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# Middle Permian Bryozoa from Irian Jaya, Indonesia

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**Abstract** Twenty-four Permian bryozoan species are described from 4 localities. Among them, *Hyphasmopora katoi* and *Streblascopora irianica* are new species. This bryozoan fauna is closely similar to that of Timor Island and is part of the typical Southern Tethys realm. The age is most probably early Guadalupian (Middle Permian).

**Key words:** Bryozoans, Permian, Southern Tethys realm, Aiduna Formation, Irian Jaya

## Introduction

The bryozoans from Irian Jaya were prepared from rock samples, collected from four localities during geological mapping of Irian Jaya (1978–1980) by field geologists. They were sent to me by Professor Makoto Kato, Hokkaido University, for study. This is the first report on Paleozoic bryozoans from Irian Jaya and they provide important additional data for determining the Permian paleobiogeographic realms.

## Fossil Localities

Of the four bryozoan fossil localities, two (80CP535B and 80P343C) are located in NW part of Waghete 1 : 250,000 map sheet area and the other two (80DT183A and 80BH303E) are in NC part of the same map sheet area (Fig. 1).

These four localities are in the Aiduna Formation which is considered to be a part of the Aifam Group in the Arafura Platform, and is probably equivalent to the fluvio-deposits in the Ainim Formation and the upper part of the Aifat Mudstone in the "Bird's Head" (Kepala Burung), western part of Irian Jaya (Fig. 2). The Ainim Formation contains *Glossopteris* and *Gangamopteris*, and overlies the Aifat Mudstone containing many brachiopods including *Stereochia*, *Stenoscisma*, *Cancrinella*, *Linoproductus*, *Spriferella* and *Streptorhynchus*. Based on these brachiopods, the age of the Aifat Mudstone is considered to be late Early Permian (late Artinskian or early Kungurian age) by Archbold (1981) and Kato *et al.* (1999).

## Bryozoan Faunas

In the present study, at least 24 species of 18 bryozoan genera are identified

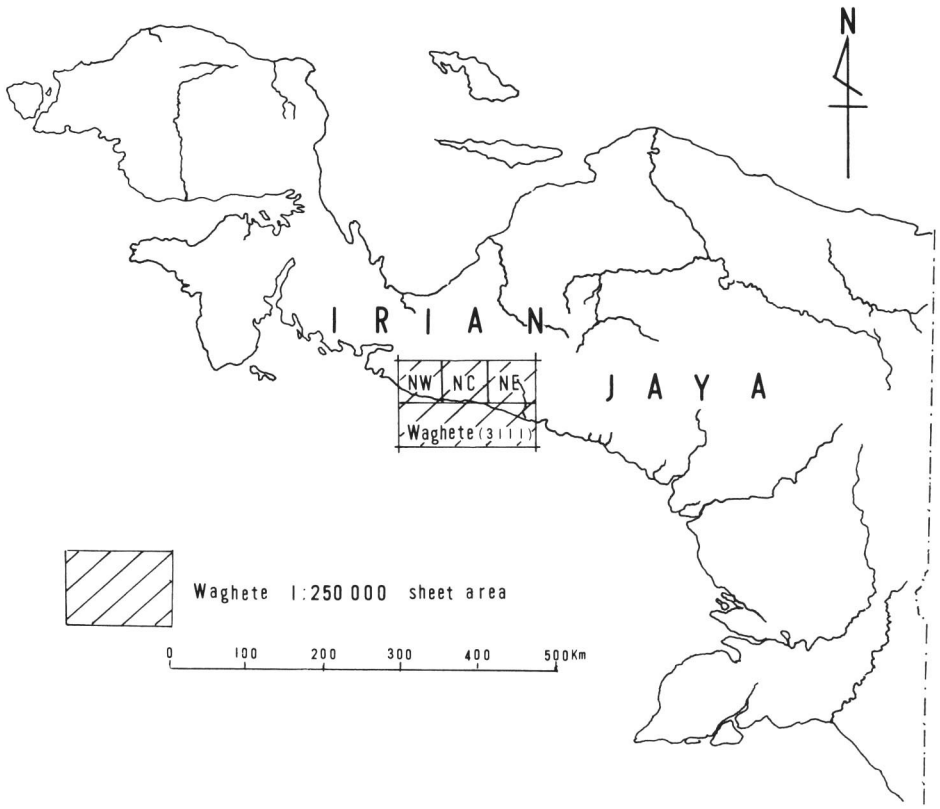



Fig. 1. Map showing the sheet area (1 : 250,000) of the Permian bryozoan localities in the present study. The detailed locations should be addressed to the Geological Research and Development Centre, Bandung, Indonesia.

from four localities: 13 named species and additional unnamed species from Loc. 80CP535B, 8 and more species from Loc. 80P343C, 6 species from Loc. 80DT183A and 4 species from Loc. 80BH303E (Table 1). Of the four localities, the first two localities have similar faunas, namely, *Fistulipora* sp. cf. *F. timorensis*, *Liguloclema* sp. cf. *L. meridianus*, *Hyphasmopora katoi* sp. nov. and *Streblascopora* sp. cf. *S. fasciculata*. And the other two localities have a different set of closely related species, e.g., *Hexagonella*? sp. indet. and *Tabulipora tenuinervis* are common.

*Fistulipora labratula* and *F. lunatifera*, both described originally from the Permian of Timor Island, have been reported from some localities in China and comparable forms have also been described from Japan. *Fistulipora* sp. cf. *F. timorensis* is closely similar to the original specimens from Timor Island, which is widely known from the Artinskian to Guadalupian in all Tethyan regions. *Eridopora parasitica*, originally described from the Salt Range of Pakistan is known also from the Permian of Central

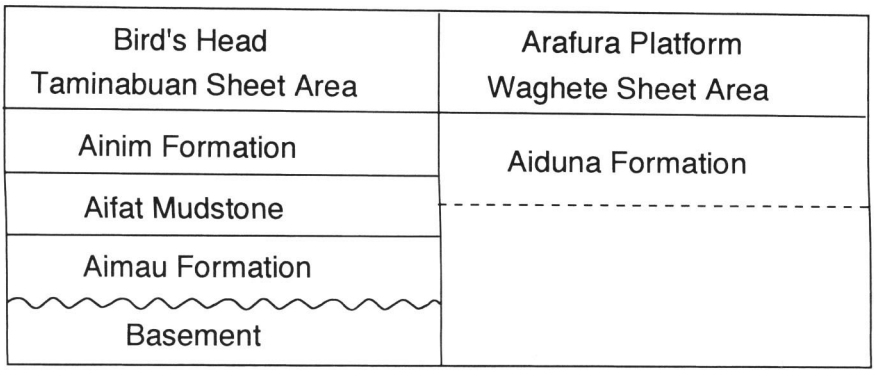



Fig. 2. Correlation of the Aifam Group between the Bird's Head and Arafura Platform. (Unpublished information by C. J. Pigram, Geologist of Irian Jaya Geological Mapping Project, 1982.)

and Northern Tethys regions, and has been at times assigned to *E. major*. *Eridopora* sp. cf. *E. oculata* was originally described from the Permian of Timor Island.

*Hexagonella*? sp. indet. may be assigned to this genus but it is only fragmentary and the hexagonellid ridges are not clear. Poor specimens of *Liguloclema* sp. cf. *L. meridianus* may be identical with the originally described species from Western Australia and also from Thailand of Central Tethys region. *Goniocladia timorensis* is known widely from the Permian of Timor Island, Western Australia, Thailand, Maritime Territory, and Oman, all in the Tethys region.

*Tabulipora tenuinervis* and *Dyscritella adnascens* were described originally from the Permian of Timor Island. *Hyphasmopora katoi* is a new species. Only two species of *Hyphasmopora* were previously described; one, *H. buski* (the type species) from Lower Carboniferous of Scotland and another: *H. symmetrica*, from the Permian of the Djulfa region of Armenia (Russia).

*Streblotrypa elegans* was described originally from the Permian (probably late Artinskian) of the peninsular part of Thailand, and *Streblascopora* sp. cf. *S. fasciculata* is morphologically close to the original specimen from Timor Island. *Streblascopora irianica* is a new species, and is quite different from previously described species of the genus in having prominent acanthostyles. Among the two species of *Rhabdomeson*, one species: *R. mammillatum*, described originally from Western Australia, Myanmar (as *R. shanse* by Reed, 1933), Thailand and China, and another: *R.* sp. cf. *R. grande* is closely similar to the originally described specimens from Timor Island. *Ascopora nakornsrii* is identical with the original specimens from Khao Phrik, the isthmus of the peninsular part of Thailand. *Saffordotaxis* sp. cf. *S. wanneri* and *Clausotrypa* sp. cf. *C. conferta* are comparable with their originally described specimens from Timor Island. *Polypora timorensis* and *Acanthocladia* sp. cf. *A. regularis* are also identical and comparable with their original specimens from Timor Is-

Table 1. Distribution of the Permian bryozoans in Irian Jaya, Indonesia.

| Species | Locality | | | |
|---|---|---|---|---|
| | 80CP535B | 80P343C | 80DT183A | 80BH303E |
| *Fistulipora* sp. cf. *F. timorensis* | ○ | ○ | | |
| *Fistulipora labratula* | | | ○ | |
| *Fistulipora lunatifera* | | | | ○ |
| *Eridopora parasitica* | | | ○ | |
| *Eridopora* sp. cf. *E. oculata* | ○ | | | |
| *Hexagonella*? sp. indet. | | | ○ | ○ |
| *Liguloclema* sp. cf. *L. meridianus* | ○ | ○ | | |
| *Goniocladia timorensis* | ○ | | | |
| *Tabulipora tenuinervis* | | | ○ | ○ |
| *Dyscritella adnascens* | | | ○ | |
| *Hyphasmopora katoi* sp. nov. | ○ | ○ | | |
| *Streblotrypa elegans* | | ○ | | |
| *Streblascopora* sp. cf. *S. fasciculata* | ○ | ○ | | |
| *Streblascopora irianica* sp. nov. | ○ | | | |
| *Rhabdomeson mammillatum* | | ○ | | |
| *Rhabdomeson* sp. cf. *R. grande* | | | | ○ |
| *Ascopora nakornsrii* | ○ | | | |
| *Saffordotaxis* sp. cf. *S. wanneri* | | ○ | | |
| *Clausotrypa* sp. cf. *C. conferta* | | | ○ | |
| "*Fenestella*" spp. indet. | ○ | ○ | | |
| *Polypora timorensis* | ○ | | | |
| *Polypora* sp. indet. | ○ | | | |
| *Acanthocladia* sp. cf. *A. regularis* | ○ | | | |
| *Pennirepora* sp. indet. | ○ | | | |

land.

