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JERZY FEDOROWSKI

THE LOWER PERMIAN  
TETRACORALLA AND TABULATA  
FROM TRESKELODDEN,  
VESTSPITSBERGEN



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NORSK POLARINSTITUTT  
OSLO 1967

NORSK POLARINSTITUTT

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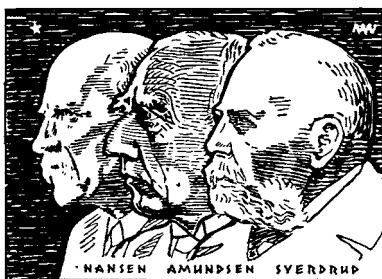
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## Foreword

During the summer of 1949 Norsk Polarinstitut sent a geological party, consisting of cand. real. SVEN FØYN, geologist, professor ANATOL HEINTZ, palaeontologist, and two assistants, to Hornsund, south Vestspitsbergen. The party spent 28 days in inner Hornsund on the north side of the fjord, below Hyrnefjellet, close to Treskelodden.

The original task was to study the Devonian deposits on both sides of Hornsund and on the mainland south of Hornsund. In addition to this task, we also spent some time investigating a section through the upper Palaeozoic and Mesozoic deposits across Treskelodden. We measured 72 horizons from the shore to the highest point of Treskelodden, and collected fossils from various horizons.

The basal part of the section was formed of more or less coarse red and reddish conglomerates and distinctly cross-bedded sandstones, with different types of stream-structures (Hyrnefjellet Beds, Middle Carboniferous. BIRKENMAJER 1964). The continuation of these deposits (older part) is developed along the north coast of Hornsund from Treskelodden and at some distance westwards. These deposits consist of still coarser conglomerates without any traces of fossils.

The corals described in this paper by Dr. FEDOROWSKI are all collected in the upper part of the red series, developed on Treskelodden (Treskelodden Beds, Upper Carbon – lowermost Permian. BIRKENMAJER 1964. See Fig. A). We divided this part of our section, which measured about 75 m, into 20 horizons. On a whole, the deposits in this part of the section become gradually finer grained towards the top. The coarse conglomerates in the lowest layers become successively less coarse, and finally beds of sandstones and calcareous sandstone become more common. However, the cross-bedding, stream-structures and more isolated conglomerate beds and single pebbles occur through the whole section.

This red series has a very marked upper limit (Fig. B). The uppermost horizon (20), which consists of grayish sandstone and calcareous sandstones, shows deep, rather broad cracks running from the surface of the layer more or less straight down about 30–50 cm. These cracks are filled with the same kind of deposits, which form the next horizon (21), covering the cracked surface of the horizon 20. Some fossils (mostly brachiopods) found in the horizon 21, can also be found deep in the cracks, sometimes quite close to the corals belonging to horizon 20, lying in the rocks between the cracks (Fig. B).

The horizon 21 (Brachiopod Cherty Limestone, Upper Permian. BIRKENMAJER 1964), as also the higher horizons, have a different lithology and contain a completely different fauna. We did not find any corals here, but plenty of brachiopods,

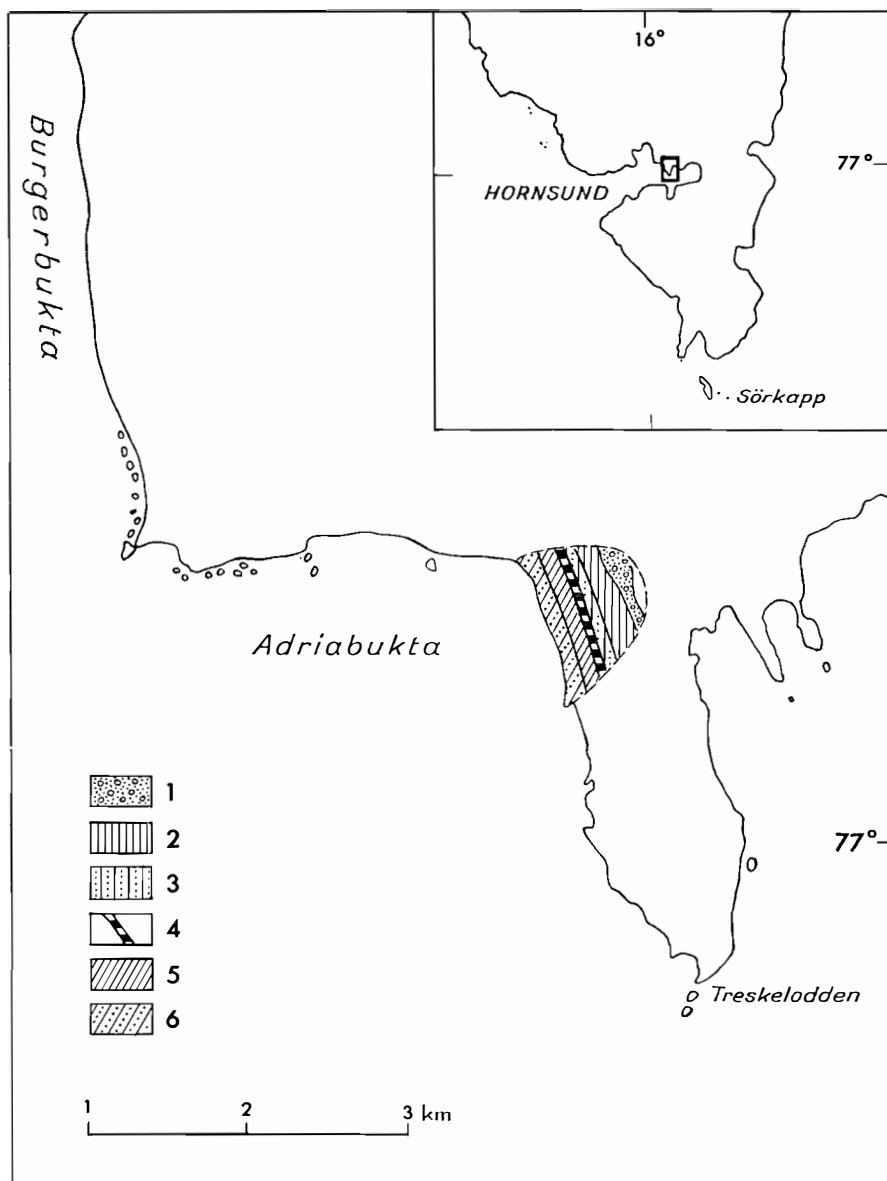


Fig. A. Map of late Palaeozoic deposits north of Hornsund, Vestspitsbergen (cut from Fig. 1, BIRKENMAJER 1964). 1) Moraines, partly outwash; 2) Middle and Upper Trias (+ Rhaetic); 3) Lower Trias (Eotrias); 4) Brachiopod Cherty Limestone (Upper Permian); 5) Treskelodden Beds (Upper Carboniferous - lowermost Permian); 6) Hyrnefjellet Beds (Middle Carboniferous).



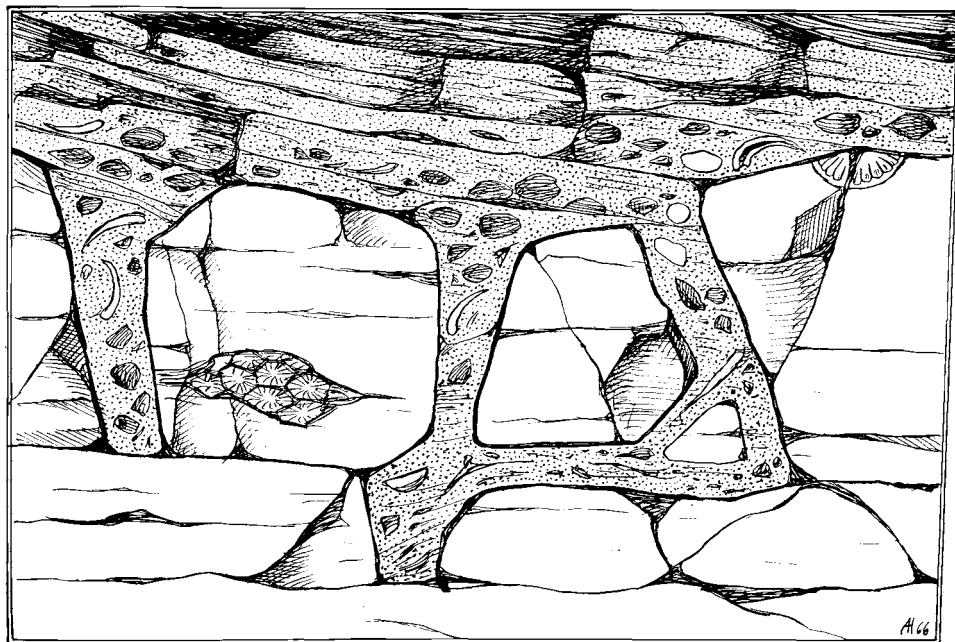


Fig. B. Lower Permian, horizons 20 and 21 (F.& H.).

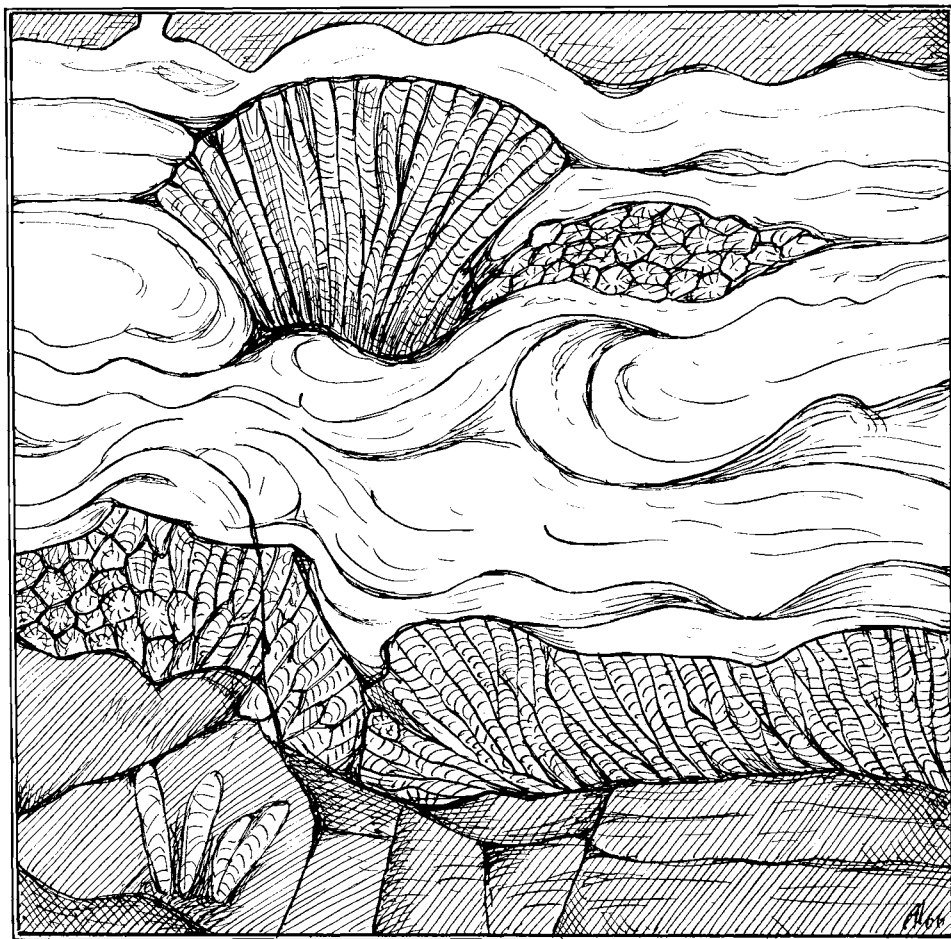
bryozoans and swamps. Thus it seems obvious that a rather long time has elapsed between the depositions of the horizons 20 and 21. The boundary between these two horizons form a distinct and natural limit between the lower and upper parts of our section.

