2 mm. wide. A broad branch between fenestrules is 1.2 mm. to 1.7 mm. wide and contains numerous zooecial openings. Long narrow zooecial openings are oval and lie in regular flexuous series around the fenestrules (Pl. 22, figs. 1, 2).

In tangential sections the zooecial openings in the median part of a branch are slightly oblique at the surface, whereas the outer two ranges of a branch have oblique zooecial openings that are inclined laterally toward the fenestrules. The outer part of the zooecial walls is composed of clear amalgamate laminae, and the inner part of the zooecial walls, 0.06 mm. wide, is a band of concentric laminae, lining the zooecial tubes. Acanthopores are abundant and occur as small distinct tube- or rod-like structures, 0.01 mm. in diameter, whose clear calcite rod structure is enclosed by slender walls. In very shallow tangential sections, the numerous acanthopores may form as many as three irregular linear series weaving between the zooecial openings. In deeper tangential sections only a single series, in the form of polygons, surrounds the zooecial tubes; about 26 acanthopores per zooecium. In deeper tangential sections cutting the mesothecal region of a zoarium the outline of the zooecia is rectangular and the zooecial walls are narrow laminate structures. The narrow lateral margins of the zoarial branches lack zooecia, but are pierced by numerous acanthopores (Pl. 22, fig. 4).

In transverse sections median tubuli lie in the narrow mesotheca.

In longitudinal sections the zooecial tubes possess well-developed superior hemisepta which project proximally into the zooecial cavities at the base of the peripheral region; the length of a superior hemiseptum is 0.03 mm. The zooecial tubes grow steeply from the mesotheca, which is 0.02 to 0.03 mm. thick, and form narrow cylinders parallel to the mesotheca until they reach the peripheral region, where they abruptly bend laterally. A complete diaphragm rarely crosses a zooecial tube. In U.S.G.D. 11411, the radius of the peripheral region is 0.09 mm. and the radius of the mesothecal region is 0.13 mm.

Measurements (in mm.):	Holotype USGD 11409
Zoarial branch width	1.2-1.7
Zoarial branch depth	0.20
Ranges on one side of a branch	7-8
No. of zooecia per 2 mm.	
Longitudinally	7
Width of zooecial walls	
Longitudinally	0.13-0.18
Laterally	0.13-0.20
Zooecial opening	0.14-0.17 by 0.08-0.09
Ratio: $\frac{\text{width of peripheral region}}{\text{width of zooecium}}$	0.45
Acanthopores per zooecium	26
Diameter of acanthopore	0.01
Depth of mesotheca	0.03
Dimensions of fenestrules	1.5 x 1.2

Discussion: The only comparable species to *Stictopora bowanensis* is *S. minima* (Ulrich), 1890, Trenton, Cannon Falls, Minnesota. Both have narrow branches with 7 to 8 ranges, 16 zooecia in 5 mm. longitudinally, one to three series of acanthopores piercing the zooecial walls in the peripheral region, and superior hemisepta. However, *S. bowanensis* has fenestrate zoaria, one or two additional ranges in the wider branches, and slightly larger zooecia separated by wider zooecial walls.

Remarks: The species derives its name from the Parish of Bowan where the type material was collected.

The holotype represents the mature part of a zoarium, with small zooecial openings and moderately wide zooecial walls.

Other Material: U.S.G.D. 10429. Portion 289, Parish of Bowan. Bowan Park Limestone. Middle to Upper Ordovician.

STICTOPORA QUANDONGENSIS sp. nov.

(Pl. 23, fig. 2, 5, 6, 8.)

Holotype: U.S.G.D. 10401. Locality 8, Portion 289, Parish of Bowan, four miles east-south-east of Cudal. Bowan Park Limestone. Middle to Upper Ordovician. Specimens in a bioclastic calcarenite.

Paratypes: Paratype A, U.S.G.D. 10449; Paratype B, U.S.G.D. 11407; Paratype C, U.S.G.D. 11416. Same locality and horizon as the holotype.

Diagnosis: Species of *Stictopora* with small zooecial openings, 0.12 to 0.17 mm. by 0.08 mm., and very narrow zooecial walls, so that the zooecia commonly are arranged in a diagonal pattern.

Description: The narrow strap-shaped bifoliate zoaria have flat undulating surfaces. Branching is dichotomous, but the interval is not determinable. The branches range in width from 1.6 to 2.0 mm.

In tangential sections the zooecial openings are oval or circular, and lie in longitudinal ranges separated by long flexuous zooecial walls. In shallow tangential sections the longitudinal arrangement of the zooecia is not particularly distinctive, because the lateral zooecial walls are so narrow, and generally a diagonal arrangement is more prominent; the diagonal intrazooecial space is about 0.09 mm. In specimens fragmented from the mature parts of colonies there are seven zooecia in 1.5 mm. longitudinally, and six ranges in 1 mm. laterally, and seven to eight ranges occur on the surface of a zoarial branch. In a portion of a zoarium 1 mm. before bifurcation, there are 4½ zooecia in 1.5 mm. longitudinally, and 5½ ranges in 1 mm. laterally. In the median part of a branch, zooecia are direct or slightly oblique at the periphery, and are 0.12 to 0.18 mm. long and 0.05 to 0.08 mm. wide in mature specimens, and 0.18 to 0.20 mm. long and 0.13 mm. wide in immature specimens. In the tangential sections narrow bands of concentric laminae, 0.01 mm. wide, form the inner part of the zooecial walls lining the zooecial tubes. The outer part of the zooecial walls, composed of amalgamate intertonguing laminae of adjacent zooecial walls, is pierced by numerous distinct acanthopores, 0.01 mm. in diameter. In shallow tangential sections a single series of acanthopores encircles each zooecium, about 28 to 30 per zooecium. In deeper tangential sections the acanthopores form long flexuous lines which swirl around the zooecial tubes, about 20 to 22 per zooecium. In the lateral parts of the zoarial branches, the outer one, or sometimes two, marginal ranges possess oblique zooecial openings, and the narrow lateral margins which lack zooecia are pierced by numerous small acanthopores (Pl. 23, fig. 5).

In transverse sections the mesotheca is 0.03 mm. thick in the axial region, and abruptly thickens in the early peripheral region to 0.14 mm.

In longitudinal sections the cylindrical zooecial tubes lack hemisepta.

Measurements (in mm.):	Holotype USGD 10401
Zoarial branch width	1.6-2.0
Zoarial branch depth	0.5-0.7
Ranges on a branch	7-8
No. of zooecia per 2 mm.	
Longitudinally	9-9½
Width of zooecial walls	
Longitudinally, median part of a branch: proximally	0.08-0.13
distally	0.14-0.20
Longitudinally, lateral part of a branch: proximally	0.13-0.16
Diagonally	about 0.06
Zooecial opening — Proximal region	0.18-.0.20 by 0.13
Distal region	0.12-0.17 by 0.05-0.08
Acanthopores per zooecium	28-30
Diameter of acanthopore	0.01
Depth of mesotheca	
In the axial region	0.02-0.03
In the peripheral region	0.14

Discussion: Stictopora quandongensis is similar to *S. mutabilis* Ulrich, 1886, Trenton shale, St. Paul, Minnesota, in the distribution of zooecia and zooecial dimensions; but its zoaria are more slender and bear fewer ranges, separated by narrower lateral zooecial walls. Acanthopores are fewer and smaller in the Australian species. The Australian species differs from *S. fenestrata* Hall, 1847, Chazy limestone, Chazyan, Chazy, New York State, in having fewer ranges across its branches, fewer zooecia per 2 mm., larger zooecial openings, narrow zooecial walls, and no hemisepta. It differs from *S. nicholsoni* (Ulrich), 1882, Tyrone formation (Trenton), High Bridge, Kentucky, in having fewer ranges across its branches. The two species are similar in the number of zooecia per 2 mm. in the median portions of their branches, their narrow zooecial walls, and the dimensions of their zooecial openings.

Other Material: Specimens U.S.G.D. 10431, 11412, 11413, and 11414, from the same locality and horizon as the holotype, have dimensions and skeletal microstructures similar to *Stictopora quandongensis*. Although in these specimens the branches are wider and the zooecia per 2 mm. more numerous than the holotype, this material appears to lie within the range of variation of *S. quandongensis*.

STICTOPORA ZEEHANENSIS sp. nov.

(Pl. 24, figs. 1, 3.)

Holotype: U.T.G.D. 20334-1. Smelters Quarry, Zeehan, Tasmania. Gordon Limestone. Middle or Upper Ordovician. Specimens in a calcareous siltstone.

Paratype: U.T.G.D. 20334-6. Same locality and horizon as the holotype.

Diagnosis: Species of *Stictopora* with slender zoarial branches, narrow zooecial walls, and numerous acanthopores in the zooecial walls.

Description: Zoaria are narrow and bifoliate and have flat, undulating, dichotomizing branches; trifurcation rarely occurs. The branches have straight parallel margins and thin elliptical transverse sections. In the median part of a branch the zoarial thickness ranges from 0.70 to 0.85 mm. The zoarial fragments are commonly 1.5 cm. long and range in width from 1.15 to 2.3 mm., increasing to 3 to 4 mm. at the point of bifurcation. Bifurcation occurs at intervals ranging from 2 to 7 mm. and is more common towards the proximal part of the zoarium.

In mature specimens the zooecia are elongated longitudinally and lie in longitudinal ranges separated by granulo-striate, slightly elevated and flexuous ridges; longitudinally 8 zooecia in 2 mm. and laterally 9 to 11 ranges on each celluliferous surface. The number of ranges increases to 13 to 18 at the point of bifurcation. In tangential sections the zooecial walls are 0.11 mm. wide longitudinally and 0.12 mm. laterally. The zooecial openings in the median part of a branch are slightly oblique. One or two, and rarely three, marginal ranges have more obliquely directed zooecial openings. The lateral margins of the branches lack zooecia and are obliquely traversed by numerous acanthopores with clear calcite axes. The flexuous ridges formed by the lateral zooecial walls also possess numerous small acanthopores, which are arranged in polygons around the zooecial openings and lie in the outer part of the zooecial walls. There are 16 to 18 acanthopores per zooecium. Concentric laminae lining the zooecial tubes form the inner part of the zooecial walls (Pl. 24, fig. 3).

In longitudinal sections the zooecia grow obliquely at 45° from the mesotheca, which is 0.05 mm. thick. In the mesothecal region the zooecial walls are thin. At the base of the peripheral region, where superior hemisepta may be present, the zooecial tubes make an abrupt lateral bend. The zooecial walls thicken considerably in the peripheral region, where they are pierced by numerous acanthopores. In a fragment with a branch thickness of 0.82 mm., the mesothecal region is 0.20 mm. wide and the peripheral region is 0.62 mm. wide (Pl. 24, fig. 1).

Transverse sections of the zoarial fragments display numerous median tubuli in the mesotheca.

Measurements (in mm.):

Zoarial branch width	1.15-2.3
Zoarial branch depth	0.70-0.85
Ranges on a branch	9-11
No. of zooecia per 2 mm.	
Longitudinally	8
Width of zooecial wall	
Longitudinally	0.11
Laterally	0.12
Zooecial opening	0.12-0.15 by 0.09-0.1
Acanthopores per zooecium	16-18
Depth of mesotheca	0.5

Discussion: Stictopora zeehanensis is not closely comparable with any known species of *Stictopora.* It differs considerably from *S. paupera* (Ulrich), 1886, Middle Ordovician, St. Paul, Minnesota, in its dimensions, having thicker zoaria, wider peripheral regions, slightly more numerous zooecia, and fewer bifurcations of the zoarial branches. Although Ulrich (1893) did not describe the skeletal microstructures of *S. paupera,* he did state that they were similar to *S. mutabilis* Ulrich. *S. mutabilis* differs considerably from *S. zeehanensis* in its zoarial dimensions, but the longitudinal sections of the two species are similar, particularly with respect to the deep curvature of the proximal region of the posterior wall, which bends abruptly into the peripheral region.

Remarks: The species derives its name from the township of Zeehan, Tasmania, where the type material was collected. Numerous zoarial fragments occur on richly fossiliferous bedding planes.

Abundant fragments of *Stictopora* occur in shale from Smelters Quarry, Zeehan (U.T.G.D. 20537 and U.T.G.D. 23416) but they are too poorly preserved and fragmentary to be indentified specifically. Pelitic rocks collected from the ridge beside the railway line near Queenstown Oval, Queenstown (U.T.G.D. 24102) contain iron-oxide casts of stictoporid colonies.

Other Material: U.T.G.D. 24116 and U.T.G.D. 24794. Same locality and horizon as the holotype.

STICTOPORA sp. A.

(Pl. 24, fig. 8.)

Material: U.S.G.D. 11404. Reedy Creek, east of Molong, New South Wales. Reedy Creek Limestone. Specimens in a bioclastic calcarenite. Middle to Upper Ordovician.

Description: Transverse sections of bifoliate zoaria show the mesotheca pierced by numerous median tubuli; depth of zoarial fragments about 0.8 mm. Zooecial openings are surrounded by numerous acanthopores. No transverse structures were observed in the slender zooecial tubes.

Remarks: The species cannot be identified, for lack of material. Its occurrence extends the distribution of the genus *Stictopora* in Ordovician sediments of central-western New South Wales. The genus is also found at Cliefden Caves, Bowan Park, and south-east of Cargo.

STICTOPORA sp. B.

(Pl. 23, figs. 3, 4.)

Material: U.S.G.D. 9384 and U.S.G.D. 11420. Three miles south-east of Cargo, New South Wales. At the base of the Regan's Creek Limestone. Middle or Upper Ordovician. Specimens in a bioclastic calcarenite.

Description: A narrow bifoliate branching zoarium, 7 mm. long and 1.0 mm. wide.

The zooecial openings are oval, but the arrangement of the zooecia is not determinable; 3½ ranges in 0.5 mm. The zooecial openings are direct in the median part of a branch and measure 0.16 mm. longitudinally and 0.11 mm. laterally. In deeper tangential sections cutting the mesothecal region the zooecia are rectangular in outline. The zooecial walls measure 0.08 to 0.11 mm. longitudinally and 0.05 to 0.07 mm. laterally. Numerous acanthopores with clear calcite axes, 0.01 mm. in diameter, occur in a single series around the zooecial openings. In very shallow tangential sections the acanthopores are irregularly scattered throughout the zooecial walls.

In a longitudinal section of specimen U.S.G.D. 11420 the mesotheca is pierced by median tubuli.

Remarks: Insufficient material is available for specific identification.

STICTOPORA sp. C.

(Pl. 23, fig. 1; Pl. 24, figs. 4-7.)

Material: U.S.G.D. 10400 and U.S.G.D. 11419. Locality 12, Portion 289, Parish of Bowan. Bowan Park Limestone. Middle to Upper Ordovician. Specimens in a bioclastic calcarenite.

Description: In longitudinal sections the zooecia grow along the mesotheca, 0.2 mm. in thickness, for a short distance before making a steep sigmoid curve which is lateral in the short peripheral region. The early part of the peripheral region is marked by a broad protuberance on the proximal wall. The zooecial openings are situated at the base of a slight vestibule, 0.04 mm. deep. The slender zooecial walls of the mesothecal region undergo sudden and considerable thickening at the base of the peripheral region. Numerous acanthopores surround the zooecial openings, at least 22 acanthopores per zooecium, and extend the complete depth of the peripheral region. The diameter of a zooecial tube measures 0.13 mm. and the vestibule measures 0.17 mm.

Remarks: The longitudinal section of this species is distinctive, and shows sigmoidal curvature of the zooecial tubes and faint superior hemisepta. Additional material is required before specific identification can be made.

STICTOPORA sp. D.

(Pl. 24, fig. 2.)

Material: U.S.G.D. 10408. Locality 2, Portion 36, Parish of Bowan. Bowan Park Limestone. Middle to Upper Ordovician. Specimens in a bioclastic calcarenite.

Description: The fragment of a narrow bifoliate zoarium is 8 mm. long and 0.13 mm. thick.

The zooecial openings are circular, but no lateral or longitudinal arrangement on the celluliferous surface is determinable. The zooecia are 0.25 mm. long and

0.14 mm. wide and are surrounded by numerous acanthopores. These are irregularly scattered throughout the zooecial walls, but in deep tangential sections the acanthopores form polygons around the zooecial tubes; at least 24 acanthopores per zooecium. The longitudinal zooecial wall is 0.11 mm. and the lateral interzooecial wall is 0.08 mm.

Median tubuli pierce the mesotheca, which is 0.03 mm. thick. No hemisepta were observed in the gently curving zooecial tube.

Remarks: This species occurs towards the base of the Bowan Park Limestone, but insufficient material is available for specific identification.

Family RHABDOMESONIDAE Vine, 1883

Since the Family Rhabdomesonidae was established in 1883 the number of genera attributed to it has increased to 29 (Bassler, 1953). An analysis of the descriptions of many of the type species suggests that on the basis of published data not all these genera are distinct and recognisable.

The Rhabdomesonidae are characterized by ramose zoaria with hemisepta in the proximal parts of the peripheral regions of zooecial tubes. Well-developed vestibules and sharply differentiated thickened walls of the peripheral region of the type genus *Rhabdomeson* resulted in the Family Rhabdomesonidae being assigned to the Cryptostomata. Many genera later grouped in this family are not distinctly characterized by these features and possess taxonomic characters indicating closer affinities with stenoporid and "batostomellid" species. In many species the zooecial walls of the axial and peripheral regions are not sharply differentiated, and the gradual curvature and thickening of the zooecial walls from the axial to peripheral regions suggest relations with the Trepostomata. The original concept of the family has therefore altered to accommodate these later described forms. Bassler (1953) replaced the Rhabdomesonidae in the Cryptostomata, believing that it has closer affinities, particularly the type genus, to the Cryptostomata.

As many of the species placed in the Rhabdomesonidae possess structural features closely resembling stenoporids and "batostomellids" — in particular the presence of moniliform wall structure and gently curving zooecial tubes lacking vestibules and hemisepta — it seemed that a comparative examination of a number of genera assigned to the Rhabdomesonidae might aid in the assessment of the taxonomic significance of different skeletal structures. The evaluation of genera which appear to have affinities with the genus *Rhombopora* reveals that some genera erected solely on external features cannot be recognized and differentiated.

The following review includes consideration of genera that appear to have affinities with *Rhombopora.*

Genus *Acanthoclema* Hall, 1886

Acanthoclema Hall, 1886, explanation of plate 25.
Acanthoclema Hall & Simpson, 1887, p. xv, 72.

Type species (by monotypy): *Trematopora alternata* Hall, 1883.

The original description, based on hand-specimens, states "zoarium ramose, solid. Cells arising from a filiform axis; apertures arranged in longitudinal rows separated by ridges. Usually one or two nodes between the cells, which are represented in the interior by short tubuli." (Hall & Simpson, 1887.)

The characteristic features of the genus seem to be the longitudinal ridges with only one, or possibly two, single nodes (megacanthopores) in the longitudinal zooecial walls between successive zooecia.

Genus *Bactropora* Hall & Simpson, 1887.

Bactropora Hall & Simpson, 1887, p. 193.

Type species (by original designation): *Trematopora? granistriata* Hall, 1883.

Hall & Simpson (1887) are inconsistent in their generic and specific descriptions of the genus. In the generic diagnosis the zoarium is unbranched, whereas in the specific description "bifurcations are distant"; the illustrations show unbranched zoarial fragments. The descriptions were based on hand-specimens and broken surfaces of specimens. The characteristic external features are the abundant acanthopores of one size arranged in longitudinal and possibly polygonal rows around the zooecial openings (Hall & Simpson, 1887, pl. 66, figs. 21, 22). Until the skeletal microstructures are known it will not be possible to distinguish this genus from either *Nicklesopora* Bassler, 1952, which was defined as having only micracanthopores, or *Saffordotaxis* Bassler, 1952, which was defined as having only megacanthopores. Thus the status of both *Nicklesopora* and *Saffordotaxis* stands in doubt.

Genus *Goldfussitrypa* Bassler, 1952

Goldfussitrypa Bassler, 1952, p. 384.

Type species (by original designation): *Rhombopora esthonia* Bassler, 1911a, p. 163, text-fig. 82.

Diagnosis: Zoarium ramose; zooecia thick-walled in the peripheral region and numerous micracanthopores at the outer edge of well-defined vestibules. Zooecial openings arranged in distinct longitudinal or diagonal lines. (After Bassler, 1952.)

This unusual genus differs from other genera of the Rhabdomesonidae in possessing diaphragms in the axial region and only micracanthopores around the polygonal zooecial openings. Its relations to the Rhabdomesonidae are doubtful.

Genus *Linotaxis* Bassler, 1952

Linotaxis Bassler, 1952, p. 384.

Type species (by original designation): *Orthopora? magna* McNair, 1952, p. 347, pl. 47, figs. 6, 10-12.

On the basis of present data *Linotaxis* cannot be distinguished from *Acanthoclema*. In erecting the new genus *Linotaxis* Bassler stated: "*Rhombopora* with zooecia arising gently from a central linear axis and a large megacanthopore at the head of each aperture." McNair indicates that the "acanthopores are small, few, less numerous than zooecia, which are separated by longitudinal sinuous ridges." Consequently the occurrence of a single megacanthopore in the longitudinal zooecial wall per zooecium, and also longitudinally arranged zooecia which are separated by longitudinal ridges, suggest identity with *Acanthoclema*.

Genus *Rhombopora* Meek, 1872

Rhombopora Meek, Moore, 1929, p. 133.
Rhombopora Meek, Bassler, 1929, p. 63.

Type species: Rhombopora lepidodendroides Meek, 1872, p. 141.

Diagnosis: Zoarium ramose, slender, cylindrical or slightly compressed; branches bifurcating at regular, distant intervals. Zooecia rhombic, regularly arranged in longitudinal and oblique spiral rows, the former sometimes separated by more or less flexuous longitudinal ridges. Small circular zooecial openings placed at the bottom of a polygonal vestibule, which are surrounded by one or more rows of micracanthopores. A megacanthopore is present at the junctions of the zooecial walls. In longitudinal sections the zooecial tubes curve from the axial region to the peripheral region without an abrupt change in direction. Poorly developed hemisepta, which, if present at all, appear as slight thickenings on the zooecial walls at the point of bending. Diaphragms have not as yet been observed.

The above diagnosis is based on consideration of data available in Meek (1872) and Bassler (1929).

At present *Rhombopora* is a difficult genus to recognize, yet many later genera have been erected by comparison with it. The status of such genera will remain uncertain until a complete description of the type species of *Rhombopora* is available.

The description of the type species *Rhombopora lepidodendroides* Meek, 1872, is based mainly on external features described by Meek and on limited data of skeletal microstructures, which are available from comments made by Bassler (1929). Although Bassler sectioned material supposedly of Meek's original type species for comparison with Permian Bryozoa from Timor, the only comments he made are as follows: "These thin sections show that the genotype, like the four following species from Timor, differ in vertical section from more typical Cryptostomata in that the vestibular part of the zooecial tubes forming the mature region does not bend at an angle as sharp as usual and that hemisepta if present at all are represented only as a very slight thickening on the wall at the point of bending. This combination of characters in connection with the growth of tubes from a more or less irregular central line characterized the species of late Palaeozoic age, but more ancient species of the genus agreeing in all other ways develop undoubted hemisepta so that this difference is only one of degree and not one of generic importance." This adds little to Meek's original description.

Moore (1929b, p. 134) comments that "hemisepta . . . so far as we can discover . . . are entirely absent in the genotype of *Rhombopora, Rhombopora lepidodendroides* Meek", and also that diaphragms are apparently absent, but does not indicate the material upon which he has based his observations. Thus the exact position of the genus appears dubious until revision of the type species is published.

The species attributed to *Rhombopora* can be arranged in two groups; in one group curvature of the zooecial tube increases sharply and the zooecial walls thicken abruptly at the proximal end of the peripheral region; in the other, the zooecial tubes curve gently throughout their length, and thickening of the zooecial walls is gradual at the proximal part of the peripheral region. The latter group includes species with wall structures simulating the moniliform character of the stenoporids. From this it is seen that the change in the concept of the Family Rhabdomesonidae was related, in great part, to consideration of this aberrant group of species of *Rhombopora.*

Genus *Nicklesopora* Bassler, 1952

Nicklesopora Bassler, 1952, p. 384.

Type species (by original designation): *Rhombopora elegantula* Ulrich, 1884, p. 33, pl. 1, fig. 3-3b.

The erection of the genus *Nicklesopora* was accompanied by the following brief note: "*Rhombopora* with a single row of micracanthopores around each zooecium. No diaphragms, hemisepta, mesopores, or central axis." Consequently the genus is dependent upon the concept of the genus *Rhombopora,* which requires revision.

A review of the descriptions and plates of species attributed to *Rhombopora* and *Nicklesopora* suggests that the present distinction between the two genera is based on external features, namely the presence of megacanthopores and micracanthopores in *Rhombopora,* but of micracanthopores only in *Nicklesopora.* Diaphragms are not a persistent structure in some genera and not always a reliable feature upon which to base generic distinctions. In some genera the development of diaphragms is related to the growth stage of a zoarium; degeneration and regeneration of structures in the distal parts of the zoarium may result in the elimination of such features, if a specimen represents an early mature part of a colony. Thus the present concept of *Rhombopora* may accommodate species with diaphragms only in part of the zoarium and the absence of such structures is not a significant generic feature.

Until a complete description of the type material of the genus *Rhombopora* is published the true distinction between *Rhombopora* and *Nicklesopora* is uncertain and quite subjective.

Genus *Tropidopora* Hall, 1886

Tropidopora Hall, 1886, explanation to plate 25, figs. 25, 26.
Tropidopora Hall & Simpson, 1887, p. xv, p. 71.

Type species (by monotypy): *Tropidopora nana* Hall, 1886.

Remarks: Tropidopora is not recognizable at present; the only known characters belonging to the genus are: "ramose zoarium; oval or circular apertures in irregular longitudinal rows which are separated by sinuous ridges."

Genus *Saffordotaxis* Bassler, 1952

Saffordotaxis Bassler, 1952, p. 385.

Type species (by original designation): *Rhombopora incrassata* Ulrich, 1890, p. 652, pl. 70, figs. 12a-d.

Remarks: Saffordotaxis, like *Nicklesopora,* is dependent upon the recognition of the genus *Rhombopora. Saffordotaxis* is considered to differ from *Nicklesopora* in having one or two rows of megacanthopores surrounding each zooecium.

Genus NICKLESOPORA Bassler, 1952

The generic status of *Nicklesopora* is discussed on page 88.

NICKLESOPORA CRENULATA sp. nov.

(Pl. 25, figs. 4, 6; Pl. 26, fig. 4.)

Holotype: C.P.C. 940. Piker Hills, four miles at 164° from Long Hole, Fossil Downs Station, Fitzroy Basin, Western Australia. Fairfield Beds. Upper Devonian. Zone of *Avonia proteus.* Paratype A, C.P.C. 964, same locality and horizon as holotype.

Diagnosis: Species of *Nicklesopora* with narrow zooecial walls, 0.06 to 0.07 mm. wide, pierced by numerous acanthopores.

Description: Zoarial fragments are solid cylindrical stems about 3 cm. long and 0.83 to 1.2 mm. in diameter. The stems bifurcate, but the intervals of bifurcation are not determinable.

Zooecial openings form distinct longitudinal ranges demarcated by longitudinally aligned acanthopores; zooecia are oval in outline, measuring 0.13 mm. by 0.08 to 0.09 mm.; longitudinally 5 zooecia in 1.5 mm. and laterally 7½ ranges in 1 mm. The narrow zooecial walls are 0.06 mm. laterally and 0.13 to 0.16 mm. longitudinally, and are pierced by numerous acanthopores 0.01 mm. in diameter. The clear calcite axes of the acanthopores are enclosed by finely laminate walls and lie in the outer part of the zooecial walls.

In longitudinal sections the zooecial tubes grow steeply inclined at 30° to the axis of growth of the branch and in the subperipheral region make an abrupt lateral bend and pass into the narrow peripheral region. The zooecial walls are slender and crenulate in the axial region and thicken abruptly at the base of the peripheral region. In this region the laminae of the narrow inner part of the zooecial walls are steeply inclined distally and intertongue with the broad distally convex laminae of the outer part of the zooecial walls.

Discussion: Nicklesopora crenulata differs from *N. westralis* sp. nov. in its smaller zooecial openings, narrower zooecial walls, and fewer acanthopores, and in lacking superior hemisepta. The two species both have thin crenulate zooecial walls in the axial region, and zooecial openings aligned in longitudinal series.

Remarks: This new species is not comparable with any previously described species of *Rhombopora* or *Nicklesopora.* The species takes its name from the

Latin, *crenulatus*, meaning minutely crenulate, and refers to the crenulate walls in the axial region.

The species is associated with *Fenestella pikerensis* sp. nov.

NICKLESOPORA FITZROYENSIS sp. nov.

(Pl. 26, figs. 6, 7.)

Holotype: C.P.C. 946. 4.6 miles at 60° from Spieler's Bore and 13.6 miles from Leopold Downs Station, Fitzroy Basin, Western Australia. Oscar Formation. Upper Devonian.

Diagnosis: Species of *Nicklesopora* with elongate zooecial openings, 0.16 mm. by 0.07 to 0.12 mm. arranged in a diagonal pattern and surrounded by a single series of acanthopores, 16 to 18 per zooecium.

Description: Zoarial fragments are solid cylindrical stems about 2 cm. long and 2.5 mm. in diameter. The branches bifurcate, but the interval of bifurcation is not determinable. Macroscopically the zooecial openings are surrounded by polygonal vestibules carrying a single series of acanthopores, and they present a rhomboidal pattern spiralling around the zoarial branches.

In tangential sections the longitudinally elliptical zooecial openings are regularly arranged in a diagonal pattern and have dimensions of 0.16 mm. in length and 0.08 to 0.13 mm. in width; an occasional longer zooecium of 0.20 mm. occurs. Longitudinally there are 10 zooecia in 3 mm. and laterally 6 ranges in 1 mm. About 31 ranges are present on a cylindrical stem that has wide zooecial walls, 0.11 to 0.13 mm. laterally and 0.13 to 0.16 mm. longitudinally, pierced by numerous acanthopores, 0.01 mm. in diameter. About 16 to 18 acanthopores in a single series surround each zooecial opening. In deep tangential sections the longitudinal arrangement of the zooecia is well defined, but acanthopores are not readily observable in the longitudinal zooecial walls. In deep tangential sections about 11 acanthopores surround each zooecium (Pl. 26, fig. 7).

In longitudinal sections in the axial region, the thin, slightly flexuous zooecial walls diverge at 60° from the axis of growth of the branch. They pass into the peripheral region with abrupt curvature laterally. The zooecia are slightly oblique at the periphery. The thickened zooecial walls of the peripheral region have broadly curved laminae in their outer part and narrow steeply inclined laminae in their inner part, and acanthopores with laminate walls extend the full depth of this peripheral region. Diaphragms are lacking in the axial region, but superior hemisepta occur on the lower walls at the base of the peripheral region. The radius of the axial region is 0.57 mm. and that of the peripheral region 0.65 to 0.70 mm.

Discussion: Nicklesopora fitzroyensis differs from *N. leopoldensis* sp. nov. in its thicker zoarial stems with larger zooecial openings, and wider peripheral regions. It lacks elongated zooecial openings arranged in longitudinal ranges. The two species are similar in possessing thin flexuous walls in the axial region, zooecial openings surrounded by numerous acanthopores, and wide zooecial walls.

Remarks: The species takes its name from the Fitzroy Basin, where the type material was collected.

NICKLESOPORA? FLEXUOSA (Chapman), 1920

(Pl. 28, fig. 1.)

Acanthoclema flexuosa Chapman, 1920, *Rec. geol. Surv. Vic.*, 4(2), 189, pl. 24, fig. 20; pl. 32, figs. 38-40.

Lectotype: N.M.V. P13964 (C2679). Gibbo River, Victoria. Silurian or Devonian. Casts and weathered fragments of bryozoa are preserved in a dark grey limy shale.