Some indeterminate species of "*Fenestella*" (s. l.), *Polypora* and *Pennirepora* are included in the present collections, but they are very poorly preserved and/or orientation of the specimens does not allow detailed discussion.

Thus, the present fauna indicates a close relationship with that from Timor Island, Thailand and Western Australia; all part of the Southern Tethys realm by Ross (1978) and Ross and Ross (1990). Among the 20 identified species, 14 species are in common with those from Timor Island, 7 species from Thailand and Malaysia, and 5 species from Western Australia. A few species are common with those from China and Japan, which are part of the Central and Northern Tethys regions, respectively.

The sedimentary paleoenvironment seems to be different at these localities. Namely, at Locs. 80CP535B and 80P343C, it appears the bryozoans were in relatively agitated wave environments of a foreslope because of the many fenestrate fragments, whereas at the other two localities, at Locs. 80DT183A and 80BH303E, bry-

ozoans were in much less agitated shoal environments because of the lack of fenestrates. The geological age is most probably early Guadalupian (Middle Permian).

## Systematic Description

All specimens in this study are deposited and registered in the Collections of the National Science Museum (NSM PA), Tokyo, Japan.

Phylum Bryozoa Ehrenberg, 1831
Order Cystoporida Astrova, 1964
Suborder Fistuliporina Astrova, 1964
Family Fistuliporidae Ulrich, 1882
Genus *Fistulipora* M'Coy, 1850

***Fistulipora*** sp. cf. ***F. timorensis*** Bassler, 1929

Fig. 3-1, 2

*Compared*:

*Fistulipora timorensis* Bassler, 1929, p. 44, pl. 227 (3), figs. 4–9; Sakagami, 1968 b, p. 50, 51, pl. 6, figs. 1–3; Morozova, 1970, p. 63, 64, pl. 2, fig. 1; Yang, Lu and Xia, 1981, p. 86, pl. 4, fig. 2, pl. 5, fig. 4; Yang and Lu, 1983, p. 265, pl. 1, figs. 7, 8; Xia, 1991, p. 188, 189, pl. 7, Figs. 6, 7; Sakagami, 1999, p. 81, 82, pl. 18, figs. 1–3.

*Fistulipora* cf. *timorensis* Bassler; Sakagami, 1961, p. 16, pl. 1, figs. 1–8; Sakagami, 1995, p. 242, figs. 1–3, 4.

*Material and Locality*: NSM PA14741a, 14746a (Loc. 80CP535B); NSM PA14747a (Loc. 80P343C).

*Description*: At first glance, this zoarium seems to be a bifurcating frond, but it may be two branches of two different zoaria. Thickness of zoarium 1.5 to 2.0 mm. In longitudinal section, zooecial tubes parallel to coenelasma for a short distance, curving rapidly upward and extending directly to outer surface of zoarium at a right angle. Diaphragms lacking. Interzooecial tissue consists of quadrate vesicles arranged regularly in longitudinal series from inner to outer zone, without any covering of fibrous material. 10 to 12 vesicles per mm longitudinally. In tangential section, zooecial tubes broadly ovate or subcircular, longitudinal diameter excluding lunarium ranges from 0.26 to 0.33 mm and transverse diameter from 0.21 to 0.26 mm. Usually 4 to 5 zooecia per 2 mm diagonally. Lunarium well developed, horse-shoe shaped, occupying nearly one-half of zooecial circumference, its thickness from 0.04 to 0.05 mm. Vesicular tissue fine and regular in size, one to three vesicles between adjacent zooecia. Usually 9 to 10 vesicles per 1 mm horizontally.

*Remarks*: Fistulipora timorenis is characterized by a thin, encrusting zoarium and no diaphragm in the zooecial tube. Mode is some doubt as to the generic assignment because the zoarial form is uncertain. If the zoarial form were encrusting, the

present form could be assigned to *F. timorensis*.

### ***Fistulipora labratula*** Bassler, 1929

Fig. 3-5, 6

*Fistulipora labratula* Bassler, 1929, p. 46, pl. 229 (5), figs. 6–9; Lu, 1982, p. 269, pl. 1, figs. 3–6.
*Fistulipora* cf. *labrataula* Bassler; Sakagami, 1968b, p. 51, 52, pl. 1, figs. 4–6.
*Fistuliramus labratulus* (Bassler); Yang and Xia, 1975, p. 412, 42, pl. 1, figs. 1–5.

*Material and Locality*: NSM PA14757a, 14757b (Loc. 80DT183A).

*Description*: A single oblique section showing tangential and longitudinal parts. Zoarial form unknown but probably small massive colony. In longitudinal section, zooecial tubes loosely meandering, making a right angle to zoarial surface. Diaphragms seem to be rare but sporadically present. Interzooecial tissue consists of irregularly arranged vesicles; more coarsely elongate in endozone, and becoming fine and depressed in exozone. In tangential section, zooecial tubes broadly ovate or subcircular with well developed lunaria; longitudinal diameter excluding lunarium ranges from 0.32 to 0.36 mm and transverse diameter from 0.26 to 0.32 mm. Usually 3.5 to 4 zooecia per 2 mm diagonally. Crescentic lunarium occupies about one-half of zooecial circumference, from 0.08 to 0.10 mm in the thickest part. Vesicular tissue not so regular in size and form; one to three vesicles between adjacent zooecia.

*Remarks*: Relatively small zooecium and prominent lunarium are characteristics of this species. The present form in all essential characters is identical with the type specimen from the Permian of Timor Island.

### ***Fistulipora lunatifera*** Bassler, 1929

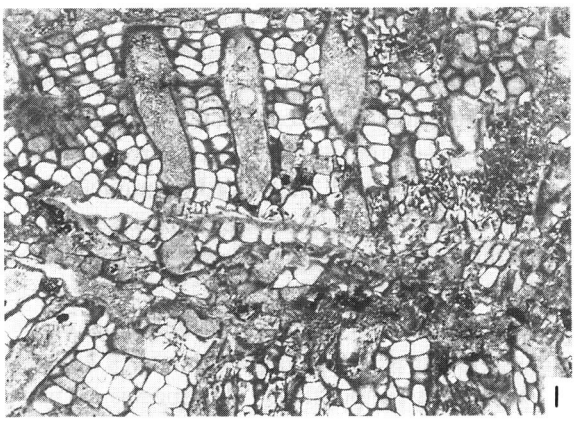
Fig. 3-3, 4

*Fistulipora lunatifera* Bassler, 1929, p. 42, pl. 227 (3), figs. 1–3; Liu, 1976, p. 138, pl. 66, figs. 2a, b; Liu, 1980, p. 191, pl. 101, figs. 3, 4; Yang and Lu, 1984, p. 40, 41, pl. 1, fig. 1.
*Fistuliramus* cf. *lunatiferus* (Bassler); Yang and Xia, 1975, p. 42, pl. 1, figs. 6–8, 13.
*Fistulipora* sp. aff. *F. lunatifera* Bassler; Sakagami and Sugimura, 2000, p. 6, pl. 1, figs. 3, 4.

*Material and Locality*: NSM PA14761a, 14761b, 14762a, 14763a, 14764a (Loc. 80BH303E).

*Description*: Shape of zoarium uncertain but probably consisting of small massive colony. In longitudinal section, zooecial tubes curve gradually in inner zone and straighten in outer zone, making a right angle to zoarial surface. Straight or slightly

→Fig. 3. 1, 2, *Fistulipora* sp. cf. *F. timorensis* Bassler. 1, longitudinal section, ×20, NSM PA14741a. 2, longitudinal sections, ×20, NSM PA14747a. 3, 4, *Fistulipora lunatifera* Bassler. 3, longitudinal section, ×20, NSM PA14761a. 4, tangential section, ×20, NSM PA14764a. 5, 6, *Fistulipora labratula* Bassler. 5, longitudinal section, ×20, NSM PA14757a. 6, tangential section, ×20, NSM PA14757b.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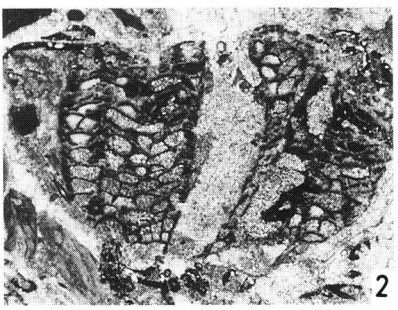
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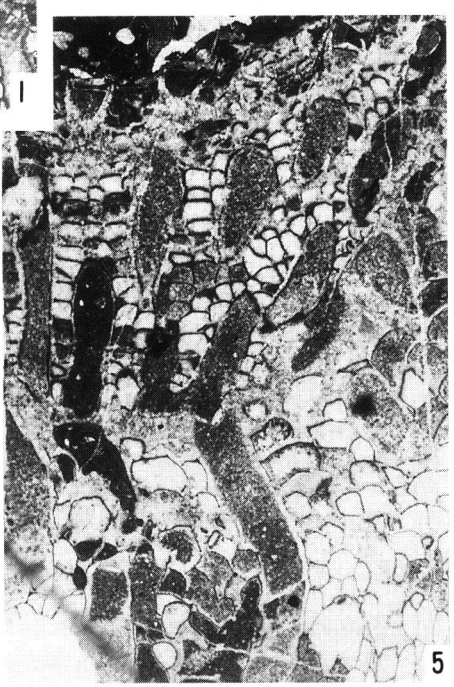
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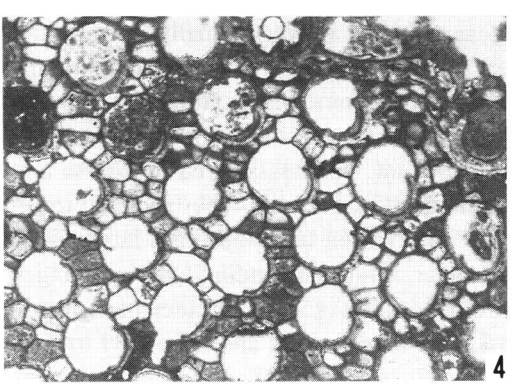
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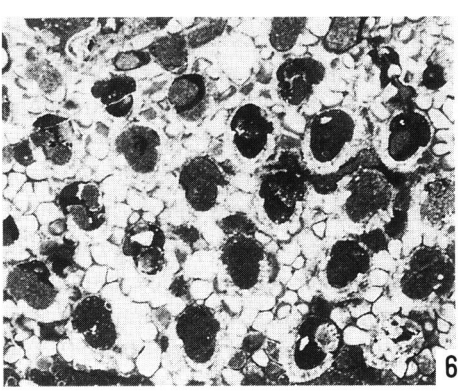
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concave diaphragms distributed throughout tube, but irregularly spaced. Interzooecial tissue consists of regularly arranged vesicular tissue, depressed quadrate in form. Usually 9 to 10 vesicles per mm longitudinally. In tangential section, zooecial tubes circular, gradually widening from the inner to outer zone; longitudinal diameter excluding lunarium ranges from 0.36 to 0.41 mm and transverse diameter from 0.39 to 0.41 mm. Usually 3.5 zooecia per 2 mm diagonally. Well developed lunarium occupies about one-third of zooecial circumference, its thickness ranges from 0.06 to 0.08 mm. Vesicular tissue regular in size, one to two vesicles between adjacent zooecia. Usually 8 to 9 vesicles per mm horizontally.