The fauna in the twenty lowest horizons of our section (1 to 20) is rather poor and uniform, and consists only of different corals. The other fossils we recorded were a few badly preserved fragments of echinoid-stalks. All the corals seem to have been transported and deposited in a secondary layer. Many of them have eroded surfaces, some are rolled, cracked or damaged in other ways. It is, however, quite understandable that corals – typical marine animals as they are – could not live in the fresh or brackish water, where the coarse sediments of the red series were deposited. The corals certainly originated from older marine deposits lifted up and eroded.

We have chosen as horizon 1 in our section the one where we discovered the first corals. This horizon is about 7 m thick and consists of conglomerate. We collected the corals in the basal part of the layer.

The horizon 2 is only about 2.5 m thick and consists of coarse conglomerate. The corals were collected in the grayish sandy layer in the upper part of the horizon. (Horizons 1 and 2 correspond probably to BIRKENMAJER's "Coral Limestone Horizons I".) The conglomerate horizon 3 was about 5 m thick and did not contain any fossils.

The horizon 4, about 1 m thick, contained on the contrary very many corals, and seemed partly to consist of larger and smaller pieces of corals and coral-



10 cm

Fig. C. Coral colonies in Lower Permian, horizon 20 (F.& H.).

colonies washed together. This horizon is in fact the richest fossiliferous layer from the red conglomerate series.

The horizon 5, nearly 3 m thick, is empty of fossils. The horizon 6, measuring less than 1 m in thickness, is on the contrary relatively rich in fossils and rather similar to horizon 4. (Horizons 4 and 6 correspond probably to BIRKENMAJER's "Coral Limestone Horizon II".)

Then follows the approx. 9 m thick conglomerate, horizon 7, without fossils. It is covered by the about 5 m thick horizon 8, containing only a few corals (corresponding probably to BIRKENMAJER's "Coral Limestone Horizon III"). These following 4 horizons, 9, 10, 11, and 12, are without fossils. Together their thickness amounts to about 12 m.

The horizon 13, about half a meter in thickness, is again fossiliferous, but contains only badly preserved, rolled corals.

Horizons 14 to 19 measured together about 24 m, and consisted of conglomerates

and sandstones. Only in horizon 15 (about 1 m thick) some fragments of corals were discovered. (Horizons 13 and 15 correspond probably to BIRKENMAJER's "Coral Limestone Horizon IV".)

The horizon 20 is approx. 6 m thick, and the uppermost part, about  $\frac{1}{2}$  m, is more or less completely penetrated by the above mentioned cracks (Fig. B). The horizon consists of more finely granulated sandstones and calcareous bands and thin more irregular layers of slate. Cross-bedding and stream-structures are common. Large pieces of coral colonies are relatively abundant, situated in a rather regular way (Fig. C). (Horizon 20 corresponds probably to BIRKENMAJER's "Coral Limestone Horizon V".) The cracks in the upper part of horizon 20 are filled, as mentioned above, with a darker finely granulated calcareous sediment with fossils (brachiopods) and rounded and oval lumps, which occur richly also in the basal part of the horizon 21.

We marked the corals collected in horizon 20 below the upper division with cracks, as collected "in horizon 20". But corals collected in the upper part of this layer among the cracks are labelled "from horizons 20-21". In fact, this determination is not exact, as horizon 21 does not contain any corals, and the corals collected in "horizons 20-21" belong in reality to the upper part of horizon 20 (Fig. B).

The horizon numbers used in Dr. FEDOROWSKI's paper refer mostly to the horizons mentioned here, but in some few cases also to horizons established by BIRKENMAJER (1964). To avoid mistakes the letters "F. & H." have been added in brackets after the number of the horizons referring to our section, *e. g.* "horizon 20 (F. & H.)".

ANATOL HEINTZ  
Paleontologisk Museum, Universitetet i Oslo



## Abstract

Lower Permian corals from Treskelodden, Hornsund, Vestspitsbergen, collected in 1949 by the Norwegian expedition led by S. FØYN, geologist, and professor A. HEINTZ, are described. The collection comprises 21 species of *Tetracoralla* (7 of them new), and 5 species of *Tabulata* (1 species new). The foreword written by Professor A. HEINTZ gives information on the stratigraphic succession of the coral-bearing beds.

## Introduction

The present paper contains only the faunal descriptions of the representatives of the *Tetracoralla* and *Tabulata*, gathered by the 1949 Norwegian expedition on the Treskelodden peninsula. The collection examined comprises 21 species of the *Tetracoralla*, as well as 5 species of the *Tabulata*. The material consists mostly of incomplete coralla without proximal parts and calices as well as strongly worn corals. Colonial forms predominate in this material.

In the present paper, the author does not either try to interpret stratigraphically the coral horizons, or undertake paleontological and other investigations, since it has already been done by him in a more extensive elaboration of corals, collected, among other places, in the same region by Doc. Dr. KRZYSZTOF BIRKENMAJER and Dr. STANISLAW CZARNIECKI, members of the 1957–1958 Polish Spitsbergen Expeditions (J. FEDOROWSKI 1965, Lower Permian *Tetracoralla* of Hornsund, Vestspitsbergen). Only new species, and those not described in the work mentioned above, are discussed here in a more extensive manner. Only the diagnosis and brief remarks are given for the remaining species. Diagnoses written in quotation marks have been cited after the author, who has introduced it. The name of the author, the year of publication and the page have been cited in parentheses. Species with unknown diagnosis, or perhaps unknown to the author, have received a new diagnosis in this paper without putting them in quotation marks. All species mentioned are illustrated.

All specimens described in the present paper are preserved at the Paleontological Museum in Oslo, Norway. An abbreviation, P.M.O., is used to denote it. In giving successive numbers of specimens belonging to particular species, except for holotypes, this abbreviation is left out.

The systematics of the *Tetracoralla* is based on "The Treatise on Invertebrate Paleontology", Part F, 1956, while that of the *Tabulata* is given according to "Osnovy Paleologii", 1962.

## Acknowledgements

I wish to thank Professor Dr. ANATOL HEINTZ, the director of the Paleontological Museum in Oslo, for entrusting me with the elaboration of this interesting collection.

I am indebted to Professor Dr. MARIA RÓŹKOWSKA, the head of the Polish Academy of Sciences, Paleozoological Laboratory in Poznań, for interesting discussions and for critically reviewing the manuscript of this paper.

My thanks are also due to Doc. Dr. KRZYSZTOF BIRKENMAJER of the Polish Academy of Sciences, Geological Laboratory in Cracow, for his help in obtaining the material described below.

## Descriptions

Type: Coelenterata  
Class: Anthozoa  
Order: Tetracoralla  
Family: Cyathopsidae DYBOWSKI, 1873  
Genus: *Caninophyllum* LEWIS, 1929

Remarks. Genus *Caninophyllum* LEWIS, 1929 is like *Caninia* MICHELIN, 1840 by its morphology and evolutionary trend. It differs from it, according to LEWIS, by the lack of an amplexoid stage in ontogenesis, by its broader dissepimentarium with an angulo-concentric pattern and longer septa of the second order, which after LEWIS' description penetrate the tabularium. These features mainly have been stated in Spitsbergen species of *Caninophyllum*. The caninophylloid ontogenetic stages have been observed only in *C. ovibos* (SALTER), 1855 (FEDOROWSKI, 1965, p. 15, Text-Fig. 1a, b), the other species being badly destroyed. The main difference lies however in the length of minor septa — short in Spitsbergen species of *Caninophyllum*.

D. HILL (1939) includes two species described by the present author, *Caninophyllum kokscharowi* (STUCKENBERG), 1895 and *C. ovibos* (SALTER), 1855 into *Caninia juddi* (THOMSON) from the Lower Carboniferous of England. The present author is not competent to determine whether THOMSON's species is either *Caninia* or *Caninophyllum*, but in his opinion the greater part of Upper Carboniferous and Permian species described from the Ural Mts., Timan Mts., Spitsbergen and Canadian Arctic Archipelago, and included by HILL, 1939 into this species, do not belong to the Lower Carboniferous species *C. juddi* (THOMSON).

*Caninophyllum ovibos* (SALTER), 1855  
(Pl. I. Fig. 1a, b)

1965 *Caninophyllum ovibos* (SALTER); J. FEDOROWSKI, Lower Permian Tetracoralla . . . , pp. 13–18, Text-Fig. 1a–f; Pl. I., Figs. 1a–d, 2, 3a, b (cum synon.).

Material. Four fragments of individual corals, Nos. A 25173, A 25178, A 25183, A 25184 from coral horizon 20 (F.& H.) have been assigned to this species.

Diagnosis. "Caninophyllum with number of septa amounting to  $73 \times 2$ ; minor septa short, not reaching the interior wall; cardinal septal fossula open, distinct tabular fossula; tabularium covering about  $\frac{2}{3}$  of the diameter of corallite; dissepimentarium broad". (After J. FEDOROWSKI, 1965, p. 14.)

Remarks. The specimens discussed are identical with those, described previously from the Spitsbergen layers, considered as the Upper Carboniferous (F. HERITSCH, 1929, 1939), or Lower Permian (J. FEDOROWSKI, 1965). Besides, this species occurs in the Lower Permian of the Canadian Arctic Archipelago (P. HARKER, 1960).

*Caninophyllum kokscharowi* (STUCKENBERG), 1895

(Pl. I, Fig. 2, Text-Fig. 1a, b)

1965 *Caninophyllum kokscharowi* (STUCKENBERG); J. FEDOROWSKI, Lower Permian Tetracoralla . . . , pp. 21, 22, Pl. I, Fig. 5a, b (cum synon.).

Material. Four rock fragments from horizon 8 (F.& H.), Nos. A 25143, A 25144, A 25147 and A 25148, containing 7 pieces of strongly damaged corals.

Diagnosis. "Simple coral of a considerable size. Septa of the 1st order thickened by stereoplasm towards the center of the vesicles, particularly in the cardinal quadrants. Septa of the 2nd order, short, thin and flexuous. Vesicles of

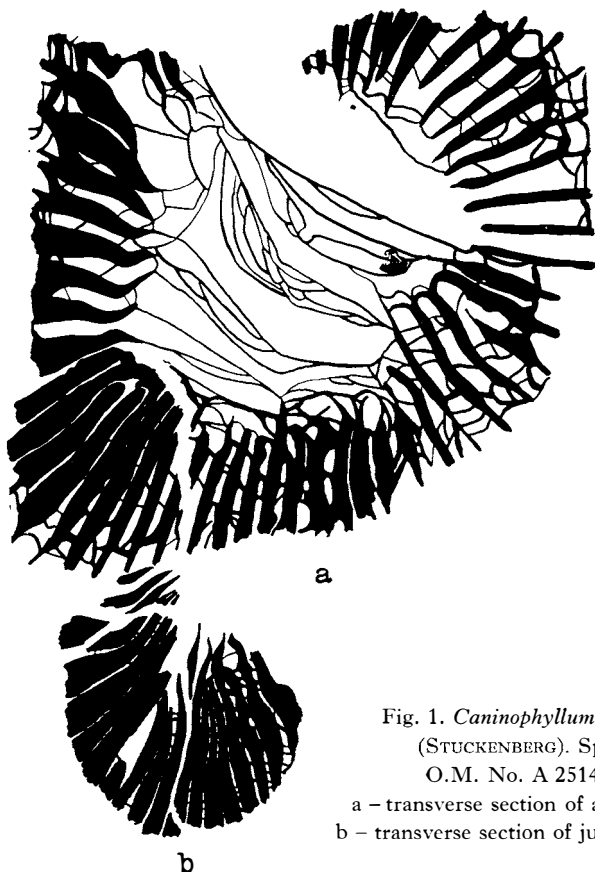


Fig. 1. *Caninophyllum kokscharowi*  
(STUCKENBERG). Specimen  
O.M. No. A 25148,  $\times 2$ .

a - transverse section of adult corallite.  
b - transverse section of juvenile corallite.

a different shape and size form a wide ring. Tabulae widely spaced, locally split. External wall thin" (T. A. DOBROLYUBOVA, 1941, p. 126.)