Description: Numerous narrow cylindrical branches range from 1.12 mm. to 3.0 mm. diameter. The greatest length of a zoarial branch is 2.5 cm.; branches bifurcate at regular intervals, and on occasions trifurcate. Circular zooecial openings are arranged in longitudinal series, 4½ zooecial openings in 2 mm., and form part of a quincuncial arrangement. The zooecial openings average 0.18 mm. in diameter. There are about 10 longitudinal ranges of zooecia on a zoarial branch. The proximal part of the zooecial tubes grows steeply inclined to the axis of growth of the branch. In the numerous casts, the axial region appears to be composed of 3 to 4 long, continuous, and parallel tubes, and this suggests a filiform axis. But it is difficult to determine the true nature of these axial tubes from the casts, as it is possible that the proximal part of the zooecia may be very long and almost upright. The zooecial tubes swing from the axial region at an angle of 45° and then gently curve to the periphery; the length of the zooecial tubes is 0.75 mm., the diameter of zooecia in the axial region 0.05 mm. to 0.10 mm, the diameter of zooecia in the peripheral region 0.20 mm.

As the specimens are mainly preserved as casts it is difficult to determine superficial features. There are granular structures around the zooecial openings, generally spaced some distance from the openings, but it is not possible to determine if they represent acanthopores.

The specimen is deeply weathered and thin sections cannot be cut.

Discussion: The few preserved external features do not enable critical comparison to be made with other described material. The possible occurrence of acanthopores has led me to place this material provisionally in the genus *Nicklesopora*.

Remarks: Chapman (1920) based his description mainly on two wax squeezes which he figured. He referred to the walls between the openings as occupied by a depressed vertical ridge. This is a very difficult feature to ascertain, since only internal casts are available.

NICKLESOPORA GEURIENSIS sp. nov.

(Pl. 25, figs. 3, 7.)

Holotype: U.S.G.D. 10438. Portion 58, Parish of Geurie, 10½ miles north-west of Wellington, New South Wales. Lower or Middle Devonian.

Diagnosis: Species of *Nicklesopora* with small zooecial openings, 0.05 mm. by 0.03 mm. in diameter, arranged in a diagonal pattern, and encircled by 2 to 4 acanthopores per zooecium.

Description: The zoaria are small cylindrical stems about 6.0 mm. long and 1.5 mm. diameter.

Zooecial openings are 0.05 mm. by 0.03 mm. and are arranged in a diagonal pattern on the surface of the zoarial stem: 4 zooecia longitudinally in 1 mm., 4½ zooecia diagonally in 1 mm. Two to four acanthopores encircle each zooecium and lie at the junctions or along the sides of the zooecia. The small zooecial openings lie at the base of polygonal vestibules.

In longitudinal sections the zooecia grow steeply inclined to the axis of growth of the branch, and the slightly crenulate zooecial walls of the axial region thicken abruptly in the early part of the peripheral region, where the zooecial walls bend laterally. Zooecial openings are direct at the periphery. In the peripheral region the zooecial walls are composed of fine, broadly curved laminae and are pierced by acanthopores, whose walls are formed by steeply inclined laminae. The acanthopores extend the depth of the peripheral region. In the peripheral region zooecial tubes are crossed by one or two diaphragms, one diaphragm being situated in the mid-peripheral region, and the other at the base of the peripheral region. Hemisepta were not visible.

Discussion: Nicklesopora geuriensis differs from *N. crenulata, N. fitzroyensis, N. leopoldensis,* and *N. westralis* in possessing fewer acanthopores per zooecium and one or two diaphragms per zooecial tube. The species are similar in possessing crenulate zooecial walls in the axial region, and markedly thickened zooecial walls in the peripheral region.

Remarks: The species takes its name from the Parish of Geurie, where the type material was collected.

Another species associated with *Nicklesopora geuriensis* may possibly be referred to the genus *Saffordotaxis*.

NICKLESOPORA LEOPOLDENSIS sp. nov.

(Pl. 25, figs. 1, 2, 5, 8; Pl. 26, fig. 1.)

Holotype: C.P.C. 945. 4.6 miles at approximately 60° from Spieler's Bore and 13.6 miles from Leopold Downs Station, Fitzroy Basin, Western Australia. Oscar Formation. Upper Devonian.

Paratype A: C.P.C. 965. Same locality and horizon as the holotype.

Diagnosis: Species of *Nicklesopora* with wide zooecial walls pierced by numerous acanthopores.

Description: Zoarial fragments are thin cylindrical stems about 1.5 cm. long and 2.2 mm. in diameter. The stems bifurcate, but the interval of bifurcation is not known (Pl. 25, fig. 5).

In shallow tangential sections the zooecial openings are almost completely hidden by greatly thickened zooecial walls. The openings are either completely obscured, or present as small elongate openings, 0.01 mm. long (Pl. 25, fig. 1).

Acanthopores are exceedingly abundant and scattered throughout the zooecial walls in an indistinct longitudinal arrangement; about 16 to 18 acanthopores per zooecium. In deeper tangential sections the acanthopores present a more regular pattern and a single series of acanthopores surrounds each zooecium. In deeper tangential sections, where acanthopores no longer pierce the longitudinal zooecial walls, about 11 acanthopores encircle a zooecial tube. The acanthopores range in diameter from 0.01 to 0.03 mm. They possess clear calcite axes and laminate walls.

The elliptical zooecial openings measure 0.01 to 0.13 mm. longitudinally, and 0.04 to 0.05 mm. laterally; 7 zooecia in 2 mm. longitudinally, and 5 ranges in 1 mm. laterally. The zooecial walls are wider than the zooecial tube diameter; the longitudinal wall between successive zooecia is uniformly 0.16 mm. wide, and the lateral zooecial wall 0.15 mm.

In longitudinal sections in the axial region the long thin flexuous zooecial walls diverge at 30° from the axis of growth of the branch. As they pass into the peripheral region the zooecia make an abrupt lateral bend. The zooecia are slightly oblique at the periphery. No transverse structures were observed to cross the zooecial tubes. The zooecial walls thicken considerably in the peripheral region and greatly restrict the zooecial openings. The radius of the axial region is 0.15 mm. and the radius of the peripheral region is 0.58 mm.

Discussion: This species is compared with *Nicklesopora fitzroyensis* sp. nov. under discussion of that species.

NICKLESOPORA WESTRALIS sp. nov.

(Pl. 26, figs. 2, 3, 5.)

Holotype: C.P.C. 941. 6 miles at 74° from Horse Springs, Fossil Downs Station, Fitzroy Basin, Western Australia. Fossil Downs Formation. Upper Devonian.

Paratypes: Paratype A, C.P.C. 942; Paratype B, C.P.C. 943; Paratype C, C.P.C. 944. Same locality and horizon as the holotype.

Diagnosis: Species of *Nicklesopora* with elliptical zooecial openings at the base of polygonal vestibules, outlined by numerous acanthopores, wide zooecial walls, and superior hemisepta in the zooecial tubes.

Description: The zoarial fragments are solid cylindrical stems of mature specimens. Fragments are 1.4 cm. long, and average 2.5 mm. in diameter. They bifurcate, but the interval of bifurcation is not known. The zooecial openings form regular longitudinal series and are outlined by polygons of acanthopores. Longitudinally there are 6½ zooecia in 2 mm., and laterally 6 to 7 ranges in 1.5 mm. In tangential sections, the zooecial openings outlined by acanthopores are elliptical, 0.17 mm. long and 0.08 to 0.14 mm. wide. The longitudinal alignment of the zooecia is occasionally disrupted by the occurrence of slightly larger zooecial openings with thicker walls, which possibly form indistinct monticules and suggest possible budding of the zoarium at such points. The zooecial walls are wider than the zooecial tube diameter; the diagonal measurement between zooecia is 0.13 to 0.23 mm. and the width of the longitudinal zooecial walls between successive zooecia is 0.13 to 0.26 mm. The outer part of the zooecial walls is pierced by numerous acanthopores, 0.01 mm. diameter, and in deep tangential sections these acanthopores form a single series encircling the zooecial tubes. In shallow tangential sections about 20 acanthopores per zooecium form polygons around the zooecial openings, and in deeper tangential sections the longitudinal linear arrangement of the acanthopores is more distinct and the acanthopores in the longitudinal zooecial walls are no longer present. Concentric laminae form the inner part of the zooecial walls.

In longitudinal sections in the axial regions the zooecial walls are slender and crenulate, diverging from the axis of growth of the branch at 40°. They pass into the peripheral region by an abrupt lateral bend. The zooecia are direct at the periphery, but considerable thickening of the walls in this region modifies the zooecial openings. The zooecial tubes in the axial region lack diaphragms, but well developed superior hemisepta appear at the base of the peripheral region, where the zooecial tubes bend abruptly. The superior hemisepta appear as spines, 0.01 mm. wide, projecting 0.06 mm. into the zooecial tubes. In the peripheral region the diameter of the zooecial tubes, 0.21 mm., is greater than that of the zooecial openings, 0.20 mm. The thickened zooecial walls are composed of broadly curving laminae. The acanthopores, with laminate walls, extend the full depth of the peripheral region and pierce the broad laminae of the zooecial walls. A terminal diaphragm crossing the zooecial openings at the periphery may be present. The radius of the peripheral region is 0.07 mm., which is wider than the axial region, 0.52 mm.

Discussion: The species is compared with *Nicklesopora crenulata* under discussion of that species.

Remarks: Nicklesopora westralis takes its name from Western Australia, where the type material was collected.

Genus Saffordotaxis Bassler, 1952

The concept of the genus is discussed on p. 88.

Saffordotaxis? sp. a.

(Pl. 27, figs. 2, 5.)

Specimens U.S.G.D. 11439 and U.S.G.D. 11440 possess subpolygonal to oval zooecial openings, 0.08 to 0.14 mm. long, and 0.05 to 0.08 mm. wide, that are situated at the base of shallow vestibules. The zooecial walls are 0.05 mm. thick and acanthopores, 0.02 to 0.03 mm. diameter, pierce the laminate zooecial walls.

In longitudinal sections the zooecial walls curve gently from the axis of growth of the zoarial branch and gradually thicken in the subperipheral region. Diaphragms are absent in the zooecial tubes.

The material occurs with *Nicklesopora geuriensis* sp. nov. in Portion 58, Parish of Geurie, 10½ miles north-west of Wellington, New South Wales. Lower or Middle Devonian.

Genus RHOMBOPORA Meek, 1872

Diagnosis and discussion on page 87.

RHOMBOPORA? GIPPSLANDICA Chapman, 1907

Rhombopora gippslandica Chapman, 1907, *Rec. geol. Surv. Vic.*, 2(1), 10, 16, pl. 2, fig. 4; pl. 7, fig. 5.

Material: N.M.V. P2314. Wombat Creek, Victoria. Silurian or Devonian. N.M.V. P12829, thin section cut from the limestone specimen No. 74 of Chapman's field numbers. Tyers River, Victoria. Silurian or Devonian.

Description: In specimen N.M.V. P2314, limonite casts of a slender cylindrical branching colony have lengths of 1 cm. and diameters of 1 mm. Wax moulds made from the limonite casts suggest that the zooecial openings are arranged in distinct longitudinal series. There are eight parallel ranges around a zoarial stem. Zooecial openings are round and very oblique to the zoarial surface, about 11 zooecial openings in 1 cm. longitudinally.

Thin section N.M.V. 12829 contains an oblique section of a cylindrical stem about 0.9 mm. diameter, and designated *Rhombopora gippslandica* by Chapman. The colony possesses cylindrical tubes gradually expanding from the axis of growth of the branch. No other skeletal microstructures were observed.

Remarks: Chapman based his original description of *Rhombopora gippslandica* on material from Tyers River and Wombat Creek. The material from Wombat Creek is preserved as casts in shale and lacks the necessary skeletal miscrostructures to permit revision. The oblique thin section, which is the only one available, throws no light on the understanding of skeletal microstructure, and hemisepta which are recorded by Chapman as being present were not observed. Hand-specimen No. 74 has not as yet been located. Until it is found and additional material gathered the generic and specific status of this species cannot be determined. The few structures so far observed do not validate the classification of the specimen in the phylum Bryozoa.

BRYOZOAN LOCALITIES AND SPECIES

MIDDLE ORDOVICIAN, NEW SOUTH WALES

1. South-east corner of Large Flat at the foot of Fossil Hill, 50 feet above the base of the Cliefden Caves Limestone. *Austraphylloporina cliefdenensis* sp. nov., *Orbignyella boonderensis* sp. nov., *Stictopora belubulensis* sp. nov.
2. Fossil Hill, Cliefden Caves, 50 feet above the base of the Cliefden Caves Limestone. *Homotrypa fenestrata* sp. nov.
3. Fossil Hill, Cliefden Caves, basal *Trimerella* horizon, Cliefden Caves Limestone. *Homotrypa fenestrata* sp. nov.
4. Fossil Hill, Cliefden Caves, 30 feet above the *Trimerella* horizon, Cliefden Caves Limestone. *Homotrypa fenestrata* sp. nov.
5. Fossil Hill, Cliefden Caves, 70 feet above the *Trimerella* horizon, Cliefden Caves Limestone. *Batostoma tubuliferum* sp. nov. and *Homotrypa fenestrata* sp. nov.
6. Reedy Creek, east of Molong, New South Wales. Reedy Creek Limestone, *Homotrypa* sp. *A*., *Stictopora* sp. *A*.

MIDDLE AND UPPER ORDOVICIAN, NEW SOUTH WALES

7. Locality 7, Portion 289, Parish of Bowan, about one half mile north-north-west of Quandong homestead; four miles east-south-east of Cudal. *Mesotrypa* sp. *A*, *Stictopora bowanensis* sp. nov.
8. Locality 8, Portion 289, Parish of Bowan, 160 feet above the lower coral horizon and locality 7. Bowan Park Limestone. *Homotrypa* sp. cf. *H. fenestrata* sp. nov., *Stictopora quandongensis* sp. nov., *Batostoma* sp. *B*.
9. Locality 12, Portion 289, Parish of Bowan, 130 feet above the lower coral horizon. Bowan Park Limestone. *Stictopora* sp. *C*.
10. Locality 2, Portion 36, Parish of Bowan, the base of the Bowan Park Limestone. *Homotrypa* sp. cf. *H. fenestrata* sp. nov. *Stictopora* sp. *D*.
11. Three miles south-east of Cargo, at the base of the Regan's Creek Limestone. *Stictopora* sp. *B*.
12. Portion 55, Parish of Bowan. Bowan Park Limestone. *Homotrypa* sp. cf. *H. fenestrata* sp. nov.

MIDDLE AND UPPER ORDOVICIAN, TASMANIA

13. Smelters Quarry, Zeehan. Gordon Limestone. *Stictopora zeehanensis* sp. nov., *Batostoma* sp. *C*.
14. Ridge beside railway line, near Queenstown Oval. Gordon Limestone. *Amplexopora queenstownensis* sp. nov.

UPPER ORDOVICIAN, CENTRAL AUSTRALIA

15. ?Middle Valley or George Gill Range, Macdonnell Ranges. *Batostoma* sp. *A*.

MIDDLE SILURIAN, NEW SOUTH WALES

16. Black Bog Creek, Hatton's Corner, Yass. ?Barrandella Shale. *Heterotrypa humensis* sp. nov.
17. Black Bog Creek, Hatton's Corner, Yass. Black Bog Beds. *Calopora hattonensis* sp. nov.
18. Hatton's Corner, Yass. Hume Limestone or Barrandella Shale. *Cheilotrypa* sp. *A*.
19. Limestone Creek, Yass. Barrandella Shale. *Fenestella yassensis* sp. nov.

SILURIAN OR DEVONIAN, VICTORIA

20. Gibbo River, tributary of the Mitta Mitta River, County of Benambra. *Nicklesopora? flexuosa* (Chapman).
21. Wombat Creek, tributary of the Mitta Mitta River, County of Bogong. *Rhombopora? gippslandica* Chapman.
22. Deep Creek, tributary of the Thomson River, seven miles south-east of Walhalla. *Fenestella australis* Chapman.
23. Tyers River, tributary of the Latrobe River, south of Walhalla. *Rhombopora? gippslandica* Chapman.

LOWER DEVONIAN, VICTORIA

24. Junction of Woori-Yallock Creek and Yarra River, south-east of Lilydale. *Fenestella margaritifera* Chapman.
25. Yering, Upper Yarra River, south-east of Lilydale. *Fenestella margaritifera* Chapman.
26. Lilydale. *Fenestella margaritifera* Chapman.
27. Griffith's Quarry, Loyola, near Mansfield. *Fistulipora victoriae* Chapman.
28. Rushworth. "*Heterotrypa rushworthensis*" Chapman.

LOWER OR MIDDLE DEVONIAN, NEW SOUTH WALES

29. Locality WR33680, Parish of Ponto, Terrabella Road, 4½ miles west of Wellington. *Heterotrypa pontensis* sp. nov.
30. Portion 58, Parish of Geurie, north of Wellington. *Nicklesopora geuriensis* sp. nov. *?Saffordotaxis* sp. *A*.
31. 12 miles north-west of Wellington on the Wellington and Dubbo Road. *Hemitrypa* sp. *B*.

MIDDLE DEVONIAN, NEW SOUTH WALES

32. Portion 208, Parish of Waroo. Murrumbidgee "Series". *Ikelarchimedes warooensis* sp. nov.
33. Taemas. Exact locality not known. Murrumbidgee "Series". *Leptotrypa* sp. *A*.
34. Portion 229, Parish of Waroo, near the road and about 200 yards north of the old Taemas Bridge, Murrumbidgee River. Murrumbidgee "Series". *Stereotoechus shearsbyi* (Crockford).
35. Nora Creek, 7¼ miles W 48° N from Molong Railway Station, Molong. *Fistulipora norensis* sp. nov.
36. 7½ miles W 55° N from Molong Railway Station, Molong. *Cyphotrypa lamellosa* sp. nov.
37. Devil's Elbow, above the Burrinjuck Dam, Murrumbidgee River. Murrumbidgee "Series". *Cyphotrypa murrumbidgensis* sp. nov.
38. Cave Flat, 3½ miles above the Burrinjuck Dam, Murrumbidge River. Murrumbidgee "Series". *Homotrypa?* sp. *B*.
39. Western face of railway cutting, Lake Bathurst Railway Station. *Hemitrypa* sp. *A*.

MIDDLE DEVONIAN, FITZROY BASIN, WESTERN AUSTRALIA

40. K 463*, section DMP 1 at Menyous Gap, Pillara Range; 1150 to 1160 feet above the base of the type section of the Pillara Formation, *Amphipora ramosa* zone. *Fistulipora pillarensis* sp. nov.

UPPER DEVONIAN, FITZROY BASIN, WESTERN AUSTRALIA

41. K236, stratigraphic section DD2, Sadler Ridge, Emanuel Range, 70 feet above the top of the Pillara Formation in the Sadler Formation, in the *Ladjia saltica* zone. *Fistulipora sadlerensis* sp. nov.
42. K 246, stratigraphic section DD 2, Sadler Ridge, Emanuel Range, 90 feet above the top of the Pillara Formation in the Sadler Formation, immediately above the *Ladjia saltica* zone. *Fenestella emanuelana* sp. nov.
43. K 403, Sadler Ridge, Emanuel Range, one to two miles south-west of Prices Hill, possibly in the *Emanuella torrida* zone of the Sadler Formation. *Fenestella westralis* sp. nov.
44. Six miles at 74° from Horse Spring, Fossil Downs Station. Fossil Downs Formation. *Nicklesopora westralis* sp. nov.
45. 4.6 miles at 60° from Spieler's Bore and 13.6 miles from Leopold Downs Station. Oscar Formation. *Nicklesopora fitzroyensis* sp. nov., *N. leopoldensis* sp. nov.
46. Piker Hills, four miles at 164° from Long Hole Bore, Fossil Downs Station. Fairfield Beds. *Nicklesopora crenulata* sp. nov., *Fenestella pikerensis* sp. nov.
47. K 283, Oscar Hill, 10 miles north-west of Fitzroy Crossing. Fairfield Beds, zone of *Avonia proteus*. *Fitzroyopora oscarensis* sp. nov.
48. K 292, stratigraphic section DF 2, south of Burramundi Range, 190 feet above the base of the Fairfield Beds, zone of *Avonia proteus*. *Granivallum fistulosum* sp. nov.
49. K 325, stratigraphic section DF 5, Fossil Downs, 7 miles east of Bullock Paddock Bore, 37 feet from the base of the Fairfield Beds, zone of *Avonia proteus*. *Granivallum fistulosum* sp. nov.
50. Eight miles at 74° from Horse Spring, Fossil Downs Station. Fairfield Beds, zone of *Avonia proteus*. *Percyopora occidentalis* sp. nov.
51. One mile at 104° from Mount Percy, Leopold Downs Station. Fairfield Beds, zone of *Avonia proteus*. *Percyopora tubulata* sp. nov., *Coelocaulis maculosa* sp. nov., *?Discotrypa* sp. *A*.
52. Teichert collection, KP 71, two miles west of Carpenter's Gap, Napier Range. Napier Formation. *Percyopora tubulata* sp. nov.
53. Teichert collection, B 7 (= T 2 = K 283), Oscar Hill, 10 miles north-west of Fitzroy Crossing. Fairfield Beds, zone of *Avonia proteus*. *Fitzroyopora oscarensis* sp. nov.
54. Teichert collection, T 25 (A 28), "Top of Mount Pierre", Fairfield Beds, zone of *Avonia proteus*. *Granivallum fistulosum* sp. nov.
55. Teichert collection, B 11 (T 29), Teichert (1949, p. 53), "On the road from Mount Pierre to Tinbilly Spring, 0.6 mile from where the road leaves the Telegraph line". Fairfield Beds, zone of *Avonia proteus*. *Granivallum fistulosum* sp. nov.
56. Teichert collection, A 16 (T 14), Teichert (1949, p. 55, pl. 1) "Second hill north-west of Fossil Hill". Fossil Downs Formation. *Granivallum fistulosum* sp. nov.

* Locality and section symbols refer to Guppy *et al.* (1958). See also Veevers (1959, p. 152-168).

MIDDLE AND UPPER ORDOVICIAN SPECIES

	Locality
Amplexopora queenstownensis sp. nov.	14
Austraphylloporina cliefdenensis sp. nov.	1
Batostoma tubuliferum sp. nov.	5
Batostoma sp. *A*	15
Batostoma sp. *B*	8
Batostoma sp. *C*	13
Homotrypa fenestrata sp. nov.	2, 3, 4, 5
Homotrypa cf. *fenestrata* sp. nov.	8, 10, 12
Homotrypa sp. *A*	6
Mesotrypa sp. *A*	7
Orbignyella boonderensis sp. nov.	1
Stictopora belubulensis sp. nov.	1
Stictopora bowanensis sp. nov.	7
Stictopora quandongensis sp. nov.	8
Stictopora zeehanensis sp. nov.	13
Stictopora sp. *A*	6
Stictopora sp. *B*	11
Stictopora sp. *C*	9
Stictopora sp. *D*	10

MIDDLE SILURIAN SPECIES

	Locality
Cheilotrypa sp. *A*	18
Fenestella yassensis sp. nov.	19
Calopora hattonensis sp. nov.	17
Heterotrypa humensis sp. nov.	16

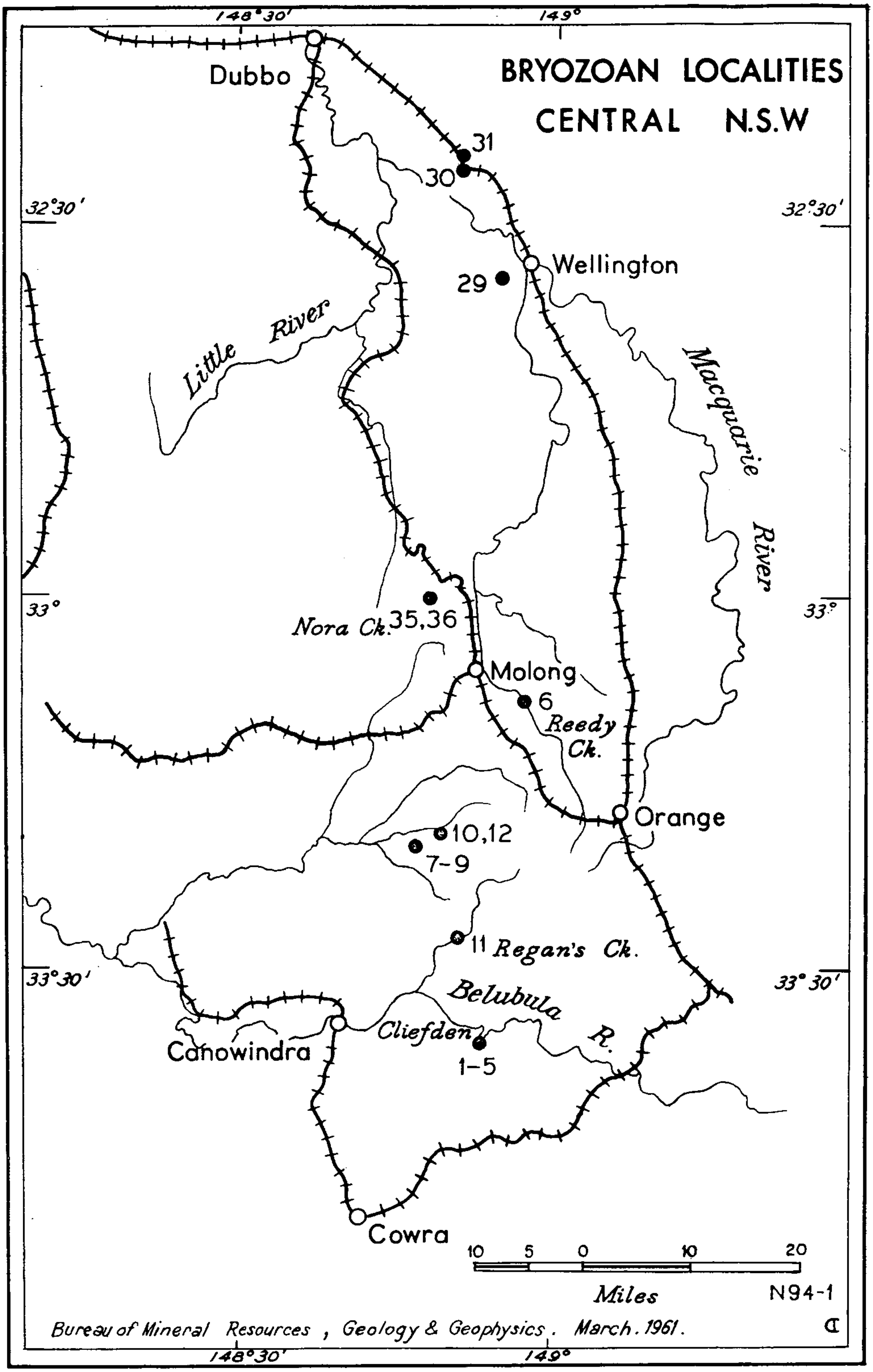
SILURIAN OR DEVONIAN SPECIES

	Locality
?*Nicklesopora flexuosa* (Chapman)	20
?*Rhombopora gippslandica* Chapman	21, 23
Fenestella australis Chapman	22

DEVONIAN SPECIES

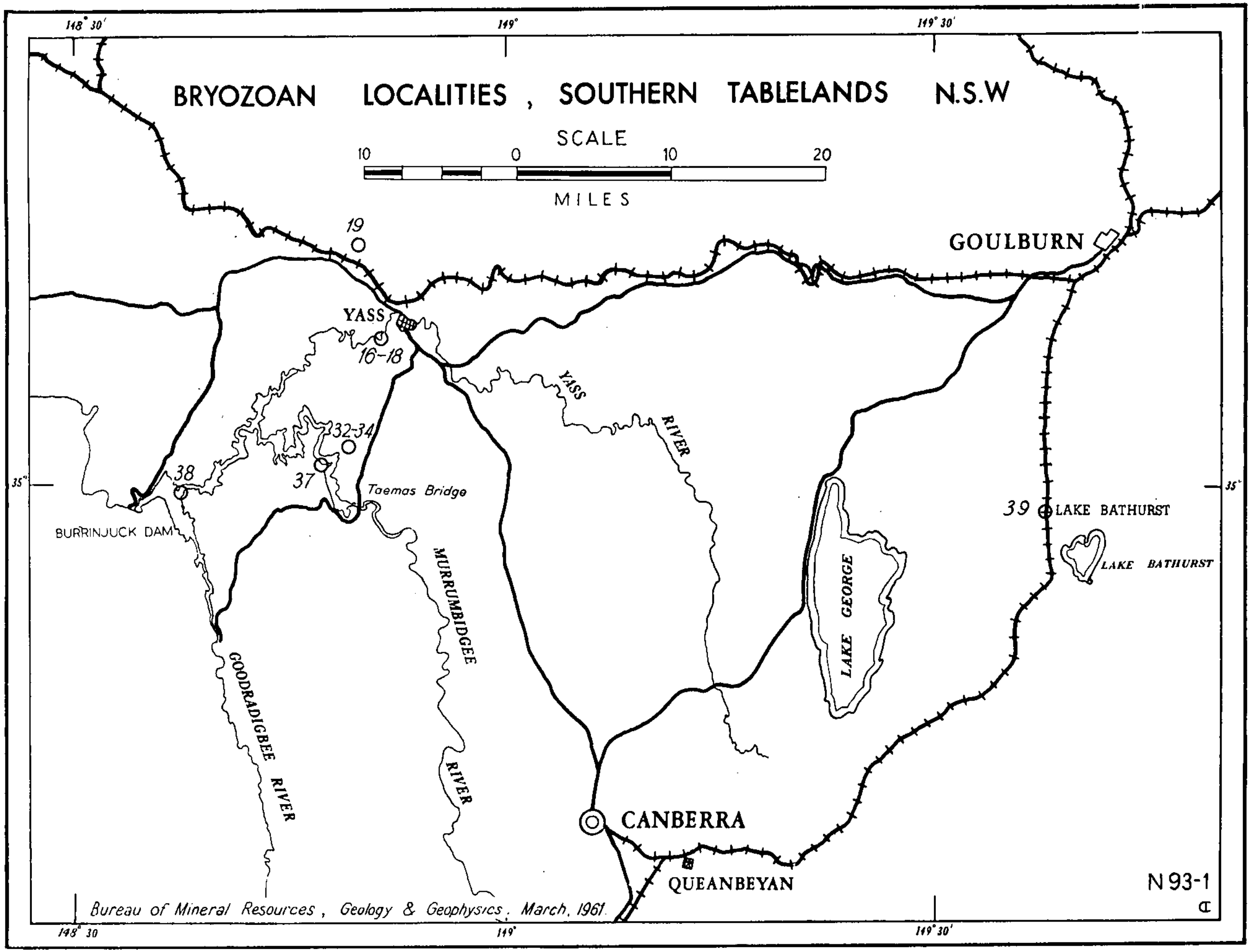
	Locality
Coelocaulis maculosa sp. nov.	51
Cyphotrypa lamellosa sp. nov.	36
Cyphotrypa murrumbidgensis sp. nov.	37
?*Discotrypa* sp. *A*	51
Fenestella emanuelana sp. nov.	42
Fenestella margaritifera Chapman	24, 25, 26
Fenestella pikerensis sp. nov.	46
Fenestella westralis sp. nov.	43