*Remarks*: Although the zoarial form of the specimens is unknown, they are identical in essential characters and measurements with the type specimens of *Fistulipora lunatifera* described by Bassler (1929) from Timor Island. This species is characterized by regularly sized, circular zooecial tubes and well-developed crescentic lunaria.

## Genus *Eridopora* Ulrich, 1882

### ***Eridopora parasitica*** Waagen and Wentzel, 1886

Fig. 4-1, 2

*Fistulipora parasitica* Waagen and Wentzel, 1886, p. 923, pl. 45, fig. 6; pl. 105, figs. 1–4.

*Eridopora parasitica* (Waagen and Wentzel); Xia, 1986, p. 232, pl. 132, figs. 8, 9, pl. 15, figs. 5, 7; Sakagami and Pillevuit, 1997, p. 206, fig. 2-3; Sakagami, 1999, p. 84, pl. 19, figs. 4–6.

*Eridopora* cf. *parasitaica* (Waagen and Wentzel); Sakagami, 1980, p. 273, pl. 31, figs. 7–9.

*Eridopora major* Bassler, 1929, p. 52, pl. 225 (1), figs. 1–4; Gorjunova, 1975, p. 45, 46, pl. 3, fig. 1; Research Group (Yanagida, ed.), 1988, pl. 12, fig. 4, pl. 13, fig. 2, pl. 14, fig. 1; Xia, 1991, p. 189, pl. 7, figs. 8, 9.

*Eridopora*? sp. indet.; Research Group (Yanagida, ed.), 1988, p. 15, figs. 1, 2.

*Material and Locality*: NSM PA14752a, 14753a, 14755a (Loc. 80DF183A).

*Description*: Zoarium attached to foreign object such as brachiopod shell as a thin layer, usually less than 2.5 mm in thickness. In longitudinal section, zooecial tubes run for a short distance along coenelasma, then curve gradually upward and make nearly right angle to zooecial surface. Straight or slightly concave diaphragms closely distributed throughout tube but obliterated in some places. Intervals between diaphragms generally about the same as zooecial diameters. Interzooecial tissue consists of poorly arranged vesicular tissue in endozone, usually covered by coarse and dark fibrous material in exozone. In tangential section, zooecial tubes rounded triangles with well-developed lunarium. Diameter of zooecial tubes becomes larger from inner to outer region: inside longitudinal diameter of tubes excluding lunarium ranges from 0.28 to 0.32 mm in inner part and from 0.38 to 0.45 mm in outer part; inside transverse diameter ranges from 0.26 to 0.33 mm in inner part and from 0.39 to 0.45 mm in outer part. Usually 3.5 to 4 zooecia per 2 mm diagonally. Lunarium occupies

about one-third to one-half of zooecial circumference. Thickest part of lunarium reaching 0.13 mm in outer part of zooecial tube, but very thin in inner part. On the opposite side of lunarium projecting into a tube, a pair of small projections occasionally visible. Vesicular tissue well developed, usually one to three vesicles between adjacent zooecia.

*Remarks*: The present form is the nearest in all essential characters to *Eridopora major* Bassler (1929) from the Permian of Timor Island, which has been recognized as a synonym of *E. parasitica* by Sakagami (1980, 1999) and Sakagami and Pillevuit (1997). This species is widely distributed in the Tethyan realm.

***Eridopora*** sp. cf. ***E. oculata*** Bassler, 1929

Fig. 4-3

*Compared*:
*Eridopora oculata* Bassler, 1929, p. 53, 54, pl. 225 (1), figs. 5–10.

*Locality and Material*: NSM PA14745a (Loc. 80CP535B).

*Descriptive remarks*: Only one fragmentary tangential section. Zooecial tubes rounded triangular with well developed V-shaped lunarium. Inside longitudinal diameter of zooecial tube excluding lunarium about 0.38 mm and transverse diameter from 0.28 to 0.32 mm in outer part.

The present form can be distinguished from *Eridopora parasitica* by the smaller zooecial diameter and seems to be similar to *E. oculata* which was described by Bassler (1929) from the Permian of Timor Island. However, the specific identification can not be made because of the poory preserved specimen.

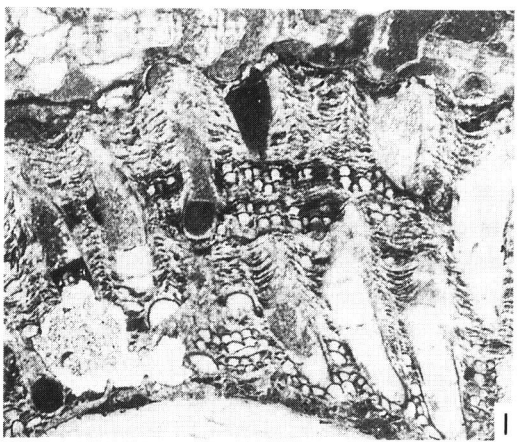
Suborder Hexagonellina Morozova, 1970
Family Hexagonellidae Crockford, 1947
Genus *Hexagonella* Waagen and Wentzel, 1886

***Hexagonella*?** sp. indet.

Fig. 5-1, 2

*Material and Locality*: NSM PA14755b (Loc. 80DT183A); NSM PA14765a (Loc. 80BH303E).

*Remarks*: Two fragmentary specimens, referred probably to *Hexagonella*, are recognized, however, detailed identifications are impossible because of the poor specimens. Only photographic illustrations are shown.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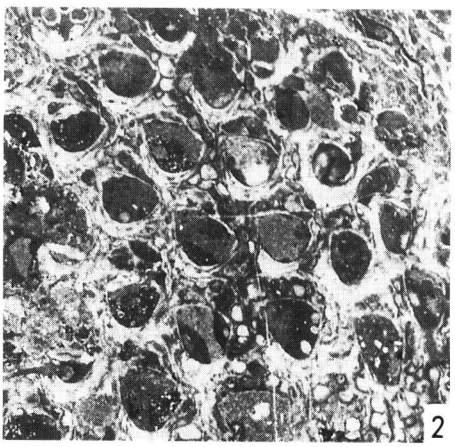
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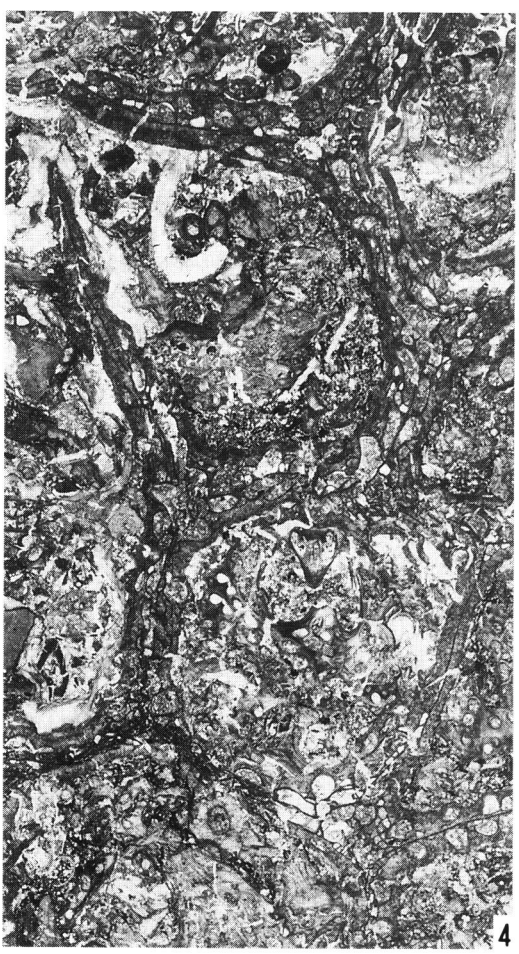
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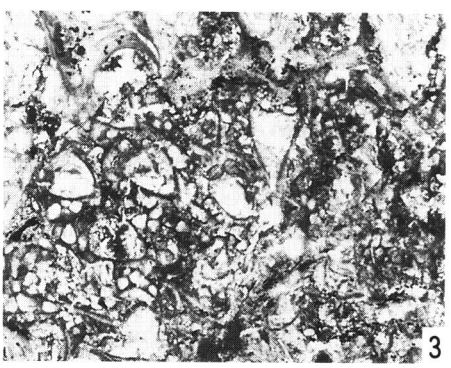
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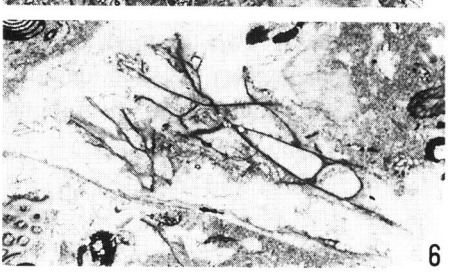
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## Family Etherellidae Crockford, 1957
## Genus *Liguloclema* Crockford, 1957

### ***Liguloclema*** sp. cf. ***L. meridianus*** (Etheridge), 1926

Fig. 4-5, 6

*Compared:*

*Sulcoretepora*? *meridianus* Etheridge; Bretnall, 1926, p. 19, pl. 1, fig. 9; Hosking, 1931, p. 15.

"*Sulcoretepora*" *meridianus* (Etheridge); Crockford, 1944, p. 156, pl. 4, fig. 6, text figs. 29, 30.

*Liguloclema meridianus* (Etheridge); Crockford, 1957, p. 37 (not illustrated); Research Group (Yanagida, ed.), 1988, pl. 17, figs. 2, 3; Engel and Ross, 1993, p. 17 (on microfiche), pl. 13, figs. 1–3; Sakagami, 1999, p. 86, 87, pl. 21, figs. 1–3.

*Liguloclema* cf. *meridianus* (Etheridge); Sakagami, 1973, p. 77, 78, pl. 11, figs. 1–4.