Remarks. In their general morphological character these corals are related to the specimens from the Ural Mountains, described by A. STUCKENBERG (1895) and T. A. DOBROLYUBOVA (1936, 1941) from the Artinskian limestones. All major septa spindle-like, are more prominent in cardinal quadrants. Minor septa, short and thin, the dissepimentarium broad. It seems that the Spitsbergen specimens have a slightly larger number of septa, as the specimens from Treskelen, Vest-spitsbergen, discussed by the present author (1965).

*Caninophyllum* sp.

(Text-Fig. 2a, b)

Material. Three severely damaged individual corals, that is, Nos. A 25658, A 25688 from horizon 4 and No. A 25167 from horizon 20 (F.& H.). Proximal ends and calices missing, surfaces of specimens extensively damaged. The determination of true diameters and number of septa impossible.

Description. Transverse section (Text-Fig. 2a) not complete, only fragments of dissepimentarium have been preserved and we may conclude that it has been large, with interior rows of dissepiments arranged in a herring bone pattern, but there is no distinct interior wall. Minor septa short. Major septa in cardinal quadrants wedge-shaped, dilated inside the tabularium, inclined towards the shortened cardinal septum. Cardinal fossula broad, open, adjacent major septa shortened. Major septa in counter quadrants within the tabularium slightly dilated, but in the dissepimentarium thin.

Longitudinal section (Text-Fig. 2b). Tabulae mostly incomplete, arched, vesicular, arranged steeply, something higher at one side of the corallite.

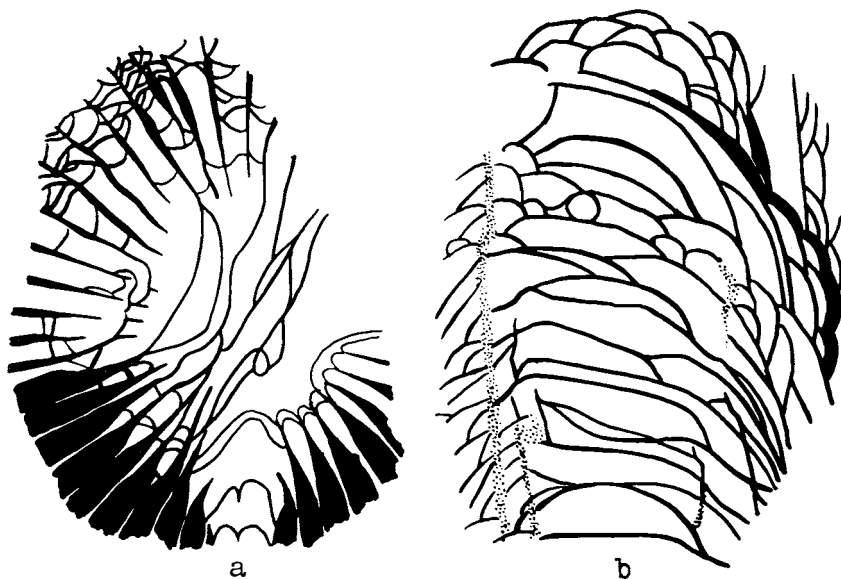


Fig. 2. *Caninophyllum* sp. ×2.

a - transverse section. Specimen O.M. No. A 25167.

b - longitudinal section. Specimen O.M. No. A 25688.



Remarks. The discussed specimens are closely related in their measurable features and shape of major septa to *Caninophyllum nikitini* (STUCKENBERG), 1905. They differ from this species by tabularium shape, which is built up by flat horizontal tabulae, and by their shorter minor septa. The described specimens did not receive a new species name as they were badly damaged.

Genus: *Bothrophyllum* TRAUTSCHOLD, 1879

*Bothrophyllum permicum* FEDOROWSKI, 1965

(Text-Fig. 3a-c)

1965 *Bothrophyllum permicum* FEDOROWSKI; J. FEDOROWSKI, Lower Permian Tetracoralla..., pp. 31-37, Text-Fig. 6a-g, Pl. III, Fig. 4a, b, Pl. IV, Figs. 2a, b, 3.

Material. Two rock fragments, Nos. A 25153 and A 25160, containing 10 fragments of corals from horizon 13 (F.& H.) and a specimen No. A 25532 from horizon 20-21 (F.& H.). Only the fragments of young parts of corallites have been preserved. The strongly cracked corals stick in a coarse clastic material on a secondary bed.

Diagnosis. "*Bothrophyllum* 38 mm in diameter and with 41-44 long, thickened, spindle-like major septa. Minor septa may penetrate the internal wall. Dissepimentarium broad. Cardinal fossula open, tabular fossula distinct. Counter septum often elongated. Tabulae with numerous vesicular accessory plates." (After J. FEDOROWSKI, 1965, p. 34.)

Remarks. In the material under study there occur much younger ontogenetic stages than those known in the holotype. In the youngest stage investigated, there

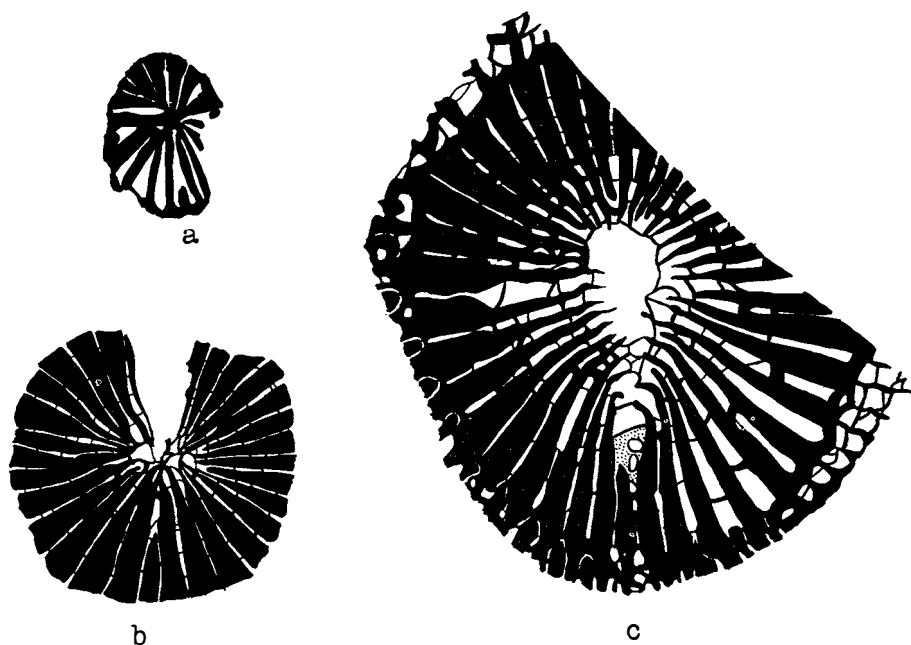


Fig. 3. *Bothrophyllum permicum* FEDOROWSKI. Specimen O.M. No. A 75160. a, b - transverse sections of juvenil stages. c - transverse section of early-ephebic stage,  $\times 3$ .

are 15 septa, combined into systems which in turn are united in a corallite's center. Neither the cardinal fossula nor the cardinal septum (Text-Fig. 3a) can be distinguished at this stage.

In further development stages, the length of major septa is differentiated and the cardinal fossula is formed in which a shortened major septum is contained. Septa remain combined into systems. Still, there are neither minor septa nor dissepimentarium.

The next development stages have been described in the holotype. In the present material they are very similar or even identical (Text-Fig. 3c) and, as mentioned above, there are no adult stages.

*Bothrophyllum orvini* n. sp.  
(Text-Fig. 4a-e)

Holotype: the specimen P.M.O. No. A 25700.

Type locality: Treskelodden, Vestspitsbergen.

Type stratum: Horizon 2 (F.& H.), Lower Permian.

Name derivation: *orvini* – in honour of Dr. A. K. ORVIN.

Material. Eleven individual corals from horizon 2 (F.& H.), from Treskelodden. Corals are set in the three fragments of a grey sandstone with calcareous cement. They are denoted by Nos. A 25397, A 25700, A 25908. Specimens are incomplete, mostly lacking calices and proximal parts. They probably occur on a secondary bed.

Diagnosis. *Bothrophyllum* with ceratoid corallites 25 mm in diameter. About 40 major septa with various lengths, many of them approaching the corallite axis. Minor septa very short. Cardinal septum shortened, the opposite one elongated, cardinal fossula open. The very narrow dissepimentarium does not occur in the calyx.

Descriptions. Transverse section (Text-Fig. 4a-c). Major septa thickened, slightly twisted or straight, with different lengths. Many of them reach the corallite axis where, together with tabulae, they form a transparent axial structure. Cardinal septum thickened, very short and located in an open cardinal fossula. Major septa, near the fossula, have their axial ends bent over the cardinal septum. Minor septa very short and narrower than major septa. A single, it seems, dissepiment ring and loosely scattered tabellae cross-sections extend between septa. In the calyx, septa become shorter and thinner, while the dissepimentarium disappears.

Longitudinal section (Text-Fig. 4d, e). Dissepiments slightly convex, arranged in 1-2 rows near the epitheca. Tabulae incomplete. In their peripheral parts, they have accessory plates regularly arranged and alternate to the tabulae. Axial part of the tabularium very irregular. Cross-sections of the twisted axial parts of major septa, playing the role of columella, as well as a few irregular tabulae with their accessory plates, occur in this place. Axial parts of these tabulae are very often tent-shaped and elevated towards columella. Axial part of the tabularium is irregular to such an extent that it seems to be crushed.

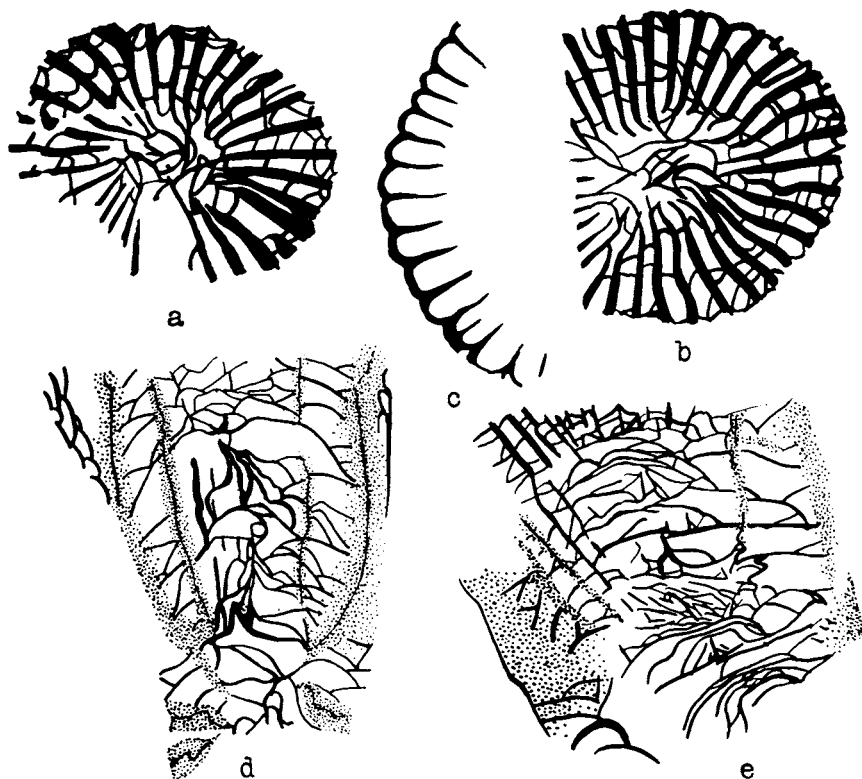


Fig. 4. *Bothrophyllum orvini* n. sp. Holotype. Specimen O.M. No. A 25700,  $\times 2$ .  
a, b - transverse sections. c - transverse section of calyx.  
d, e - longitudinal sections.

Remarks. The new species differs from other representatives of the genus *Bothrophyllum* in 1) a very small dissepimentarium which appears only in the final development stage, and never reaches a large width and disappears in the calyx; 2) identical thickening of major septa in all quadrants; 3) very short minor septa.