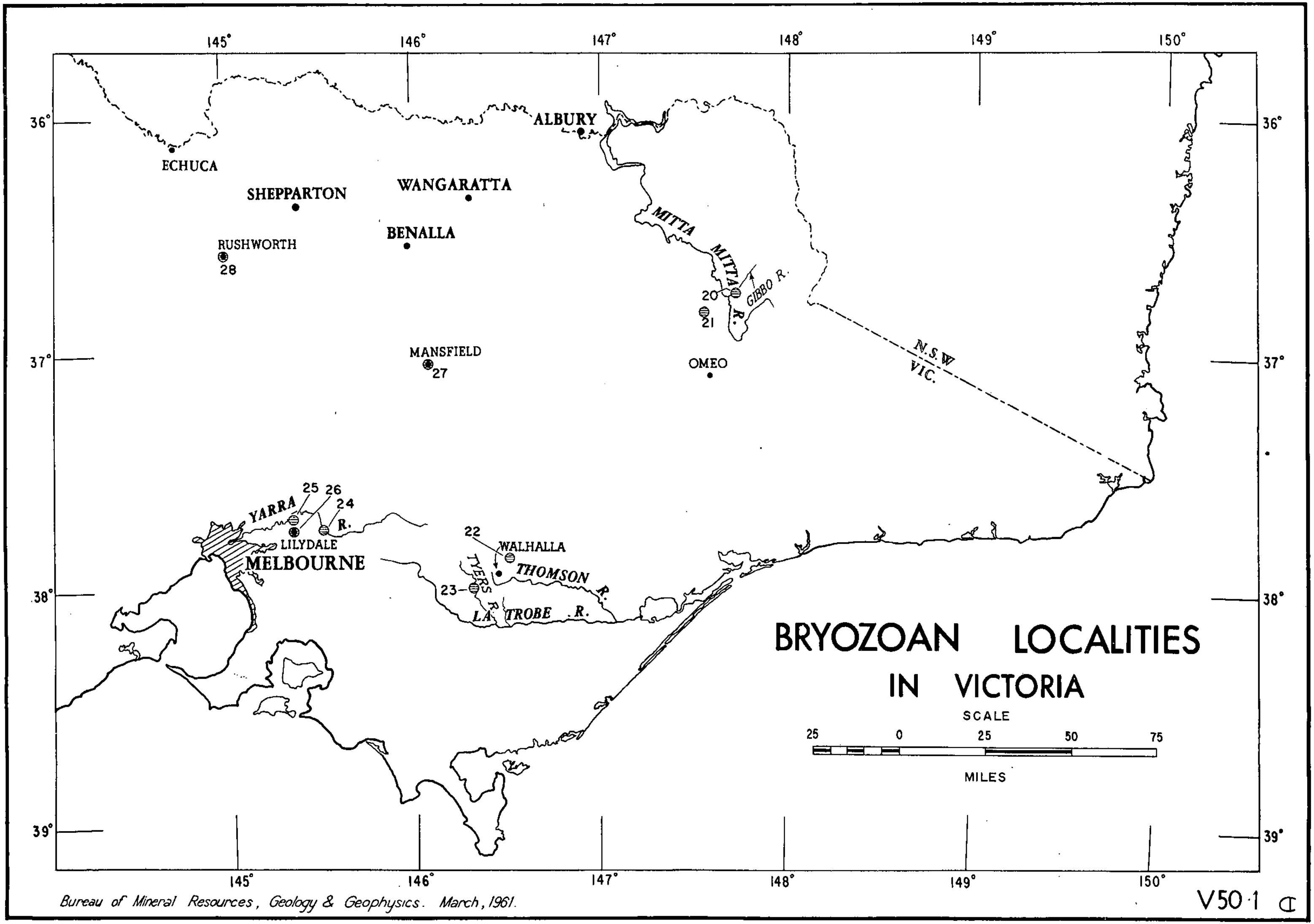
	Locality
Fistulipora norensis sp. nov.	35
Fistulipora pillarensis sp. nov.	40
Fistulipora sadlerensis sp. nov.	41
Fistulipora victoriae Chapman	27
Fitzroyopora oscarensis sp. nov.	47, 53
Granivallum fistulosum sp. nov.	48, 49, 54, 55, 56
Hemitrypa sp. *A*	39
Hemitrypa sp. *B*	31
Heterotrypa pontensis sp. nov.	29
?*Homotrypa* sp. *B*	38
Ikelarchimedes warooensis sp. nov.	32
Leptotrypa sp. *A*	33
Nicklesopora crenulata sp. nov.	46
Nicklesopora fitzroyensis sp. nov.	45
Nicklesopora geuriensis sp. nov.	30
Nicklesopora leopoldensis sp. nov.	45
Nicklesopora westralis sp. nov.	44
Percyopora occidentalis sp. nov.	50
Percyopora tubulata sp. nov.	51, 52
?*Saffordotaxis* sp. *A*	30



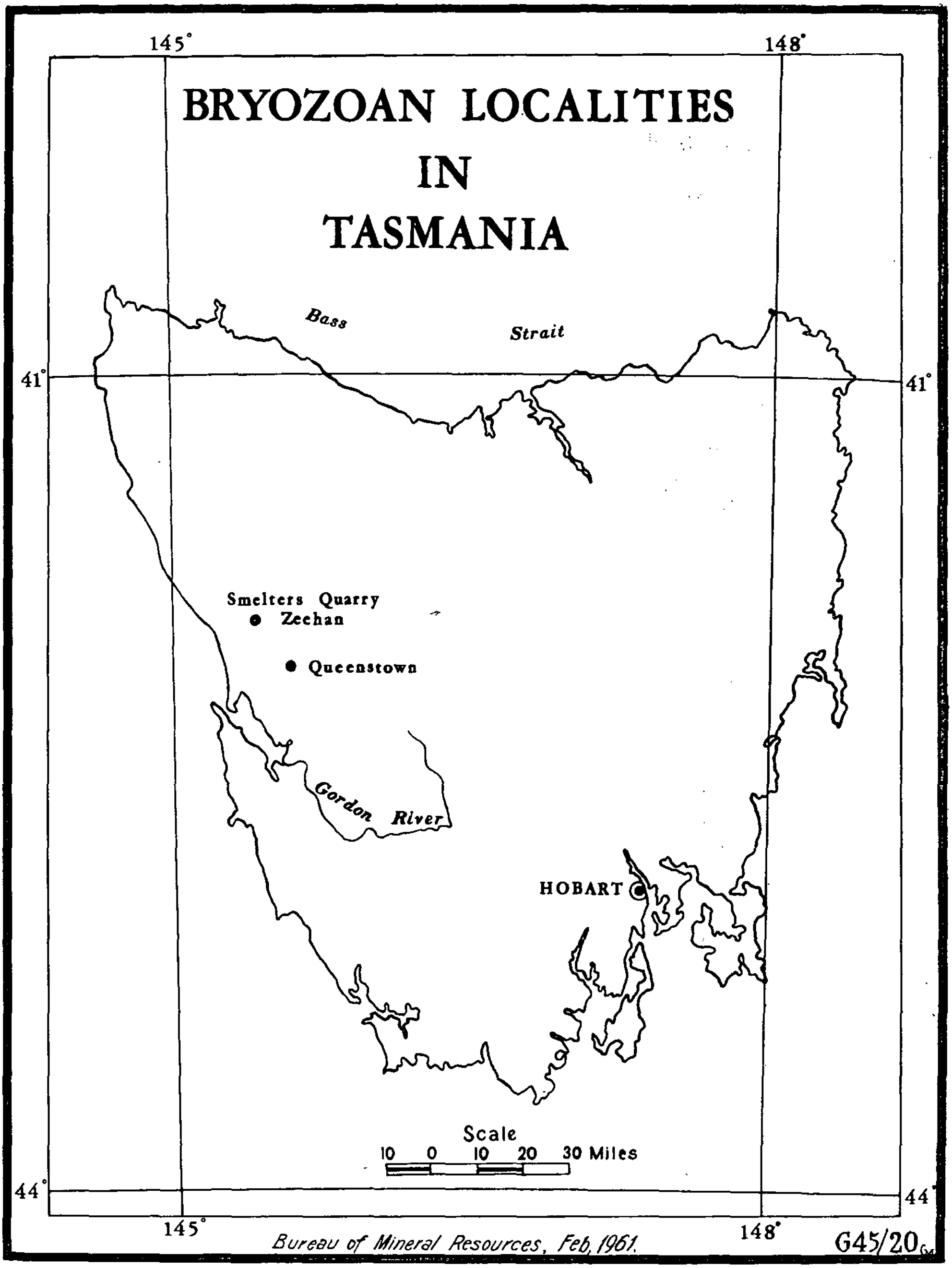
TEXT-FIGURE 9.

TEXT-FIGURE 10.

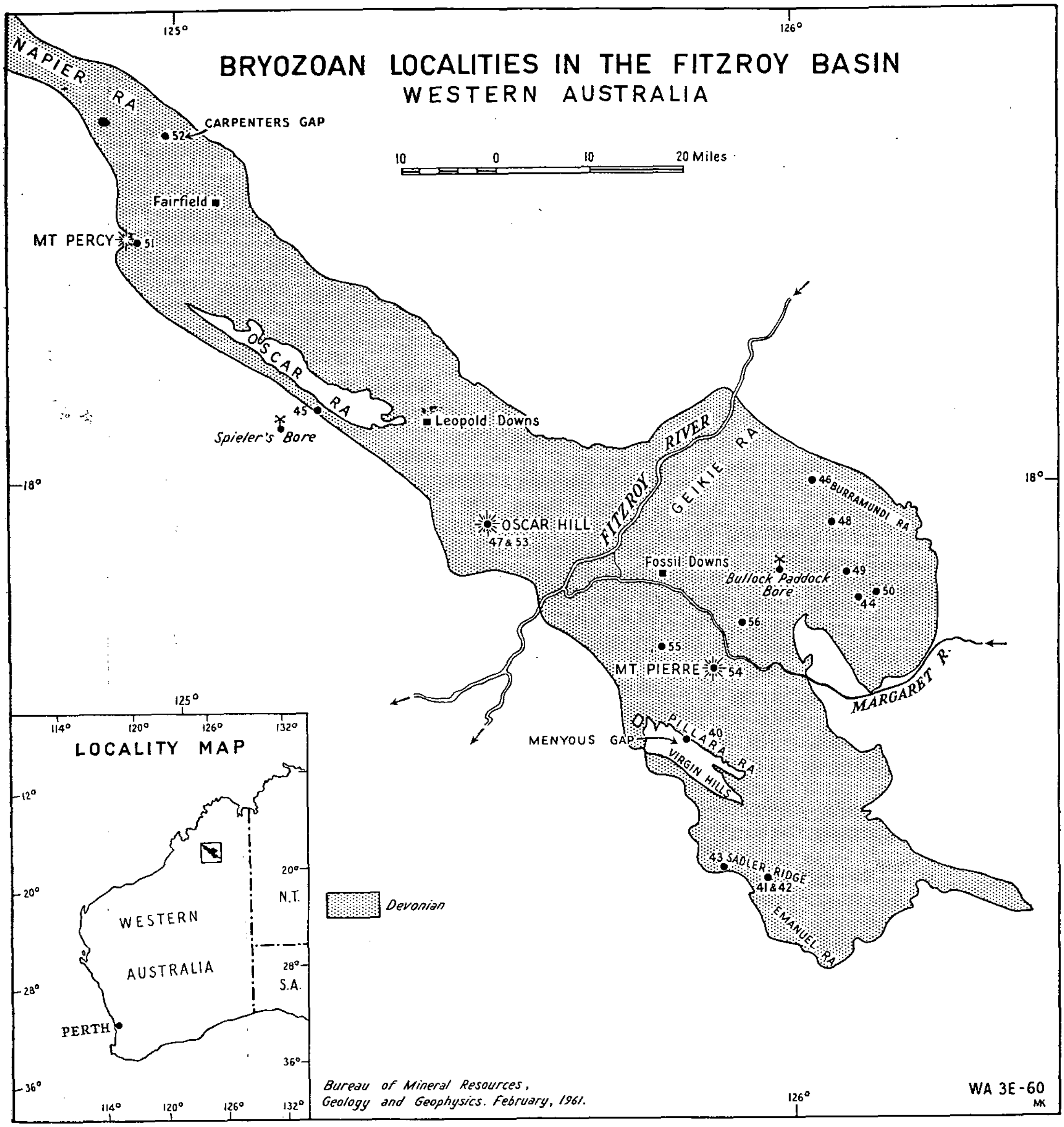




TEXT-FIGURE 11.



TEXT-FIGURE 12.



TEXT-FIGURE 13.

APPENDIX: REASSIGNMENT OF SPECIES FORMERLY PLACED IN THE PHYLUM BRYOZOA

Phylum COELENTERATA
Order TABULATA Milne-Edwards & Haime, 1850
Family FAVOSITIDAE Dana, 1846

Genus VETOFISTULA Etheridge, 1917

Type species: Vetofistula mirabilis Etheridge, 1917, p. 17-20.

VETOFISTULA MIRABILIS Etheridge, 1917
(Pl. 27, figs. 1, 3, 4, 6.)

Vetofistula mirabilis Etheridge, 1917, *Geol. Surv. Qld Publ.* 260, p. 17-20.

Holotype: A.M. F899. Reid's Gap, near Townsville, Queensland. Middle Devonian.

Remarks: Thin sections of the syntypes show fine vertical striations on the inner surface of the corallites. The walls possess numerous perforations and the wall structure consists of dense calcitic material without distinct structures. A dark median line occurs in the outer part of adjacent walls. The apertures of the corallites are crescent-shaped. No central axial tube, as described by Etheridge, is present. All transverse sections which were examined by Etheridge were oblique and so the occasional larger eccentric corallite diameter is due to peculiarities associated with sectioning, and also to the expansion of the corallite in the middle region followed by a tapering towards the periphery. An occasional tabula is present.

In *Vetofistula mirabilis* Etheridge, as in many other thamnoporoid colonies, the walls suddenly thicken in the subperipheral region and continue so to the periphery. The wall structure is massive, homogeneous, and structureless. Small tubes of uniform diameter cross the intracorallite spaces. Tabulae are not abundant and communication pores are present.

The features mentioned above are not indicative of any group of Bryozoa. The taxonomic features suggest that the species is a tabulate coral with affinities with *Thamnopora.*

Order RUGOSA Milne-Edwards & Haime, 1850
Family CYSTIPHYLLIDAE Milne-Edwards & Haime, 1850

Diagnosis: Solitary or fasciculate; septa very numerous, each represented by a vertical series of discrete, typically holacanthine trabeculae commonly set in lamellar schlerenchyme which coats the horizontal skeletal elements; tabulae sagging to inversely conical, incomplete; dissepimentarium wide, dissepiments usually smaller than tabellae. Silurian. (Hill, 1956, in Hill & Stumm.)

?CYSTIPHYLLUM sp. A.

(Pl. 28, figs. 4, 5.)

Fistulipora cowombatensis Chapman, 1917, *Rec. geol. Surv. Vic.*, 4 (1), 103; Chapman, 1920, *Ibid.*, 4 (2), 188, pl. 27, figs. 26, 27.

Material: N.M.V. P13963 (C. 2170) — Slide N.M.V. P1762; N.M.V. P13962 (C. 2134) — Slide N.M.V. P1364. Cowombat Creek, north-east Gippsland, Victoria. Silurian or Devonian. The specimens occur as small coral fragments in dark limestone.

Description: The small corallite fragment N.M.V. P13961 is 2 cm. by 1 cm. in cross section, and about 1 cm. long after sectioning. In a transverse section of N.M.V. P13962 the abundant horizontal skeletal elements are distally arched. Septal spines rest on the dissepimental material and in the axial region are continuous for a short distance of 1.5 mm. In the peripheral region the trabeculae appear to be connected by granular material so as to suggest the development of acanthine septa.

In the longitudinal section the arched, overlapping dissepimental material is pierced by upright granular lines which correspond to the trabeculae, approximately 0.08 mm. diameter. In N.M.V. specimen P1396 similar structures are observed.

Remarks: Chapman regarded the dissepimental material as perforate zooecial walls possessing a relatively irregular structure. The longitudinal section referred to by Chapman is actually an oblique transverse section and in this respect is misleading for purposes of identification. As only small fragments of the coral have been collected insufficient material is available for specific identification.

"HETEROTRYPA RUSHWORTHENSIS" Chapman

(Pl. 28, fig. 2.)

Heterotrypa rushworthensis Chapman, 1920, *Rec. geol. Surv. Vic.*, 4 (2), 74, pl. 13, fig. 6; pl. 15, fig. 17.

Material: N.M.V. P14072. Rushworth, Victoria. Devonian.

Remarks: Specimen P14072, figured pl. 13, fig. 6, Chapman, 1920, was sectioned and found to be inorganic.

SELECTED BIBLIOGRAPHY

ADRIAN, J., 1956.—The geology of the Molong District. *B. Sc. (Hons.) Thesis, Univ. Sydney. (Unpubl.)*

BASNETT, E. M., and COLDITZ, M. J., 1945.—Geology of the Wellington District. *J. Roy. Soc. N.S.W.*, 79, 37-47.

BASSLER, R. S., 1903.—The structural features of the bryozoan genus *Homotrypa*, with description of species from the Cincinnatian Group. *Proc. U.S. nat. Mus.*, 26, 565-591, pls. 20-25.

BASSLER, R. S., 1911a.—The early Paleozoic Bryozoa of the Baltic Provinces. *U.S. nat. Mus. Bull*, 77, 1-382.

BASSLER, R. S., 1911b.—Bryozoa. Chap. 5 *In* H. F. CLELAND, The fossils and stratigraphy of the Middle Devonic of Wisconsin. *Wisconsin Geol. nat. Hist. Surv. Bull* 21, *Sci. Ser.* 6, 59-67.

BASSLER, R. S., 1923.—Bryozoa. *In* Systematic Paleontology of Silurian Deposits, Silurian. *Bull Mld geol. Surv.*, 405-412.

BASSLER, R. S., 1929.—The Permian Bryozoa of Timor. *Paläont. Timor*, 16 (28), 37-90.

BASSLER, R. S., 1936.—Nomenclatorial notes on fossil and recent Bryozoa. *J. Wash. Acad. Sci.*, 26, 156-162.

BASSLER, R. S., 1939.—The Hederelloidea, a Suborder of Paleozoic Cyclostomatous Bryozoa. *Proc. U.S. nat. Mus.*, 87, 25-91.

BASSLER, R. S., 1952.—Fossil and Recent Bryozoa. *J. Wash. Acad. Sci.*, 42, 381-385.

BASSLER, R. S., 1953.—TREATISE ON INVERTEBRATE PALEONTOLOGY: Pt. G, BRYOZOA. *Univ. Kansas Press.*

BORG, F., 1923.—On the structure of Cyclostomatous Bryozoa. *Ark. Zool.*, 15 (11), 1.

BORG, F., 1926.—Studies of Recent Cyclostomatous Bryozoa. *Zool. Bid. Uppsala*, 10, 181-507.

BORG, F., 1933.—A revision of the Recent Heteroporidae (Bryozoa). *Ibid.*, 14, 253-394.

BROWN, IDA A., 1941.—The stratigraphy and structure of the Silurian and Devonian Rocks of Yass-Bowning District, New South Wales. *J. Roy. Soc. N.S.W.*, 74, 312-341.

BROWN, IDA A., 1952.—Ordovician limestone at Bowan Park, New South Wales. *Aust. J. Sci.*, 15, 29-30.

BROWNE, IDA A., 1955.—Presidential address. *J. Roy. Soc. N.S.W.*, 88, 3-11.

CAREY, S. W., 1953.—Geological structure of Tasmania in relation to mineralisation. *5th Emp. Min. metall. Congr.*, I: THE GEOLOGY OF AUSTRALIAN ORE DEPOSITS, 1114-1127.

CARNE, J. E., and JONES, L. J., 1919.—The limestone deposits of New South Wales. *Miner. Resour. N.S.W.*, 25.

CHAPMAN, F., 1903.—New or little known Victorian fossils in the National Museum, Melbourne. Part 1: Some Palaeozoic Species. *Proc. Roy. Soc. Vic.*, 16 (n.s.), (2), 60-82.

CHAPMAN, F., 1907.—New Silurian fossils of eastern Victoria, Part 1. *Rec. geol. Surv. Vic.*, 2 (1), 6-17.

CHAPMAN, F., 1914.—Newer Silurian fossils of eastern Victoria. Pt. 3. *Ibid.*, 3 (3), 301-316, pl. 46-61.

CHAPMAN, F., 1917.—Preliminary notes on new species of Silurian and Devonian fossils from north-east Gippsland. *Ibid.*, 4 (1), 103-104.

CHAPMAN, F., 1919.—Silurian silicified corals and a Polyzoan from Rushworth. *Ibid.*, 4 (2), 171-175, pl. 13-15.

CHAPMAN, F., 1920.—Palaeozoic fossils of eastern Victoria. Part 4. *Ibid.*, 4, 175-194, pl. 16-32.

CONDRA, G. E., and ELIAS, M. K., 1941a.—*Fenestella* Lonsdale and *Fenstrellina* d'Orbigny. *J. Paleont.*, 5, 565-566.

CONDRA, G. E., and ELIAS, M. K., 1941b.—The generic names *Fenestella* and *Fenestrellina*. *Nature*, 148, 339.

CONDRA, G. E., and ELIAS, M. K., 1944.—Study and revision of *Archimedes* (Hall). *Spec. Pap. geol. Soc. Amer.*, 53.

CORYELL, H. N., 1921.—Bryozoan faunas of the Stones River Group of Central Tennessee. *Proc. Indiana Acad. Sci.*, 1919, 261-340.

CROCKFORD, JOAN M., 1941.—Bryozoa from Silurian and Devonian of New South Wales. *J. Roy. Soc. N.S.W.*, 75, 104-114.

CROCKFORD, JOAN M., 1943a—Bryozoa from the Port Keats Bore, Northern Territory. *Proc. Linn. Soc. N.S.W.*, 68 (3-4), 145-148.

CROCKFORD, JOAN M., 1943b.—An Ordovician Bryozoan from Central Australia. *Ibid.*, 68, 148-149.

CROCKFORD, JOAN M., 1947.—Bryozoa from the Lower Carboniferous of New South Wales and Queensland. *Proc. Linn. Soc. N.S.W.*, 72 (1-2), 1-48.

CROCKFORD. JOAN M., 1957.—Permian Bryozoa from the Fitzroy Basin, Western Australia. *Bur. Min. Resour. Aust. Bull.* 34.

CUMINGS, E. R., 1902.—A revision of the Bryozoan genera *Dekayia, Dekayella* and *Heterotrypa* of the Cincinnati Group. *Amer. Geol.*, 29 (4) ,197-217.

CUMINGS, E. R., 1904.—Development of some Paleozoic Bryozoa. *Amer. J. Sci.*, ser. 4, 17, 49-78.

CUMINGS, E. R., 1905a.—Development and morphology of "*Fenestella*". *Amer. Geol.*, 29, (4), 197-217.

CUMINGS, E. R., 1905b.—Development of *Fenestella*. *Amer. J. Sci.*, ser. 4, 20, 169-177.

CUMINGS, E. R., 1908.—Stratigraphy and paleontology of the Cincinnati Series of Indiana. *Bull. Indiana geol. Surv.*, 32, 605-1188.

CUMINGS, E. R., 1912.—Development and systematic position of the Monticuliporoids. *Bull. geol. Soc. Amer.*, 23, 357-370.

CUMINGS, E. R., and GALLOWAY, J. J., 1912.—A note on the *Batostomas* of the Richmond Series. *Proc. Indiana Acad. Sci.* for 1911, p. 147-166.

CUMINGS, E. R., and GALLOWAY, J. J., 1913.—Stratigraphy and paleontology of the Tanner's Creek section of the Cincinnati Series of Indiana. *Ann. Rep. Indiana geol. Surv.*, 37, 35-478.

CUMINGS, E. R., and GALLOWAY, J. J., 1915.—Study of the morphology and histology of the Trepostomata or Monticuliporids. *Bull. geol. Soc. Amer.*, 26, 349-375.

DANA, J. D., 1846.—Zoophytes. *U.S. Explor. Exped. (Washington)*, v. 7, 740 p., 61 pl. (1849).

DAVID, T. W. E., and BROWNE, W. R., 1950.—THE GEOLOGY OF THE COMMONWEALTH OF AUSTRALIA. London, Arnold.

DUNCAN, HELEN, 1939.—Trepostomatous Bryozoa from the Traverse Group of Michigan. *Contr. Mus. Paleont. Univ. Mich.*, 5 (10), 171-270.

DUNCAN, HELEN, 1949.—Genotypes of some Paleozoic Bryozoa. *J. Wash. Acad. Sci.*, 39, 122-136.

DUNCAN, HELEN, LOEBLICH, A. R., and MOORE, R. C., 1955.—Proposed validation under the Plenary Powers of "*Fistulipora*" McCoy, 1849 (Class Bryozoa, Order Cyclostomata, Family Fistuliporidae). *Bull. zool. Nomencl.*, 11 (5), 155-157.

ELIAS, M. K., 1956.—A revision of *Fenestella subantiqua* and related Silurian Fenestellids. *J. Paleont.*, 30, 314-332.

ETHERIDGE, R., JNR., 1899.—Description of new or little known Victorian Palaeozoic and Mesozoic fossils. 1. *Prog. Rep. geol. Surv. Vic.*, 2, 34.

ETHERIDGE, R., JNR., 1917.—*Vetofistula*, a new form of Palaeozoic Polyzoa, Reid's Gap. *Geol. Surv. Qld. Publ.* 200, 17-20.

ETHERIDGE, R., JNR., and FOORD, A. H., 1884.—On two species of *Alveolites* and one of *Amplexopora* from the Devonian rocks of Northern Queensland. *Ann. Mag. nat. Hist.*, 5th ser., 14, 175-179, pl. 6.

FRITZ, M. A., and STEWART, G. A., 1937.—Catalogue of type invertebrate fossils of North America (Devonian); Unit 3A: Fenestrellinidae. *Wagner Free Inst. Sci.*, Phila., 252 pp.

GARRETTY, M. D., 1936a.—Introductory account of the geology and petrology of the Lake George District, Part 1; General geology. *Proc. Linn. Soc. N.S.W.*, 61, 186-207.

GARRETTY, M. D., 1936b.—Geological notes on the country between the Yass and the Shoalhaven Rivers. *J. Roy. Soc. N.S.W.*, 70, 364-374.

GILL, E. D., 1940.—The Silurian rocks of Melbourne and Lilydale. A discussion of the Melbournian-Yeringian boundary. *Proc. Roy. Soc. Vic.*, 52, 249-261.

GILL, E. D., 1942.—On the thickness and age of the type Yeringian strata, Lilydale, Victoria. *Ibid.*, 54, 21-52.

GILL, E. D., 1949.—Devonian fossils from Sandy's Creek, Gippsland, Victoria. *Mem. nat. Mus. Melb.*, 16, 91-114.

GILL, E. D., 1951a.—Revision of McCoy's "Prodromus" types from Lilydale and Killara Districts of Victoria. *Proc. Roy. Soc. Vic.*, 63, (n.s.), 31-39.

GILL, E. D., 1951b.—Further studies in Chonetidae (Palaeozoic Brachiopoda) from Victoria. *Ibid.*, 63, (n.s.), 57-72.

GIRTY, G. H., 1908.—Descriptions of new species of Upper Paleozoic fossils from China. *Proc. U.S. nat. Mus.*, 33, 37-48.

GRABAU, A. W., 1898.—Geology and paleontology of Eighteen Mile Creek and the Lake Shore sections of Erie County, New York. *Bull. Buffalo Soc. nat. Sci.*, 6, 1-91.

GRAY, J. E., 1848.—LIST OF SPECIMENS OF BRITISH ANIMALS IN THE COLLECTION OF THE BRITISH MUSEUM. Part 1. Centroniae or Radiated Animals. London. 173 pp.

GREGORY, J W., 1902.—The Heathcotian and its distribution in Victoria. *Proc. Roy. Soc. Vic.*. 15, 148-174.

GUPPY, D. J., LINDNER, A. W., RATTIGAN, J. H., and CASEY, J. N., 1957.—The geology of the Fitzroy Basin, Western Australia. *Bur. Min. Resour. Aust. Bull.* 36.

HALL, J., 1847.—Descriptions of the organic remains of the lower division of the New York system. *N.Y. nat. Hist. Surv., Paleont. N.Y.*, 1, 1-362.

HALL, J., 1851.—New genera of fossil corals from the report by James Hall, on the paleontology of New York. *Amer. J. Sci.*, ser. 2, 11, 398-401.

HALL, J., 1852.—Descriptions of the organic remains of the lower middle division of the New York system. *N.Y. nat. Hist. Surv., Paleont. N.Y.*, 2, 1-362.

HALL, J., 1874.—Descriptions of Bryozoa and Corals of the Lower Helderberg group. *26th Ann. Rep. N.Y. St. Mus.*, 93-116.
HALL, J., 1883.—Descriptions of new species of fossils from the Niagara formation of Waldron, Indiana. *Trans. Albany Inst.*, 10, 148-182.
HALL, J., 1886.—Bryozoa of the Upper Helderberg group. *5th Ann. Rep. St. Geol. N.Y.* for 1885, pls. and explanation sheets.
HALL, J., and SIMPSON, G. B., 1887.—Corals and Bryozoa; text and plates containing descriptions and figures from the Lower Helderberg, Upper Helderberg and Hamilton Groups. *N.Y. nat. Hist. Surv., Palaeont. N.Y.*, 6, 1-292.
HARPER, L. F., 1909.—The geology of the Murrumbidgee District. *Rec. geol. Surv. N.S.W.*, 9, 1-54.
HILL, DOROTHY, 1939.—The Devonian corals of Lilydale and Loyola, Victoria. *Proc. Roy. Soc. Vic.*, 51 (n.s.), 219-256.
HILL, DOROTHY, 1940a.—The Silurian Rugosa of the Yass-Bowning District, New South Wales. *Proc. Linn. Soc. N.S.W.*, 65, 388-420.
HILL, DOROTHY, 1940b.—The lower middle Devonian rugose corals of the Murrumbidgee and Goodradigbee Rivers, New South Wales. *J. Roy. Soc. N.S.W.*, 74, 247-276.
HILL, DOROTHY, 1942a.—The middle Devonian rugose corals of Queensland, Part 3; Burdekin Downs, Fanning River, and Reid Gap, North Queensland. *Proc. Roy. Soc. Qld*, 53, 229-268.
HILL, DOROTHY, 1942b—Some Tasmanian Palaeozoic corals. *Pap. Roy. Soc. Tas.*, 1941, 3-12,
HILL, DOROTHY, 1942c.—Middle Palaeozoic rugose corals from the Wellington District, New South Wales. *J. Roy. Soc. N.S.W.*, 76, 182-189.
HILL, DOROTHY, 1943.—A re-interpretation of the Australian Palaeozoic record based on a study of the rugose corals. *Proc. Roy. Soc. Qld*, 54, 53-66.
HILL, DOROTHY, 1951.—Ordovician corals: Presidential address. *Proc. Roy. Soc. Qld*, 62, 1-27.
HILL, DOROTHY, 1954a.—Coral faunas from the Silurian of New South Wales and the Devonian of Western Australia. *Bur. Min. Resour. Aust. Bull.* 23.
HILL, DOROTHY, 1954b.—Devonian corals from Waratah Bay, Victoria. *Proc. Roy. Soc. Vic.*, 66 (n.s.), 105-118, pls. 6-9.
HILL, DOROTHY, 1955.—Ordovician corals from Ida Bay, Queenstown, and Zeehan, Tasmania. *Pap. Roy. Soc. Tas.*, 89, 237-254.
HILL, DOROTHY, 1958.—Ordovician corals from New South Wales. *J. Roy. Soc. N.S.W.*, 91, 97-107, pls. 2-4.
HILL, DOROTHY, and EDWARDS, A. B., 1941.—Note on a collection of fossils from Queenstown, Tasmania. *Proc. Roy. Soc. Vic.*, 53 (n.s.) (1), 222-230.
HILL, DOROTHY, and JONES, O. A., 1940.—The corals of the Garra Beds, Molong District, New South Wales. *J. Roy. Soc. N.S.W.*, 74, 175-208.
HILL, D., and STUMM, E. C., 1956.—Rugosa and Tabulata. *In* TREATISE ON INVERTEBRATE PALEONTOLOGY. Part F: Coelenterata. *Univ. Kansas Press.*
HOSKING, LUCY F. V., 1931.—Fossils from the Wooramel District, Western Australia. *J. Roy. Soc. W. Aust.*, 17, 7-52.
JOPLIN, GERMAINE A., and CULEY, ALMA G., 1938.—The geological structure and stratigraphy of Molong-Manildra district. *J. Roy. Soc. N.S.W.*, 71, 267-281.
KING, WILLIAM, 1849.—On some families and genera of corals. *Ann. Mag. nat. Hist.*, ser. 2, 3, 388-390.
KOENIG, J. W., 1954.—Application of cellulose peel technique to fenestrate sections. *J. Paleont.*, 28, 76-78.
LEE, G. E., 1912.—The British Carboniferous Trepostomata. *Mem. geol. Surv. G.B., Paleont.*, 1 (3), 135-195.
LOEBLICH, A. R., 1942.—Bryozoa from the Ordovician Bromide Formation, Oklahoma. *J. Paleont.*, 16, 437-458.
LONSDALE, W., 1839.—Corals. *In* MURCHISON, R. I., THE SILURIAN SYSTEM, pt. 2, 675-694.
LONSDALE, W., 1844.—Descriptions of six new species of corals from the Paleozoic formation of Van Diemen's Land. *In* DARWIN, GEOLOGICAL OBSERVATIONS ON THE VOLCANIC ISLANDS, VISITED DURING THE VOYAGE OF THE H.M.S. BEAGLE, Appendix, 161-169. London.
LONSDALE, W., 1845.—Polyparia. *In* STRZELECKI, P.E. de, PHYSICAL DESCRIPTION OF NEW SOUTH WALES AND VAN DIEMEN'S LAND, 262-268, pls. 8, 9. London.
MCCOY, F., 1849.—On some new genera and species of Palaeozoic corals and Foraminifera. *Ann. Mag. nat. hist.*, dec. 2, ser. 3, 130-131, figs.
MCCOY, F., 1854. A systematic description of British Palaeozoic fossils in the Geological Museum of the University of Cambridge: Bryozoa, p. 11-12, 22-26, 45-51, 75-76, 82-83, 113-116. *In* SEDGWICK, A., SYNOPSIS OF THE CLASSIFICATION OF THE BRITISH PALAEOZOIC ROCKS. Cambridge.
MCNAIR, A. H., 1940.—Devonian Bryozoa from Colombia. *Bull. Amer. Paleont.*, 25 (93).