*Material and Locality*: NSM PA14738a (Loc. 80CP535B); NSM PA14750a (Loc. 80P343C).

*Remarks*: Only two very small fragmentary specimens belonging to the same species were examined. The present form is not unlike *Liguloclema meridianus*, however, the specimens are too poorly preserved for detailed comparison. Only photographic illustrations are shown.

## Family Goniocladiidae Waagen and Pichl, 1885
## Genus *Goniocladia* Etheridge, 1876

### ***Goniocladia timorensis*** Bassler, 1929

Fig. 4-4

*Goniocladia timorensis* Bassler, 1929, p. 89, pl. 247 (23), figs. 8–15; Crockford, 1944, p. 157, pl. 5, fig. 8; Crockford, 1957, p. 38; Sakagami, 1966, p. 153, 154, text-figs. 4a,b; Morozova, 1970, p. 80, 81, pl. 4, fig. 3; Engel and Ross, 1993, p. 19 (on microfiche), pl. 13, fig. 6.

*Material and Locality*: NSM PA14745b (Loc. 80CP535B).

*Description*: Zoarium consisting of anastomosing branches. Fenestrule pentagonal, hexagonal or irregularly polygonal with rounded corners in outline. Width and length of fenestrule ranges from 2.0 to 3.2 mm and 3.2 to 3.8 mm, respectively. Number of fenestrules in 10 mm measured about 2 to 2.5. Branch width ranges from about 0.80 to 1.0 mm. Zooecial tubes circular in tangential section near surface, diameter ranges from 0.16 to 0.22 mm, arise from mesotheca, parallel to coenelasma for a short distance and curve rapidly upward, meeting outer zoarial surface at an angle of about right angle. Diaphragms absent. Interzooecial tissue consisting of dark fibrous

←Fig. 4. 1, 2, *Eridopora parasitica* Waagen and Wentzel. 1, longitudinal section, ×20, NSM PA14752a. 2, tangential section, ×20, NSM PA14753a. 3, *Eridopora* sp. cf. *E. oculata* Bassler, tangential section, ×20, NSM PA14745a. 4, *Goniocladia timorensis* Bassler, tangential section, ×10, NSM PA14745b. 5, 6, *Liguloclema* sp. cf. *L. meridianus* (Etheridge). 5, transverse section, ×20, NSM PA14738a. 6, oblique section, ×20, NSM PA14750a.

material. Vesicular tissue occasionally developed only in endozone.

*Remarks*: Bassler (1929) distinguished *Goniocladia timorensis* as having a smaller size of the fenestrule from *G. indica* described by Waagen and Pichl (1885) from the Middle Productus Limestone of the Salt Range. The present form in all essential characters agrees with the original specimens from the Permian of Timor Island.

Order Trepostomida Ulrich, 1882
Family Stenoporidae Waagen and Wentzel, 1886
Genus *Tabulipora* Young, 1883

***Tabulipora tenuinervis*** Bassler, 1929

Figs. 5-4, 5; 6-1

*Tabulipora tenuinervis* Bassler, 1929, p. 60, pl. 235 (11), figs. 8–11.

*Material and Locality*: NSM PA14753b, 14755c, 14756a, b (Loc. 80DT183A); NSM PA14758a, 14759a, 14760a (Loc. 80BH303E).

*Description*: Zoarium solid, exact shape unknown, attached to *Fistulipora labratula* in one specimen from Loc. 80DT183A; and consisting of thick cylindrical stem of about 15 mm diameter in the other specimens from Loc. 80BH303E. In longitudinal section, zooecial tubes proximally parallel to zoarial base, and then bending rapidly perpendicular to surface. Zooecial wall thin, gently crenulate, forming arcuate rows of monilae in endozone and rapidly thickened with well-developed monilae in exozone. Many centrally perforated diaphragms present usually between two monilae, at interval of 0.48 to 0.64 mm. In transverse section, zooecial tubes thin-walled, irregularly arranged, polygonal in central part of endozone. In tangential section, zooecial tubes circular to oval in exozone, shorter diameter 0.17 to 0.19 mm; polygonal in endozone. Mesozooecia very rare, diameter less than 0.13 mm. Megacanthostyles located at intersection of zooecial walls, outside diameter about 0.05 mm and inside diameter not measurable because they are too small. A single series of micracanthostyles in outer part of zooecial walls.

*Remarks*: This species is characterized by well-developed monilae, many perforated diaphragms and relatively small zooecial tubes. This taxon is identical in all essential characters and measurements with the holotype which Bassler (1929) described from the Permian of Timor Island.

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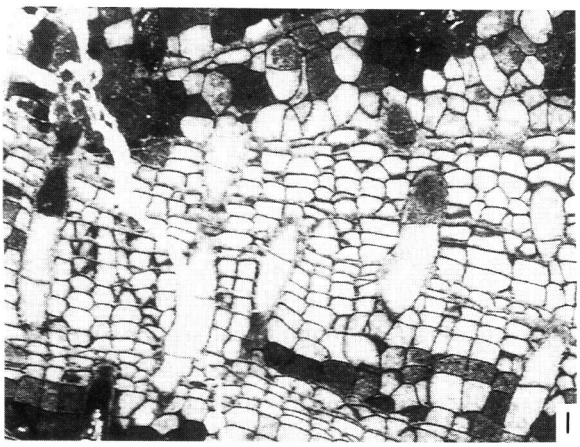
→Fig. 5. 1, 2, *Hexagonella*? sp. indet. 1, longitudinal section, ×20, NSM PA14755b. 2, longitudinal section, ×20, NSM PA14765a. 3, *Dyscritella adnascens* Bassler, longitudinal section, ×20, NSM PA14752b. 4, 5, *Tabulipora tenuinervis* Bassler. 4, longitudinal section, ×20, NSM PA14756a. 5, a part of transverse section, ×20, NSM PA14756b.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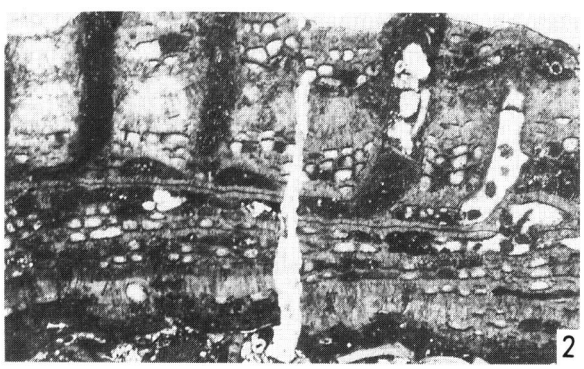
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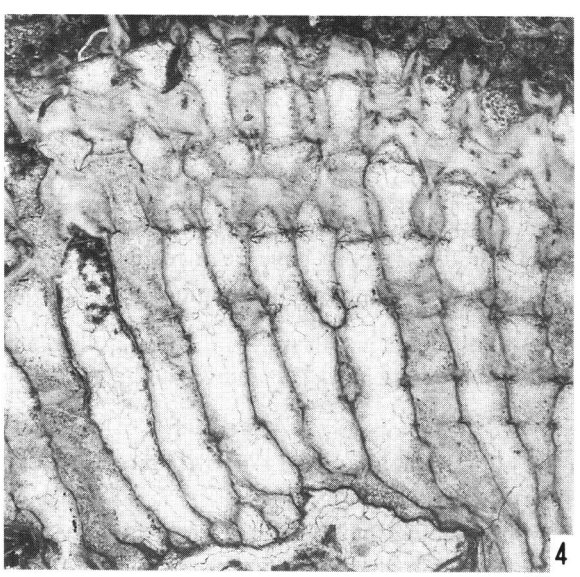
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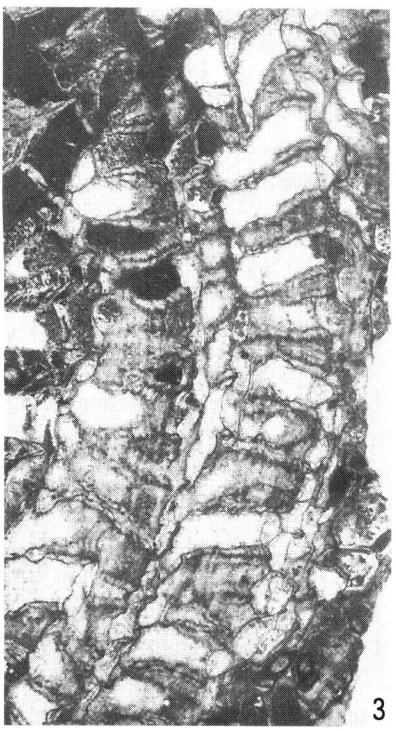
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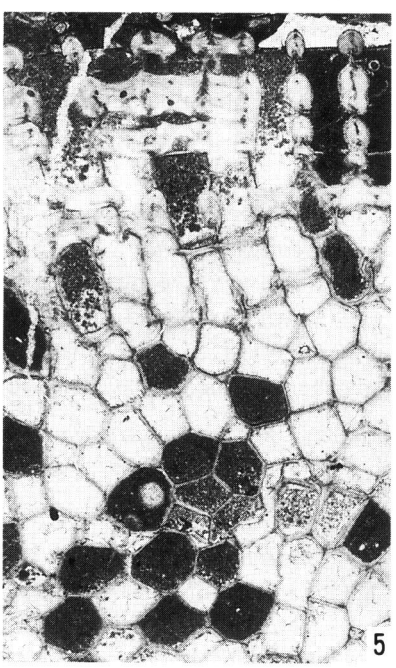
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Family Dyscritellidae Dunaeva and Morozova, 1967
Genus *Dyscritella* Girty, 1911

***Dyscritella adnascens*** Bassler, 1929

Fig. 5-3

*Dyscritella adnascens* Bassler, 1929, p. 62, pl. 236 (12), figs. 3–5.

*Material and Locality*: NSM PA14752b (Loc. 80DT183A).

*Description*: Typical longitudinal and partly tangential sections. Thin lamellate zoarium multiple layers accumulated, attached on a zoarium of *Eridopora parasitica*, usually less than 1 mm in thickness for each layer. In longitudinal section, zooecial tubes arise from coenelasma parallel for a very short distance and either curve rapidly at inner edge of exozone or curve gradually upward, making a right angle to zoarial surface. Zooecial walls thin in endozone and rapidly thickened in exozone. Zooecial walls in exozone consists of relatively coarse laminated fibers. Monilae and diaphragms not observed. Although a typical tangential section not observed in the present specimens, zooecial tubes may be circular and their diameter ranges from 0.23 to 0.28 mm. Mesozooecia may be occasionally present, about 0.06 mm in diameter. Acanthostyles located at intersections of zooecial walls, their outside diameter about 0.05 mm. Many acanthostyles present but exact arrangement uncertain.