The differentiation of the lengths of major septa is a distinct generic feature. Some major septa reach the corallite axis and, together with tabulae, form a loose axial structure with columella.

*B. permicum* FEDOROWSKI, also described from Spitsbergen, in which the thickness of major septa is not differentiated at all, is a species related to *B. orvini* n. sp.

Family: Polycoeliidae ROEMER, 1883

Genus: *Svalbardphyllum* FEDOROWSKI, 1965

*Svalbardphyllum* sp.

(Pl. I, Fig. 3, Text-Fig. 5a, b)

Material. Seven fragments of rock, Nos. A 25139 - A 25142, A 25145, A 25146, from horizon 8 and No. A 25630 from horizon (F.& H.) containing 13 fragments of individual corals.



Fig. 5. *Svalbardphyllum* sp. Specimen O.M. No. A 25146,  $\times 2$ .  
a - transverse section. b - longitudinal section.

Remarks. Due to the lack of a transverse section of an adult individual, the number of septa remains unknown. Major septa strongly thickened and arranged in systems similar to *S. pachyseptatum* FEDOROWSKI in which proto- and, sometimes, metasepta are combined in pairs. Such an arrangement of the major septa and the lack of the dissepimentarium induced the present author to assign the specimens in question to the genus *Svalbardphyllum*.

In younger development stages, septa are also strongly thickened and combined into systems. They fill the entire interior of the corallite. A narrow tabularium with widely scattered concave tabulae is visible in the longitudinal section. Dissepimentarium is lacking.

In view of the lack of complete adult stage specimens, neither the diagnosis nor the species name have been established for the specimens described, which probably belong to a new species. They are much larger and have more septa than *S. pachyseptatum* FEDOROWSKI, which so far is the only representative of the genus *Svalbardphyllum*.

Family: Aulophyllidae DYBOWSKI, 1873

Genus: *Heintzella* n. gen.

Type species: *Heintzella multiseptata* n. sp.

Type locality: Treskelodden, Vestspitsbergen.

Type stratum: Horizon 13 (F. & H.), Lower Permian.

Name derivation: *Heintzella* - in honour of Professor Dr. ANATOL HEINTZ, Director of Paleontologisk Museum, Oslo.

Geographical distribution: Spitsbergen, Ural Mts. and Central Russia, USSR.

Generic diagnosis. Phaceloid Aulophyllidae with well developed dissepimentarium, composed of the regular, or regular and herring-bone dissepiments. Septa of two orders, thickened in the tabularium. No lonsdaleoid vesicles. Cardinal

fossula, in general, present, narrow, open, usually slightly sunken into the dissepimentarium. Cardinal septum shortened. Axial structure poorly developed, irregular, interrupted. May be constructed only by septal lamellae without medial plate.

Included species will be listed below:

*Heintzella multiseptata* n. sp.  
*Heintzella spitsbergensis* (FEDOROWSKI)  
*Heintzella densiseptata* (FEDOROWSKI)  
*Heintzella radiata* (FEDOROWSKI)  
*Heintzella rossica* (STUCKENBERG)  
*Heintzella stuckenbergi* (DOBROLYUBOVA)

Remarks. This genus is a new name for *Fischerina* STUCKENBERG, 1904. LANG, SMITH and THOMAS (1941) have stated that the generic name of *Fischerina* was already used for a foraminiferal genus *Fischerina* TERQUEM, 1878.

M. KATO (1959) discussed with some certainty the similarities and differences between "*Fischerina*" and related genera. The present author has however another opinion as to the genus *Koninckophyllum* NICHOLSON et THOMSON, 1876. This is:

1. Both genera "*Fischerina*" (= *Heintzella*) and *Koninckophyllum* have a cardinal fossula and a shortened cardinal septum. This sign is weakly accented in *Heintzella*, and some individuals in colonies may not have a fossula. Perhaps STUCKENBERG (1904) has described such individuals.

2. Septa of the second order reach the tabularium in both genera, but in *Heintzella* – generally in Russian species – the second order septa may be shortened, and a herring-bone structure appears.

3. The most important differences are as follows:

- a) the dissepimentarium is considerably narrower in *Heintzella*, and
- b) the construction of the axial structure in *Heintzella* is very similar to that of the family Durhaminidae MINATO & KATO, 1965, for the columella is not thickened or is lacking and there remain only irregular septal lamellae and vesiculate central tabellae.

*Heintzella* differs from *Durhamina* WILSON & LANGENHEIM, 1962 by the complete lack of lonsdaleoid vesicles. Of all members of the Durhaminidae family it differs by the presence of the cardinal fossula and the shortened cardinal septum. This feature enabled the author to include the new genus *Heintzella* in the family Aulophyllidae DYBOWSKI, 1873.

*Heintzella spitsbergensis* (FEDOROWSKI), 1960  
(Pl. I, Fig. 4a, b, Pl. II, Fig. 1)

1965 *Fischerina spitsbergensis* (FEDOROWSKI); J. FEDOROWSKI, Lower Permian Tetracoralla... , pp. 49–52, Text-Figs. 10a–e, 11<sub>1–9</sub>, 16; Pl. VI, Figs. 1a, b, 2 (cum synon.).

Material. Twenty-one specimens from Treskelodden, No. A 25135 from horizon 6, and Nos. A 25117–A 25120, A 25122, A 25126, A 25128, A 25534, A 25620, A 25624, A 25625, A 25627, A 25633, A 25650, A 25662, A 25683–A 25685, A 25687, A 25691 from coral horizon 4 (F. & H.).

Diagnosis. "*Heintzella* with corallites ranging from  $13.0 \times 10.5$  mm to  $18.1 \times 14.4$  mm in diameter. Number of septa  $23 \times 2$  to  $27 \times 2$ ; septa long, thin, almost straight, do not reach the axis of the corallite occupied by a weak axial structure, more rarely by a columella. Tabularium occupies about a half of diameter of the corallite. Cardinal fossula poorly developed." (After J. FEDOROWSKI, 1965, p. 51.)

Remarks. This species was first described by the present author (J. FEDOROWSKI, 1965), also from Treskelodden, and its Coral Limestone Horizon I (K. BIRKENMAJER's division, 1959, 1960, 1964; K. BIRKENMAJER and S. CZARNIECKI, 1960). The specimens discussed fall completely within the range of the individual variability of this species. Some corals differ from those described previously only in their more complex axial structure and in a more distinct cardinal fossula, their measurable features remaining identical.

*Heintzella multiseptata* n. sp.

(Pl. II, Figs. 2a-c, 3)

Holotype: the specimen P.M.O. No. A 25158.

Type locality: Treskelodden, Vestspitsbergen.

Type stratum: Horizon 13 (F.& H.), Lower Permian.

Name derivation: multiseptata – after numerous septa.

Material. Eight fragments of the fasciculate colonies Nos. A 25621, A 25671, A 25676 from coral horizon 4, and Nos. A 25134, A 25154, A 25156 – A 25158 from coral horizon 13 (F.& H.). Corallites large, widely scattered in the colony, many specimens crushed. Calices and proximal parts of the colony lacking.

Diagnosis. *Heintzella* with corallites 18–22 mm in diameter and with  $31 \times 2$  to  $38 \times 2$  septa. Axial structure interrupted, irregular. Cardinal fossula not always distinct; tabular fossula present.

Description. Transverse section (Pl. II, Fig. 2a, b). Major septa long, thickened in the tabularium, straight; wavy, thin in the dissepimentarium. In general, they do not make up a part of an axial structure. Minor septa wavy, thin, slightly penetrating the tabularium. Axial structure in the form of an irregular, entangled network, more or less complex and broken in several places. Columella mostly undistinguishable.

Dissepimentarium narrower than tabularium, consists of fine dissepiments. Near the internal wall, they are more densely arranged. Cardinal fossula narrow, open, usually slightly sunken into the dissepimentarium. Cardinal septum shortened, its axial end thickened.

Longitudinal section (Pl. II, Figs. 2c, 3). Dissepimentarium consists of 5–8 rows of dissepiments, vertically disposed. Slightly thickened walls of the internal dissepiment row form an internal wall. Tabularium broad. Incomplete tabulae, near the cardinal septum concave, form a tabular fossula. On the opposite side, tabulae vesicular, with numerous accessory plates, obliquely disposed. In the axis, when columella occurs, tabulae are raised obliquely towards the axis and furnished with numerous accessory plates. Where there is no axial structure, tabulae are flat in the axis and with a few accessory plates.

Individual variability. The species is relatively stable. The axial structure, a rudimentary element, is subject to the greatest variability even in the same corallite. In the fragments of corallites, it takes the form of a more or less tangled irregular network. Sometimes, it may disappear. Cardinal fossula is also subject to slight changes, with a tendency to reduction. The length and thickness of the cardinal septum is different in certain corallites. These changes do not exceed, however, the broad amplitude of the individual variability which, in fact, is typical of most Lower Permian species.

Remarks. The species described is morphologically similar to *H. radiata* (FEDOROWSKI), 1965. It differs from the latter in somewhat larger diameters of corallites and in a much larger number of septa with the same diameter.

In addition, *H. multiseptata* n.sp. has a more complex axial structure, its major septa are shorter, more thickened in the tabularium and more wavy in the dissepimentarium. Minor septa are in general longer and its dissepimentarium denser than in *H. radiata*. On the other hand, the longitudinal sections of both species are very similar to each other.

Family: Lithostrotionidae D'ORBIGNY, 1851

Genus: *Tschussovskenia* DOBROLYUBOVA, 1936

*Tschussovskenia captiosa* DOBROLYUBOVA, 1936

(Text-Fig. 6)

1965 *Tschussovskenia captiosa* DOBROLYUBOVA; J. FEDOROWSKI, Lower Permian Tetracoralla. . . , pp. 66–68, Text-Figs. 18a–d, 21; Pl. V, Figs. 2, 3a, b (cum synon.).

Material. Two specimens, Nos. A 25155 and A 25159, from coral horizon 13 (F.& H.).

Diagnosis. "Coralla fasciculate with corallites 4–16 mm in diameter and  $17 \times 2$  to  $27 \times 2$  septa of various length and thickness. Dissepimentarium and internal wall weakly developed or absent. Tabulae arched, partially incomplete. Epitheca of various thickness. Sometimes columella in the form of free lamella or a simple axial structure is present." (After T. A. DOBROLYUBOVA, 1941, p. 149.)

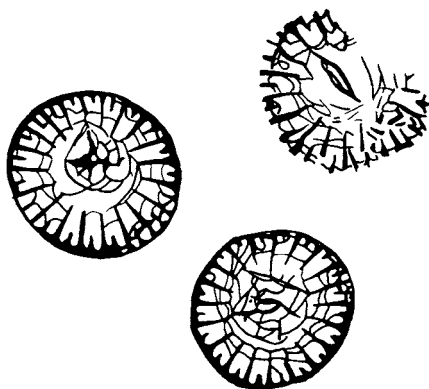


Fig. 6. *Tschussovskenia captiosa* DOBROLYUBOVA. Specimen O.M. No. A 25159,  $\times 2$ .

Remarks. This species, first described from the Ural Mountains (T. A. DOBROLYUBOVA, 1936), is also known from Laos (A. FONTAINE, 1961). It was described by the present author from Coral Limestone Horizon IV in Spitsbergen (K. BIRKENMAJER's division, 1959, 1960, 1964; K. BIRKENMAJER and S. CZARNIECKI, 1960).

The specimens described are almost identical with those described previously from Spitsbergen, except for their slightly more frequent complex axial structure. Their measurable properties are identical and are in the middle of the range of the intraspecific variability, given by T. A. DOBROLYUBOVA, 1936.

Genus: *Stylastraea* LONSDALE, 1845  
*Stylastraea toulai* (STUCKENBERG), 1895  
(Pl. II, Fig. 4, Pl. III, Fig. 1)

1965 *Stylastraea toulai* (STUCKENBERG); J. FEDOROWSKI; Lower Permian Tetracoralla... , pp. 78-82, Text-Figs. 25a-c, 26<sub>1-6</sub>, 29; Pl. VII, Figs. 2a, b, 3a, b, 4 (cum synon.).