McNair, A. H., 1942.—Upper Devonian Bryozoa (U.S.). *J. Paleont.*, 16, 343-350.
Madigan, C. T., 1932.—Geology of the Western Macdonnell Ranges. *Quart. J. geol. Soc. Lond.*, 88, 672-711.
Meek, F. B., 1872.—Report on the paleontology of Eastern Nebraska, with some remarks on the Carboniferous of that district: Part 2 of Hayden's *Final Report of U.S. Geological Survey of Nebraska and Portion of Adjacent Territories.* Washington.
Miller, S. A., 1889. North American Geology and Paleontology. Cincinnati, Ohio.
Miller, S. A., and Dyer, C. B., 1878.—Contributions to paleontology. *J. Cincinn. Soc. nat. Hist.*, 1, 24-39, pl. 1, 2.
Milne-Edwards, H., and Haime, J., 1850-54.—A monograph of the British fossil corals. *Palaeontogr. Soc. Monogr.*
Moore, R. C., 1929.—A Bryozoan faunule from the Upper Graham Formation, Pennyslvanian, of North Central Texas. *J. Paleont.*, 3, 1-27, 121-156.
Moore, R. C., and Dudley, R. M., 1944.—Cheilotrypid Bryozoans from Pennsylvanian and Permian rocks of the midcontinental region. *Kans. geol. Surv. Bull.* 52, 229-408.
Nekhoroshev, V., 1926.—Les Bryozoaires du Devonien Moyen du Nord-ouest de la Mongolie et une description de la methode microscopique de la determination des Fenestellides. *Trav. Mus. geol. U.S.S.R.*, 1, 1-28.
Nekhoroshev, V., 1930.—On certain Palaeozoic Bryozoa in the British Museum (Natural History). *Geol. Mag.*, 67, 178-189.
Nekhoroshev, V., 1932.—Microscopical method of exploration of Paleozoic Bryozoa of the Family Fenestellidae. *Trans. All-Un. geol. prosp. Serv. U.S.S.R.*, 51 (17), 279-303.
Nekhoroshev, V., 1933.—Upper Silurian Bryozoa from East Balkhashland. *Ibid.*, Fasc. 338.
Nekhoroshev, V., 1936.—New Finds of Silurian Bryozoa. *Ibid.*, Fasc. 61, p. 1-40, 2 pls.
Nicholson, H. A., 1879.—On the Structure and Affinities of the "Tabulate Corals" of the Palaeozoic Period. Edinburgh and London, Blackwood.
Nicholson, H. A., 1881.—On the Structure and Affinities of the Genus Monticulipora and its Sub-genera. Edinburgh, Blackwood.
Nickles, J. M., and Bassler, R. S., 1900.—A synopsis of American fossil Bryozoa. *U.S. geol. Surv. Bull.* 173.
Norman, A. M., 1903.—Notes on the natural history of East Finmark. *Ann. Mag. nat. Hist.*, ser. 7, 11, 567-598.
D'Orbigny, M. A., 1849.—Description de quelques genres nouveaux de Mollusques bryozoaires. *Rev. Mag. Zool.*, ser. 2, 1, 499-501.
D'Orbigny, M. A., 1850.—Prodrome De Paleontologie Stratigraphique. Vol. 1. Paris.
Pettijohn, F. J., 1949.—Sedimentary Rocks. N.Y., Harper.
Phillips, J., 1841.—Figures and Descriptions of the Palaeozoic Fossils of Cornwall and West Somerset. London.
Phillips, June R. P., 1960. Re-study of types of seven Ordovician bifoliate Bryozoa. *Palaeontology*, 3 (1), 1-25, pls. 1-10.
Rafinesque, Prof.—Enumeration and Account of Some Remarkable Natural Objects of the Cabinet of Prof. Rafinesque, in Philadelphia; Being Animals, Shells, Plants, and Fossils collected by him in North America, between 1816 and 1831. Philadelphia. 8 p.
Ripper, Elizabeth A., 1933.—The stromatoporoids of the Lilydale Limestone: Part 1; *Actinostroma* and *Clathrodictyon*. *Proc. Roy. Soc. Vic.*, 45 (2) (n.s.), 152-164.
Ripper, Elizabeth A., 1936.—The stromatoporoids of the Lilydale Limestone. Part 2, *Syringostroma, Stromatopora,* and other genera. *Ibid.*, 49 (2) (n.s.), 178-205.
Ripper, Elizabeth A., 1937.—On some stromatoporoids from Griffith's quarry, Loyola, Victoria. *Ibid.*, (*n.s.*), 50, 1-8.
Sherrard, Kathleen M., 1952.—The geology of the Nanima-Bedulluck district, near Yass, New South Wales. *J. Roy. Soc. N.S.W.*, 85, 63-80.
Sherrard, Kathleen M., 1954.—The assemblages of graptolites in New South Wales. *Ibid.*, 87, 73-101.
Simpson, G. B., 1895.—A discussion of the different genera of Fenestellidae. *Ann. Rep. St. Geol. N.Y.* for 1893, Albany, 1894. *N.Y. St. Mus. Rep.*, 47, 879-921.
Simpson, G. B., 1897.—Handbook of the genera of the North American Paleozoic Bryozoa. *Ann. Rep. N.Y. St. Mus.* for 1894, 14, 403-669.
Stevens, N. C., 1950.—The geology of the Canowindra District, New South Wales: Part 1; The stratigraphy and structure of the Cargo-Toogong District. *J. Roy. Soc. N.S.W.*, 82 (1948), 319-337.
Stevens, N. C., 1951.—The geology of the Canowindra District, New South Wales: Part 2; The Canowindra-Cowra-Woodstock Area. *Ibid.*, 84, 46-52.
Stevens, N. C., 1952.—Ordovician stratigraphy at Cliefden Caves, near Mandurama, New South Wales. *Proc. Linn. Soc. N.S.W.*, 77, 114-120.
Stevens, N. C., 1956.—Further notes on Ordovician formations of central New South Wales. *J. Roy. Soc. N.S.W.*, 90, 44-50.

TEICHERT, C., 1949.—Observations on stratigraphy and palaeontology of Devonian, western portion of Kimberley Division, Western Australia. *Bur. Min. Resour. Aust. Rep.* 2.
TEICHERT, C., and GLENISTER, B., 1953.—Ordovician and Silurian Cephalopods from Tasmania, Australia. *Bull. Amer. Paleont.*, 34 (144).
THOMAS, D. E., 1939.—The structure of Victoria with respect to the Lower Palaeozoic rocks. *Min. geol. J.*, 1 (4), 59-64.
TWENHOFEL, W. H., 1954.—Correlation of the Ordovician Formations of North America. *Bull. geol. Soc. Amer.*, 65, 257-298.
ULRICH, E. O., 1879.—Description of a new genus and some new species of Bryozoans from the Cincinnatian Group. *J. Cincinn. Soc. nat. Hist.*, 2, 119-131.
ULRICH, E. O., 1882.—American Paleozoic Bryozoa. *Ibid.*, 5 (3), 121-175.
ULRICH, E. O., 1883.—American Paleozoic Bryozoa. *Ibid.*, 6, 82-92, 148-168, 245-279.
ULRICH, E. O., 1884.—American Paleozoic Bryozoa. *Ibid.*, 7, 26-33.
ULRICH, E. O., 1886.—Report on the Lower Silurian Bryozoa with preliminary descriptions of some new species. *Minnesota geol. nat. Hist. Sur., 14th Ann. Rep.* for 1885, 57-103, no pls.
ULRICH, E. O., in FOERSTE, A. F., 1887.—The Clinton Group of Ohio, Part 3, Bryozoa. *Bull. Sci. Labs. Denison Univ.*, 2, 150-176.
ULRICH, E. O., 1890.—Palaeozoic Bryozoa. *Ill. geol. Surv. Bull.* 8 (2), sect. 6, 283-688.
ULRICH, E. O., 1893.—On Lower Silurian Bryozoa of Minnesota. Extracted from Geology of Minnesota, vol. 3, *Minnesota geol. nat. Hist. Surv.*, 1895, p. 96-332, 28 pls. (Author's separate, 1893).
ULRICH, E. O., 1896.—Bryozoa. In ZITTEL'S TEXTBOOK OF PALAEONTOLOGY. Trans. and edited by C. EASTMAN. Vol. 1, pt. 1, 257-291.
ULRICH, E. O., and BASSLER, R. S., 1905.—A revision of Paleozoic Bryozoa. Part 2; On genera and species of Trepostomata. *Smithson. misc. Coll.*, 47, 15-55.
VEEVERS, J. J., 1959.—Devonian Brachiopods from the Fitzroy Basin, Western Australia. *Bur. Min. Resour. Aust. Bull.* 45.
VINE, G. R., 1883.—Fourth Report on fossil Polyzoa. *Rep. Brit. Assoc. Adv. Sci.*, 161-209.
WAAGEN, W., and WENTZEL, J., 1887.—Coelenterata. *In* WAAGEN, W., *Productus* Limestone Fossils. *Paleont. Indica*, ser. 13, *Salt-Range Fossils*, 1, p. 835-942; pl. 97-116.
WHITELAW, H. S., 1954.—Some limestone and marble deposits in east Gippsland. *Min. geol. J.*, 5 (3), 23-27.

PLATE 1.

Homotrypa fenestrata sp. nov. .... page 24

Figs. 1-5.

Cliefden Caves Limestone, Cliefden Caves. Middle Ordovician.

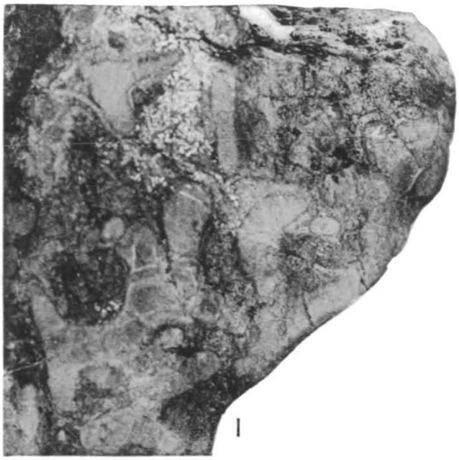
1. External aspect of a colony with cylindrical, fenestrate branches, U.S.G.D. 11406. X1.

2. Transverse section showing a cylindrical branch with numerous diaphragms and cystiphragms in the peripheral region. Section cut from holotype U.S.G.D. 10410. X20.

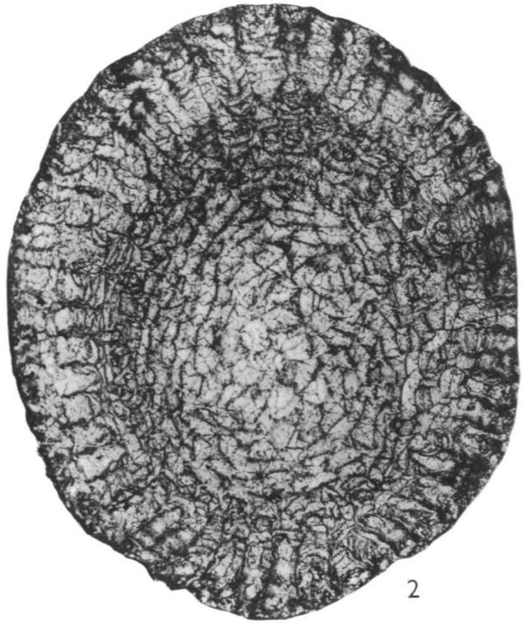
3. Longitudinal section showing flat diaphragms in the axial region, diaphragms and cystiphragms in the peripheral region, and overgrowths at the periphery. Section cut from U.S.G.D. 10413. X15.

4. Tangential section showing zooecial tubes crossed by curved cystiphragms, and closely spaced acanthopores located in the outer part of the zooecial walls. Section cut from the holotype, U.S.G.D. 10410. X60.

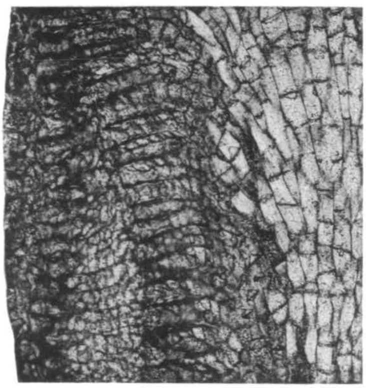
5. Longitudinal section across a colony showing the arrangement of zooecia around the large fenestrules. Section cut from the holotype, U.S.G.D. 10410. X6.



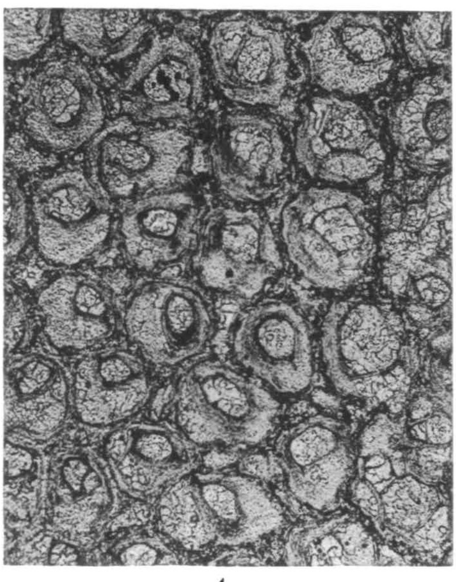
1



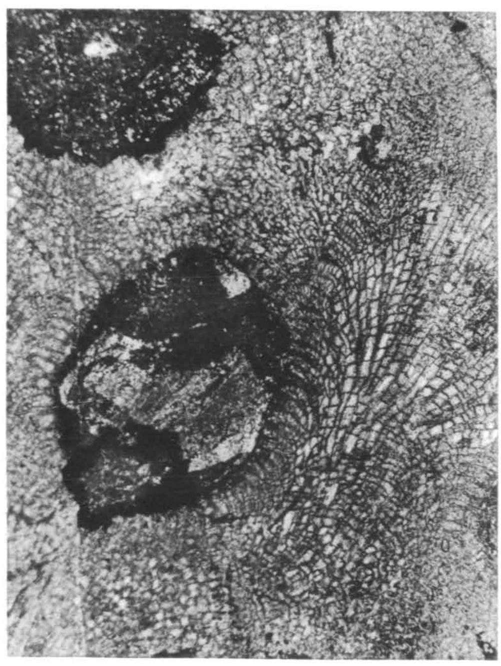
2



3



4



5

PLATE 2.

Homotrypa fenestrata sp. nov. .... page 24

Figs. 1, 2, 5.

Cliefden Caves Limestone, Cliefden Caves. Middle Ordovician.

1. Longitudinal section showing numerous overlapping cystiphragms in regular series and flat diaphragms in the peripheral region. Section cut from holotype, U.S.G.D. 10410. X15.

2. Enlargement of portion of Figure 1, showing laminate structure of cystiphragms passing into the zooecial walls. Section cut from holotype, U.S.G.D. 10410. X70.

5. Portion of a longitudinal section showing the laminate structure of the inner part of the zooecial walls and the dark irregular laminate structure of the outer part of the zooecial walls. Section cut from U.S.G.D. 10414. X50.

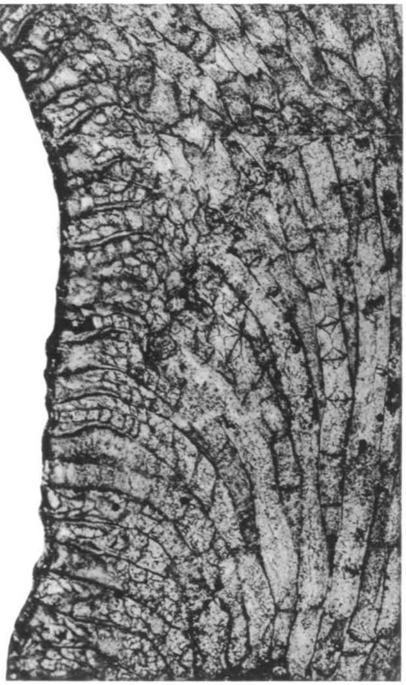
Homotrypa? sp. *B.* .... page 27

Figs. 3, 4.

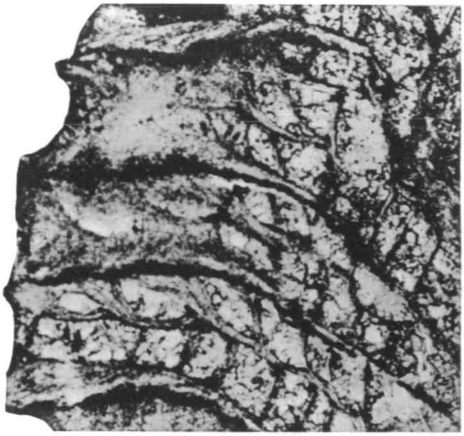
Murrumbidgee "Series", Cave Flat, N.S.W. ?Middle Devonian. A.M. F286.

3. Deep tangential section showing polygonal zooecial openings crossed occasionally by curved cystiphragms, and acanthopores at the junctions of slender zooecial walls. X20.

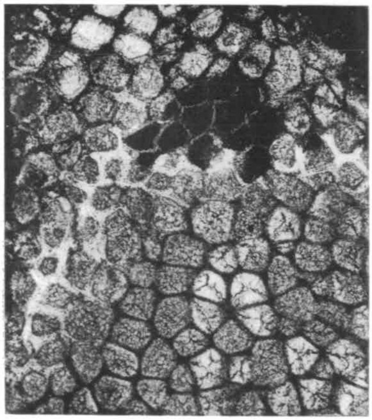
4. Longitudinal section showing sparsely distributed diaphragms in the axial region and numerous diaphragms and cystiphragms in the peripheral region. X12.



1

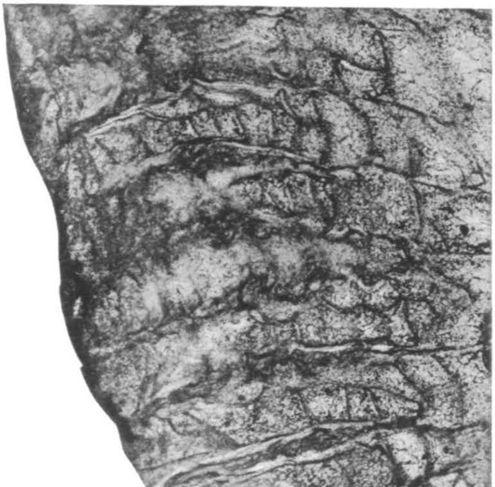


2



3

4



5

Plate 3.

Orbignyella boonderensis sp. nov. .... page 29

Figs. 1, 3, 6.

Cliefden Caves Limestone, Cliefden Caves. Middle Ordovician. Sections cut from the holotype, U.S.G.D. 9245.

1. Deep tangential section showing polygonal zooecial tubes and slender zooecial walls pierced by acanthopores. X45.

3. Deep tangential section showing the arrangement of the zooecial openings. X16.

6. Longitudinal section showing thin-walled zooecia crossed by flat complete, and curved incomplete diaphragms. X15.

Mesotrypa sp. *A*. .... page 30

Fig. 2.

Bowan Park Limestone, Parish of Bowan. Middle or Upper Ordovician. Section cut from specimen U.S.G.D. 11405.

Deep tangential section showing circular zooecial openings crossed by curved diaphragms and slender zooecial walls pierced by an occasional acanthopore. Numerous mesopores fill the narrow intrazooecial spaces. X12.

Batostoma tubuliferum sp. nov. .... page 31

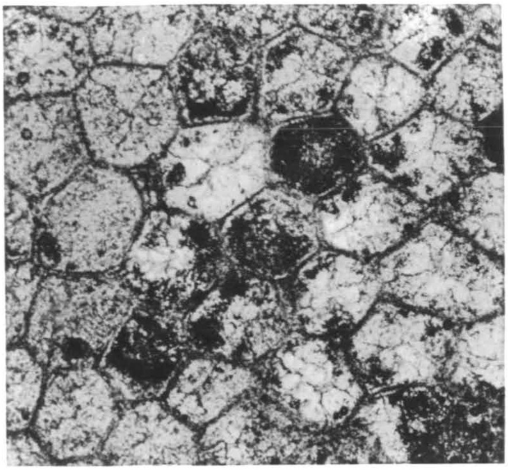
Figs. 4, 5, 7.

Cliefden Caves Limestone. Middle Ordovician.

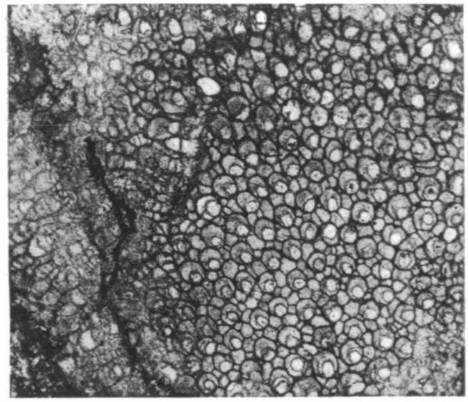
4. External aspect of a zoarial branch, U.S.G.D. 10417. X3.

5. Portion of a longitudinal section showing fine diaphragms in the subperipheral region and laminate zooecial walls in the peripheral region. Section cut from U.S.G.D. 10415. X50.

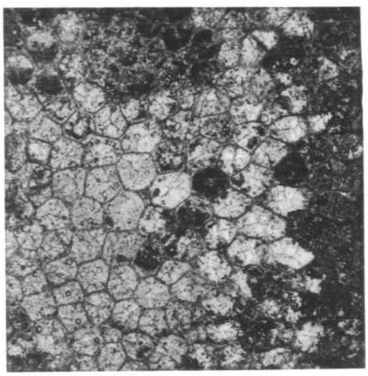
7. Oblique longitudinal section showing slender zooecial walls in the wide axial region and thickened laminate zooecial walls in the narrow peripheral region. Section cut from the holotype, U.S.G.D. 10415. X15.



1



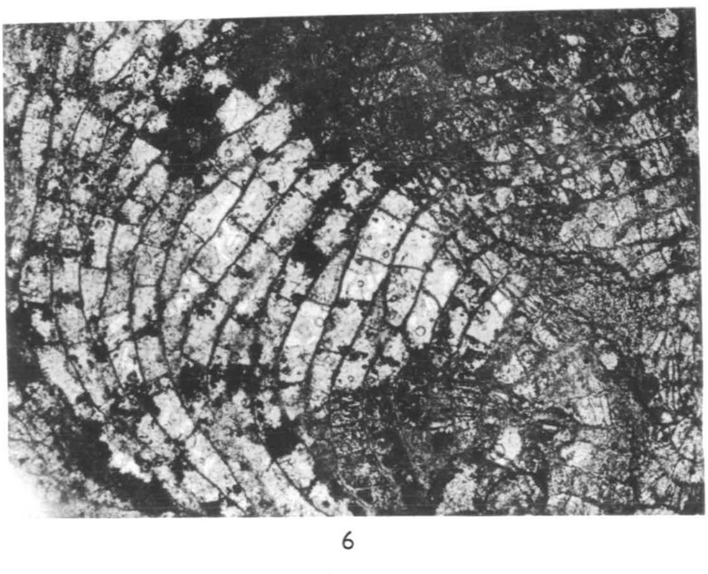
2



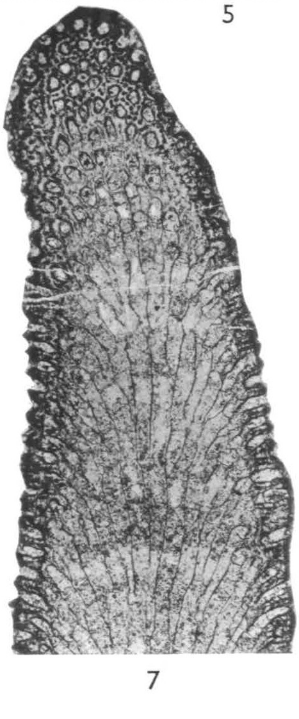
3

4

5



6



7

PLATE 4.

Batostoma tubuliferum sp. nov. .... page 31

Figs. 1, 2.

Cliefden Caves Limestone, Cliefden Caves. Middle Ordovician.

1. Portion of an oblique longitudinal section showing in the peripheral region laminate zooecial walls pierced by acanthopores. Section cut from U.S.G.D. 10415. X50.

2. Tangential section showing wide amalgamate zooecial walls pierced in their outer part by numerous acanthopores. Section cut from U.S.G.D. 10415. X50.

Heterotrypa humensis sp. nov. .... page 39

Fig. 3.

?Barrandella Shale, Hatton's Corner, N.S.W. Middle Silurian.

Deep tangential section showing subpolygonal zooecia and slender zooecial walls pierced by acanthopores and numerous mesopores. Section cut from holotype, A.M. F46926. X20.

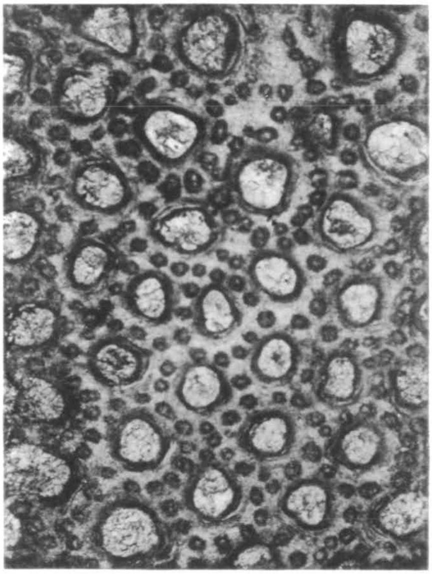
Amplexopora queenstownensis sp. nov. .... page 37

Fig. 4.

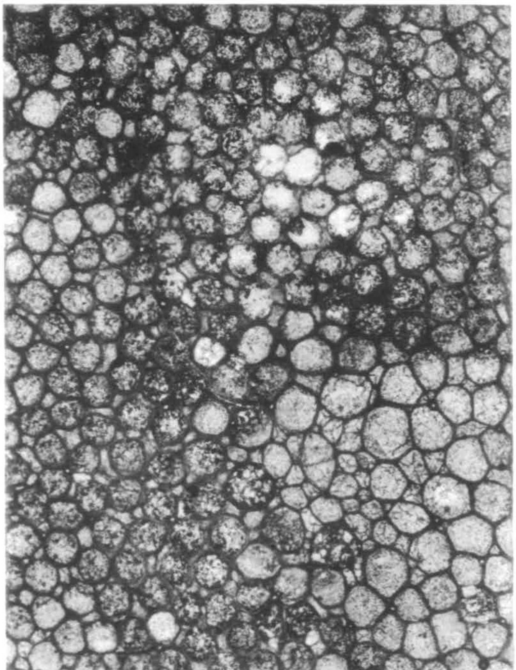
Gordon Limestone, Queenstown, Tasmania. Middle or Upper Ordovician.

Branching stem showing diaphragms in both the axial and peripheral regions. A fragment of *Stictopora* sp. is enclosed by the branch. Section cut from holotype, U.T.G.D. 24120-9. X10.

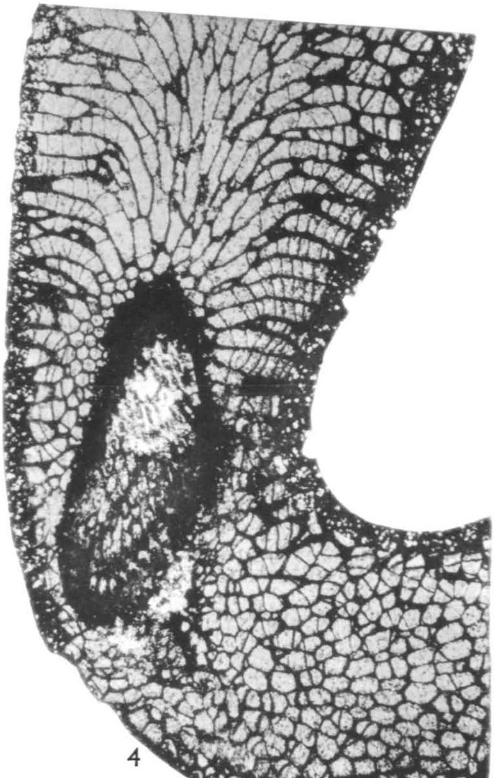
1



2



3



4

PLATE 5.

Batostoma sp. *B.* .... page 34

Figs. 1, 4.

Bowan Park Limestone, Parish of Bowan. Middle or Upper Ordovician. Sections cut from U.S.G.D. 11421.

1. Transverse section showing polygonal zooecia and slender zooecial walls pierced by acanthopores. X20.

4. Oblique longitudinal section showing subperipheral and peripheral regions of the zooecia crossed by diaphragms and acanthopores in the peripheral region. X15.

Batostoma sp. *A.* .... page 33

Fig. 2.

Larapintine "Series", Macdonnell Ranges, Central Australia. ?Upper Ordovician.

Longitudinal section showing steeply inclined zooecia in the axial region and thick walled zooecia in the very narrow peripheral region. Section cut from U.S.G.D. 494. X20.

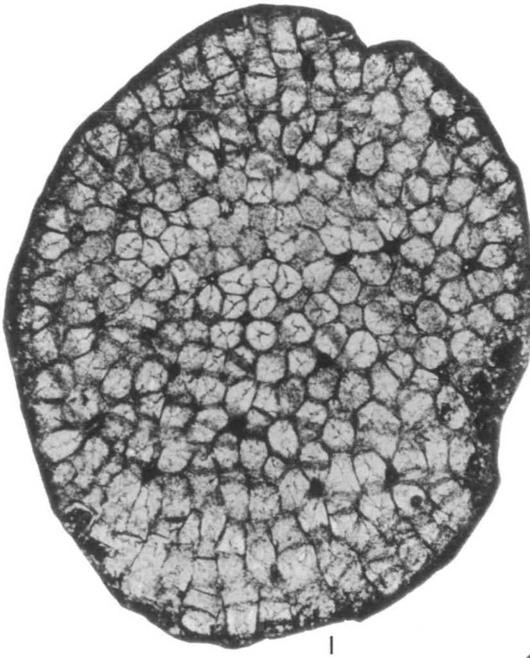
Amplexopora queenstownensis sp. nov. .... page 37

Figs. 3, 5.

Gordon Limestone, Queenstown, Tasmania. Middle or Upper Ordovician. Sections cut from holotype, U.T.G.D. 24120-9.

3. Portion of an oblique longitudinal section showing numerous diaphragms, flat and curved, and thickened zooecial walls in the peripheral region. X30.

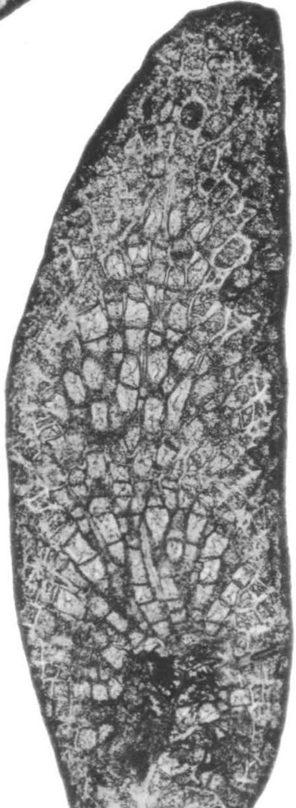
5. Tangential section showing slender walls pierced by acanthopores. X35.