*Remarks*: The present form is identical in all essential characters and measurements with the originally described specimens from Timor Island.

Order Cryptostomida Vine, 1883
Suborder Rhabdomesina Astrova and Morozova, 1956
Family Hyphasmoporidae Vine, 1886
Genus *Hyphasmopora* Etheridge, 1875

*Type species*: *Hyphasmopora buskii* Etheridge, 1875.

*Geological range*: Early Carboniferous to Late Permian.

*Remarks*: The present genus was restudied and illustrated in detail by Blake (1983) who examined the thin sectioned internal structures of the type species of Etheridge (1875). Only a few species of *Hyphasmopora* have been recorded, but it may be presumed to have been missed because of the small and simple colony form.

***Hyphasmopora katoi*** sp. nov.

Fig. 6-2–8

*Material and Locality*: NSM PA14741b (holotype), 14741c (paratype) (Loc. 80CP535B); NSM PA14747b (paratype) (Loc. 80P343C).

*Description*: Zoarial surface not observable because of only two sections, typical longitudinal and transverse sections. Slender cylindrical stem, about 0.5 mm in di-

ameter. Branching system not observed. In longitudinal section, zooecial tubes straight and parallel to longitudinal direction of zoarium in endozone, and then rapidly curve outward to meet outer surface of zoarium at an angle of about 30°. Length of zooecial tubes 0.6 to 0.7 mm in endozone, and about 0.15 mm in exozone. One moderately developed hemiseptum on distal walls in middle level of endozone. Diaphragm absent. Zooecial walls in exozone consist of very fine fibrous material. Metapores arise from base of exozone. In tangential section of exozone, zooecial tubes oval, longer and shorter diameters about 0.13 and 0.08 mm, respectively. Small metapores usually circular but irregular in size and shape, diameter ranging from 0.005 to 0.01 mm, usually two rows with 7 or more in each row longitudinally. In transverse section, about 0.32 mm in diameter of endozone, and 0.10 to 0.13 mm in thickness of exozone.

*Remarks*: The present new species is similar to the type species: *Hyphasmopora buskii* from the Lower Carboniferous of Scotland, but differs in its detailed characters such as the shape and size of hemiseptum, and arrangement of metapores. The present form can not be compared in detail with *Hyphasmopora asymmetrica* because Nikiforova (1933) described only the surface characters of specimens from the Permian of the Djulfa region (Armenia); it can be distinguished by the zoarial diameter.

The specific name is dedicated to Professor Makoto Kato (Sapporo) who gave me the opportunity to study these bryozoan collections.

Genus *Streblotrypa* Vine, 1885

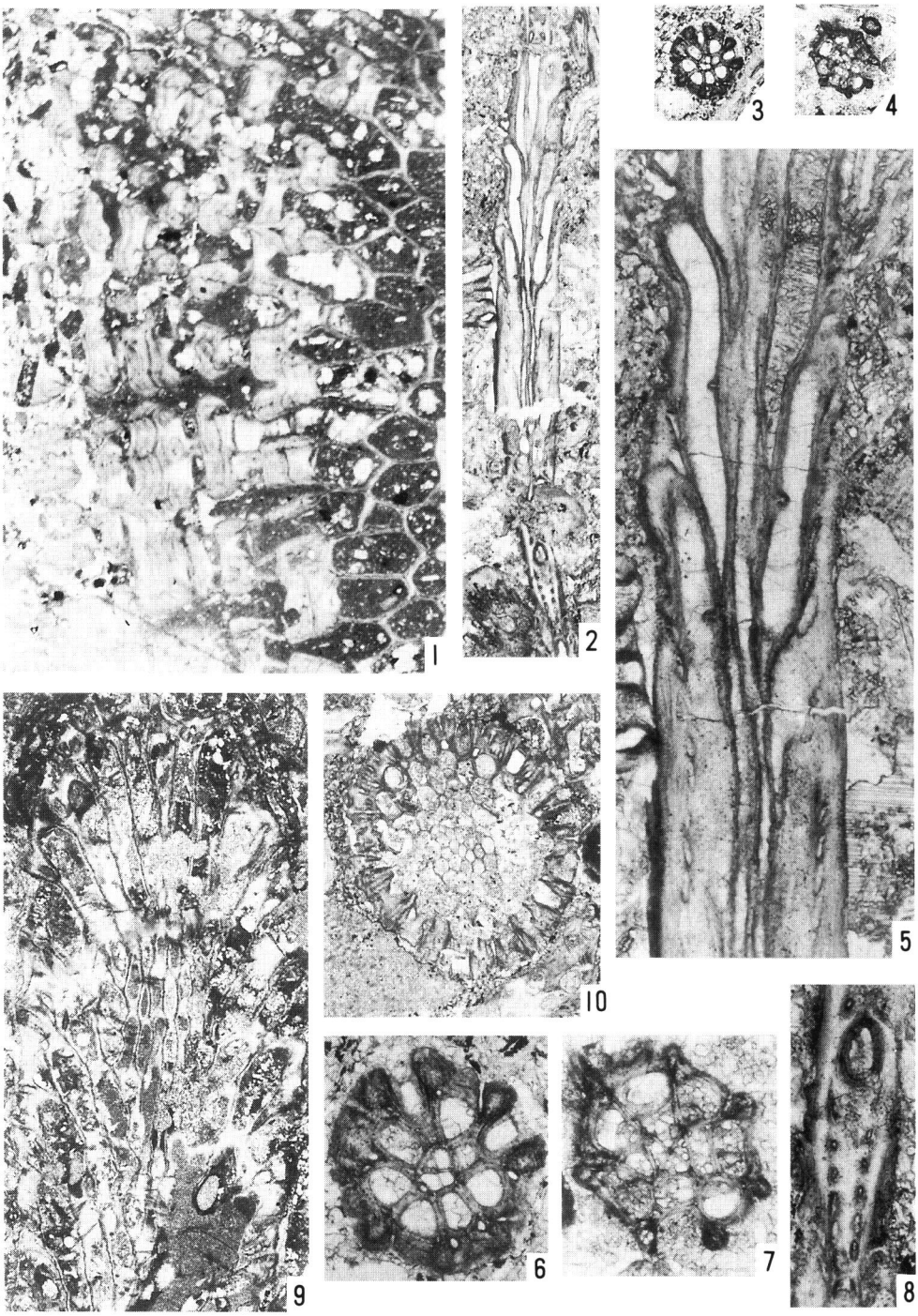
***Streblotrypa elegans*** Sakagami, 1970

Fig. 7-6

*Streblotrypa elegans* Sakagami, 1970, p. 65, 66, pl. 13, figs. 5–9.

*Material and Locality*: NSM PA14751a (Loc. 80P343C).

*Descriptive remarks*: Zoarium cylindrical stem, 1.3 mm in diameter. Zooecial tubes parallel to longitudinal direction of zoarium in endozone, and curve rapidly outward at posterior end of exozone. The shorter diameter of zooecial tubes 0.14 to 0.16 mm. Even with only one transverse and partly tangential section, this form identical in the size of zoarium, arrangement of mesozooecia and the other all essential characters with *Streblotrypa elegans* described originally from Ko Muk (Island), western side of peninsular Thailand.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## Genus *Streblascopora* Bassler, 1952

### ***Streblascopora*** sp. cf. ***S. fasciculata*** Bassler, 1929

Fig. 6-9, 10

*Compared*:

*Streblotrypa fasciculata* Bassler, 1929, p.66, pl. 239 (15), figs. 4, 5.

*Streblascopora fasciculata* (Bassler); Shishova, 1965, p. 58, pl. 6, fig. 2; Morozova, 1970, p. 15, 151, pl. 27, fig. 3; Yang and Lu, 1984, p. 289, pl. 7, figs. 10–15; Lu, 1986, p. 127, pl. 4, figs. 17, 18.

*Material and Locality*: NSM PA14746b (Loc. 80CP535B); NSM PA14748a (Loc. 80P343C).

*Description*: Only a longitudinal section (from Loc. 80P343C) and a transverse section (from Loc. 80CP535B) were examined. Zoarium consists of cylindrical ramose branches, 1.6 to 1.9 mm in diameter. In longitudinal section, diameter of central bundle 0.6 to 0.7 mm, ratio of zoarial diameter to central bundle from about 2.7 : 1. Number of tubes in central bundle 5 to 6. Zooecial tubes arise from central bundle at an angle of about 25°, nearly straight in endozone and curving rapidly at inner edge of exozone. Metapores arise from base of exozone, parallel to zooecial tubes in exozone. In tangential section of exozone, zooecial tubes may be oval, but exact diameter is not measurable. Total number of metapores disposed between zooecial tubes in one series not countable in the present specimens. In transverse section, number of tubes in central bundle not certain, but may be about 20.

*Remarks*: Although the specimens at hand are imperfect, the present form is identical in the zoarial diameter and other essential characters with the originally described specimens of *Streblascopora fasciculata* from the Permian of Timor Island.

### ***Streblascopora irianica*** sp. nov.

Fig. 7-1–3

*Material and Locality*: NSM PA14738b (holotype), 14743a, 14743b, 14744a (paratypes) (Loc. 80CP535B).

*Description*: Zoarium consists of cylindrical ramose branches; branch diameter varies from 2.6 to 3.0 mm, occasionally diverge at right angle from main branch. In longitudinal section, diameter of central bundle 0.8 to 1.0 mm, ratios of zoarial diameter to central bundle ranging from 3.0 : 1 to 3.3 : 1, and number of tubes in central bundle 7 to 8. Zooecial tubes arise from central bundle at an angle of about 30°,

←Fig. 6. 1, *Tabulipora tenuinervis* Bassler, a part of transverse section, ×20, NSM PA14758a. 2–8, *Hyphasmopora katoi* sp. nov. 2, longitudinal section, ×20, NSM PA14741b (holotype). 3, transverse section, ×20, NSM PA14741c. 4, transverse section, ×20, NSM PA14747b. 5, 8, enlarged parts of Fig. 6-2, ×60. 6, enlarged photo of Fig. 6-3, ×60. 7, enlarged photo of Fig. 6-4, ×60. 9, 10, *Streblascopora* sp. cf. *S. fasciculata* Bassler. 9, longitudinal section, ×20, NSM PA14748a. 10, transverse section, ×20, NSM PA14746b.

straight in endozone, parallel to endozone wall for a very short distance, then curving rapidly outward and parallel to zooecial tubes in exozone. In tangential section of exozone, zooecial tubes oval, longer diameter usually 0.23 to 0.28 mm and shorter diameter 0.15 to 0.19 mm. Zooecial apertures arranged in slightly alternating and regularly longitudinal series with about 3 zooecia in 2 mm measuring lengthwise. Proximal hemiseptum may be absent but slender distal hemiseptum seen occasionally at middle to upper level of endozone in zooecial tube. Metapores circular to oval, occasionally polygonal, irregularly size, usually 0.013 to 0.038 mm in shorter diameter, usually 3 rows with 3 pores in both sides and 2 in central rows. One prominent acanthostyle disposed at distal part of each zooecium

*Remarks*: This new species belongs to the genus *Streblascopora* in essential characters, however, it differs from every other known species of the genus, all of which have no acanthostyles, in having a prominent acanthostyle located at distal part of each zooecium.