Material. Two fragments of the cerioid coralla, No. A 25689 from coral horizon 4 and No. A 25185 from horizon 20-21 (F.& H.).

Diagnosis. "*Stylastraea* with cerioid coralla, tabular or hemispheric. Corallites 11.5 to 16 mm in diameter. Major septa 18 to 21 in number, usually continuous, penetrating for about 1 mm into the tabularium. Minor septa rudimentary. Columella absent." (After J. FEDOROWSKI, 1965, p. 78.)

Remarks. This species is known from the Lower Permian of the Ural Mountains and of the Canadian Arctic Archipelago. It was described by the present author (J. FEDOROWSKI, 1965) from Spitsbergen's Coral Limestone Horizon V (K. BIRKENMAJER, 1959, 1960, 1964; K. BIRKENMAJER and S. CZARNIECKI, 1960), as well as from layers considered to be the Artinskian.

The specimen No. A 25185 is identical with the specimen No. 30 described by the author (J. FEDOROWSKI, 1965, Pl. VIII, Fig. 2a, b). The specimen No. A 25689 differs slightly in its broader dissepimentarium, in longer minor septa, and in the occurrence of the rudimentary columella in corallite fragments.

*Stylastraea tenuiseptata* FEDOROWSKI, 1965  
(Pl. III, Fig. 2a, b, Text-Fig. 7a, b)

1965 *Stylastraea tenuiseptata* FEDOROWSKI; J. FEDOROWSKI, Lower Permian Tetracoralla... , pp. 82-86, Text-Figs. 27a-e, 28<sub>1-6</sub>, 29; Pl. VIII, Figs. 1a, b, 2, Pl. XIV, Fig. 4.

Material. Nine fragments of cerioid coralla, that is, Nos. A 25171, A 25179 from coral horizon 20 and Nos. A 25638-A 25640, A 25644, A 25648, A 25677, A 25680 from coral horizon 4 (F.& H.).

Diagnosis. "*Stylastraea* with corallites 9 to 13 mm in diameter, and 16 to 18 major septa, not infrequently detached from epitheca. Minor septa partly reduced. Weak, discontinuous axial structure present in fragments of corallites." (After J. FEDOROWSKI, 1965, p. 82.)



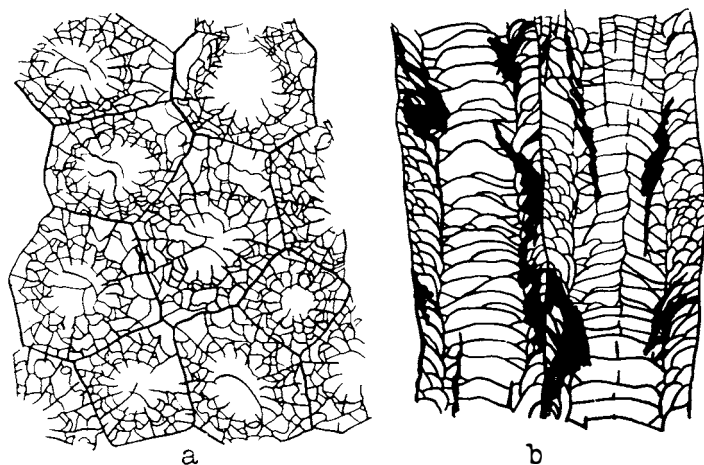


Fig. 7. *Stylostraea tenuiseptata* FEDOROWSKI. Specimen O.M. No. A 25677,  $\times 2$ .  
a - transverse section. b - longitudinal section.

Remarks. This species was previously described also from layer "a" of Coral Limestone Horizon V from Treskelodden (K. BIRKENMAJER, 1959, 1960, 1964; K. BIRKENMAJER and S. CZARNIECKI, 1960). The specimens discussed fall within the range of the individual variability of the genus, this range being, in fact, very extensive. They show a considerable extent of variability both within a colony and between several coralla. Corallites are in general finer than in the holotype (they are mostly 8–10 mm in diameter) and have frequently less major septa (15–16).

The lengths of major septa are differentiated to a great extent. In some coralla they barely penetrate the internal wall, in others, they reach the corallite axis. A columella or an axial structure occur in some corallites more frequently, in others, only sporadically. The specimen No. A 25680, with long major septa, often separated from the epitheca, and with a very small number of rudimentary columella, differs to a great extent from the remaining specimens. It is somewhat related to the genus *Thysanophyllum*.

The blastogenesis investigated in specimen Nos. A 25171 and A 25640, is slightly different in its details from that in the holotype, its fundamental properties remaining, however, identical. As a matter of fact, the variability of the blastogenetic details seems to be typical of this unstable species.

*Stylostraea minima* n.sp.

(Text-Figs. 8a, b, 9a–g, Pl. III, Fig. 3a, b)

Holotype: the specimen P.M.O. No. A 25163.

Type locality: Treskelodden, Vestspitsbergen.

Type stratum: Coral horizon 15 (F.& H.), Lower Permian.

Name derivation: minima – after relatively small dimensions.

Material. Five fragments of cerioid coralla, Nos. A 25651, A 25668, A 25669 from coral horizon 4, No. A 25163 from coral horizon 15, and No. A 25168 from

coral horizon 20 (F.& H.). Coralla cylindrical, corallites very long, polygonal in shape. Gemmation occurs very seldom.

Diagnosis. *Stylastraea* with corallites 5.5 to 9 mm in diameter. Fifteen to eighteen major septa, reaching almost the corallite axis, are sometimes separated from the epitheca. Minor septa often pierce the internal wall. Rare rudimentary columella.

Description. Transverse section (Pl. III, Fig. 3a, Text-Fig. 8a). Major septa long, almost straight, thickened in tabularium, reaching almost the corallite axis. Sometimes, mostly in corners, they are separated from the epitheca. Minor septa, about one-half as long as major septa, usually occur in their full number and, only sporadically, are partially reduced. Often they penetrate the internal wall and, in such cases, their axial ends are thickened.

The columella is broken, occurs seldom, taking the form of a thin or slightly thickened lamina. Numerous corallites never produce columella. Dissepimentarium narrow, mostly consisting of two dissepiment rings. Fine marginal vesicles occur in places where major septa detach from the epitheca.

Longitudinal section (Pl. III, Fig. 3b, Text-Fig. 8b). Dissepiments flat, elongated, obliquely disposed and almost reaching vertical position, arranged in 1–3 rows. Internal wall is not thickened. Tabulae complete, more or less convex, widely scattered. Sometimes, mostly in the periphery, accessory plates are visible. In the case when columella occurs, tabulae are raised towards it.

Ontogenetic development. (Text-Fig. 9a–g.) Blastogenesis was investigated in the specimen No. A 25168. It is quite similar to some blastogenetic variants in *S. tenuiseptata* FEDOROWSKI, and typical of this genus.

1. Hystero-nepionic stage. In the gemmation sector, almost all septa of parent individual detach from the epitheca and, subsequently, are divided into peripheral and internal sections (Text-Fig. 9a). Some peripheral sections may disappear.

Internal sections become reduced, and sometimes even disappear. After the formation of a new epitheca between the bud and a parent corallite, these sections remain on the side of the latter (Text-Fig. 9a–f). In this stage, the peripheral part of the bud is well-developed. This internal part (near the parent corallite) develops only after the formation of the epitheca or, in the neanic stage.

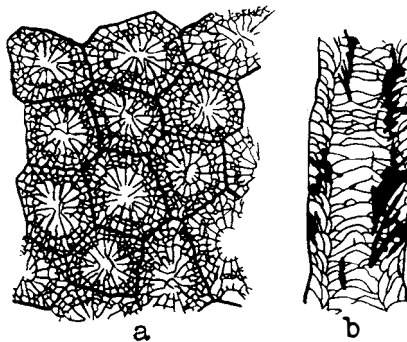


Fig. 8. *Stylastraea minima* n.sp. Specimen O.M. No. A 25163, Holotype,  $\times 2$ .  
a – transverse section. b – longitudinal section.

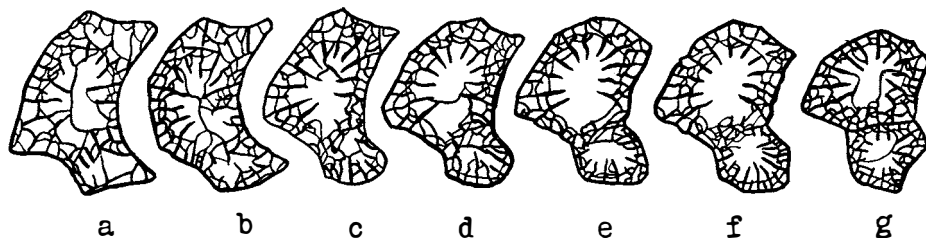


Fig. 9. *Stylastraea minima* n.sp. Specimen O.M. No. A 25168,  $\times 3$ .  
Serial sections of successive stages of blastogenesis.  
a-f - hystero-nepionic stages. g - neanic stage.

2. Neanic stage (Text-Fig. 9g) is characterized by the formation of all structural elements, typical of the genus. A young corallite grows rapidly, increasing its dimensions to the size, typical of its species.

Individual variability. This is a relatively stable species with a low variability amplitude. Several coralla differ slightly from each other in the dimensions of corallites and average number of their major septa. Corallites of the same colony can differ, in addition to the properties mentioned above, in their having or not having a vestigial columella, as well as in a partial separation of septa from epitheca and in the length of major and minor septa.

Remarks. The specimen described differs from the related species *S. tenuiseptata* FEDOROWSKI, and *S. noinskyi* (PORFIRIEV) primarily in its major septa, which are longer, and in a smaller diameter of corallites. It approaches these species in its general number of septa.

Family: Durhaminidae MINATO & KATO, 1965

Genus: *Kleopatrina* MC CUTCHEON & WILSON, 1963

Subgenus: *Kleopatrina* MC CUTCHEON ET WILSON, 1963

*Kleopatrina* (*Kleopatrina*) *pseudoelegans* (DOBROLYUBOVA), 1936  
(Pl. II, Fig. 5, Pl. IV, Figs. 2a-c, 3; Text-Figs. 10a-c, 11a-e)

1965 *Kleopatrina* (*Kleopatrina*) *pseudoelegans* (DOBROLYUBOVA); M. MINATO & M. KATO, Durhaminidae, p. 70 (cum synon.).

Material. Nine fragments of the cerioid coralla, Nos. A 25628, A 25645, A 25659-A 25661, A 25693, A 25695-A 25697, from coral horizon 4 (F. & H.). Blastogenesis was investigated in specimen Nos. A 25660 and A 25697.

Diagnosis. «Cerioid coralla; corallites 4.5 to 10 mm in greatest diameter, with 14 to 18 major septa, usually continuous, sometimes reaching the complicated axial structure.» (After T. A. DOBROLYUBOVA, 1941, p. 188.)

Description. Transverse section (Pl. IV, Figs. 2a, 3; Text-Fig. 10a). Major septa slightly undulate, and in tabularium somewhat thickened. Some of them can be connected to the axial structure. Minor septa short, usually not reaching the internal wall, sometimes partially reduced. Axial structure loose, consisting mostly of a well-developed columella, a few accessory plates and cross sections of tabulae. Dissepimentarium narrow, dissepimenta fine, disposed in 2-4 rings.

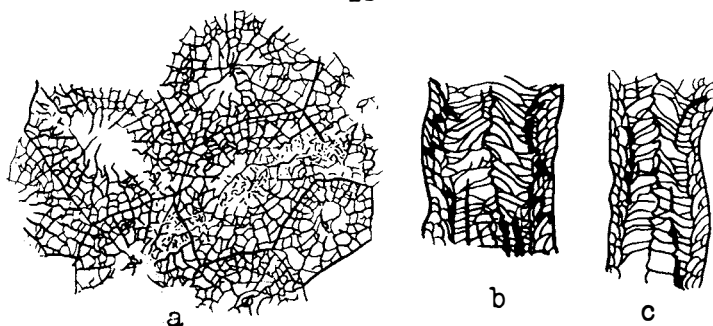


Fig. 10. *Kleopatrina (Kleopatrina) pseudoelegans* (DOBROLYUBOVA),  $\times 2$ .  
 a – transverse section. Specimen O.M. No. A 25659.  
 b, c – longitudinal sections. Specimen O.M. No. A 25697.