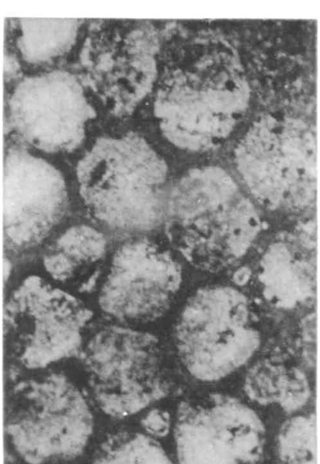
1

2

3



4



5

PLATE 6.

Batostoma sp. *C.* .... page 35

Fig. 1.

Gordon Limestone, Zeehan, Tasmania. Middle to Upper Ordovician.

Transverse section showing thin-walled zooecia in the wide axial region and thicker walled zooecia in the peripheral region having numerous diaphragms, complete and incomplete. U.T.G.D. 24796-2. X10.

Heterotrypa pontensis sp. nov. .... page 40

Figs. 2, 5, 6.

Parish of Ponto, near Wellington, N.S.W. Lower or Middle Devonian. Sections cut from holotype, U.S.G.D. 10440.

2. Oblique longitudinal section of a frondescent zoarium showing long slender zooecia sparsely tabulate, interspersed with numerous closely tabulate mesopores. X8.

5. Enlarged view of the peripheral region of a longitudinal section showing tabulate mesopores indenting the zooecial walls and slender zooecial walls pierced by acanthopores. X50.

6. Tangential section in the region of a monticule showing well developed laminate walls of the acanthopores at the junctions of the zooecial walls. X50.

Cyphotrypa lamellosa sp. nov. .... page 41

Fig. 3.

?Garra Beds, near Molong, N.S.W. ?Middle Devonian.

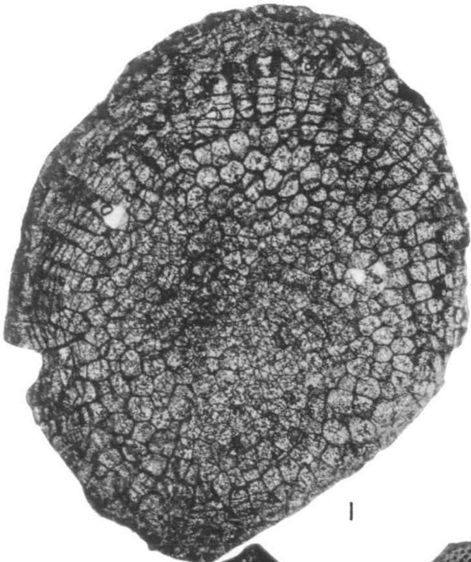
Longitudinal section showing long zooecial tubes crossed by flat diaphragms. Holotype, U.S.G.D. 10444. X14.

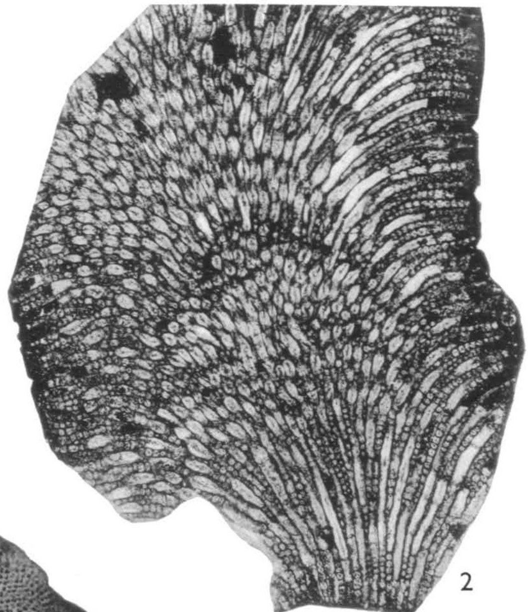
Discotrypa? sp. *A.* .... page 38

Fig. 4.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

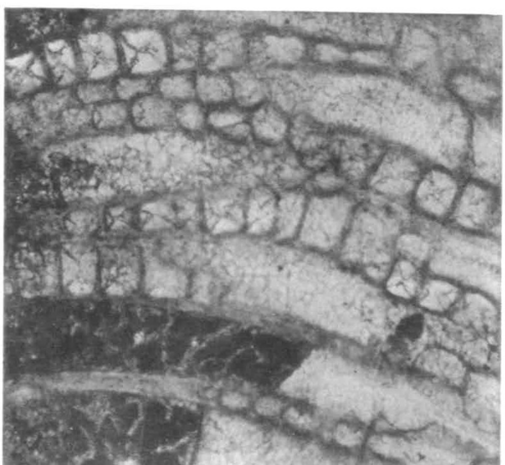
External aspect of an incrusting zoarium. C.P.C. 969. X4.


1


2


3


4


5

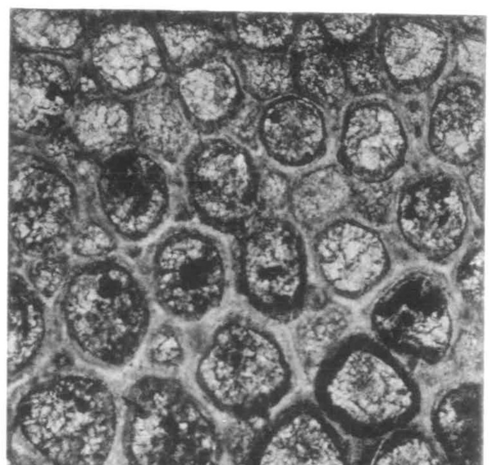

6

PLATE 7.

Heterotrypa pontensis sp. nov. .... page 40

Figs. 1, 3.

Parish of Ponto, near Wellington, N.S.W. Lower or Middle Devonian. Sections cut from holotype, U.S.G.D. 10440.

1. Tangential section showing subpolygonal zooecial openings separated by mesopores and slender zooecial walls pierced by sparsely distributed acanthopores. X30.
3. Tangential section showing the arrangement of the zooecial openings. X14.

Cyphotrypa lamellosa sp. nov. .... page 41

Fig. 2.

?Garra Beds, near Molong, N.S.W. ?Middle Devonian.

Tangential section showing polygonal zooecia, and slender zooecial walls pierced at their junctions by acanthopores. U.S.G.D. 10444. X90.

Leptotrypa sp. *A*. .... page 43

Fig. 4.

Taemas, N.S.W. ?Middle Devonian.

Tangential section showing the arrangement of zooecia. U.S.G.D. 11435. X7.

Cyphotrypa murrumbidgensis sp. nov. .... page 42

Fig. 5.

Murrumbidgee "Series", Devil's Elbow, N.S.W. ?Middle Devonian.

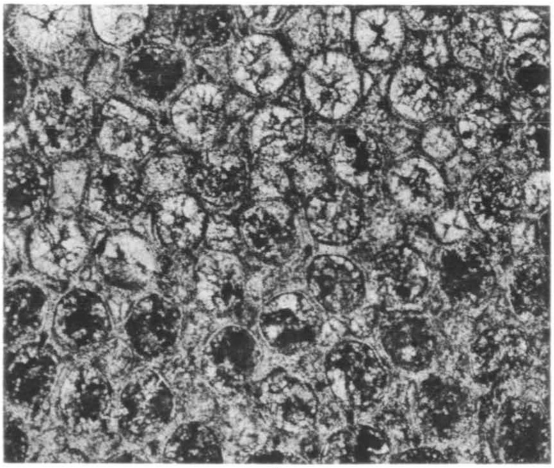
Longitudinal section showing the gentle curvature of the long zooecial tubes crossed by numerous diaphragms in their subperipheral and peripheral regions. Holotype, U.S.G.D. 11436. X7.

Percyopora tubulata sp. nov. .... page 46

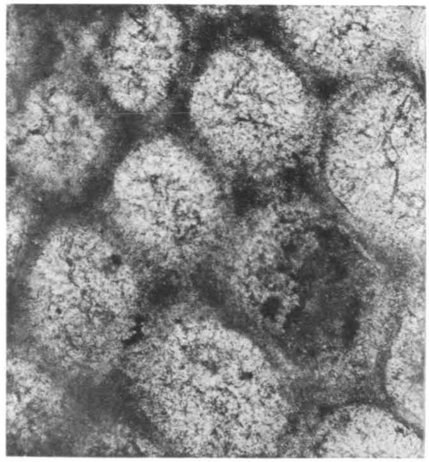
Fig. 6.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

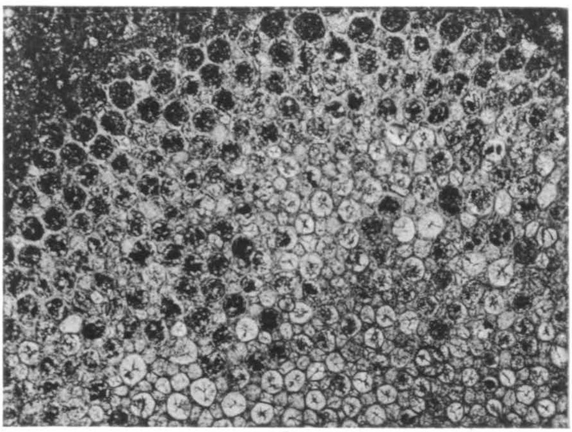
Tangential section showing small acanthopores piercing the zooecial walls. X50.



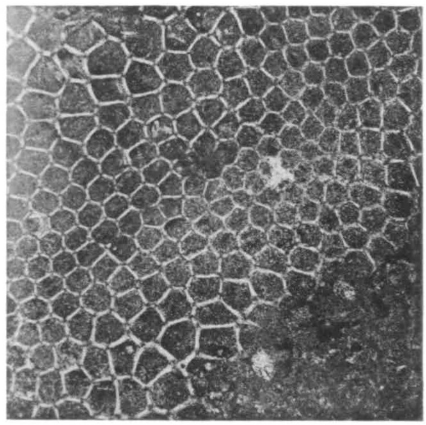
1



2

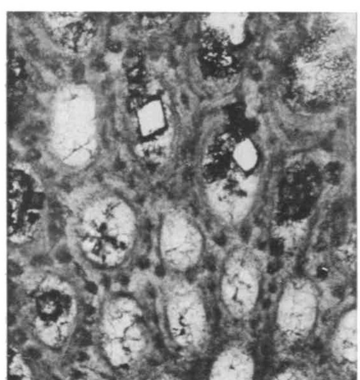


3



4

5



6

PLATE 8.

Cyphotrypa murrumbidgensis sp. nov. .... page 42

Figs. 1, 4.

Murrumbidgee "Series", Devil's Elbow, N.S.W. ?Middle Devonian. Sections cut from holotype, U.S.G.D. 11436.

1. Deep tangential section showing polygonal zooecia, very slender zooecial walls pierced at their junctions by fine acanthopores. X55.

4. Longitudinal section of a hemispherical zoarium showing erect thin-walled zooecia crossed by flat diaphragms. X7.

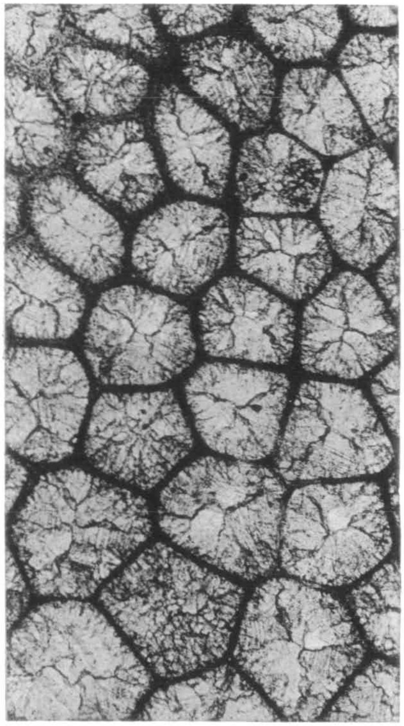
Leptotrypa sp. *A*. .... page 43

Figs. 2, 3.

Taemas, N.S.W. ?Middle Devonian. Sections cut from U.S.G.D. 11435.

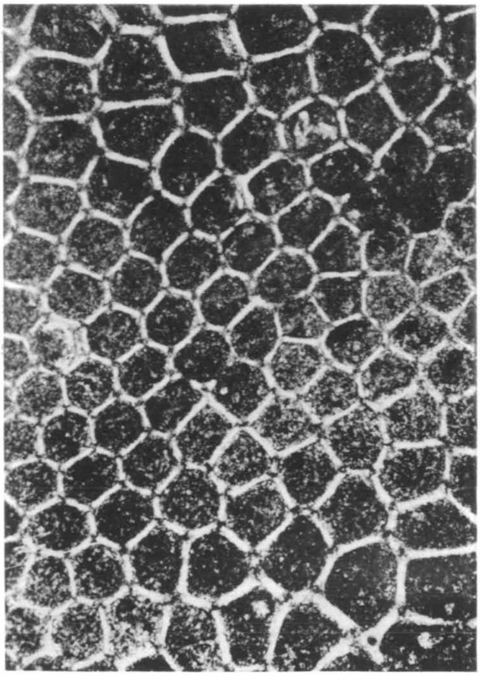
2. Longitudinal section showing the curved proximal region of the zooecial tubes crossed by abundant diaphragms. X50.

3. Tangential section showing polygonal zooecia and slender zooecial walls pierced at their junctions by small acanthopores. X27.

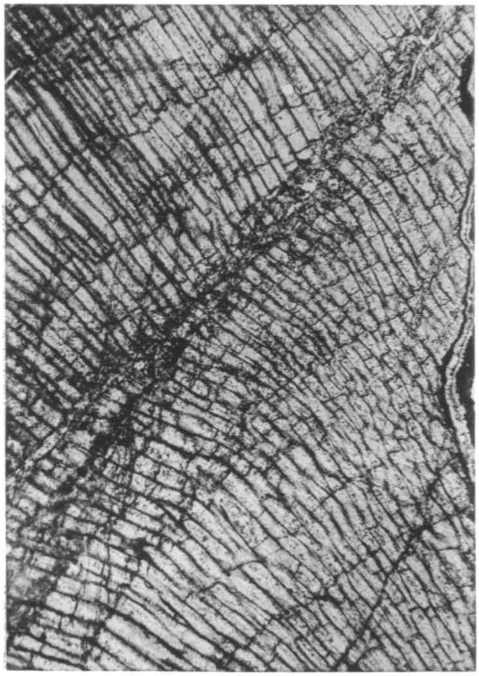


1

2



3



4

PLATE 9.

Leptotrypa sp. *A*. .... page 43

Fig. 1.

Taemas, N.S.W. ?Middle Devonian.

Longitudinal section of an incrusting zoarium showing partly recrystallized zooecial walls. U.S.G.D. 11435. X12.

Percyopora tubulata sp. nov. .... page 46

Figs. 2-8.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

2. Longitudinal section showing crenulate zooecial walls slightly thickened in the very narrow peripheral region. Paratype A, C.P.C. 958. X12.

3. Tangential section showing slender zooecial walls pierced by numerous acanthopores. C.P.C. 975. X28.

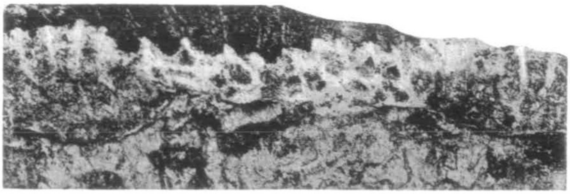
4. Tangential section showing the arrangement of the zooecial tubes and numerous acanthopores. C.P.C. 958. X10.

5. Branching zoarium showing development of short irregular branches. C.P.C. 960. X5.

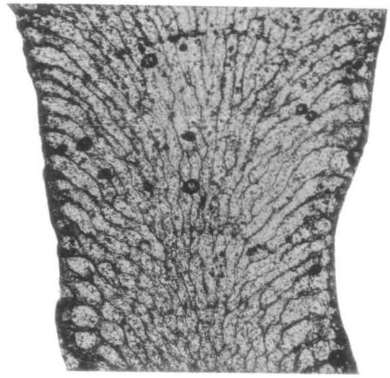
6. Portion of a longitudinal section showing laminate structure of the slightly thickened zooecial walls in the peripheral region. X50.

7. External aspect of a zoarium having numerous small branches. C.P.C. 950. X4.

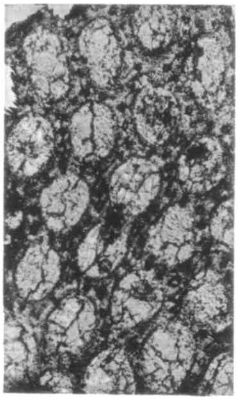
8. Longitudinal section showing crenulate zooecial walls, slightly thickened in the peripheral region; an occasional diaphragm crosses the zooecial tubes near their periphery. Holotype, C.P.C. 950. X30.



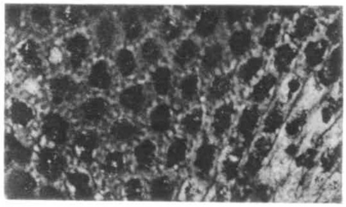
1



2

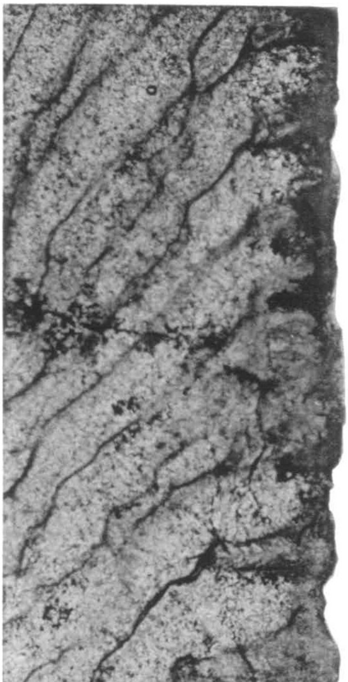


3



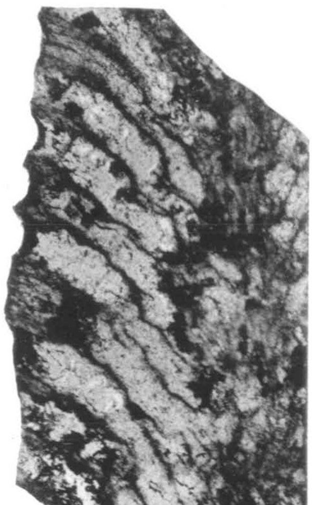
4

5



6

7



8

PLATE 10.

Percyopora tubulata sp. nov. .... page 46

Figs. 1-6, 8.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

1. Longitudinal section showing gentle curvature of crenulate zooecial walls crossed by arcuate bands of slight thickening. C.P.C. 976. X20.

2. Cylindrical zoarial fragment showing the longitudinal arrangement of the zooecia. Paratype B, C.P.C. 959. X10.

3. Tangential section showing the arrangement of the zooecia. C.P.C. 975. X53.

4. Longitudinal section showing the crenulate zooecial walls, thickening only slightly in the peripheral region; two to three diaphragms occasionally cross the distal part of the zooecial tubes. C.P.C. 975. X12.

5. External aspect of a slender zoarial stem. C.P.C. 967. X5.

6. Tangential section showing acanthopores piercing the outer part of the zooecial walls; an occasional smaller cell lies at the junction of the zooecial walls. C.P.C. 975. X100.

8. Transverse section showing the narrow peripheral region of thickened zooecial walls. X20.

Percyopora occidentalis sp. nov. .... page 47

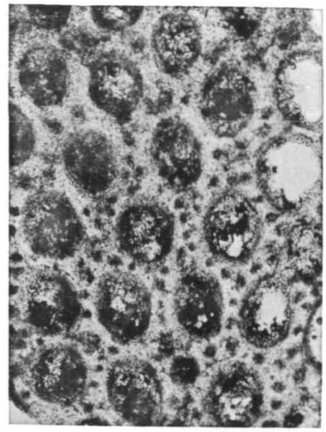
Fig. 7.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

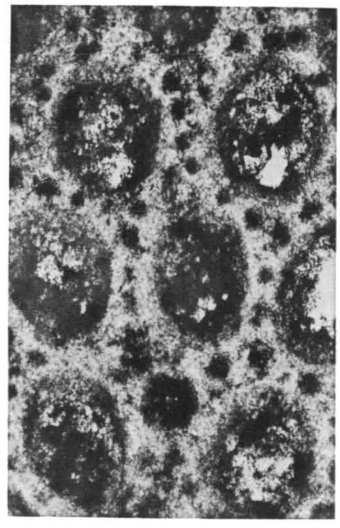
External aspect of a zoarial fragment. Holotype C.P.C. 951. X8.

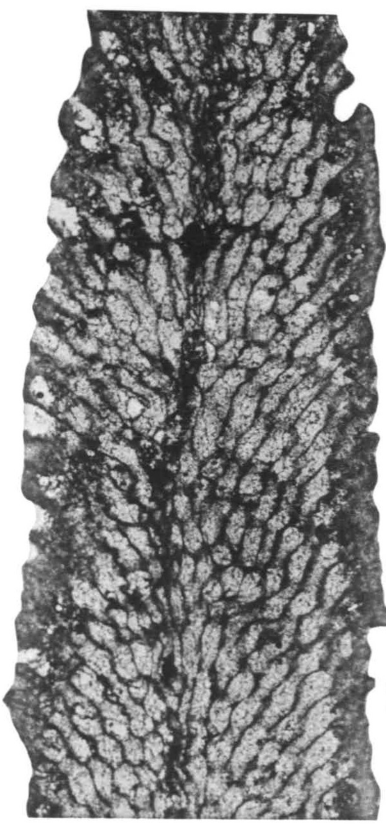

1


2


3


5


6


4


7

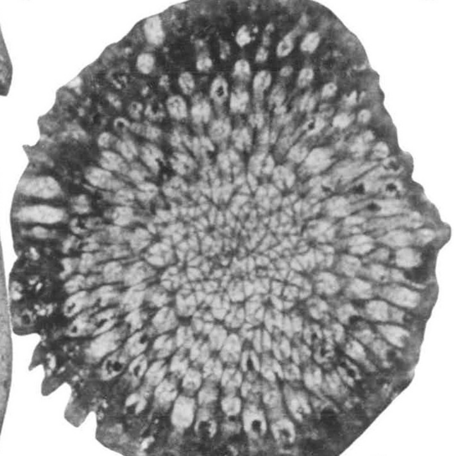

8

PLATE 11.

Percyopora occidentalis sp. nov. .... page 47

Figs. 1, 3.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian. Sections cut from holotype, C.P.C. 951.

1. Shallow tangential section showing narrow zooecial walls pierced by numerous acanthopores. X30.

3. Longitudinal section showing thin crenulate zooecial walls in the axial region, and irregularly thickened walls in the subperipheral and peripheral region. X5.

Fitzroyopora oscarensis sp. nov. .... page 49

Figs. 2, 4-7.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

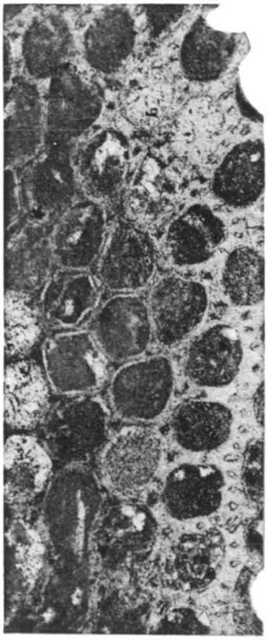
2. External aspect of a solid, subcylindrical zoarial stem. Holotype, C.P.C. 947. X2.

4. External aspect of a branching zoarium. Paratype A, C.P.C. 948. X2.

5. Longitudinal section showing slightly crenulate zooecial walls in the axial region crossed by arcuate bands of thickening; and thickened zooecial walls of the peripheral region pierced by numerous acanthopores. Holotype C.P.C. 947. X7.

6. Tangential section showing zooecial walls pierced by numerous acanthopores. Locality T2. X50.

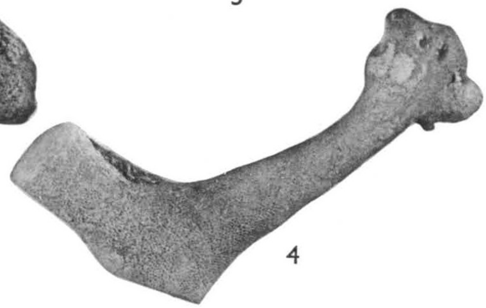
7. Tangential section showing the arrangement of zooecial openings. Holotype, C.P.C. 947. X12.



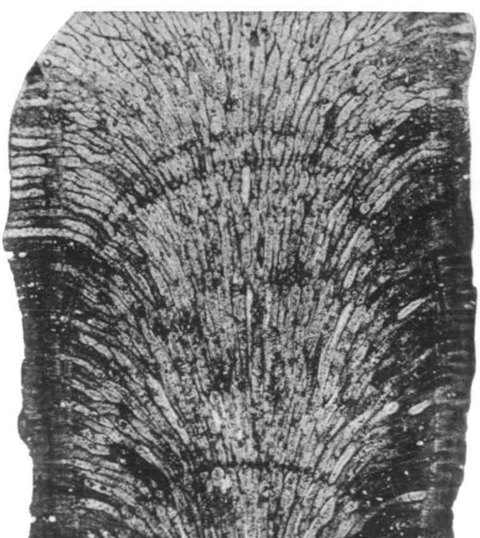
1

2

3

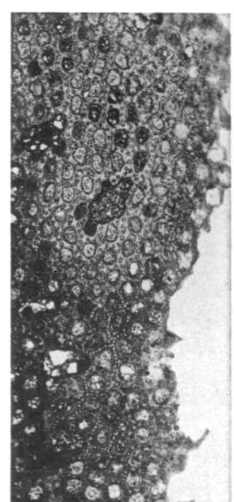


4



5

6



7

Plate 12.

Granivallum fistulosum sp. nov. .... page 52

Figs. 1, 2, 4, 5.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

1. Tangential section showing the arrangement of slender polygonal zooecia, and slender zooecial walls pierced by acanthopores. Section cut from holotype, C.P.C. 949. X15.

2. Enlarged view of a tangential section showing the granular structure of the slender zooecial walls. C.P.C. 949. X45.

4. Longitudinal section showing the slender zooecial tubes crossed by numerous fine diaphragms in a multilaminate zoarium. C.P.C. 949. X8.

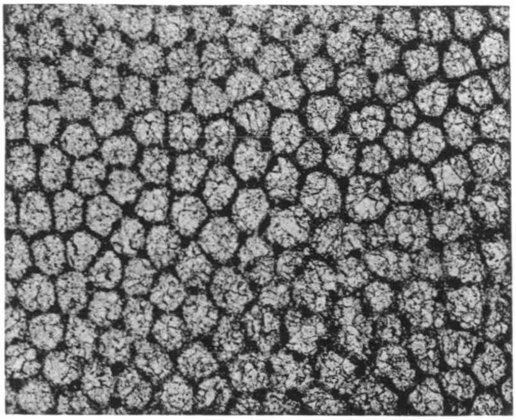
5. Longitudinal section showing very finely beaded zooecial walls pierced by steeply inclined laminae of the acanthopore walls, and clear calcite axes of the acanthopores. Locality T2. X50.

Fitzroyopora oscarensis sp. nov. .... page 49

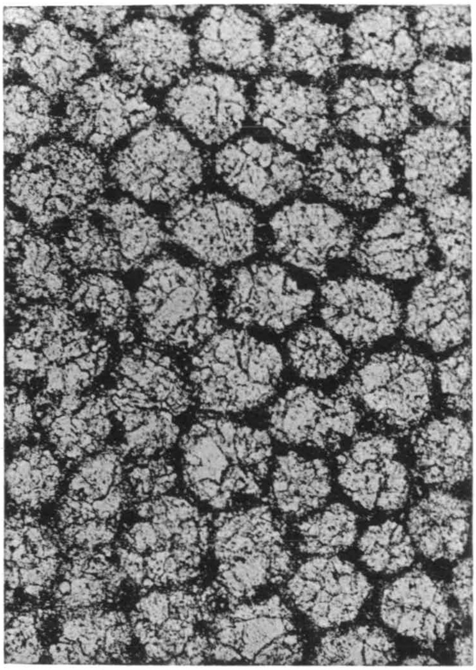
Fig. 3.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

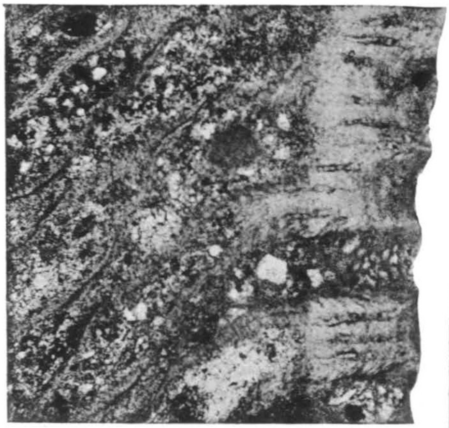
Portion of a longitudinal section showing numerous acanthopores piercing the thickened laminate zooecial walls of the peripheral region. Locality T2. X50.



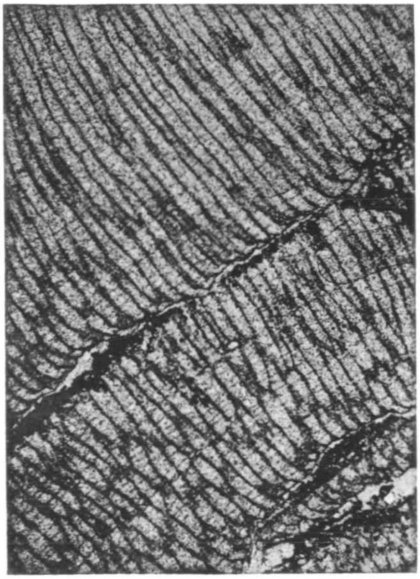
1



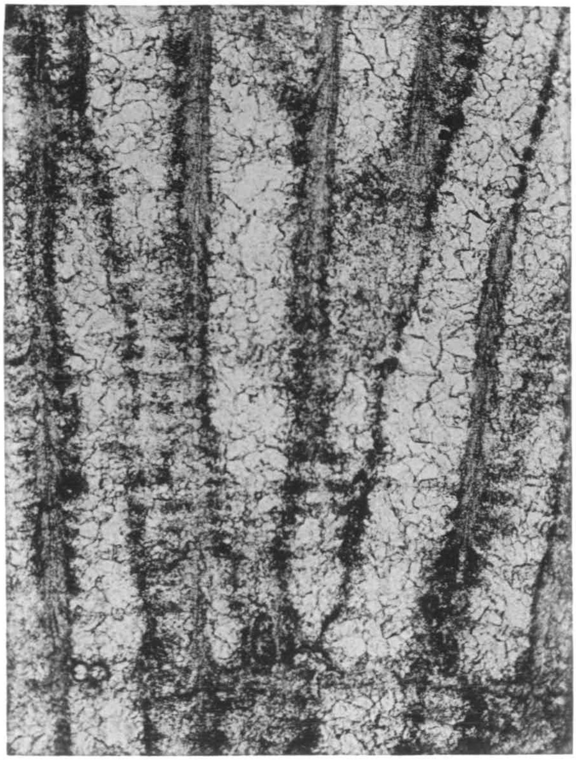
2



3



4



5

Plate 13.

Stereotoechus shearsbyi (Crockford) .... page 54

Figs. 1, 3, 5.

Murrumbidgee "Series", Taemas, N.S.W. ?Middle Devonian. Sections cut from holotype, U.S.G.D. 1439.

1. Tangential section showing regularly arranged zooecial openings, acanthopores, and occasional mesopores. Monticule in the lower left corner. X12.

3. Tangential section showing acanthopores at the junctions of the outer part of the zooecial walls. X48.

5. Oblique longitudinal section across the peripheral region showing the wide laminate zooecial walls pierced by steeply inclined laminae of the acanthopore walls. X18.