## Family Rhabdomesidae Vine, 1884
## Genus *Rhabdomeson* Young and Young, 1874
### ***Rhabdomeson mammillatum*** (Bretnall), 1926

Fig. 7-4, 5

*Rhombopora mammillata* Bretnall, 1926, p. 24, pl. 1, fig. 2.
*Rhabdomeson mammillata* (Bretnall); Hosking, 1931, p. 14; Crockford, 1944, p. 166, pl. 5, fig. 14, text figs. 39–41; Yang and Lu, 1983, 283, 284, pl. 7, figs. 4–6.
*Rhabdomeson mammillatum* (Bretnall); Crockford, 1957, p. 73; Sakagami, 1966, p. 165, 166, pl. 6, fig. 12, text-fig. 2; Engel and Ross, 1993, p. 58 (on microfiche), pl. 20, figs. 13–15.
*Rhabdomeson mammillatus* (Bretnall); Yang and Xia, 1974, p. 308, pl. 161, figs. 3–5.
*Rhabdomeson* shanse Reed, 1933, p. 113, pl. 2, fig. 3.

*Material and Locality*: NSM PA14747c, 14750b, 14750c, 14751b (Loc. 80P343C).

*Description*: Zoarium ramose, consisting of hollow cylindrical stem, 2.1 to 2.5 mm in diameter. Diameter of central tube about 0.5 mm measured on all four specimens. Ratio of zoarial diameter to central tube 4.2 : 1 to 5.0 : 1. In longitudinal section, zooecial tubes straight and thin walled in endozone, arise from wall of central tube at angle of about 40°, and quickly curve outward and rapidly thicken at inner edge of exozone, making large angle of about 70° to surface. Poorly developed hemiseptum and no diaphragm in zooecial tube. In tangential section of exozone,

→Fig. 7. 1–3, *Streblascopora irianica* sp. nov. 1, obliquely longitudinal section, ×20, NSM PA14738b (holotype). 2, 3, enlarged parts of Fig. 7-1. 4, 5, *Rhabdomeson mammillatum* (Etheridge). 4, obliquely longitudinal section, ×20, NSM PA14747c. 3, obliquely transverse section, ×20, NSM PA14751b. 6, *Streblotrypa elegans* Sakagami, transverse section, ×20, NSM PA14751a.


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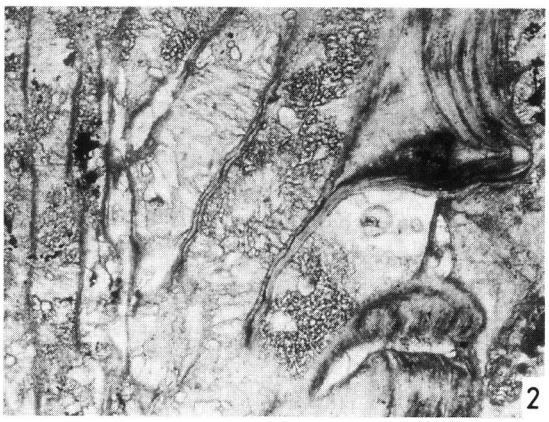
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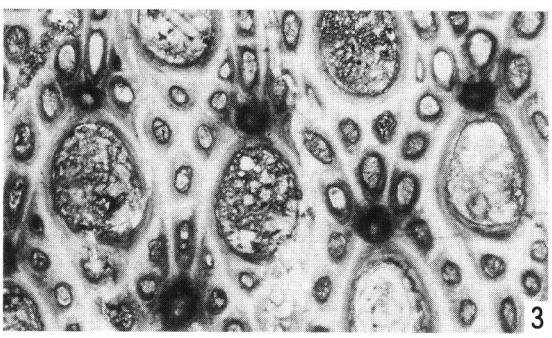
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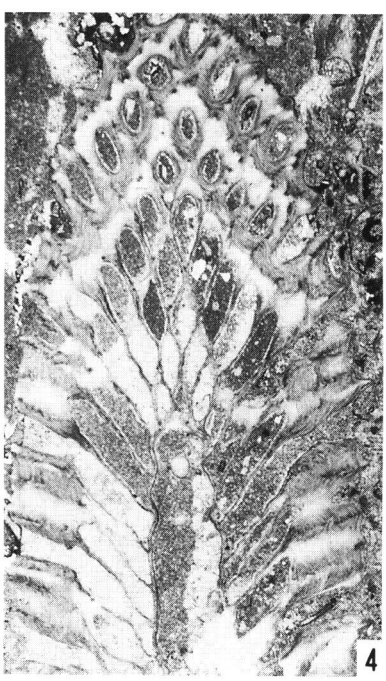
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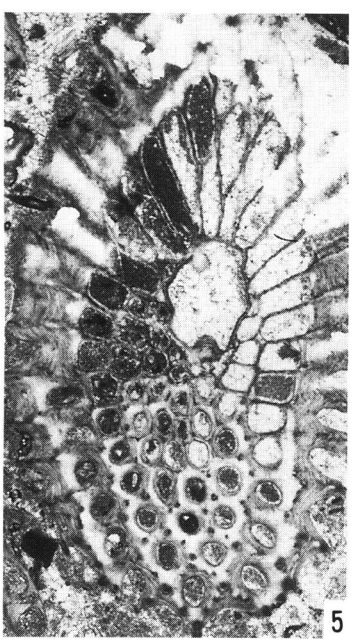
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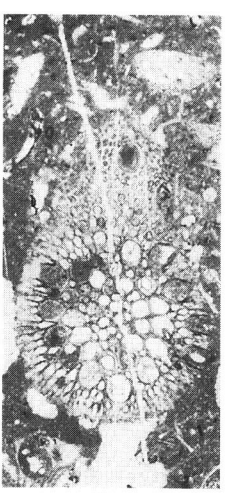
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zooecial tubes elliptical, longer diameter ranges from 0.23 to 0.26 mm, shorter diameter ranges from 0.13 to 0.14 mm, regularly arranged in longitudinal and diagonal directions, usually 4 zooecia per 2 mm longitudinally and about 6 per 2 mm diagonally. Usually 1, occasionally 2 acanthostyles at each corner of zooecial tube: they are surrounded by concentric fibers; outer and inner diameters range from 0.03 to 0.05 mm and less than 0.006 mm, respectively. Usually 1 to 3 paurostyles between acanthostyles, outer diameter about 0.03 mm.

In transverse section, central tube of zoarium usually circular but irregular in one specimen (NSM PA14751b) and thin walled. The other characters observed in thin section are the same as those of the longitudinal section.

*Remarks*: The present form is identical in all essential characters with the specimens from Western Australia. The original specimen of this species were described based on only the surface by Bretnall (1926). Later Crockford (1944) described in detail this species from the Noonkanbah Series in Western Australia. According to Crockford (1944), *Rabdomeson shanse* described by Reed (1933) should be referred to *R. mammillatum*.

### ***Rhabdomeson*** sp. cf. ***R. grande*** Bassler, 1929

Fig. 8-1

*Compared*:

*Rhabdomeson grande* Bassler, 1929, p. 69, 70, pl. 237(13), figs. 9–14.; Crockford, 1957, p. 75, pl. 19, fig. 5; Engel and Ross, 1993, p. 57 (on microfiche), pl. 20, fig. 12.

*Material and Locality*: NSM PA-14760b (Loc. 80BH303E).

*Descriptive remarks*: In single oblique section, zoarium shows a thick cylindrical ramose branch, reaching about 9 mm in diameter, and with central tube of about 2 mm in diameter. Ratio of zooecial diameter to central tube about 4.5 : 1.

The present form is identical in all essential characters with *Rhabdomeson grande* which was originally described from the Basleo beds of Timor Island by Bassler (1929) and also from the Noonkanbah Formation of Western Australia by Crockford (1944).

### Genus *Ascopora* Trautshold, 1876

### ***Ascopora nakornsrii*** Sakagami, 1968

Fig. 8-2, 3

*Ascopora nakornsrii* Sakagami, 1968a, p. 55, 56, pl. 10, figs. 7, 8.