Longitudinal section (Pl. II, Fig. 5, Pl. IV, Fig. 2b, c; Text-Fig. 10b, c). Dissepiments steeply inclined, internal wall not thickened. Tabulae incomplete, with numerous accessory plates. Accessory plates and tabulae almost horizontal in the periphery and steeply ascending towards columella in the axis. Columella distinct, strongly undulate. Sometimes, axially disposed tabulae are vesicular in shape.

Ontogenetic development. (Text-Fig. 11a–e.)

1. Hystero-nepionic stage. A part of the septa of a parent individual separates from epitheca in the gemmation sector (Text-Fig. 11a). The division of septa in this sector into peripheral and internal sections occurs almost at the same time. A bud tabularium is formed between them (Text-Fig. 11b). Internal sections are subject to considerable shortening. Oriments of new septa begin to appear (Text-Fig. 11c, d). A new epitheca being formed, it separates small fragments of the internal sections of septa and new septa on the side of the bud (Text-Fig. 11d). In the bud, near the old epitheca, new septa rapidly grow, the dissepimentarium appears.

2. Neanic stage (Text-Fig. 11e). At the new epitheca, a young individual constructs the skeleton in the form typical of the genus and species and increases its dimensions. It is only at the end of this stage that axial structure is formed.

The blastogenesis, described above, differs from that typical of the genus and

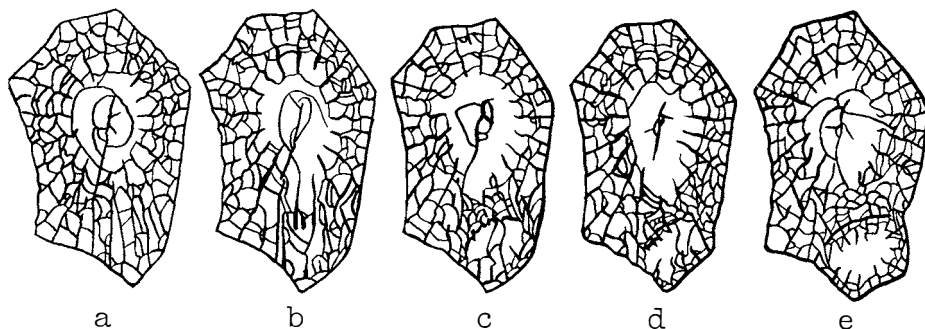


Fig. 11. *Kleopatrina (Kleopatrina) pseudoelegans* (DOBROLYUBOVA).  
 Specimen O.M. No. A 25660,  $\times 3$ .  
 Serial sections of successive stages of blastogenesis.  
 a–d – hystero-nepionic stages. e – early-neanic stage.

recorded in several species. The septa remain unthickened in the gemmation sector, and there is a fairly extensive reduction of the internal sections of the septa. These characteristics relate this blastogenesis to that of the genus *Protowentzelella* PORFIRIEV, 1941.

Individual variability. The range of variability is relatively small. Small differences occur in corallite diameters (to 2.5 mm) and in number of major septa (to 2). Minor septa occur in their full or partially decreased numbers. Relatively great differences occur in the anatomy of the axial structure which shows varying degrees of complexity. The columella is sometimes interrupted.

Remarks. The specimens from Treskelodden, described here, are almost identical with those described by T. A. DOBROLYUBOVA (1936, 1941) from the Artinsk of the Ural Mountains from the beds characteristic of the occurrence of *Pseudofusulina* ex.gr. *anderssoni*. Their somewhat less complex axial structure and broader dissepimentarium (to 5 dissepiment rings) are the only difference.

*Kleopatrina (Kleopatrina) magnifica* (PORFIRIEV), 1941  
(Pl. V, Fig. 1a, b)

1965 *Wentzelella magnifica* PORFIRIEV; J. FEDOROWSKI, Lower Permian Tetracoralla. . . , pp. 96–100, Pl. X, Fig. 1a, b; Text-Figs. 36a, b, 37<sub>1–5</sub>, 40.

1965 *Kleopatrina (Kleopatrina) magnifica* (PORFIRIEV); M. MINATO & M. KATO, Durhaminidae, p. 70 (cum synonym.).

Material. Only one specimen, No. A 25629, from coral horizon 4 (F.& H.).

Diagnosis. "Cerioid coralla. Corallites 9–15 mm in greatest diameter, with 15–22 major septa well developed, sometimes disconnected from epitheca. Minor septa short, sometimes lacking. Marginal vesicles rather regular, forming a wide ring. Tabulae in axial part arched, in periaxial part with tabellae. Epitheca continuous. The centre of the corallite occupied by a reticulate axial structure, consisting of medial lamella, axial ends of major septa and tabellae; locally it is disappearing." (After G. S. PORFIRIEV, 1941, p. 199.)

Remarks. This specimen approaches in the variable length of minor septa the holotype to a higher degree than do the coralla, described from Spitsbergen before by the present author (J. FEDOROWSKI, 1965). These remaining morphological properties are related to the Ural, as well to the Spitsbergen forms. Measurable properties are contained within the range of the intraspecific variability of the species. They are: 13–16 mm in corallites diameter and seventeen to twenty-one major septa. This species is known from Ural Mts. and from Spitsbergen of the Lower Permian.

*Kleopatrina (Kleopatrina) różkowskæ* n. sp.  
(Pl. IV, Figs. 4a, b, 5a, b; Text-Figs. 12a–c, 13a–h)

Holotype: The specimen P.M.O. No. A 25682.

Type locality: Treskelodden, Vestspitsbergen.

Type stratum: Horizon 4 (F.& H.), Lower Permian.

Name derivation: *różkowskæ* – in honour of Professor Dr. MARIA RÓZKOWSKA, Head of the Laboratory of Paleozoology of the Polish Academy of Sciences in Poznań.

Material. Nine fragments of the cerioid coralla, Nos. A 25623, A 25641, A 25646, A 25652, A 25670, A 25672, A 25673, A 25682, A 25694, from coral horizon 4 (F.&H.) from Treskelodden. Colonies without their proximal parts and calices. Corallites long, seldom budding.

Diagnosis. *Kleopatrina* (*Kleopatrina*) with corallites 15–20,5 mm in diameter and with  $23 \times 2$  to  $26 \times 2$  septa. Dissepimentarium broad, axial structure mostly very complex, consisting mainly of the axial parts of tabulae.

Description. Transverse section (Pl. IV, Fig. 4a, Text-Fig. 12a, c). Major septa wavy and thin in dissepimentarium, slightly thickened and straight in tabularium. They mostly reach axial structure. Minor septa have various lengths in several corallites. They mostly reach the slightly thickened internal wall. Dissepimentarium broad, dense, with dissepiments irregular and different in size and shape. A “herring-bone” pattern visible near the internal wall. Axial structure more or less complex, consists of a thickened, twisted columella and very numerous tabulae cross sections, concentrically arranged. Sometimes the columella is not thickened or even disappears, and tabulae cross sections are few.

Longitudinal section (Pl. IV, Figs. 4b, 5b; Text-Fig. 12b). Dissepimentarium takes about a half of the corallite diameter, dissepiments different in size and shape, in general fine, convex, and seldom, – large and flat. They are disposed in semi-

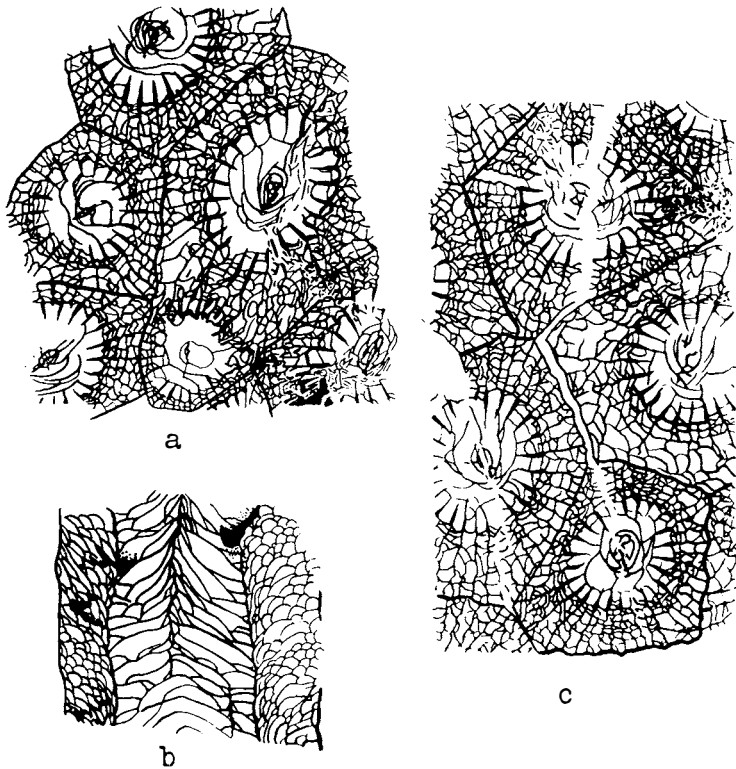


Fig. 12. *Kleopatrina* (*Kleopatrina*) *różkowskiae* n. sp.,  $\times 2$ .  
a – transverse section. Specimen O.M. No. A 25682. Holotype.  
b – longitudinal section. Specimen O.M. No. A 25682. Holotype.  
c – transverse section. Specimen O.M. No. A 25673.

circular rows, almost horizontal at the epitheca, vertical at the tabularium. The internal row of dissepiments, with a thickened wall, forms an internal wall. Tabulae mostly incomplete. In the peripheral part, they are placed obliquely upwards and have a few convex or flat accessory plates. Towards the axis they are tent-shaped and bent upwards, reaching the thickened, twisted columella where they have numerous, flat, tent-shaped accessory plates.

Ontogenetic development (Text-Fig. 13a–h). Corals of this species seldom gemmate. The author has succeeded in the investigation of the blastogenesis in one specimen only. In general outline it is identical with the blastogenesis of other species of this genus.

1. Hystero-nepionic stage. Major and minor septa in the gemmation sector become strongly thickened, and then divide into the peripheral, medial and – less thickened – internal sections (the latter applies only to major septa, Text-Fig. 13a–d). Peripheral sections grow thinner, and medial ones are subject to considerable shortening (Text-Fig. 13c–e). The new epitheca separates them, and they remain on the side of the bud (Text-Fig. 13e–f).

2. Hystero-neanic stage. Upon the closing of the epitheca, a young individual has short major septa, an almost full number of minor septa, and one ring of dissepiments. Axial structure appears only at the end of this stage (Text-Fig. 13 g, h).

The blastogenesis, discussed above, differs from that typical of the genus in: 1) considerable shortening of medial sections of septa; 2) slow growth of new septa at the epitheca in the bud; 3) relatively late formation of the axial structure.

Individual variability. In its main morphological properties, this is a fairly stable species. In addition to insignificant differences in measurable properties, minor septa and axial structure are subject to variations. Minor septa are gradually reduced, hence their various lengths in different corallites, that is, from those reaching the internal wall (the most common) up to very short ones, barely 1 mm in length.

Axial structure mostly consists of a thickened columella and numerous, tent-shaped tabulae. Sometimes a columella grows even thinner and disappears completely in other cases, however, 2–4 accessory plates appear beside it. Axial part of tabulae may rise more or less steeply and, therefore, in cross-section, they may be observed in large numbers, as well as in a few isolated specimens.

Remarks. In its measurable properties, this species approaches *Kleopatrina* (*Kleopatrina*) *magnifica* (PORFIRIEV), from which it differs in its anatomy, particularly in a broad dissepimentarium and axial structure which, in *Kleopatrina* (*Kleopatrina*) *rózkowskiae*, is built primarily of tabulae.

Subgenus: *Porfirievella* MINATO & KATO, 1965

*Kleopatrina* (*Porfirievella*) *vesiculosa* n. sp.