Austraphylloporina cliefdenensis sp. nov. .... page 58

Figs. 2, 4.

Cliefden Caves Limestone, Cliefden Caves, N.S.W. Middle Ordovician.

2. External aspect of an anastomosing zoarium. U.S.G.D. 9263. X5.

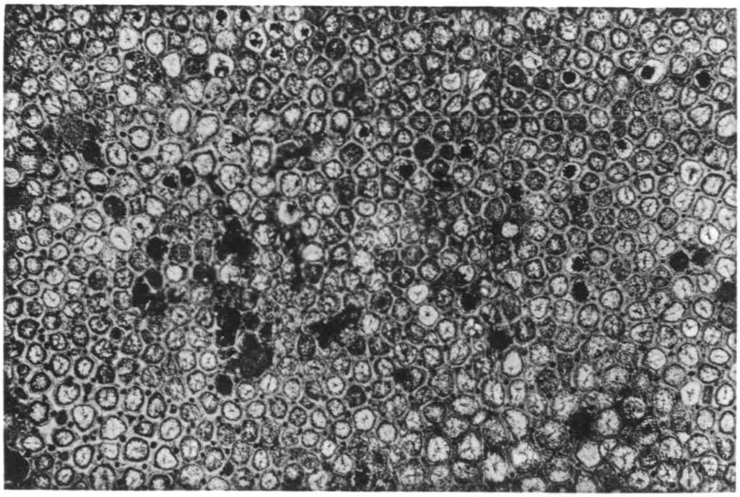
4. Tangential section showing polygonal fenestrules separating branches bearing circular zooecial openings. Holotype, U.S.G.D. 9262. X18.

Granivallum fistulosum sp. nov. .... page 52

Fig. 6.

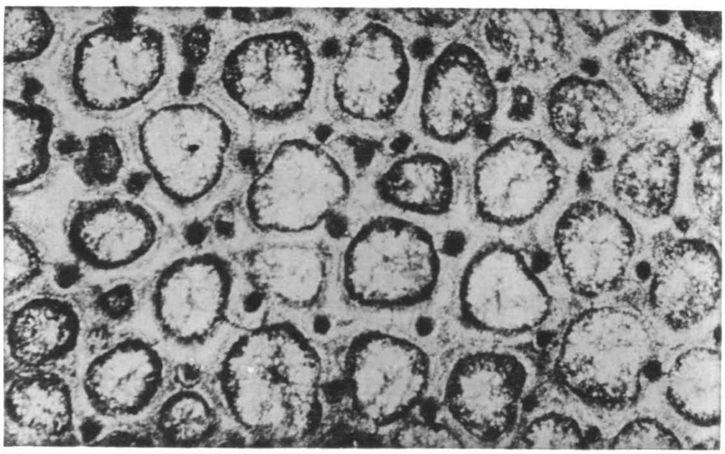
Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

External aspect of a multilaminate zoarium. Locality T29. X1.

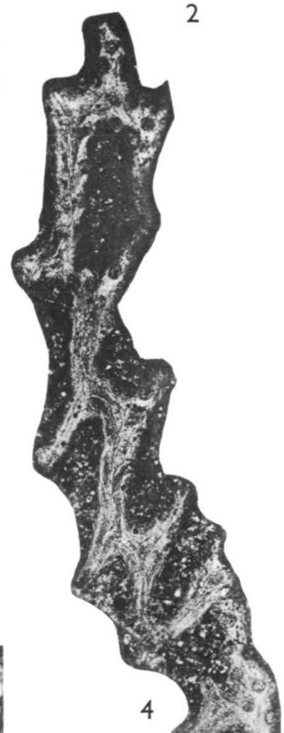


1

2



3



4

5

6

PLATE 14.

Coelocaulis maculosa sp. nov. .... page 66

Fig. 1.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

1. Hollow cylindrical zoarium of *Coelocaulis maculosa* only visible at the upper part of the fragment, which is incrusted by *Discotrypa?* sp. *A*. C.P.C. 968. X2.

Fistulipora sadlerensis sp. nov. .... page 63

Figs. 2, 4, 6.

Sadler Formation, Fitzroy Basin, Western Australia. Upper Devonian.

2. Cylindrical zoarial fragment showing polygonal zooecial openings and distinct maculae filled with dense calcitic material. C.P.C. 970. X5.

4. Tangential section showing circular zooecial orifices isolated by a single series of polygonal vesicles. Section cut from holotype, C.P.C. 932. X5.

6. Shallow tangential section showing the irregular zooecial openings separated by dense calcitic material, and a macula composed of vesicular material. C.P.C. 936. X20.

Austraphylloporina cliefdenensis sp. nov. .... page 58

Figs. 3, 5.

Cliefden Caves Limestone, Cliefden Caves, N.S.W. Middle Ordovician.

3. External aspect of celluliferous surface of a zoarium. U.S.G.D. 9263. X5.

5. Tangential section showing circular zooecial openings separated by longitudinal rows of acanthopores. On the left the deep tangential view shows zooecial tubes growing from the carina and opening into the fenestrules. Section cut from the holotype, U.S.G.D. 9262. X40.

Fistulipora norensis sp. nov. .... page 61

Fig. 7.

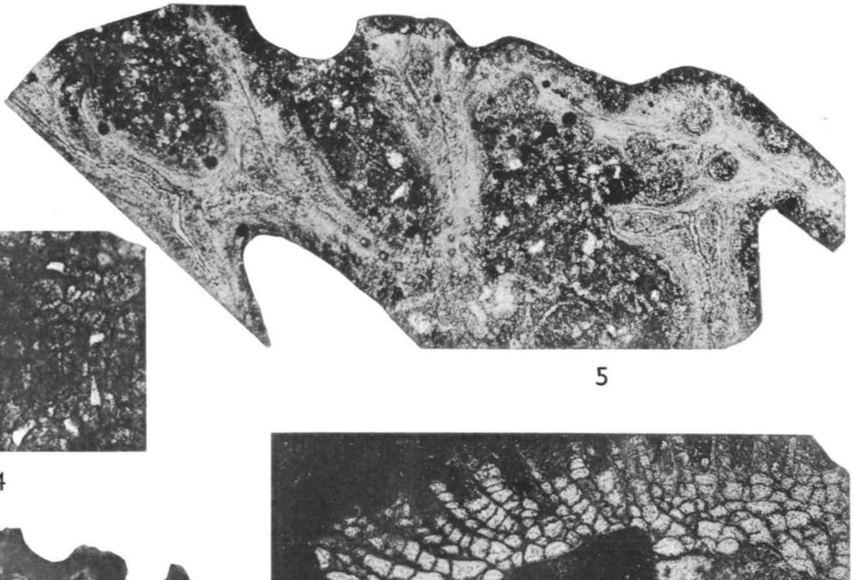
Garra Beds, Nora Creek, N.S.W. ?Middle Devonian.

Longitudinal section of an incrusting zoarium having zooecial tubes crossed by diaphragms and separated by one to three rows of vesicles. Section cut from holotype, U.S.G.D. 10446. X12.

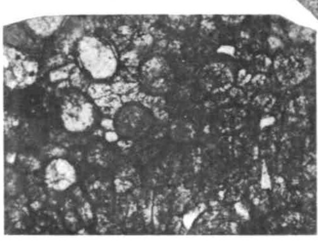
1

2

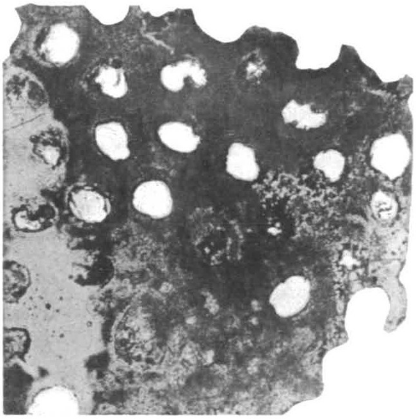
3



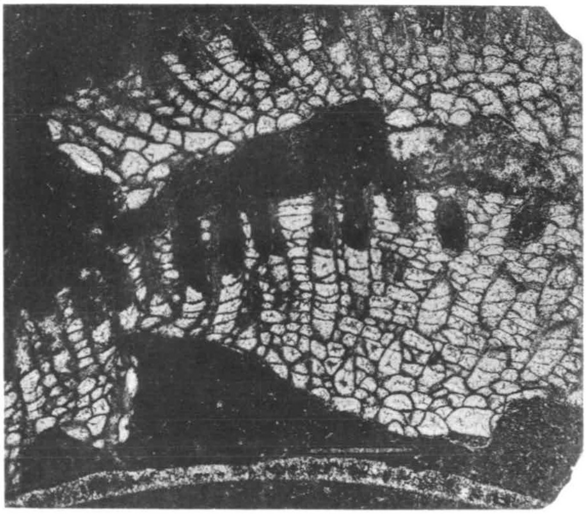
5



4



6



7

PLATE 15.

Calopora hattonensis sp. nov. .... page 56

Figs. 1, 2, 4.

Black Bog Beds, Hatton's Corner, N.S.W. Middle Silurian. Sections cut from the holotype, A.M. F8852.

1. Longitudinal section showing long zooecial tubes in the axial region crossed by an occasional diaphragm. Zooecial tubes in the peripheral region diaphragms are more abundant and numerous mesopores fill the intrazooecial spaces. XO.9.

2. Enlarged portion of Figure 1 showing development of mesopores in the subperipheral region. X14.

4. Deep tangential section showing oval zooecial openings, slender zooecial walls occasionally pierced by an acanthopore, and a single series of mesopores, partly separating the zooecia. X40.

Cheilotrypa sp. *A*. .... page 65

Fig. 3.

Hume Limestone or Barrandella Shale, Hatton's Corner, N.S.W. Middle Silurian.

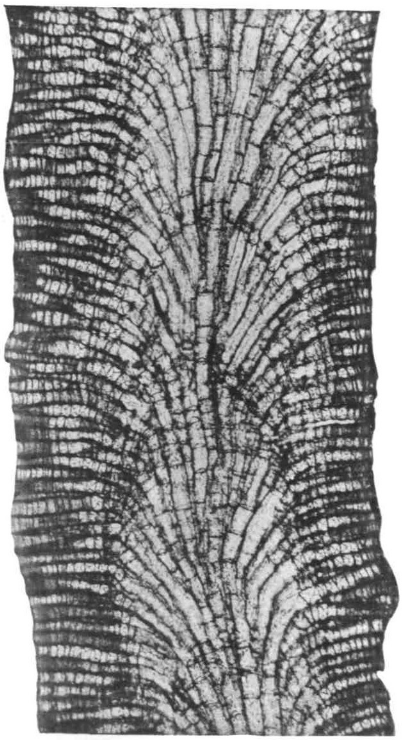
Longitudinal section showing a slender cylindrical stem with slender hollow axial tube from which zooecia grow. Section cut from specimen U.S.G.D. 10436. X12.

Coelocaulis maculosa sp. nov. .... page 66

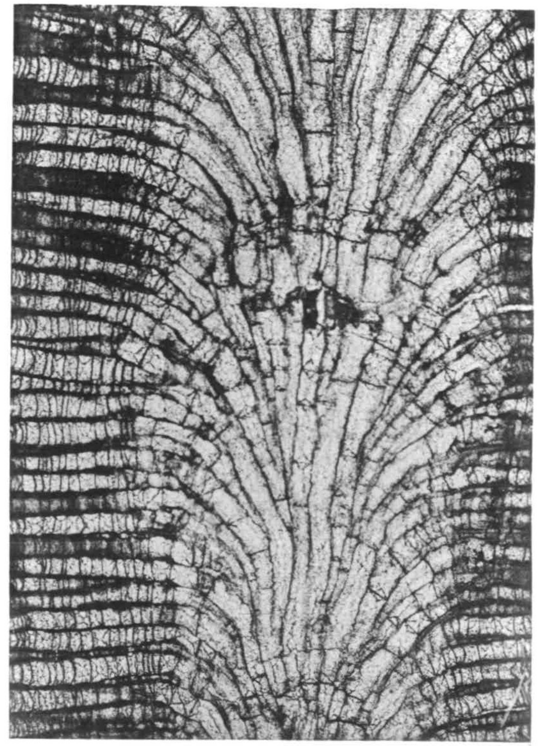
Fig. 5.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

Longitudinal section showing part of the wrinkled coenelasma, diaphragms in the proximal region of the zooecial tubes, and two rows of convex vesicles filling the intrazooecial spaces. Section cut from holotype, C.P.C. 952. X33.

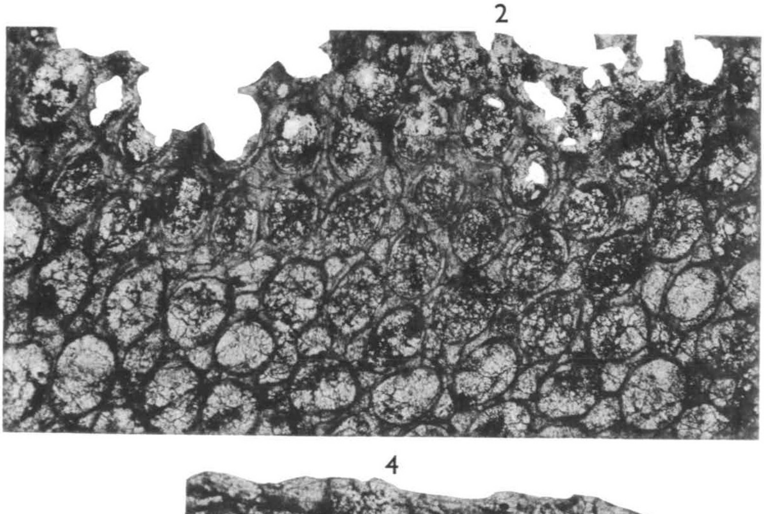


1

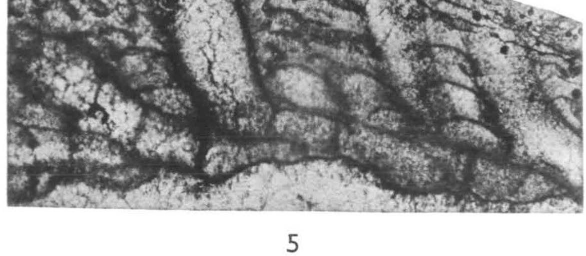


2

3



4



5

PLATE 16.

Coelocaulis maculosa sp. nov. .... page 66

Figs. 1, 4.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

1. External aspect of a broad ramose zoarium showing hoods across portion of the zooecial orifices. C.P.C. 969. X5.

4. Transverse section showing smooth coenelasma, initially recumbent zooecia upright in the peripheral region, intrazooecial vesicular material, and diaphragms in the zooecial tubes. Holotype, C.P.C. 952. X18.

Fistulipora pillarensis sp. nov. .... page 62

Figs. 2, 3, 5.

Pillara Formation, Fitzroy Basin, Western Australia. Middle Devonian. Sections cut from holotype, C.P.C. 931.

2. External aspect of the zoarial surface showing maculae composed of dense calcitic material. X5.

3. Oblique longitudinal section of a multilaminar zoarium. Diaphragms occur in the proximal part of the zooecial tubes. X16.

5. Oblique tangential section showing zooecia slightly indented by lunaria and isolated by polygonal vesicular material. X30.

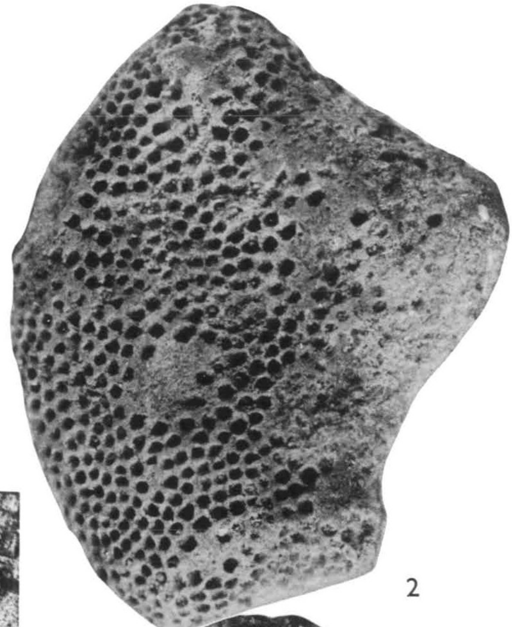
Fistulipora sadlerensis sp. nov. .... page 63

Fig. 6.

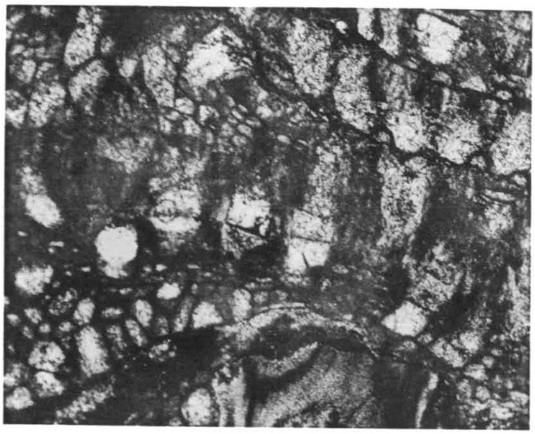
Sadler Formation, Fitzroy Basin, Western Australia. Upper Devonian.

Tangential section showing the irregular outline of the zooecial openings which are separated by wide densely filled intrazooecial spaces. C.P.C. 933. X32.

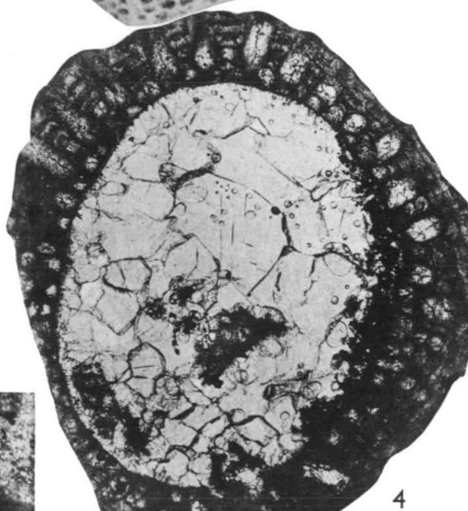
1



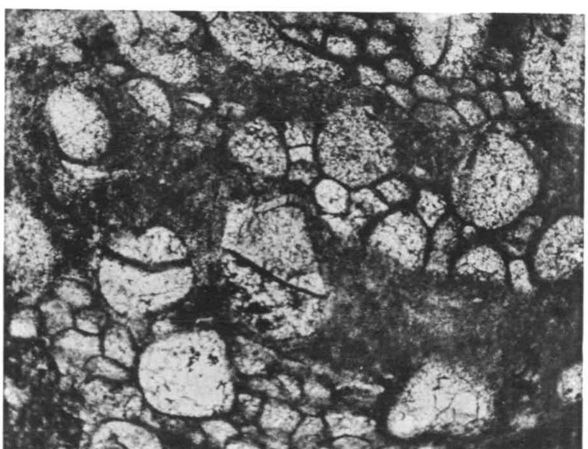
2



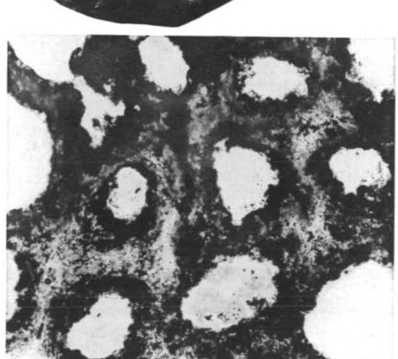
3



4



5



6

PLATE 17.

Fistulipora pillarensis sp. nov. .... page 62

Figs. 1, 5.

Pillara Formation, Fitzroy Basin, Western Australia. Middle Devonian.

1. Tangential section showing subcircular zooecia indented slightly by short lunaria. Holotype, C.P.C. 931. X40.

5. Tangential section showing the arrangement of zooecia and intrazooecial spaces filled with calcitic and vesicular material. C.P.C. 931. X15.

Hemitrypa sp. *B*. .... page 74

Fig. 2.

12 miles north-west of Wellington. Lower or Middle Devonian.

Transverse section of a fenestrate zoarium showing two rows of zooecia on each branch, which is surmounted by a well developed superstructure. U.S.G.D. 10447. X14.

Fistulipora sadlerensis sp. nov. .... page 63

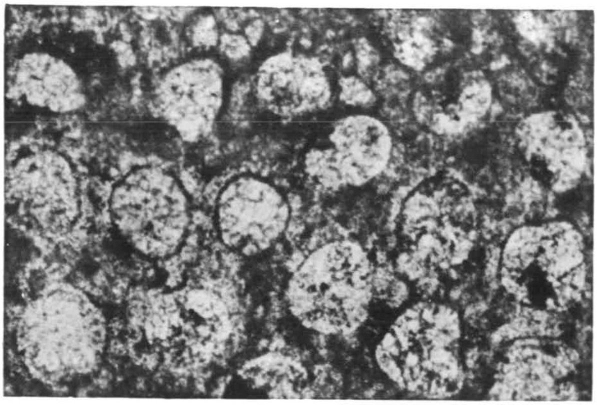
Figs. 3, 4, 6.

Sadler Formation, Fitzroy Basin, Western Australia. Upper Devonian.

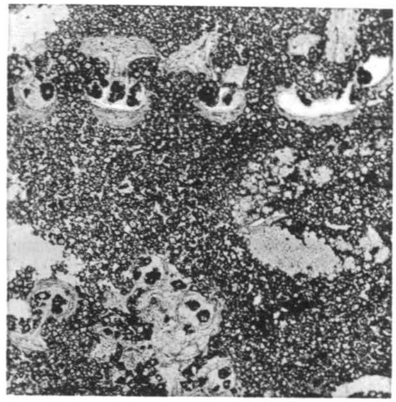
3. Oblique longitudinal section showing gently curving zooecial tubes crossed by diaphragms and separated by vesicular material. C.P.C. 932. X15.

4. Oblique longitudinal section showing slender zooecia crossed by diaphragms and vesicular material in the intrazooecial spaces extending from the subperipheral to the peripheral region. C.P.C. 970. X15.

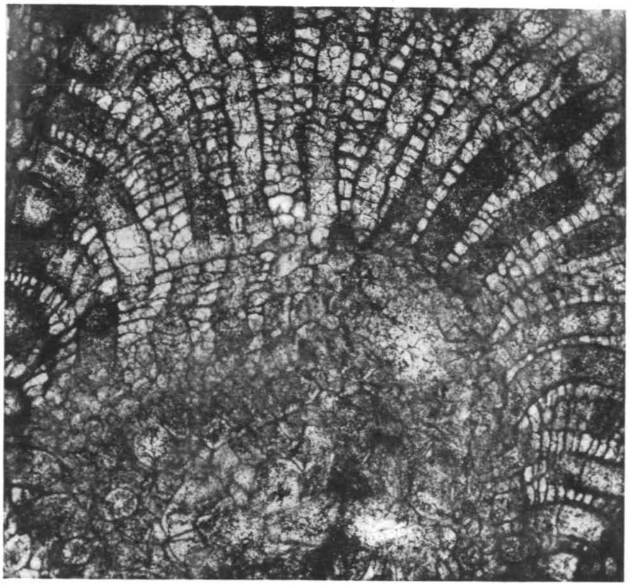
6. Oblique longitudinal section showing thin-walled zooecia in the axial region, numerous diaphragms in the peripheral region of the zooecial tubes, and vesicular material filling the subperipheral and peripheral region of the intrazooecial spaces. Paratype A, C.P.C. 933. X13.



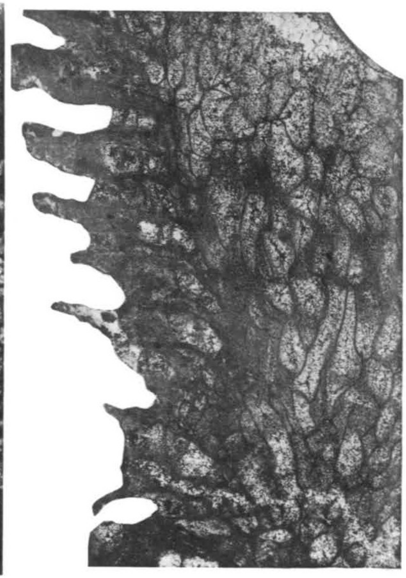
1



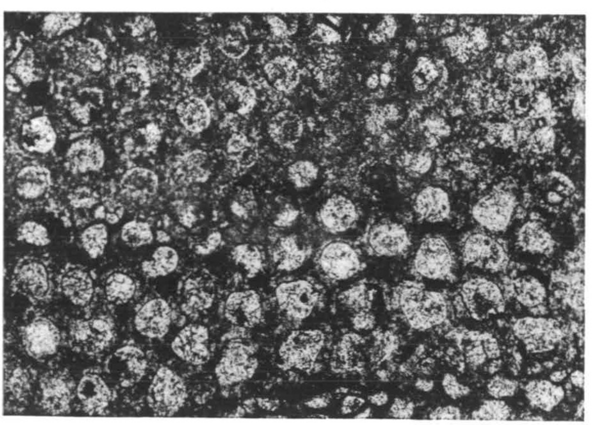
2



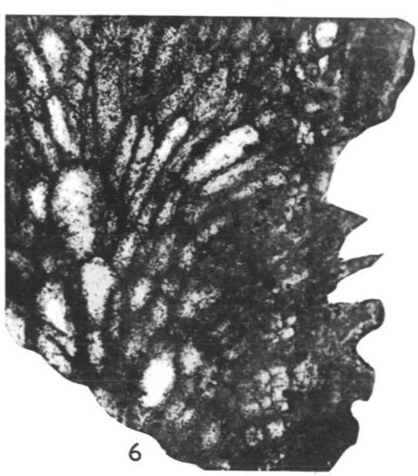
3



4



5



6

Plate 18.

Fenestella pikerensis sp. nov. .... page 70

Fig. 1.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

Oblique tangential section showing two rows of circular zooecial openings separated by a tuberculate carina. The basal zooecial sections are polygonal. Holotype, C.P.C. 939. X16.

Coelocaulis maculosa sp. nov. .... page 66

Fig. 2.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

Tangential section showing circular zooecial openings, slightly indented by lunaria and separated by vesicular material. Macula in the lower right consists of vesicular material. Holotype, C.P.C. 952. X15.

Fenestella yassensis sp. nov. .... page 72

Fig. 3.

Barrandella Shale, Yass, N.S.W. Middle Silurian.

Reverse surface of a fine fenestrate zoarium. Holotype, N.M.V. P7507. X2.

Ikelarchimedes warooensis sp. nov. .... page 75

Figs. 4-6, 8, 9.

Murrumbidgee "Series", Taemas, N.S.W. ?Middle Devonian.

4. External aspect of the obverse surface of a fenestrate colony and its axis. Paratype D, U.S.G.D. 11446. X20.

5. Obverse surface of a zoarial fragment, with superstructure partly broken to expose the zooecial openings. U.S.G.D. 12404. X20.

6. Obverse surface of a zoarial fragment showing zooecial openings along the zoarial branches. U.S.G.D. 12401. X20.

8. Obverse surface of a zoarial fragment having a smooth superstructure. Holotype, U.S.G.D. 11442. X20.

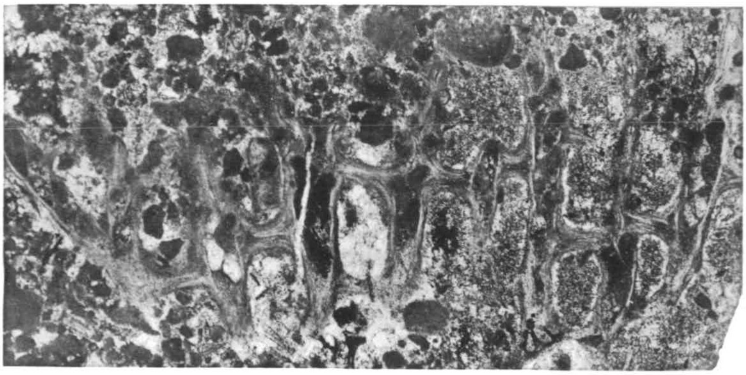
9. Obverse surface of a zoarium showing its well-developed superstructure. U.S.G.D. 12402. X20.

Fenestella emanuelana sp. nov. .... page 69

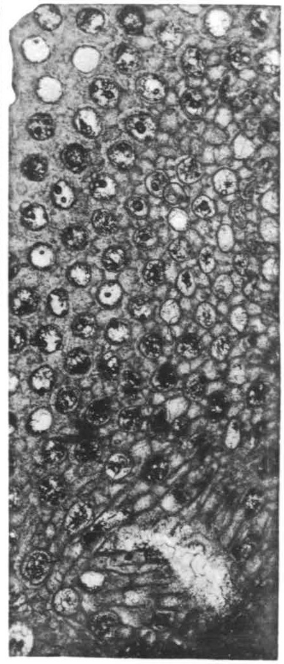
Fig. 7.

Sadler Formation, Fitzroy Basin, Western Australia. Upper Devonian.

Portion of a fenestrate zoarium showing slender high branches with a high carina and two rows of zooecial openings obliquely placed. Holotype, C.P.C. 937. X6.

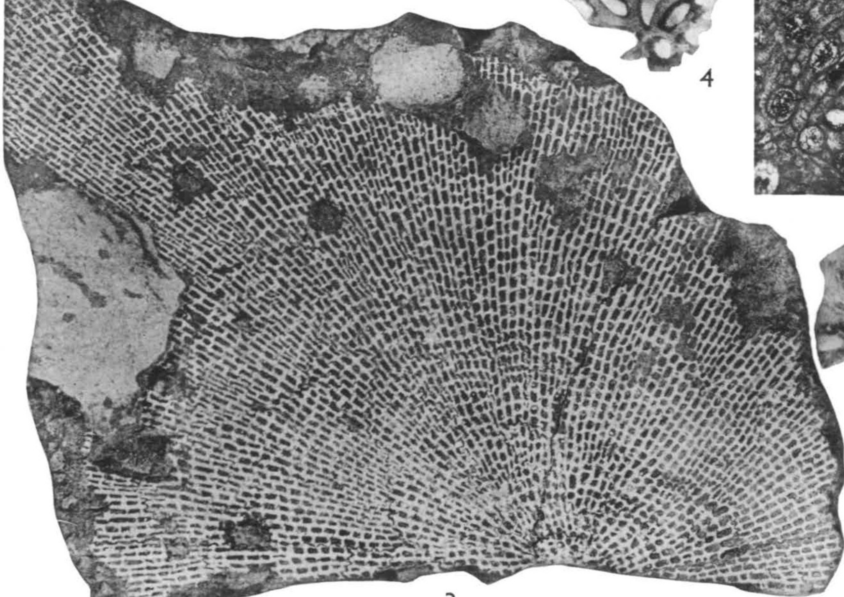


1



2

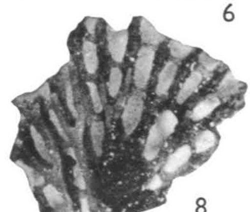
4



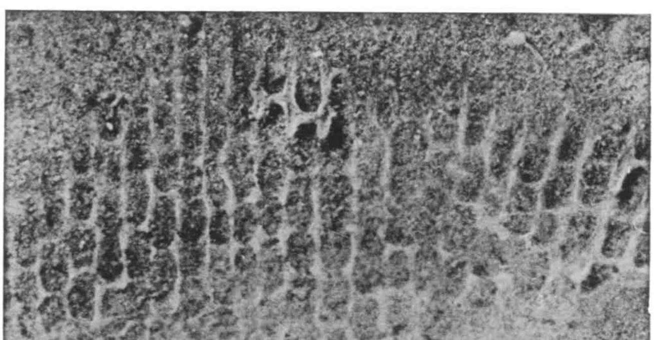
3

5

6



8



7

9

Plate 19.

Fistulipora sadlerensis sp. nov. .... page 63

Fig. 1.

Sadler Formation, Fitzroy Basin, Western Australia. Upper Devonian.

Transverse section showing thin-walled zooecia in the axial region, numerous diaphragms crossing the zooecial tubes and vesicular and dense calcitic material in the intrazooecial spaces in the peripheral region. The two large zooecia in the axial region are unusual in that transverse sections more distally located possess zooecia, uniform in size. Paratype C, C.P.C. 935. X12.