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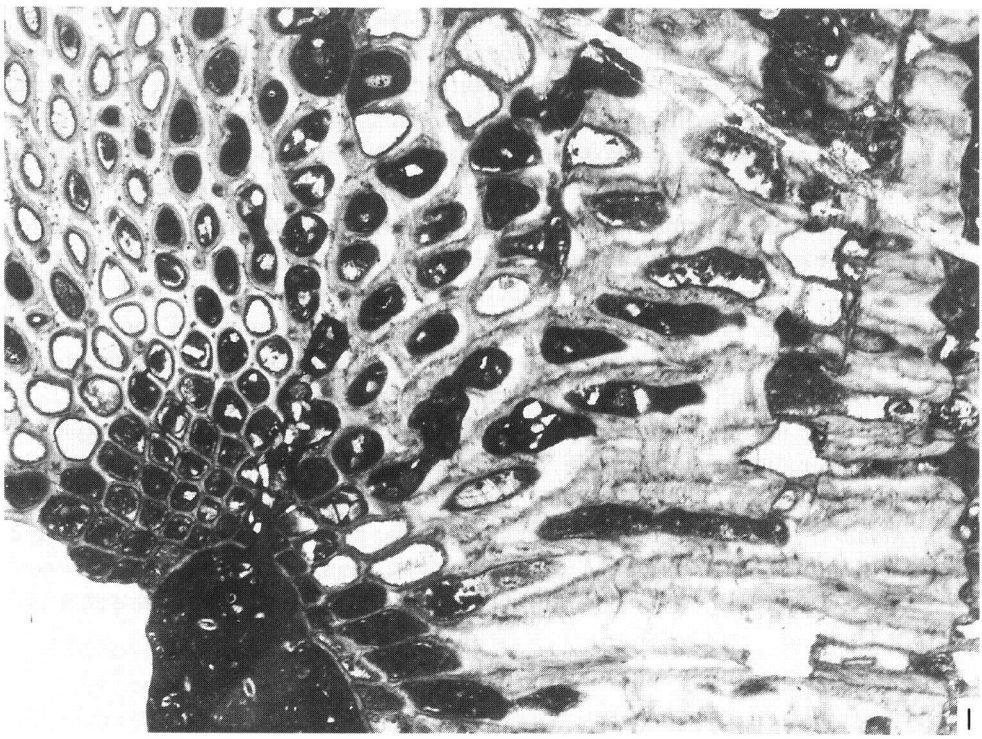
→Fig. 8. 1, *Rhabdomeson* sp. cf. *R. grande* Bassler, longitudinal section, ×20, NSM PA14760b. 2, 3, *Ascopora nakornsrii* Sakagami, longitudinal and tangential sections from the same zoarium, ×20, NSM PA14741d.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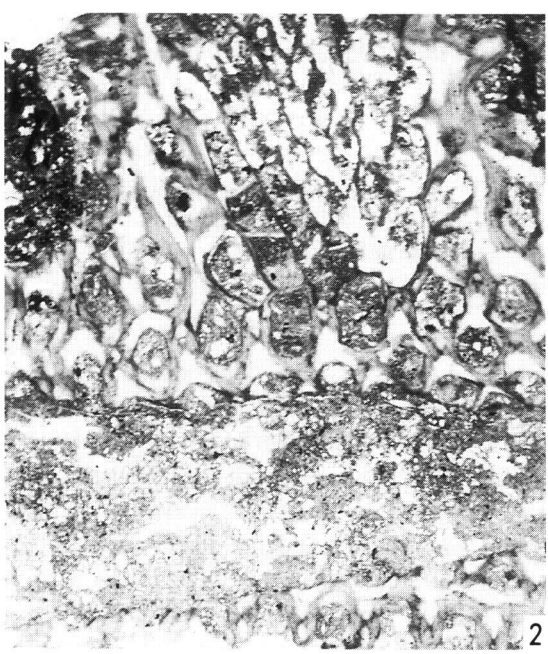
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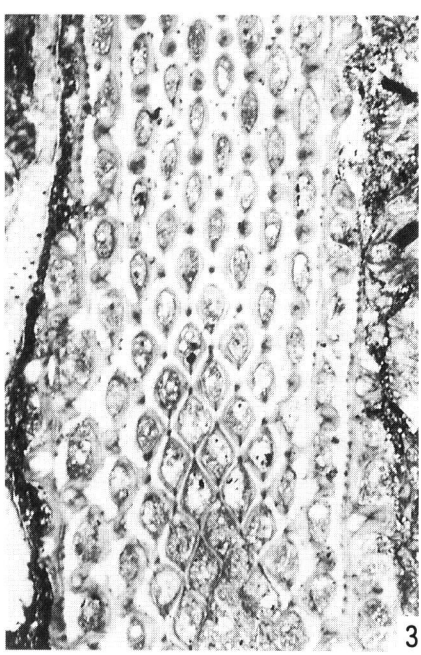
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*Material and Locality*: NSM PA-14741d (Loc. 80CP535B)

*Description*: A single thin section with both typical longitudinal and tangential parts. Zoarium consists of cylindrical straight stem, 3.2 mm in diameter, branching at an angle of about 90°. In longitudinal section, most of endozone obliterated in this specimen. Zooecial tubes in exozone straight but short, 0.6 to 0.7 mm in length. Diaphragm lacking. Zooecial wall very thin in endozone, rapidly thickened in exozone. Development of hemiseptum obscure. In tangential section, zooecial tubes elongated elliptical in exozone, longer diameter ranges from 0.27 to 0.32 mm, shorter diameter ranges from 0.08 to 0.12 mm, but regularly arranged rhomb in inner part. Zooecial apertures regularly arranged longitudinally and diagonally. Number of zooecia about 4 in 2 mm longitudinally and about 7 in 2 mm diagonally. One acanthostyle at each point of zooecial wall between zooecial tubes; outside diameter ranges from 0.12 to 0.13 mm, and inner pore diameter very small, less than 0.01mm. Paurostyles in straight longitudinal row very near surface; only one row in interspace of zooecia, very small, about 0.016 mm in outside diameter.

*Remarks*: Although the inner structure of the present form is obliterated, this form agrees in the zoarial diameter and other all essential characters with *Ascopora nakornsrii* which was described from Khao Phrik at the isthmus of the peninsular part of Thailand.

Family Rhomboporidae Simpson, 1895

Genus *Saffordotaxis* Bassler, 1952

***Saffordotaxis*** sp. cf. ***S. wanneri*** (Bassler), 1929

Fig. 9-1

*Compared*:

*Rhombopora wanneri* Bassler, 1929, p. 64, 65, pl. 245 (21), figs. 7–9.

*Saffordotaxis* cf. *wanneri* (Bassler); Crockford, 1957, p. 76, 77; Engel and Ross, 1993, p. 62, 63 (on microfiche), pl. 21, fig. 4.

*Ulrichotrypella wanneri* (Bassler); Morozova, 1970, p. 88, 89, pl. 9, fig. 1.

*Material and Locality*: NSM PA14747d, 14750d, 14751c, 14751d (Loc. 80P343C).

*Description*: Oblique longitudinal and transverse sections were examined. Zoarium thick cylindrical stem, varies from 2.3 to 3.7 mm in diameter. In longitudinal section, zooecial tubes straight and making a small angle with longitudinal direction in endozone, bending outward at inner edge of exozone, perpendicular to surface. Diameter of endozone ranges from 1.0 to 1.3 mm. Thickness of exozone varies from 0.7 to 1.3 mm. Zooecial wall thin in endozone, and gradually thicken in exozone. In tangential section of exozone, zooecial tubes oval; longer diameter ranges from 0.24 to 0.26 mm, shorter diameter ranges from 0.14 to 0.16 mm, regularly arranged in longitudinal and diagonal directions, about 4 zooecia in 2 mm longitudinally. Acan-

thostyles (aktinotostyles) well developed, surround zooecial tube in single row, regularly sized, the outside diameter ranges from 0.04 to 0.05 mm.

*Remarks*: This form may be identical in many features with *Saffordotaxis wanneri*, which was originally described from the Permian of Timor Island, but is different from the latter by the smaller zoarial diameter, about 2.3 mm by measurement from Bassler's (1929) photographic illustration (Fig. 9, Plate 245). Later, Crockford described this species as a comparable form without illustration and Engel and Ross (1993) illustrated only the surface of zoarium which shows about 4 mm in zoarial diameter.

Family Nikiforovellidae Gorjunova, 1975
Genus *Clausotrypa* Bassler, 1929

***Clausotrypa*** sp. cf. ***C. conferta*** Bassler, 1929

Fig. 9-2

*Compared*:
*Clausotrypa conferta* Bassler, 1929, p. 72, pl. 238 (14), figs. 1–3, Sakagami, 1999, p.92, pl. 23, fig. 3.
*Clausotrypa* sp. indet.; Research Group (Yanagida, ed.), 1988, pl. 19, fig. 4.

*Material and Locality*: NSM PA14754a (Loc. 80DT183A).

*Descriptive remarks*: A single oblique section, with typical transverse and longitudinal parts observable. In longitudinal section of encrusted part, zoarial colony covers cylindrical part of the same specimen or brachiopod shell. Zooecial tubes arise from coenelasma for a short distance and curve gradually upward, making a right angle to zoarial surface, somewhat irregularly walled with one to two diaphragms, 0.15 to 0.23 mm zooecial diameter. Diaphragms in mesozooecia concave to surface, abundant and regularly spaced, 0.04 to 0.05 mm interval. Although typical tangential section of zoarium not observed, acanthostyles present but detailed arrangement not clear. Zoarial diameter about 2.4 mm on the tyical transverse section.

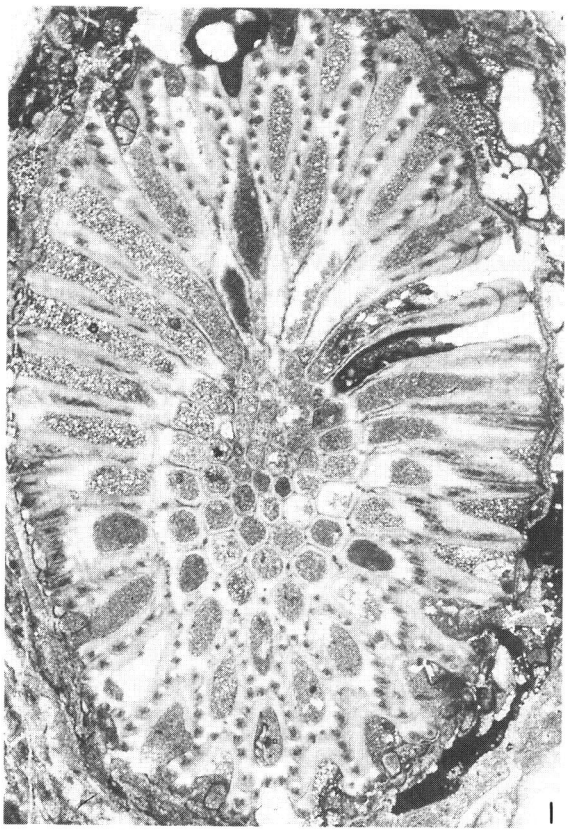
The present form is the nearest in all essential characters to *Clausotrypa* conferta which Sakagami (1999) described from Loc. O of Khao Hin Kling area, near Phetchabun, North-central Thailand.

Order Fenestrata Elias and Condra, 1957
Family Fenestellidae King, 1849
Genus "*Fenestella*" (s. l.)

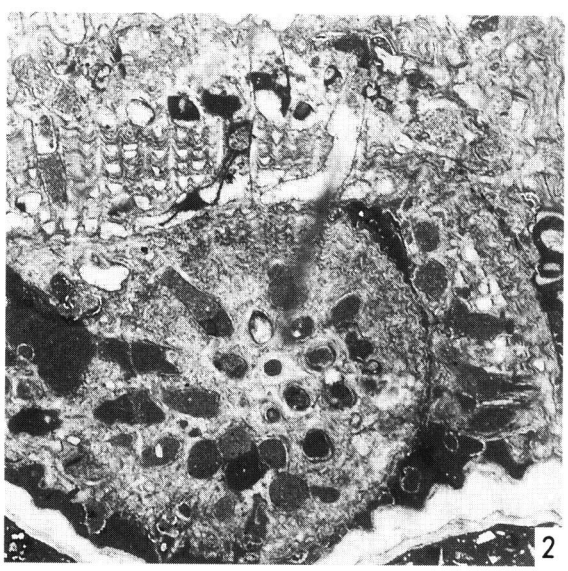
**"*Fenestella*"** spp. indet.