Pl. III, Fig. 4a, b, Pl. IV, Fig. 1a, b)

1964 *Wentzelella* aff. *indica* (MANSUY); J. FEDOROWSKI, On Late Palaeozoic Rugosa . . . , Tab. 1.

1965 *Wentzelella* aff. *indica* WAAGEN & WENTZEL (= *W. indica* MANSUY); J. FEDOROWSKI, Lower Permian Tetracoralla . . . , pp. 91–94, Pl. IX, Figs. 5a, b, 6a, b; Text-Figs. 33a–c, 34<sub>1–4</sub>, 40.

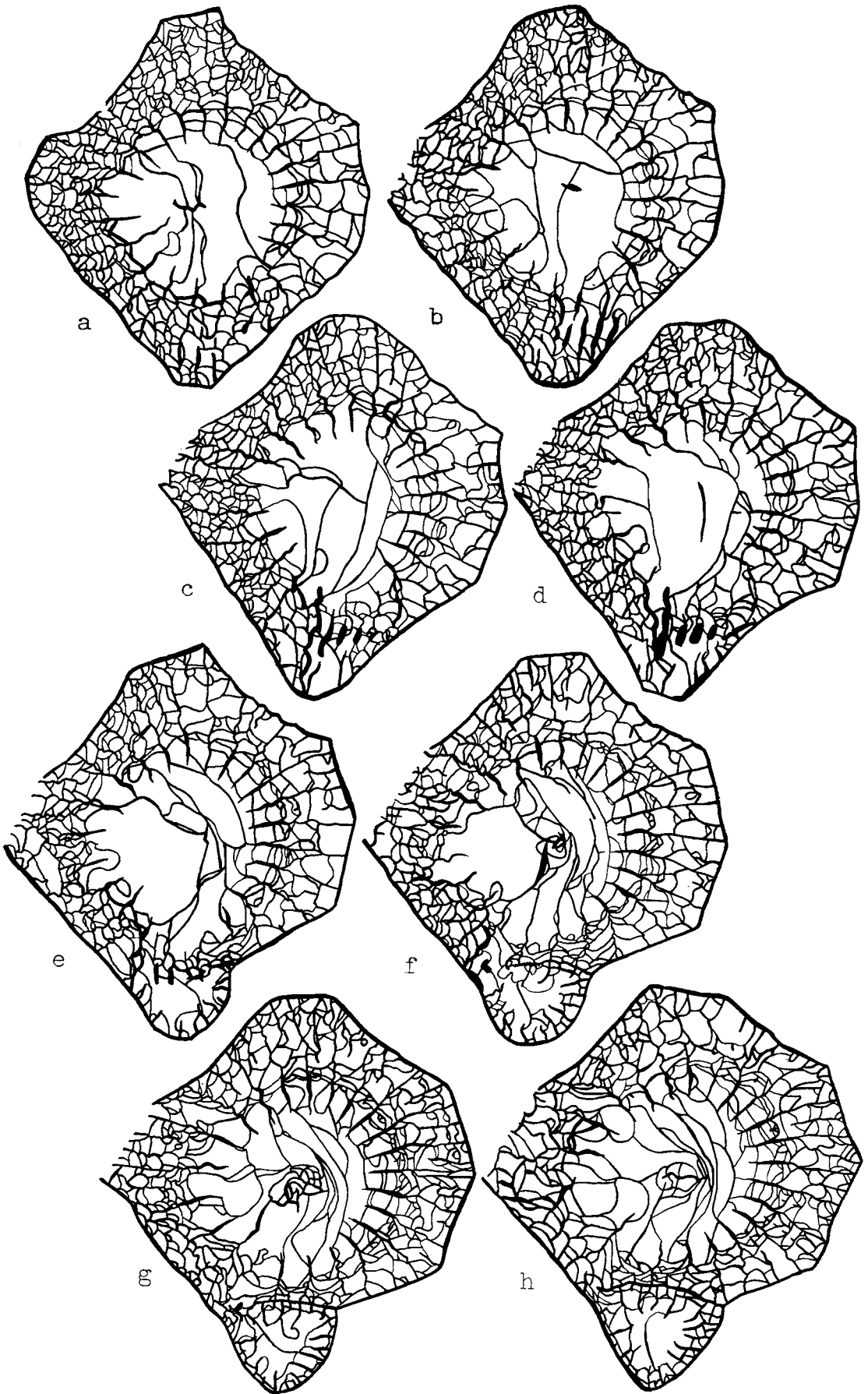


Fig. 13. *Kleopatrina (Kleopatrina) różkowskæ* n. sp. Specimen O.M. No. A 25652,  $\times 3$ .  
Serial sections of successive stages of blastogenesis. a-f - hystero-epionic stages. g, h - early-neanic stages.



Holotype: The specimen No. 33 (part "a" and "b"), Text-Fig. 33a, b, Pl. IX, Fig. 5a, b (in FEDOROWSKI, 1965).

Type locality: Hyrnefjellet (southern part), Vestspitsbergen.

Type stratum: Treskelodden Beds, Va Coral Limestone Horizon.

(After K. BIRKENMAJER.)

Name derivation: vesiculosa – with marginal vesicles.

Material. Ten fragments of the cerioid coralla, that is, Nos. A 25622, A 25632, A 25636, A 25667, A 25675, A 25678, A 25686 from horizon 4, No. A 25170 from horizon 20, and No. A 25532–1 from coral horizon 20–21 (F. & H.).

Diagnosis. "Corallites up to 13 mm in diameter, usually with 15–17 major septa. Major septa may be partly detached from epitheca, minor septa rarely pierce the interior wall. Axial structure complicated, but may be locally discontinuous. Sometimes, only the columella is present." (After J. FEDOROWSKI, 1965, p. 91.)

Remarks. The specimens discussed are almost identical with those described by the present author (J. FEDOROWSKI, 1965) from Coral Limestone Horizon V (K. BIRKENMAJER, 1959, 1960, 1964; K. BIRKENMAJER and S. CZARNECKI, 1960) from Treskelodden and Hyrnefjellet (Vestspitsbergen). They show an equally broad range of ontogenetic variability with identical trends. The latter are expressed in the partial reduction of some minor septa, in the separation of the peripheral parts of some major septa from the epitheca, and in the simplification of the axial structure. It should be, however, emphasized that in most specimens it remains complex. The blastogenesis, investigated in 7 coralla, also shows a far-reaching similarity to the blastogenesis of this species, described by the author before.

Discussion. This species has been described by the author (1965) as *Wentzella aff. indica* WAAGEN & WENTZEL (= *W. indica* MANSUY) after PORFIRIEV, 1941. The Spitsbergen specimens differ from those described by PORFIRIEV from the Ural Mountains by having lonsdaleoid vesicles. This feature is, after MINATO & KATO, 1965, the principal sign of the new subgenus Porfirievella MINATO & KATO (genus *Kleopatrina*). The Spitsbergen specimens differ from all species included by MINATO & KATO, 1965, to this subgenus. Therefore, the present author gives a new species name to the Spitsbergen specimens described by him before, in 1965.

*Kleopatrina (Porfirievella) permica* (FEDOROWSKI), 1965

(Pl. VI, Fig. 2a, b; Text-Fig. 14a, b)

1965 *Lonsdaleia permica* FEDOROWSKI; J. FEDOROWSKI, Lower Permian Tetracoralla . . . , pp. 118–124, Pl. XII, Figs. 2, 3a, b, 4a, b, 5; Text-Figs. 48a–e, 49a<sub>1–6</sub>, 49b<sub>1–3</sub>, 52.

Material. Eight fragments of cerioid coralla, Nos. A 25631, A 25634, A 25637, A 25653–A 25656, A 25664, from coral horizon 4 (F. & H.) of Treskelodden.

Diagnosis. "*Kleopatrina (Porfirievella)* with corallite diameter 18 to 24.2 mm, and 20 to 23 major septa, dilated from the interior wall, often reaching the epitheca. Axial structure weak, irregular, not continuous." (After J. FEDOROWSKI, 1965, p. 120.)

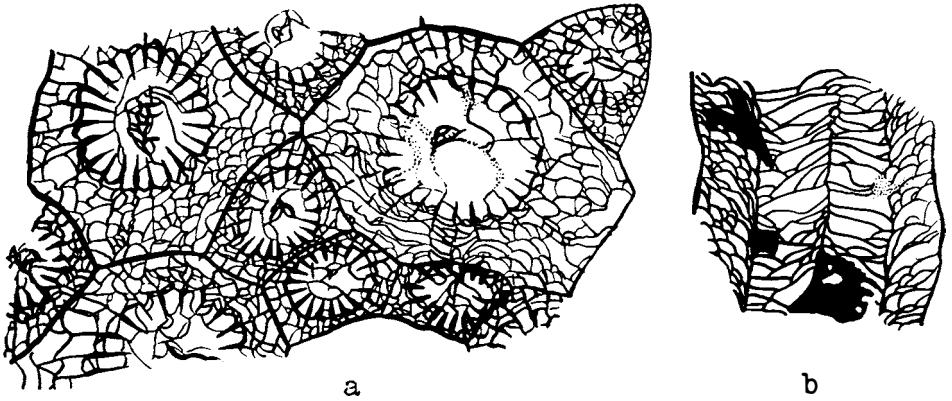


Fig. 14. *Kleopatrina (Porfirievella) permica* (FEDOROWSKI).  
Specimen O.M. No. A 25656,  $\times 2$ .  
a - transverse section. b - longitudinal section.

Remarks. The specimens discussed have measurable properties identical with those given by the present author in 1965. They differ only in a slightly larger number of complete septa connected to the epitheca. In addition, the specimens Nos. A 25637, A 25656 and A 25664 have their axial structure more complex than that in the holotype. The blastogenesis is also very similar to that recorded in the other species of this genus. This species was described from Coral Limestone Horizon V from Treskelodden and Urnetoppen (K. BIRKENMAJER, 1959, 1960, 1964; K. BIRKENMAJER and S. CZARNIECKI, 1960).

Genus: *Protolonsdaleiastraea* GORSKY, 1932

*Protolonsdaleiastraea complexa* (DOBROLYUBOVA), 1936

(Pl. VI, Fig. 3a, b; Text-Fig. 15a, b)

1965 *Protolonsdaleiastraea complexa* (DOBROLYUBOVA); M. MINATO & M. KATO, Durhaminidae, p. 64 (cum synon.).

Material. One fragment of the plocoid colony, No. A 25130, has been described from coral horizon 6 (F. & H.).

Diagnosis. "Coralla astraeoid with diameter of corallites ranging from 7–15 mm and 15–22 major septa, which may traverse the dissepimentarium and sometimes reach the axial field. Minor septa sometimes lacking. Dissepimentarium broad. Periaxial tabulae nearly horizontal. Epitheca discontinuous. Axial structure complicated, often regular, consisting of axial sections of tabellae, some axial ends of major septa and a medial plate." (After T. A. DOBROLYUBOVA, 1941, p. 210).

Description. Transverse section (Pl. VI, Fig. 3a; Text-Fig. 15a). Epitheca is subject to reduction mainly in corners, walls are mostly complete. Dissepimentarium broad, dissepiments different in size and shape. Small marginal vesicles in corners. Major septa long, slightly thickened in tabularium, reaching axial structure and, sometimes, forming its parts. It is more frequent, however, that the detached axial ends of the septa are the components of the axial structure. Minor

septa mostly penetrate the thickened internal wall. Axial structure complex, transparent and fairly regular. Frequently, it consists of an unthickened columella, axial sections of major septa and numerous axial parts of tabulae.

Longitudinal section (Pl. VI, Fig. 3b, Text-Fig. 15b). Dissepiments convex, disposed in a few almost vertical rows. Tabulae incomplete, in periphery almost horizontal, widely scattered, with individual accessory plates. Axial parts of tabulae tent-shaped and rising towards the columella. Sometimes, accessory laminae may occur next to columella and then tabulae may be vesicular in form.