Fenestella westralis sp. nov. .... page 71

Fig. 2.

Sadler Formation, Fitzroy Basin, Western Australia. Upper Devonian.

Portion of a fenestrate zoarium showing slender branches bearing oblique zooecial openings which are divided by a high carina marked by tubercles. Holotype, C.P.C. 938. X10.

Hemitrypa sp. *A*. .... page 73

Figs. 3, 4.

Lake Bathurst, N.S.W. ?Middle Devonian.

3. Obverse surface of a fenestrate zoarium masked by superstructure of primary and secondary bars and cross bars. A.M. F30191. X16.

4. Weathered surface of an undulate fenestrate zoarium showing the more proximal part of the zooecial tubes. A.M. F30175. X5.

Ikelarchimedes warooensis sp. nov. .... page 75

Figs. 5, 6, 8, 9.

Murrumbidgee "Series", Taemas, N.S.W. ?Middle Devonian.

5. External aspect of a zoarial fragment showing smooth superstructure and the axis of the colony. U.S.G.D. 11447. X20.

6. External aspect of the obverse surface showing the smooth superstructure. U.S.G.D. 12400. X20.

8. External aspect of obverse zoarial surface. U.S.G.D. 12403. X20.

9. External aspect of a zoarium displaying two rows of zooecia along the zoarial branches. U.S.G.D. 11450. X20.

Fistulipora norensis sp. nov. .... page 61

Fig. 7.

Garra Beds, Nora Creek, N.S.W. ?Middle Devonian.

Oblique tangential section showing circular zooecial openings, slightly thickened in the region of the lunaria, and polygonal vesicles. Holotype, U.S.G.D. 10446. X18.

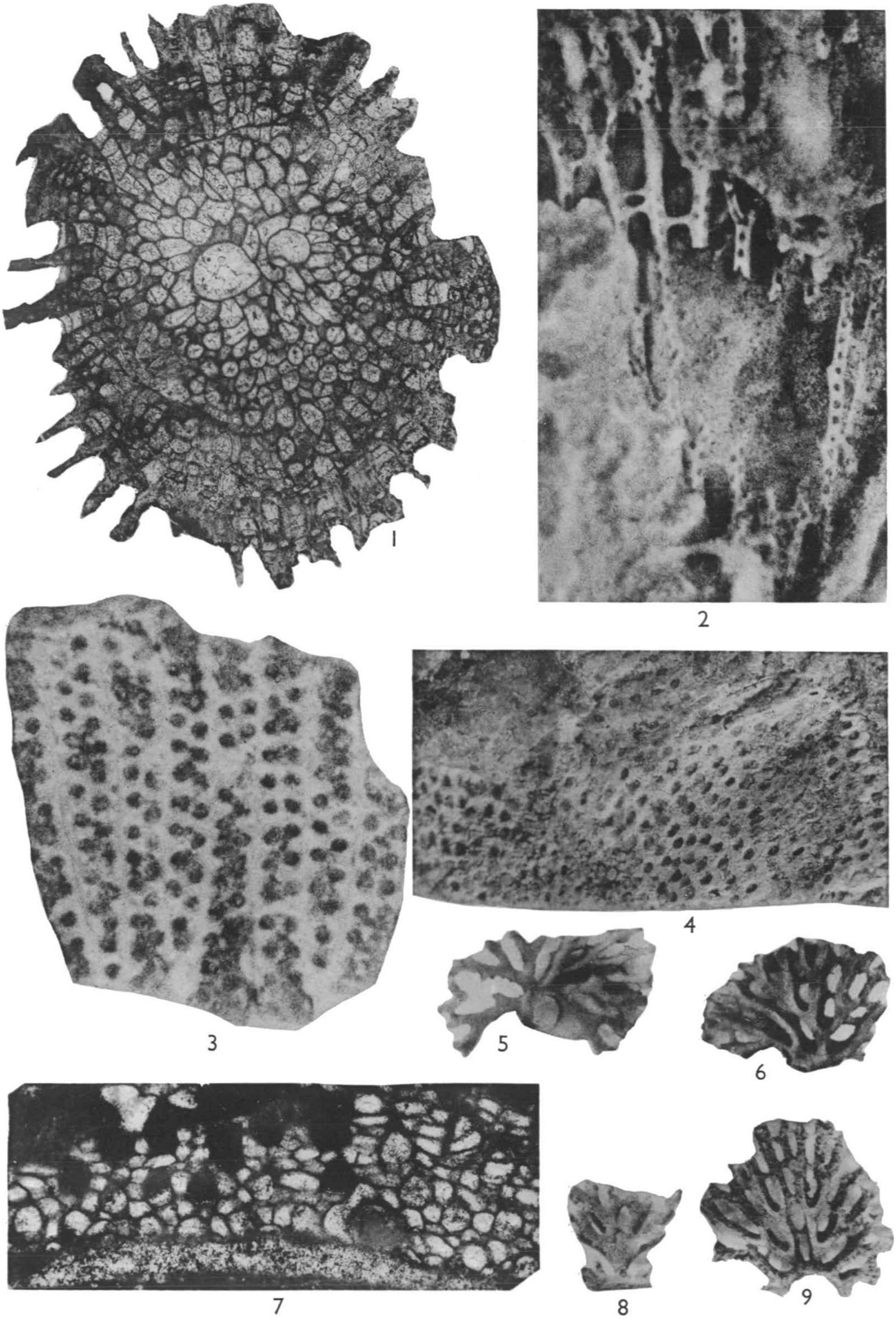

1
2
3
4
5
6
7
8
9

Plate 20.

Fenestella margaritifera Chapman .... page 73

Fig. 1.

Yering, Victoria. ?Lower Devonian.

Cast of a portion of a fenestrate zoarium showing oval fenestrules and wide branches bearing regularly spaced zooecia. N.M.V. P593. X30.

Fistulipora victoriae Chapman .... page 64

Fig. 2.

Loyola, Victoria. Lower Devonian.

Tangential section showing subcircular zooecial openings isolated by polygonal vesicles. N.M.V. P12930. X40.

Ikelarchimedes warooensis sp. nov. .... page 75

Figs. 3-6, 8.

Murrumbidgee "Series", Taemas, N.S.W. ?Middle Devonian.

3. Fenestrate zoarium showing zooecial openings beneath a superstructure. U.S.G.D. 11445. X20.
4. Zooecial openings on steeply sloping branches. U.S.G.D. 11443. X20.
5. Zooecial openings on steeply sloping branches. U.S.G.D. 11444. X20.
6. Obverse surface of a zoarial fragment showing a smooth superstructure. U.S.G.D. 11446. X35.
8. Zooecial openings on steeply sloping branches. U.S.G.D. 11449. X20.

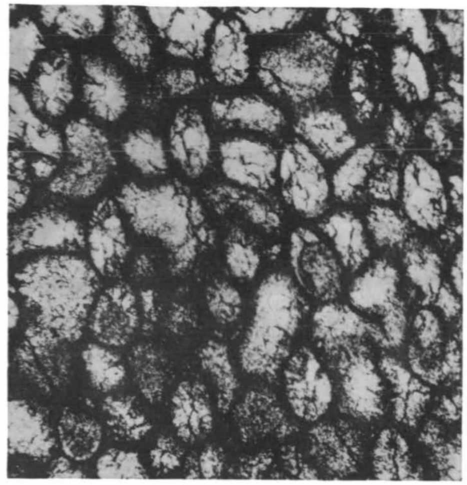
Fenestella australis Chapman .... page 68

Fig. 7.

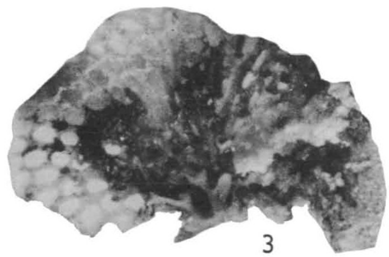
South-east of Walhalla, Victoria. Silurian or Devonian.

Portion of a fenestrate zoarium showing three to four zooecial openings developed along a fenestrule. Lectotype, N.M.V. P1205A. X20.

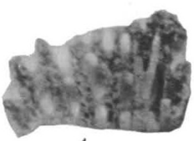
1



2

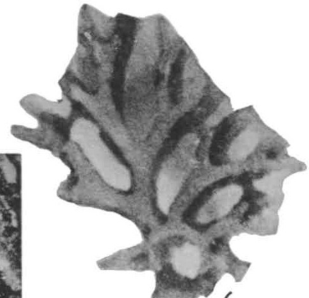


3



4

5



6

7

8

PLATE 21.

Fistulipora victoriae Chapman .... page 64

Figs. 1, 4, 7.

Loyola, Victoria. Lower Devonian. Section cut from N.M.V. P12930.

1. Deep tangential section showing subcircular zooecial openings isolated by polygonal vesicles. X40.

4. Oblique longitudinal section showing long slender tabulate zooecial tubes separated by one or two vertical series of vesicles. X7.

7. Oblique longitudinal section showing concave diaphragms in the zooecial tubes and globose vesicles filling the intrazooecial spaces. X40.

Stictopora belubulensis sp. nov. .... page 77

Figs. 2, 3, 5, 9.

Cliefden Caves Limestone, Cliefden Caves, N.S.W. Middle Ordovician.

2. External aspect of a strap-shaped zoarial fragment. U.S.G.D. 9252. X4.

3. Longitudinal section showing narrow zooecial tubes lacking hemisepta. Holotype, U.S.G.D. 9234. X30.

5. External aspect of an undulating zoarial surface. U.S.G.D. 9241. X10.

9. Transverse section showing a slender mesotheca pierced by median tubuli. U.S.G.D. 11408. X50.

Ikelarchimedes warooensis sp. nov. .... page 75

Figs. 6, 8.

Murrumbidgee "Series", Taemas, N.S.W. ?Middle Devonian.

6, 8. External aspect of proximal part of zoarium. U.S.G.D. 12406. and U.S.G.D. 12407 respectively. X20.

Hemitrypa sp. *A*. .... page 73

Fig. 10.

Lake Bathurst, N.S.W. ?Middle Devonian.

Weathered zoarial surface showing reticulate superstructure with straight primary bars and secondary zig-zag bars. A.M. F30175. X12.

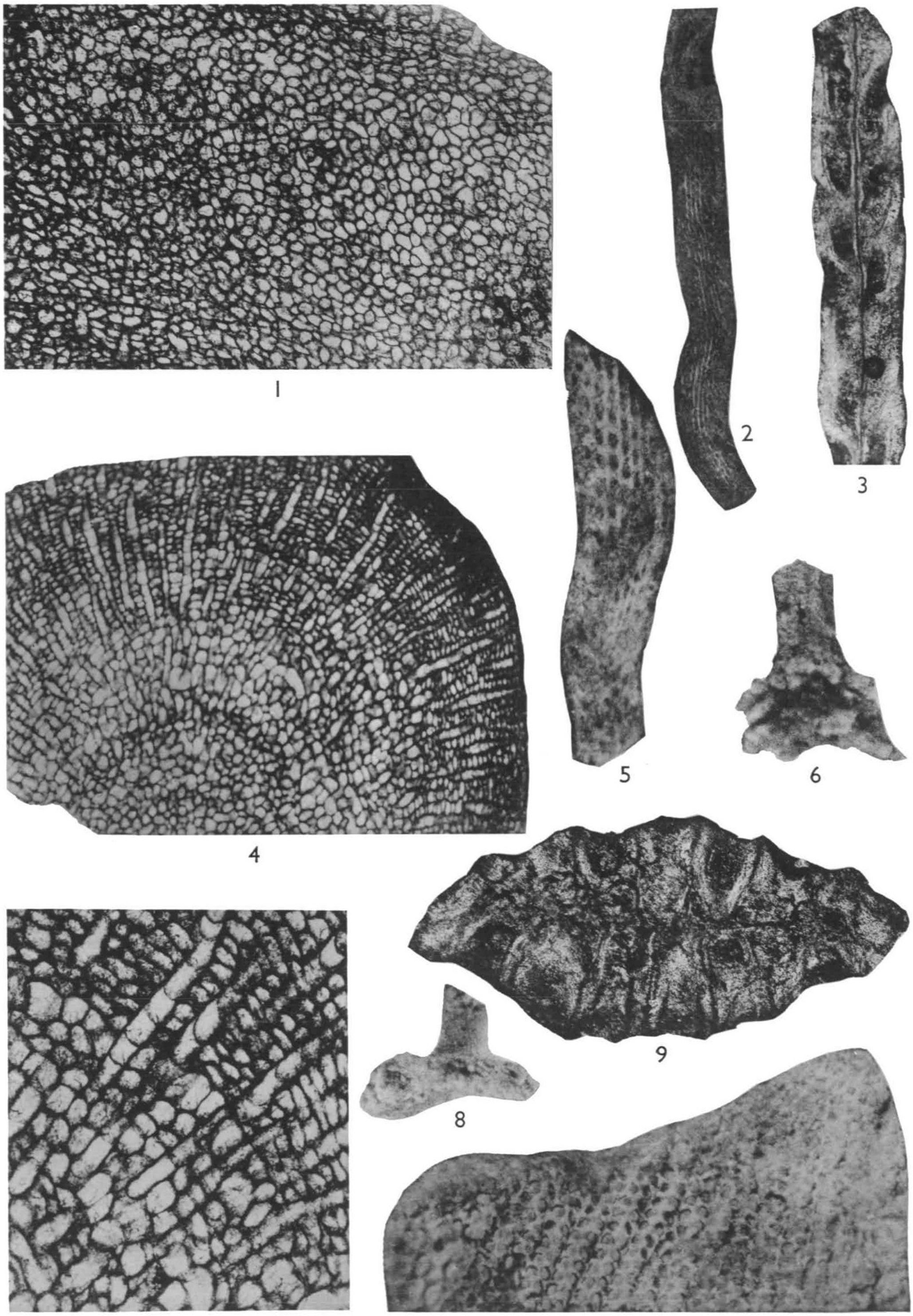

1
2
3
4
5
6
7
8
9
10

PLATE 22.

Stictopora bowanensis sp. nov. .... page 78

Figs. 1-5.

Bowan Park Limestone, Parish of Bowan, N.S.W. Middle to Upper Ordovician.

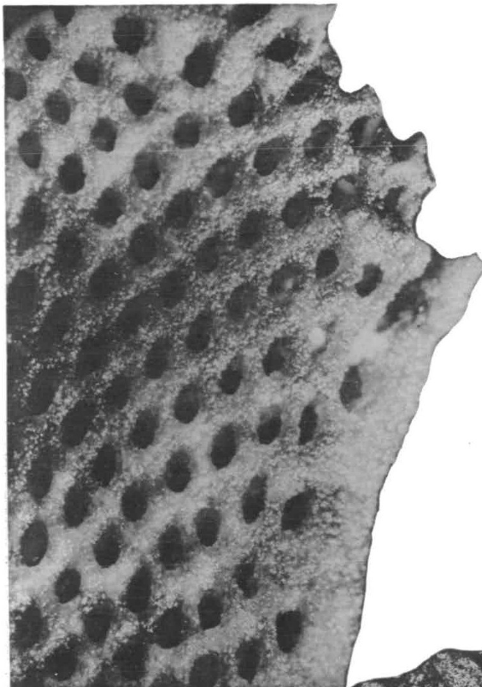
1. External aspect of part of a zoarial branch. U.S.G.D. 11415. X30.

2. External aspect of an etched specimen showing a fenestrate zoarium. Paratype C, U.S.G.D. 11410. X10.

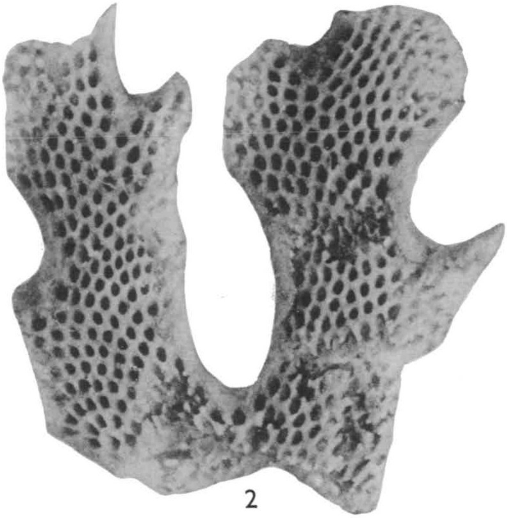
3. Oblique transverse section showing a slender mesotheca pierced by median tubuli. Paratype A, U.S.G.D. 10409. X50.

4. Tangential section showing circular zooecia in the peripheral region and quadrate zooecia in the mesothecal region. Holotype, U.S.G.D. 11409. X12.

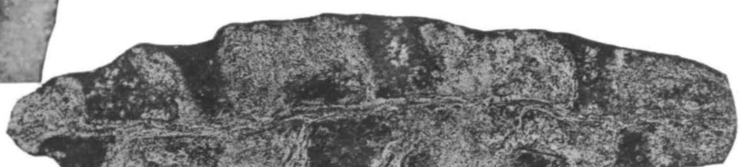
5. Tangential section of a fenestrate zoarium showing regularly distributed zooecia, and acanthopores in the zooecial walls. U.S.G.D. 10429. X9.



1

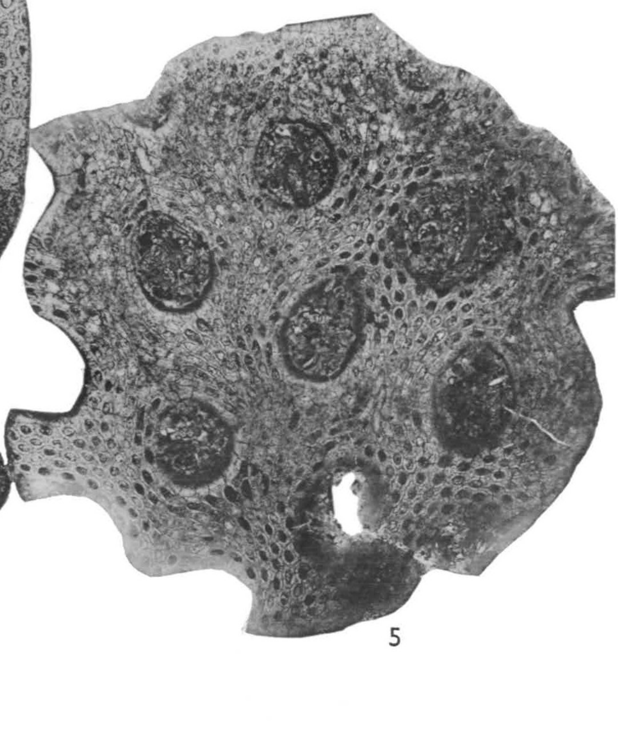


2



3

4



5

PLATE 23.

Stictopora sp. *C.* .... page 84

Fig. 1.

Bowan Park Limestone, Parish of Bowan, N.S.W. Middle to Upper Ordovician.

Oblique tangential section showing numerous acanthopores piercing the zooecial walls. U.S.G.D. 10400. X20.

Stictopora quandongensis sp. nov. .... page 80

Figs. 2, 5, 6, 8.

Bowan Park Limestone, Parish of Bowan, N.S.W. Middle to Upper Ordovician.

2. Longitudinal section showing sigmoidal zooecial tubes growing from the mesotheca. Paratype B, U.S.G.D. 11407. X44.

5. Tangential section showing longitudinal ranges of zooecia and a lateral margin pierced by numerous acanthopores. U.S.G.D. 10431. X20.

6. Tangential section of a bifurcating branch having zooecia surrounded by numerous acanthopores. Holotype, U.S.G.D. 10401. X15.

8. Tangential section showing zooecial walls and lateral margins crowded with acanthopores. Paratype A, U.S.G.D. 10449. X45.

Stictopora sp. *B.* .... page 83

Figs. 3, 4.

Regan's Creek Limestone, south-east of Cargo, N.S.W. Middle or Upper Ordovician.

3. Deep tangential section showing the quadrate outline of zooecia; zooecial walls cut near the periphery show numerous small acanthopores. U.S.G.D. 9384. X36.

4. Longitudinal section showing slender zooecial tubes growing from a mesotheca pierced by median tubuli. U.S.G.D. 11420. X30.

Stictopora sp. *E.*

Fig. 7.

Bowan Park Limestone, Parish of Bowan, N.S.W. Middle to Upper Ordovician.

External aspect of the proximal basal part of a zoarium showing the broad celluliferous expanded base and low maculae in the more distal part. U.S.G.D. 11433. X10.

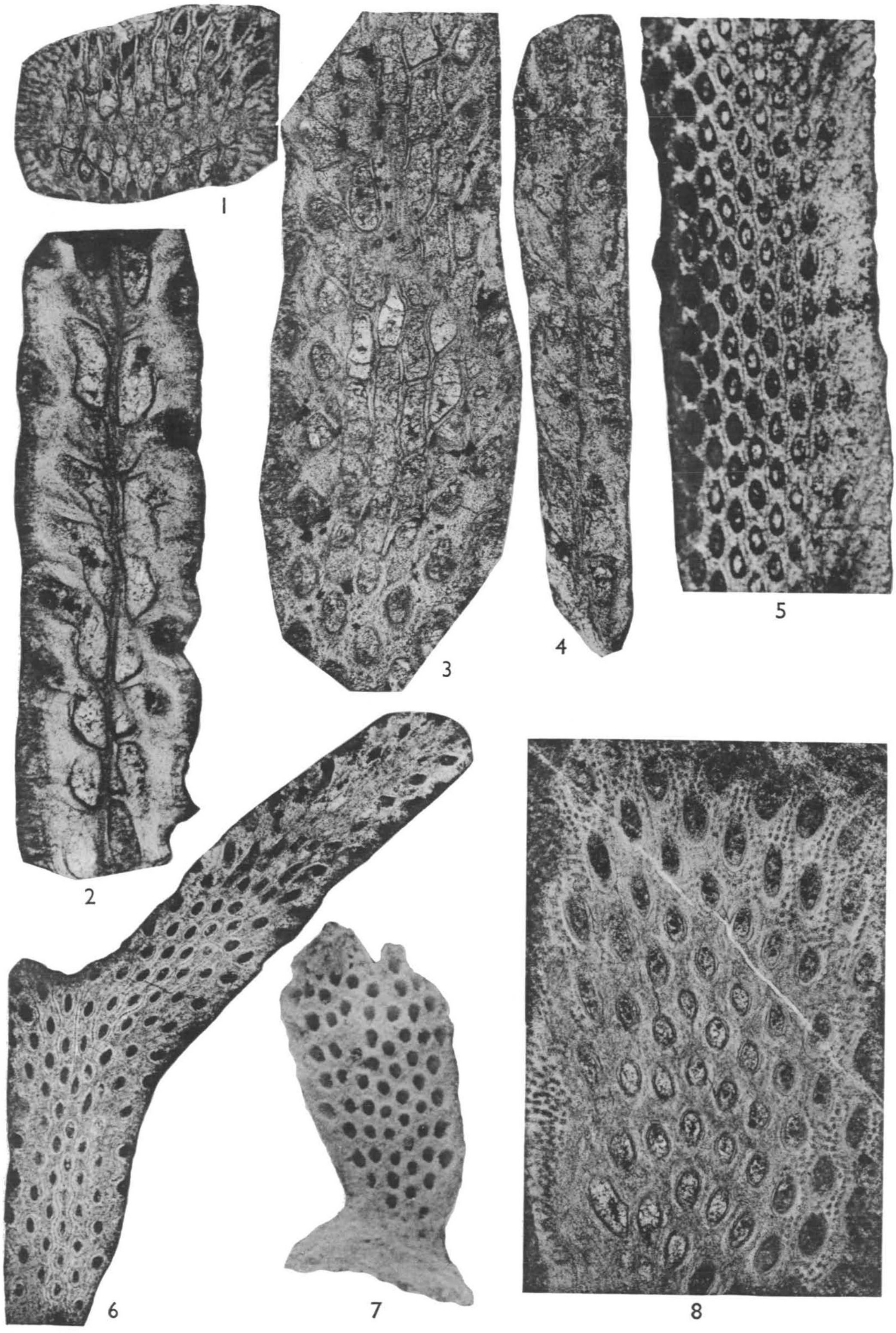


Plate 24.

Stictopora zeehanensis sp. nov. .... page 81

Figs. 1, 3.

Gordon Limestone, Zeehan, Tasmania. Middle to Upper Ordovician.

1. Longitudinal section showing sigmoidally curved zooecial tubes growing from the mesotheca. Holotype, U.T.G.D. 20334-1. X30.

3. Tangential section showing oval zooecia and zooecial walls and lateral margins crowded with a single series of acanthopores. Paratype A, U.T.G.D. 20334-6. X30.

Stictopora sp. *D.* .... page 84

Fig. 2.

Bowan Park Limestone, Parish of Bowan, N.S.W. Middle to Upper Ordovician.

Oblique longitudinal section showing zooecia growing from the mesotheca and acanthopores piercing the zooecial walls. U.S.G.D. 10408. X15.

Stictopora sp. *C.* .... page 84

Figs. 4-7.

Bowan Park Limestone, Parish of Bowan, N.S.W. Middle to Upper Ordovician. Sections cut from U.S.G.D. 10400.

4. Longitudinal section showing the narrow mesothecal region, wide peripheral region, small rounded projections at the peripheral region, and numerous acanthopores piercing the zooecial walls. X50.

5. Oblique longitudinal section showing numerous acanthopores in the zooecial walls. X20.

6. Deep tangential section showing the wide lateral region crowded with acanthopores and slender zooecial walls. X50.

7. Transverse section showing numerous median tubuli in the mesotheca. X50.

Stictopora sp. *A.* .... page 83

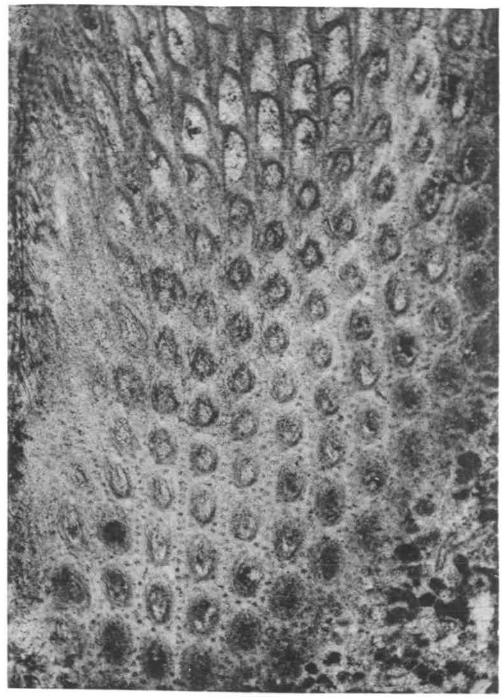
Fig. 8.

Reedy Creek Limestone, Reedy Creek, near Molong, N.S.W. ?Middle Ordovician.

Oblique longitudinal section showing median tubuli piercing the slender mesotheca. U.S.G.D. 11404. X45.

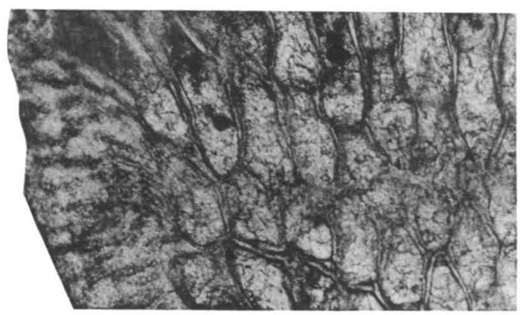

1

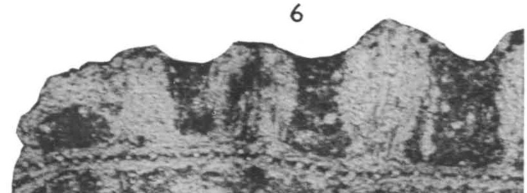

2


3


4


5


6


7


8

PLATE 25.

Nicklesopora leopoldensis sp. nov...... .... page 92

Figs. 1, 2, 5, 8.

Oscar Formation, Fitzroy Basin, Western Australia. Upper Devonian.

1. Tangential section showing excessive thickening of the zooecial walls almost obscuring the zooecial openings and numerous acanthopores piercing the outer part of the zooecial walls. Paratype A, C.P.C. 965. X33.

2. Longitudinal section showing strong differentiation of the axial and peripheral regions. The laminate structure of the acanthopores and zooecial walls is well defined. Paratype A, C.P.C. 965. X30.

5. External aspect of a cylindrical zoarial fragment. Holotype, C.P.C. 945. X10.

8. Longitudinal section showing thin-walled zooecia in the axial region, and laminate zooecial walls in the peripheral region. Holotype, C.P.C. 945. X30.

Nicklesopora geuriensis sp. nov. .... page 91

Figs. 3, 7.

North-west of Wellington, N.S.W. Lower or Middle Devonian. Sections cut from the holotype, U.S.G.D. 10438.

3. Tangential section showing the small zooecial openings outlined by polygonal zooecial walls bearing acanthopores. X20.

7. Longitudinal section showing slender crenulate zooecial walls in the axial region passing abruptly into the thickened peripheral region. X25.

Nicklesopora crenulata sp. nov. .... page 89

Figs. 4, 6.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

4. Tangential section showing large zooecial openings and slender zooecial walls pierced by numerous acanthopores. Holotype, C.P.C. 940. X80.

6. Transverse section showing the thin-walled zooecia in the axial region and thickened zooecial walls in the peripheral region. Paratype A, C.P.C. 964. X30.

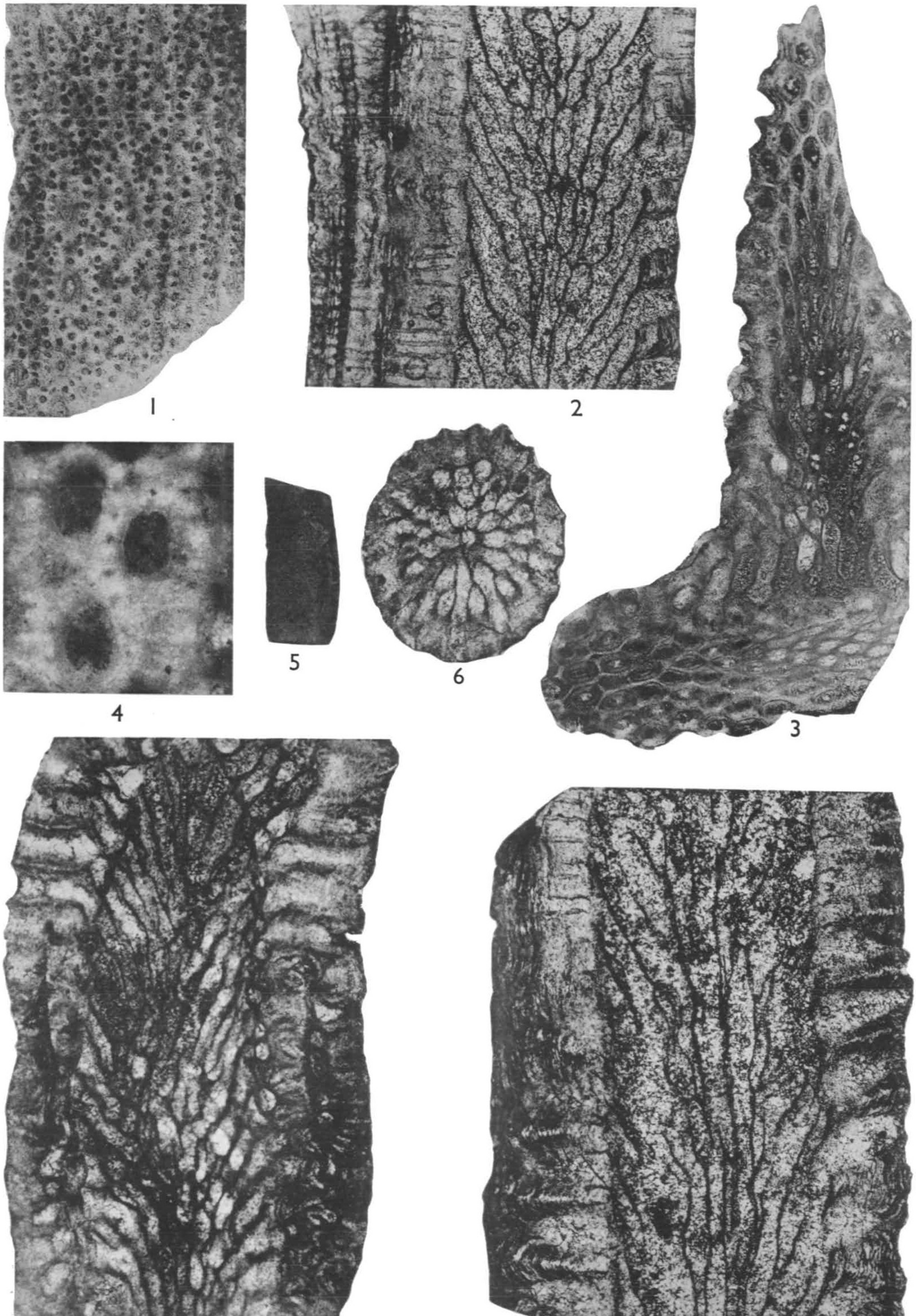

1
2
3
4
5
6
7
8

Plate 26.