Figs. 9-3–5; 10-5

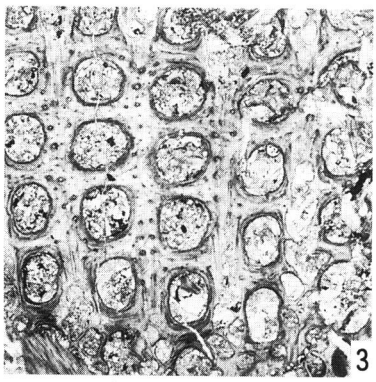
*Material and Locality*: NSM PA14738c, 14739c, 14740a, 14740b, 14740c, 14741e, 14742a, 14742b, 14742c, 14744a, 14744b, 14744c, 14746c (Loc. 80CP535B).



1



2



3

4

5

*Remarks*: Many fragments of "*Fenestella*" (s. l.) are recognized in thin sections from Loc. 80CP535B, however, the detailed identification is not possible because of poor orientation of specimens. Only photographic illustrations of some of fragments are shown.

Family Polyporidae Vine, 1883
Genus Polypora M'Coy, 1844

***Polypora timorensis*** Bassler, 1929

Fig. 10-1

*Polypora timorensis* Bassler, 1929, p. 79, pl. 243 (19), figs. 1–4.
*Polypora* cf. *P. timorensis* Bassler; Ross and Ross, 1962, p. 58, 59, pl. 14, figs. 2–4; Sakagami, 1963, p. 208, pl. 12, figs. 13, 14.

*Material and Locality*: NSM PA14740d, 14743c (Loc. 80CP535B).

*Description*: Zoarium consists of straight, parallel branches connected by dissepiments at regular intervals. Bifurcation of branches not known. Branch width 0.64 to 0.80 mm; about 7 branches per 10 mm horizontally. Fenestrules oval in outline; width ranges from 0.64 to 0.74 mm; length ranges from 0.38 to 0.45 mm; 6 to 7 per 10 mm of branch length. Dissepiments narrower than branches, width about 0.50 mm. Zooecial tubes arranged usually 4 rows on each branch, rhomboidal at middle level of branch because of strongly alternating, intercalated zooecial tubes in longitudinal series. Zooecia circular in tangential section near surface, ranging from 0.10 to 0.12 mm in diameter. Number of zooecial apertures about 15 per 5 mm length of one range, usually 5 to 6 apertures per fenestrule. Distance between zooecial apertures from center to center 0.26 to 0.32 mm longitudinally. Stereom covering reverse side of branch consists of inner semitransparent layer of colonial plexus and outer sclerenchyma of darker, coarser fibers with fine granules.

*Meshwork formula*: ca. 7/6-7//ca. 15/4* (*ca.7 branches in 10 mm of zoarial width; 6-7 fenestrules in 10 mm of zoarial length; ca.15 zooecia in 5 mm of branch length; 4 number of rows of zooecia).

*Remarks*: The present form can be identified with *Polypora timorensis*, described from the Permian of Timor Island by Bassler (1929), in the meshwork formula and essential characters, but slight differences are recognized in the microscopic measurements. The width of dissepiment in the present form seems to be slightly narrower than that of the holotype.

←Fig. 9. 1, *Saffordotaxis* sp. cf. *S. wanneri* (Bassler), oblique section, ×20, NSM PA14751c. 2, *Clausotrypa* sp. cf. *C. conferta* Bassler, transverse section, ×20, NSM PA14754a. 3–5, "*Fenestella*" spp. indet., tangential sections, ×20, NSM PA14744b, 14742a and 14742b, respectively.

***Polypora*** sp. indet.

Fig. 10-4

*Material and Locality*: NSM PA-14743d, 14746d (Loc. 80CP535B).

*Remarks*: The present form is apparently different and can be easily distinguished from the preceding species in the zoarial form and number of rows of zooecia on branch; width of branch about 1.6 mm and zooecial tubes arranged usually 8 rows on each branch. Only two fragmentary sections, and they are too poor to make detailed comparison and specific identification. Only photographic illustrations are shown.

Family Acanthocladiidae Zittel, 1880

Genus *Acanthcladia* King, 1849

***Acanthocladia*** sp. cf. ***A. regularis*** Bassler, 1929

Fig. 10-2

*Compared*:

*Acanthocladia regularis* Bassler, 1929, p. 84, pl. 244 (20), figs. 1–6.

?*Acanthocladia anceps* Waagen and Pichl, 1885, p. 812, pl. 94, figs. 1–3.

*Material and Locality*: NSM PA14744e (Loc. 80CP535B).

*Description*: A single zoarium consisting of a pinnate, broad, nearly straight main branch and short lateral branches. Width of main branch about 0.9 to 1.0 mm. Lateral branch slightly narrower than main branch, extending alternately at about 70° to main branch and at intervals of about 1.6 mm and about 3 lateral branches per 5 mm length of main branch. Zooecial tubes arranged in alternating longitudinal series, 3 to 4 rows on each branch. Zooecia circular at middle and upper levels of branch, 13 zooecia per 5 mm length of one range. Distance between zooeical apertures from center to center ranges from 0.32 to 0.38 mm longitudinally. Usually one, occasionally two, large tubercle-like structures present between zooecial tubes in longitudinal series, from 0.08 to 0.10 mm in outside diameter. Stereom consists of inner semitransparent layer of colonial plexus and outer sclerenchyma of dark, coarser fibers with fine granules.

*Remarks*: This form is characterized by prominent tubercle-like structures between the zooecial tubes in longitudinal series. However, all essential characters and measurements of the present form are identified with those of *Acanthocladia regularis* described by Bassler (1929), but he did not write about the tubercle-like struc-

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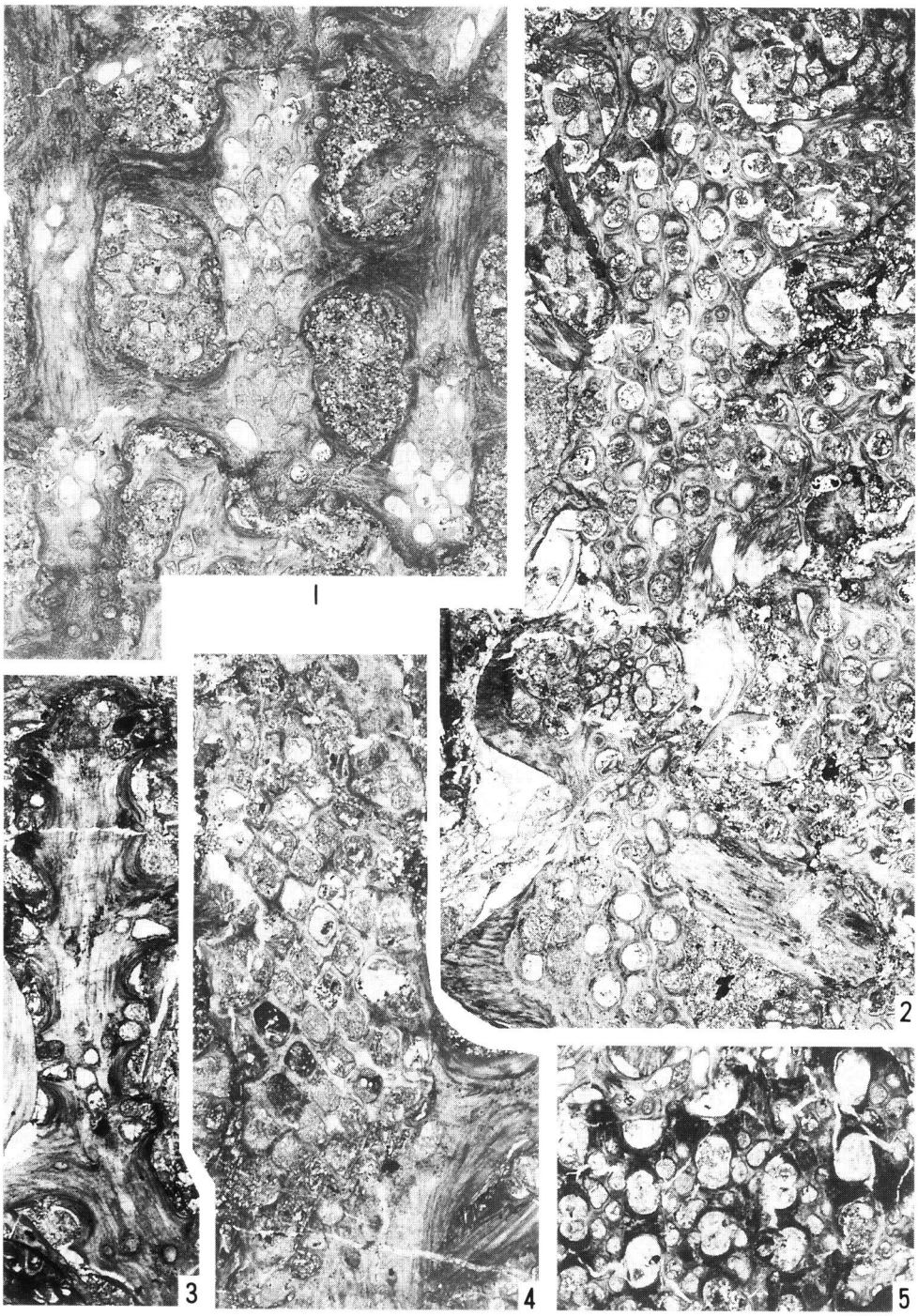
→Fig. 10. 1, *Polypora timorensis* Bassler, tangential section, ×20, NSM PA14743c. 2, *Acanthocladia* sp. cf. *A. regularis* Bassler, tangential section, ×20, NSM PA14744e. 3, *Penniretepora* sp. indet., tangential section, ×20, NSM PA14738d. 4, Polypora sp. indet., tangential section, ×20, NSM PA14746d. 5, "*Fenestella*" sp. indet., tangential section, ×20, NSM PA14742c.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tures. Bassler recommended including ?*Acanthocladia anceps* (Schlotheim) described by Waagen and Pichl (1885) from the Middle Productus Limestone of the Salt Range, but not the genotype of *Keratophytes anceps* Schlotheim.

Genus *Penniretepora* d'Orbigny, 1849

***Penniretepora*** sp. indet.

Fig. 10-3

*Material and Locality*: NSM PA14738d (Loc. 80CP535B).

*Remarks*: A single fragmentary specimen is recognized as *Penniretepora*, however, specific identification can not be made because of poor orientation and preservation of specimen. Only photographic illustration is shown.

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