Nicklesopora leopoldensis sp. nov. .... page 92

Fig. 1.

Oscar Formation, Fitzroy Basin, Western Australia. Upper Devonian.

Tangential section showing considerably thickened zooecial walls restricting the zooecial openings. Deeper tangential sections show the lack of acanthopores in the longitudinal zooecial walls. Holotype, C.P.C. 945. X33.

Nicklesopora westralis sp. nov. .... page 93

Figs. 2, 3, 5.

Fossil Downs Formation, Fitzroy Basin, Western Australia. Upper Devonian.

2. Tangential section showing longitudinal ranges of zooecia and longitudinal series of acanthopores. Holotype, C.P.C. 941. X18.

3. Longitudinal section showing thin-walled zooecia in the axial region, and laminate zooecial walls, acanthopores, and superior hemisepta in the peripheral region. Holotype, C.P.C 941. X25.

5. External aspect of a cylindrical zoarial fragment. Holotype, C.P.C. 941. X5.

Nicklesopora crenulata sp. nov. .... page 89

Fig. 4.

Fairfield Beds, Fitzroy Basin, Western Australia. Upper Devonian.

Tangential section showing zooecial walls pierced by acanthopores in the peripheral region and crenulate zooecial walls in the axial region. Holotype, C.P.C. 940. X14.

Nicklesopora fitzroyensis sp. nov. .... page 90

Figs. 6, 7.

Oscar Formation, Fitzroy Basin, Western Australia. Upper Devonian. Sections cut from holotype, C.P.C. 946.

6. Longitudinal section showing well defined axial and peripheral regions and rudimentary superior hemisepta at the base of the peripheral region. X25.

7. Tangential section showing regularly arranged zooecial openings and a single series of acanthopores piercing the zooecial walls. X18.

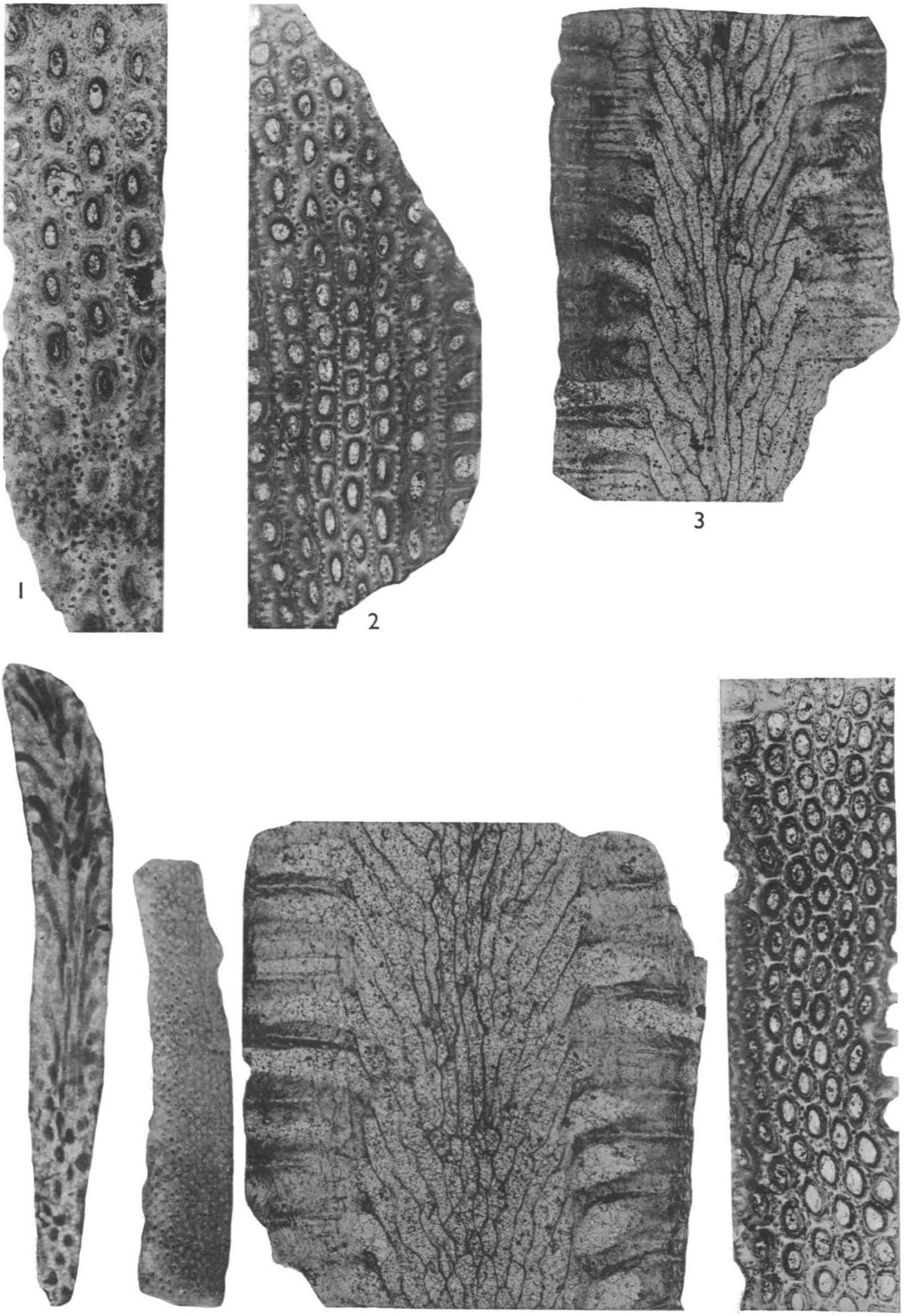

1
2
3
4
5
6
7

PLATE 27.

Vetofistula mirabilis Etheridge .... page 105

Figs. 1, 3, 4, 6.

Reid's Gap, near Townsville, Queensland. Middle Devonian. A.M. F899.

1. Transverse section illustrated by Etheridge (1917, pl. 4, figs. 3, 4) showing the oblique orientation of the section on the left and the lack of a central axial tube. X8.

3. Longitudinal section illustrated by Etheridge (1917, pl. 4, fig. 1) showing the gentle curvature of the corallites that open obliquely at the periphery. X7.

4. Longitudinal section illustrated by Etheridge (1917, pl. 4, fig. 2) showing well developed perforate corallite walls thickening in the subperipheral and peripheral regions. X15.

6. Tangential section showing finely serrated corallite calices lined by short longitudinal spines. X25.

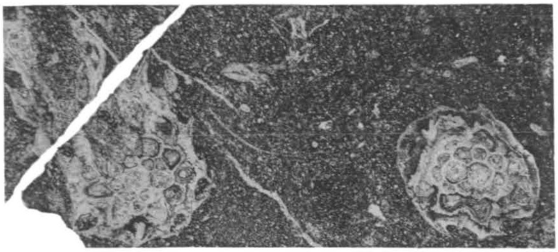
Saffordotaxis? sp. *A*. .... page 94

Figs. 2, 5.

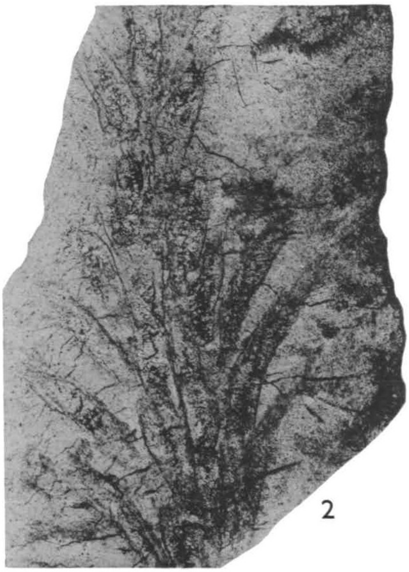
North-west of Wellington, N.S.W. Lower or Middle Devonian.

2. Longitudinal section showing gentle curvature of the zooecial tubes from the axial to the peripheral region. U.S.G.D. 11439. X38.

5. Deep tangential section showing subcircular zooecial openings indented by acanthopores. U.S.G.D. 11440. X60.



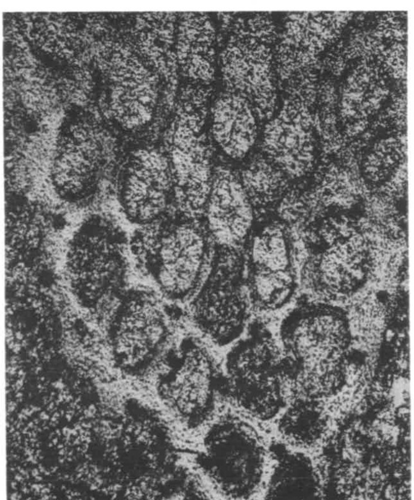
1



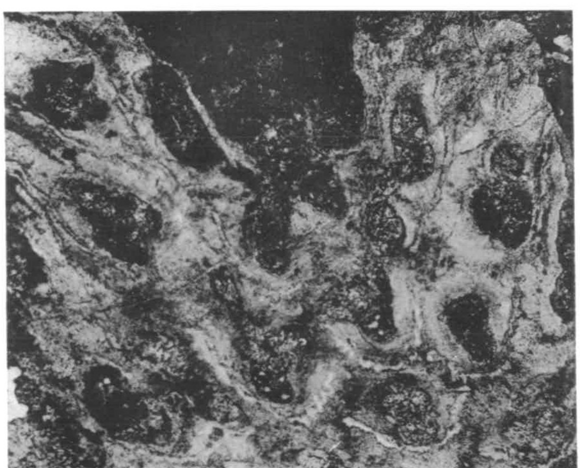
2

3

4



5



6

PLATE 28.

Nicklesopora? flexuosa Chapman .... page 91

Fig. 1.

Gibbo River, Victoria. Silurian or Devonian.

Deeply weathered branching zoarium showing gently curving zooecial tubes. Holotype, N.M.V. P13964. X3.5.

"Heterotrypa rushworthensis" Chapman .... page 106

Fig. 2.

Rushworth, Victoria.

External aspect of specimen. N.M.V. P14072. X8.

Rhombopora? gippslandica Chapman .... page 95

Fig. 3.

Tyer's River, Victoria. Silurian or Devonian.

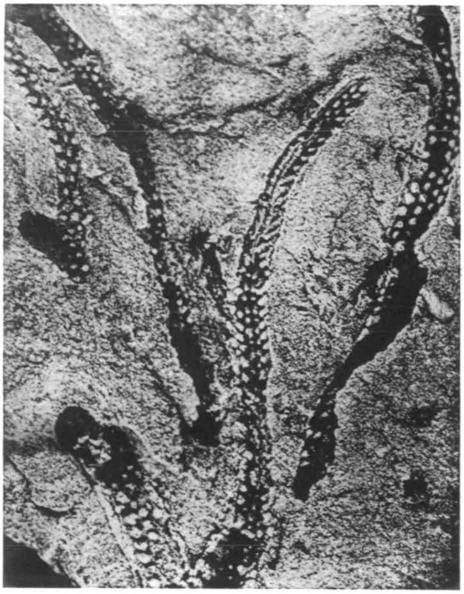
Longitudinal section showing gently curving cylindrical tubes thickening towards the periphery. N.M.V. P12829. X8.

?Cystiphyllum sp. .... page 106

Figs. 4, 5.

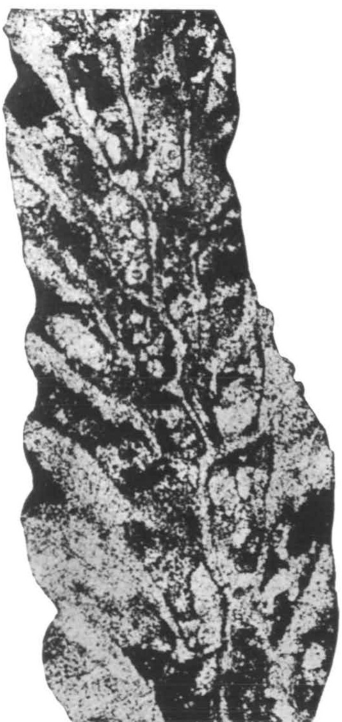
Cowombat Creek, north-east Gippsland, Victoria. Silurian or Devonian.

Transverse sections showing abundant lateral skeletal material and septal spines. Slide N.M.V. 1364 and Slide N.M.V. 1762, respectively. X40.

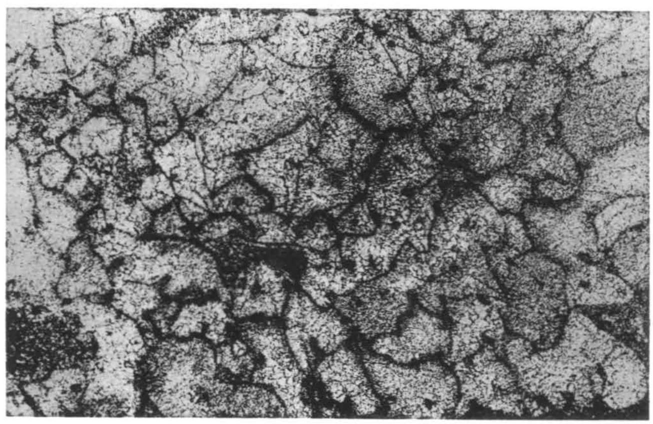


1

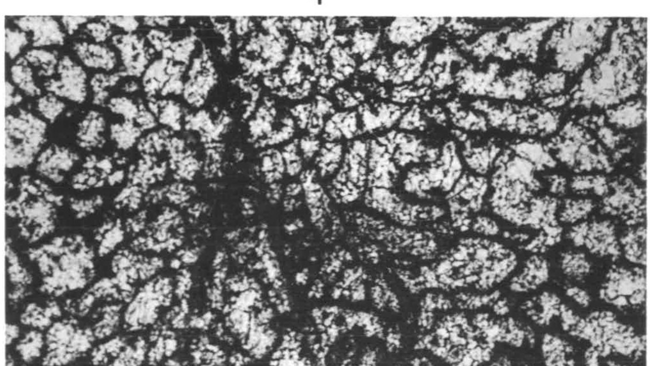
2



3



4



5

INDEX

Acanthoclema, 85.
acervulosa, Leptotrypa, 41.
alternata, Trematopora, 85.
Amphipora ramosa, 17.
Amplexopora, 19, 36.
cingulata, 36.
pustulosa, 14, 37.
queenstownensis, 14, **37**, 118, 120.
Amplexopora? konincki, 12.
Amplexoporidae, 36.
antiqua, Fenestella, 68.
Archimedes, 21, 74.
australis, Fenestella, **68**, 150.
Receptaculites, 18.
Austraphylloporina, 12, **58**.
cliefdenensis, 12, **58**, 136.
Avonia proteus, Zone of, 17, 22, 38, 46, 53, 66, 70, 89.
Axial region, 23.
Bactropora, 86.
Barrandella Shale, 15, 39, 65, 72.
Batostoma, 12, 19, 31.
fertile, 34.
magnoporum, 34.
minnesotense, 33.
tubuliferum, 12, 20, 26, **31**, 116, 118.
winchelli, 35.
sp. *A*, 14, **33**, 120.
sp. *B*, **34**, 120.
sp. *C*, 14, **35**, 122.
Belubula River, 78.
belubulensis, Stictopora, 12, **77**, 152.
Bifoliate, 23.
Black Bog Beds, 56.
Black Bog Creek, Hatton's Corner, 15, 39, 56.
boonderensis, Orbignyella, 20, **29**, 116.
bowanensis, Stictopora, 13, **78**, 154.
Bowan, Parish of, 13, 26, 30, 34, 78, 80, 83, 84.
Bowan Park Limestone, 13, 26, 30, 34, 78, 80, 84, 85.
Brood Chamber, 23.
browni, Hederella, 12.
Bullock Paddock Bore, 52.
Burindi "Series", 61.
Burrinjuck dam, 27, 42.
Burramundi Range, 53.
Buskopora, 60.
calceola, Leptotrypa, 44.
Callopora, 55.
venusta, 66, 67.
Calloporidae, 55.
Calopora, 14, 18, 55.
dumalis, 57.
elegantula, 55.
hattonensis, 15, **56**, 140.
macrostoma, 57.
pulchella, 57.
ramosa, 57.
Caloporidae, 55.
Cargo, 12, 14, 83.
Carina, 23.
Cave Flat, 27.
Chaetetes elegans, 37.
Chasmatoporella, 58, 59.
Cheiloceras zone, 17.
Cheilotrypa, 60, 65.
hispida, 65, 66.
sp. *A*, 15, **65**, 142.
Cheilotrypidae, 60.
Chondraulus, 51.
densus, 53.
granosus, 53.
cingulata, Amplexopora, 35.
Cliefden Caves, 12, 13, 24, 29, 59, 78, 83.
Cliefden Caves Limestone, 12, 13, 24, 26, 29, 31, 58, 77.
cliefdenensis, Austraphylloporina, 12, **58**, 136, 138.
Coelocaulis, 60, 66.
maculosa, 17, 22, 38, **66**, 138, 140, 142, 146.
Venusta, 67.
Cowombat, Victoria, 106.
cowombatensis, Fistulipora, 106.
crenulata, Nicklesopora, 17, 22, **89**, 92, 160, 162.
Crurithyris, apena zone, 17.
Cryptostomata, 68.
curvata, Homotrypa, 26.
Cyclotrypa, 60.
Cyclostomata, 59.
Cyphotrypa, 41.
expanda, 42.
lamellosa, 20, **41**, 122, 124.
murrumbidgensis, 18, **42**, 124.
traversensis, 43.
Cystiphyllidae, 105.
?Cystiphyllum sp. *A*, **106**, 162.
Deep Creek, near Walhalla, 16, 68.
densus, Chondraulus, 53.
Devil's Elbow, 42.
Diphyphylum porteri var. *mitchellensis*, 10.
Diplotrypa infida, 30.
Discotrypa, 19, 37.
? sp. *A*, **38**, 122, 136.
Disphyllum sp., 18.
dumalis, Calopora, 57.
Dybowskiella, 60.
elegans, Chaetetes, 37.
elegantula, Calopora, 55.
elegantula, Rhombopora, 88.
emanuelana, Fenestella, 17, 22, **69**, 71, 72, 146.

Emanuel Range, 63, 64, 69, 71.
Emanuella torrida zone, 17, 22.
esthonia, Rhombopora, 86.
Eostenopora, 45, 49, 51.
expanda, Cyphotrypa, 42.
Fairfield Beds, 17, 22, 38, 46, 47, 49, 52, 53, **66**, **89**.
Favositidae, 105.
Fenestella, 15, 17, 20, 22, 68.
 antiqua, 68.
 australis, **68**, 150.
 emanuelana, 17, 22, **69**, 71, 72, 146.
 margaritifera, **73**, 150.
 pikerensis, 17, 22, **70**, 72, 90, 148.
 subantiqua, 68.
 westralis, 22, 70, **71**, 148.
 yassensis, 15, 21, **72**, 146.
Fenestellidae, 23, 68.
fenestrata, Homotrypa, 20, **24**, 27, 112, 114.
fenestrata, Stictopora, 76, 81.
fertile, Batostoma, 34.
Fistulipora, 17, 60.
 cowombatensis, 106.
 major, 61.
 minor, 60.
 mirari, 61.
 norensis, **61**, 62, 138, 148.
 octonaria, 64, 65.
 pillarensis, 17, 22, **62**, 142, 146.
 sadlerensis, 17, 22, **63**, 65, 138, 142, 144, 146.
 victoriae, **64**, 150, 152.
 sp., 66.
Fistuliporella, 60.
Fistuliporidae, 59.
fistulosum, Granivallum, 17, 20, 22, 51, **52**, 134, 136.
fitzroyensis, Nicklesopora, 17, 22, **90**, 92, 162.
Fitzroyopora, 20, 21, 22, 48.
 oscarensis, 17, 22, **49**, 132, 134.
flexuosa, Nicklesopora?, **91**, 166.
Fossil Downs, 52.
Fossil Downs Formation, 22, 93.
Fossil Downs Station, 89, 93.
Fossil Hill, see Cliefden Caves.
Garra Beds, 41, 61.
George Gill Range, Macdonnell Ranges, 33.
Geurie, Parish of, 18, 91, 95.
geuriensis, Nicklesopora, **91**, 160.
Gibbo River, Victoria, 15, 91.
gippslandica, Rhombopora?, **95**, 166.
Glen William, N.S.W., 61.
Goldfussitrypa, 86.
Gordon Limestone, 14, 37, 81.
gracilis, Nemagraptus, Zone of, 13.
granistriata, Trematopora?, 86.
Granivallum, 22, 51.
 fistulosum, 17, 20, 22, 51, **52**, 134, 136.
granosus, Chondraulus, 53.
Griffith's Quarry, Loyola, 64.
Halloporidae, 50, 55.
hattonensis, Calopora, **56**, 140.
Hatton's Corner, 15, 39, 56, 65.
Hederella browni, 12.
Hemidictya, 76.
Hemitrypa, 73.
 oculata, 73.
 sp. *A.*, **73**, 148.
 sp. *B.*, **74**, 144.
Heteropora, 50.
 pelliculata, 50, 51.
Heterotrypa, 15, 19, 39.
 australis, 10.
 humensis, **39**, 118.
 lobata, 40.
 pontensis, 19, 20, **40**, 120, 122.
 solitaria, 41.
"*Heterotrypa rushworthensis*", 16, 106, 166.
Heterotrypidae, 38, 50.
hispida, Cheilotrypa, 65, 66.
Homotrypa, 12, 19, 24.
 curvata, 26.
 fenestrata, 20, **24**, 27, 112, 114.
 minnesotensis, 28.
 multitabulata, 26.
 sp. cf. *H. fenestrata,* 13, 26.
 sp. *A.*, 13, 27, 28.
 ? sp. *B.*, 18, **27**, 114.
Horse Springs, Fossil Downs Station, 47, 93.
Hume Limestone, 15, 65.
Hume, Parish of, 40.
humensis, Heterotrypa, **39**, 118.
Ikelarchimedes, 21, 74.
Ikelarchimedes warooensis, 18, 74, **75**, 146, 148, 150, 152.
implicata, Monticulipora, 31.
incrassata, Rhombopora, 89.
infida, Diplotrypa, 30.
interruptum, Semicoscinium, 76.
Keilorian Series, 15.
Ladjia saltica, zone of, 17, 22, 69.
Lake Bathurst, N.S.W., 18, 73.
lamellosa, Cyphotrypa, 20, **41**, 122, 124.
Larapintine "series", 12, 14, 33.
Large Flat, see Cliefden Caves.
Leopold Downs Station, 90, 92.
leopoldensis, Nicklesopora, 17, 22, 90, **92**, 160, 162.
lepidodendroides, Rhombopora, 87.
Leptotrypa, 43.
 acervulosa, 41.
 calceola, 44.
 minima, 43.
 sp. *A.*, **43**, 124, 126, 128.

Lichenotrypa, 60.
Lilydale, 15, 19.
Limestone Creek, Yass, 15, 72.
Linotaxis, 86.
lobata, *Heterotrypa*, 40.
Loyola, 19, 64.
Macdonnell Ranges, 14, 33.
macrostoma, *Calopora*, 57.
maculosa, *Coelocaulis*, 17, 22, 38, **66**, 138, 140, 142, 146.
magna, *Orthopora?*, 86.
magnoporum, *Batostoma*, 34.
major, *Fistulipora*, 61.
Malongulli, N.S.W., 31.
Malongulli Formation, 13.
mammulata, *Monticulipora*, 39.
Mansfield, 19, 64.
"*Manticoceras*" Zone, 17.
margaritifera, *Fenestella*, **73**, 150.
Median tubuli, 23.
Melbournian, 15.
Menyous Gap, Pillara Range, 62.
Mesopora, 23.
Mesotheca, 23.
Mesotrypa, 12, 19, 30.
  sp. *A*., **30**, 116.
Middle Valley, Macdonnell Ranges, 33.
minima, *Leptotrypa*, 43.
minima, *Stictopora*, 79.
minnesotense, *Batostoma*, 33.
minnesotensis, *Homotrypa*, 28.
minor, *Fistulipora*, 60.
mirari, *Fistulipora*, 61.
mirabilis, *Vetofistula*, 12, 105, 164.
Molong, N.S.W., 18, 27, 41, 61, 83.
Moniliform, 23.
Monticulipora implicata, 31.
  mammulata, 39.
Monticuliporidae, 24.
Moorephylloporina, 58.
  typica, 59.
Mount Percy, Leopold Downs Station, 38, 46, 66.
Mount Pierre, 53.
multitabulata, *Homotrypa*, 26.
Murrumbidgee "Series", 27, 28, 42, 54, 75.
murrumbidgensis, *Cyphotrypa*, 18, **42**, 124.
mutabilis, *Stictopora*, 78, 81, 83.
nana, *Tropidopora*, 88.
Nemagraptus gracilis Zone, 13.
nicholsoni, *Stictopora*, 81.
Nicklesopora, 21, 22, 86, 88, 89.
  crenulata, 17, 22, **89**, 92, 160, 162.
  fitzroyensis, 17, 22, **90**, 92, 162.
  geuriensis, **91**, 160.
  leopoldensis, 17, 22, 90, **92**, 160, 162.
  westralis, 17, 22, 89, 92, **93**, 162.
Nicklesopora? flexuosa, **91**, 166.
Nora Creek, near Molong Station, 61.
norensis, *Fistulipora*, **61**, 62, 138, 148.
Notanoplia loyolensis, 19.
Nyege scopimus Zone, 17.
occidentalis, *Percyopora*, 17, 22, **47**, 132, 134.
octonaria, *Fistulipora*, 64, 65.
oculata, *Hemitrypa*, 73.
Odontotrypa, 60.
Orbignyella, 12, 19, 29.
  boonderensis, 20, **29**, 116.
  sublamellosa, 29, 30.
Orthopora? magna, 86.
Oscar Formation, 90, 92.
Oscar Hill, Fitzroy Crossing, 49.
oscarensis, *Fitzroyopora*, 17, 22, **49**, 132, 134.
paupera, *Stictopora*, 83.
pelliculata, *Heteropora*, 50, 51.
Percyopora, 20, 21, 22, 45.
  occidentalis, 17, 22, **47**, 132, 134.
  tubulata, 17, 22, **46**, 124, 128, 130.
Peripheral region, 23.
Pesnastylus, 15.
Phillipsastrea, 19.
Phylloporinidae, 21, 57.
Piker Hills, 70, 89.
pikerensis, *Fenestella*, 16, 20, 68, 70, 90.
Pillara Formation, 17, 62.
Pillara Range, 62.
pillarensis, *Fistulipora*, 17, 22, **62**, 142, 144.
Pinacotrypa, 60.
pontensis, *Heterotrypa*, 19, 20, **40**, 120, 122.
Ponto, Parish of, 18, 40.
Prices Hill, 71.
Productella zone, 17.
pulchella, *Calopora*, 57.
pustulosa, *Amplexopora*, 14, 37.
quandongensis, *Stictopora*, **80**, 156.
Queenstown, Tasmania, 14, 37, 83.
queenstownensis, *Amplexopora*, 14, **37**, 118, 120.
ramosa, *Calopora*, 57.
Receptaculites australis, 18.
Reedy Creek Limestone, 13, 27, 83.
Reedy Creek, Molong, 12, 13, 27, 83.
Regan's Creek Limestone, 14, 83.
Reid's Gap, Queensland, 105.
Rhabdomeson, 85.
Rhabdomesonidae, 38, 85.
Rhinidictya, 76.
Rhinidictyidae, 23, 76.
Rhombopora, 45, 86ff., 95.
  elegantula, 88.
  esthonia, 86.
  incrassata, 89.
  lepidodendroides, 87.
Rhombopora? gippslandica, **95**, 166.
Rugosa, 105.

Rushworth, Victoria, 106.
"*rushworthensis, Heterotrypa*", 106, 162.
Sadler Formation, 17, 22, 63, 69, 71.
Sadler Ridge, Emanuel Range, 63, 69.
sadlerensis, Fistulipora, 17, 22, **63**, 65, 138, 142, 144, 148.
Saffordotaxis, 86, 88, 92, 94.
Saffordotaxis? sp. *A.*, **94**, 164.
Semicoscinium, 21, 74.
  interruptum, 76.
shearsbyi, Stereotoechus, 18, 20, **54**, 138.
Smelters Quarry, Zeehan, Tasmania, 14, 37, 81.
solitaria, Heterotrypa, 41.
Spieler's Bore, 90.
Sporadoceras zones, lower and upper, 17.
Stenoporidae, 44.
Stereotoechus, 19, 21, 53.
  shearsbyi, 18, 20, **54**, 136.
  typicus, 53, 55.
Stictopora, 12, 76.
  belubulensis, 12, **77**, 152.
  bowanensis, 13, **78**, 154.
  fenestrata, 76, 81.
  minima, 79.
  mutabilis, 78, 81, 83.
  nicholsoni, 81.
  paupera, 83.
  quandongensis, **80**, 156.
  zeehanensis, 14, **81**, 158.
  sp. *A.*, 13, **83**, 158.
  sp. *B.*, 14, **83**, 156.
  sp. *C.*, **84**, 156, 158.
  sp. *D.*, **84**, 158.
  sp. *E.*, 156.
  sp., 118.
Stictoporid group, 21, 76.
Striatopora sp., 74.
Stringocephalus fontanus zone, 17.
subantiqua, Fenestella, 68.
sublamellosa, Orbignyella, 30.
Sulcopora, 76.
Syringopora sp., 18.
Tabulata, 105.
Taemas, 10, 18, 43, 54.
Tamworth, 10.
Terrabella Road, 40.
Thamnophyllum, 19.
Thamnopora, 105.
Thomson River, Victoria, 16, 65.
Tinbilly Spring, 53.
traversensis, Cyphotrypa, 43.
Trematopora alternata, 85.
Trematopora? granistriata, 86.
Trematoporidae, 31.
Trepostomata, 20, 21, 23.
Tropidopora nana, 88.
Tubercles, 23.
tubulata, Percyopora, 17, 22, **46**, 124, 128, 130.
tubuliferum, Batostoma, 12, 20, 26, **31**, 116, 118.
Tyers River, Victoria, 95.
typica, Moorephylloporina, 59.
typicus, Stereotoechus, 53, 55.
Variability, growth stages, 22.
  oriented thin sections, 22.
venusta, Coelocaulis, 67.
Vetofistula, 105.
  mirabilis, 12, 105, 164.
victoriae, Fistulipora, **64**, 150, 152.
Walhalla, Victoria, 16, 68.
Waroo, Parish of, 54, 75.
warooensis, Ikelarchimedes, 18, 74, **75**, 146, 148, 150, 152.
Wellington, 18, 40, 74, 91.
westralis, Fenestella, 22, 70, **71**, 148.
westralis, Nicklesopora, 17, 22, 89, 92, **93**, 162.
winchelli, Batostoma, 35.
Wombat Creek, Victoria, 16, 95.
Woori-Yallock Creek, Victoria, 19.
Yarra River, Victoria, 19, 73.
Yass, N.S.W., 10, 14, 15, 21, 39, 57, 65, 72.
yassensis, Fenestella, 15, 21, **72**, 146.
Yering, Victoria, 73.
Yeringian, 15, 16, 19.
Zeehan, Tasmania, 14, 37, 81.
zeehanensis, Stictopora, 14, **81**, 158.

Printed by The Dominion Press, 62 Carrington Road, Box Hill, Victoria.