Remarks. Individual variability slight, these are mostly small differences in the anatomy of axial structure. Similarities and differences of this species were discussed by T. A. DOBROLYUBOVA (1941). The Spitsbergen specimen differs from holotype in the less reduced epitheca and longer minor septa, measurable properties remaining identical. Thus far, this species has been known from the Ural Mountains and the Ufimsk Plateau, that is from limestones of which the Lower Permian *Pseudofusulina mölleri* – *Pseudofusulina lutugini* is a typical representative (T. A. DOBROLYUBOVA, 1936, 1941).

*Protolonsdaleiastraea composita* n. sp.

(Pl. V, Figs. 5, 6, Pl. VI, Figs. 4, 5; Text-Fig. 16a, b)

Holotype: the specimen P.M.O. No. A 25129.

Type locality: Treskelodden, Vestspitsbergen.

Type stratum: Horizon 6 (F.& H.) Lower Permian.

Name derivation: *composita* – having a very compound anatomy.

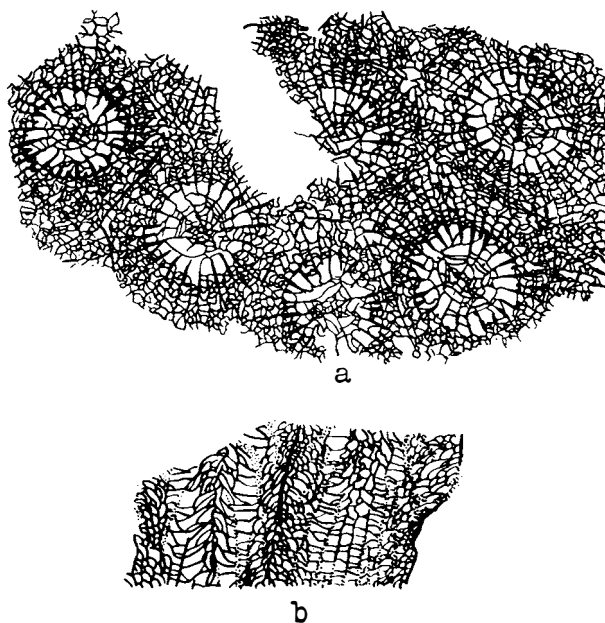


Fig. 15. *Protolonsdaleiastraea complexa*. (DOBROLYUBOVA).

Specimen O.M. No. A 25130,  $\times 2$ .

a – transverse section. b – longitudinal section.

Material. Two fragments of the plocoid coralla, Nos. A 25129 and A 25131, from coral horizon 6 (F.& H.).

Diagnosis. *Protolonsdaleiastraea* with corallites 13–16 mm in diameter. Septa numbering  $18 \times 2$  to  $21 \times 2$ . Axial structure complex, sometimes occurring in the form of a regular cobweb with a thickened columella. Very numerous, small peripheral vesicles.

Description. Transverse section (Pl. VI, Figs. 4, 5; Text-Fig. 16a). Epitheca divided into larger or smaller fragments, sometimes complete. Dissepimentarium broad, dissepiments fine, multiform, major septa from the internal wall generally thickened, reaching axial structure. Their detached ends, together with a thickened columella and numerous tabulae cross-sections, make up component parts of axial structure. Minor septa, in length, almost equal to major septa. Their axial ends thickened.

Longitudinal section (Pl. V, Figs. 5, 6; Text-Fig. 16b). Dissepiments of various dimensions, convex, semi-circular and obliquely arranged, with their internal rows often vertical. Tabulae incomplete, in peripheral part almost horizontal, with individual accessory plates, diagonally disposed. In axial part tent-shaped and raised towards a twisted columella. In this part they have numerous accessory plates.

Remarks. The specimens described above approach the Spitsbergen representatives of "*Lonsdaleiastraea*" *longiseptata* DOBROLYUBOVA, 1936 (= *Protolonsdaleiastraea dobrolyubovae* MINATO & KATO, 1965), described by the present author (1965); from which they differ: 1) in their more complex axial structure, connected to major septa; 2) in a denser peripheral dissepimentarium with very small peripheral vesicles.

This species, having a very complex structure, is similar to the species of the genus *Lonsdaleiastraea* GERTH, 1921, from which it differs, generally, by the lack of tertiary septa.

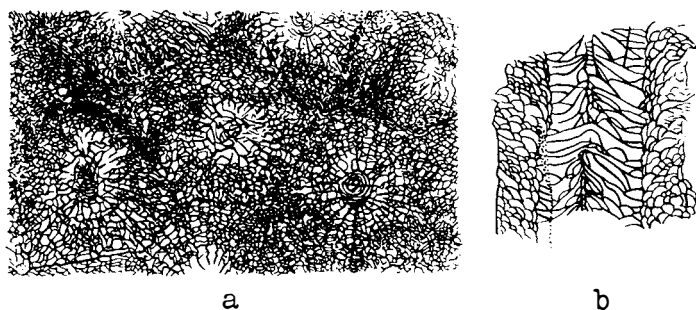


Fig. 16. *Protolonsdaleiastraea composita* n. sp.,  $\times 2$ .  
a – transverse section. Specimen O.M. No. A 15129. Holotype.  
b – longitudinal section. Specimen O.M. No. A25131.

Family: Lonsdaleiidae CHAPMAN, 1893

Genus: *Thysanophyllum* NICHOLSON & THOMSON, 1876

*Thysanophyllum cf. cystosum* DOBROLYUBOVA, 1936

(Pl. V, Figs. 2a, b, 3a, b, 4a, b; Text-Fig. 17a, b)

Material. Eight fragments of the cerioid coralla, Nos. A 15666, A 25679, A 25690 from coral horizon 4, Nos. A 25166, A 25174, A 25180, A 25181 from coral horizon 20, and No. A 25532 from coral horizon 20–21 (F. & H.), all of them from Treskelodden.

Diagnosis. *Thysanophyllum* with corallites up to 14 mm in diameter and 14 to 16 major septa. Some corallites with complete septa; columella interrupted.

Remarks. Numerous corallites in all coralla assigned to this species are of a different anatomy than the typical *T. cystosum* DOBROLYUBOVA. Individuals with complete major septa occur particularly often.

Blastogenesis has been investigated in specimen Nos. A 25166, A 25180, A 25181, A 25666 and A 25690. It also differs from the blastogenesis described by the present author for this species (J. FEDOROWSKI, 1965). Its fundamental properties, however, i. e. the new septa at first formed by the bud on vesicles near the old epitheca, as well as the inheritance of septa – at a new epitheca – from a budding individual, are common for both forms.

The specimens discussed, although considered to be most closely related to the species *T. cystosum* DOBROLYUBOVA, have many common properties with *T. cystoides* PORFIRIEV, 1941. Generally speaking, it seems that the latter species is only *T. cystosum*'s extreme form, approximating primitive, starting stages. It still retained many primitive properties, such as numerous complete septa and a columella. Many individuals of the coralla, elaborated here, form a link which unites both species mentioned above.

Individual variability is in this and in related species of such an extent that, sometimes, even assigning to a genus presents considerable difficulties. The actual variability is often increased by an interesting form of recrystallization, observable, for instance, in the specimen No. A 25180 (Pl. V, Fig. 3a, b). Certain fragments

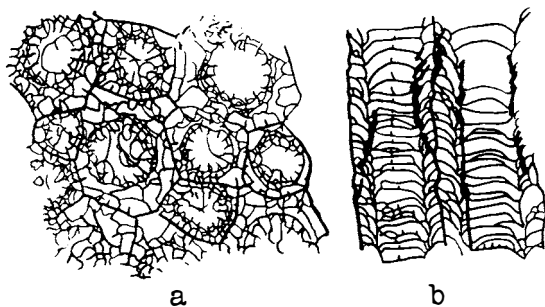


Fig. 17. *Thysanophyllum cf. cystosum* DOBROLYUBOVA.

Specimen O.M. No. A 25666,  $\times 2$ .

a – transverse section. b – longitudinal section.

of this colony did not recrystallize and are similar not only to *T. cystosum* DOBROLYUBOVA, but also to *T. cystoides* PORFIRIEV and, sometimes, even to the genus *Stylastraea*. In others great calcite crystals were formed which, in a deceptively natural manner, completely changed the internal structure of the corallites. Great marginal vesicles were formed, while minor and, to a considerable extent, also major septa disappeared. Numerous corallites resemble *T. aseptatum* DOBROLYUBOVA, 1936. New structures cannot be distinguished from the actual ones. Finding and describing such a fragment when a whole is unavailable or, recrystallization of the entire colony, can lead to a totally erroneous systematic assignment.

*Thysanophyllum dubiosum* n. sp.

(Pl. VI, Fig. 1a, b; Text-Figs. 18a-c, 19A, B)

Holotype: The specimen P.M.O. No. A 25643 -b.

Type locality: Treskelodden, Vestspitsbergen.

Type stratum: Coral horizon 4 (F. & H.), Lower Permian.

Name derivation: *dubiosum* - having properties which are not characteristic of the genus.

Material. Three coralla fragments, Nos. A 25640-1, A 25643-b, A 25653b-1, from coral horizon 4 (F. & H.), occurring in conglomerates on a secondary bed, together with other corals. Surfaces of the coralla are damaged, calices and proximal parts lacking.

Diagnosis. Subcerioid *Thysanophyllum* with corallites 8-11 mm in diameter. Thirteen to sixteen major septa. Minor septa mostly lacking. Sometimes one of major septa is elongated and forms a columella.

Description. Transverse section (Pl. VI, Fig. 1a; Text-Fig. 18a, b). Major septa short, straight and thin. Often during a corallite's life-time, they adhere to the epitheca and, again detach from it. Separated septa are more numerous. One of them may elongate as far as beyond the corallite axis and form a columella, connected with it or not. Minor septa often disappear, particularly in the case when marginal vesicles occur. Dissepimentarium, with a variable width, takes

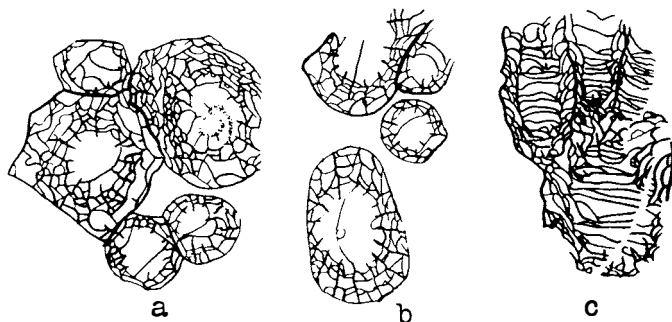


Fig. 18. *Thysanophyllum dubiosum* n. sp.  
Specimen O.M. No. A 25643b. Holotype,  $\times 2$ .  
a, b - transverse sections. c - longitudinal section.

about a half of the corallite's diameter. It consists of fine dissepiments, as well as of marginal vesicles with various sizes, mostly large and irregular in shape.

Longitudinal section (Pl. VI, Fig. 1b; Text-Fig. 18c). Dissepiments and marginal vesicles slightly convex, arranged in a few almost horizontal rows. Tabularium regular, not very broad. Tabulae mostly complete, flat in axial part, elevated in peripheries (approaching the trapezoid shape), with a few flat accessory plates. Sometimes a single, flat columella occurs in the axis.

Ontogenetic development (Text-Fig. 19 A, B<sub>a-f</sub>). Gemmation has been investigated in a few corallites of the colony, No. A 25643-b. Its course is very slow, the entire process being slightly different from that in a typical *Thysanophyllum* with cerioid coralla.

1. Hystero-nepionic stage. In the gemmation sector, septa of a parent individual splits into internal sections which remain in the budding corallite and medial sections (Text-Fig. 19 A<sub>a,b</sub>). These sections are subject to a gradual reduction, sometimes disappearing almost completely (Text-Fig. 19 A<sub>c,d</sub>).

A section of a new epitheca, at first unconnected to the old epitheca, is subsequently formed in the gemmation sector (Text-Fig. 19 A<sub>c</sub>). In the bud, near the new and old epitheca, there are formed marginal vesicles, (Text-Fig. 19 A<sub>c</sub>) and then new septa appear on the vesicles or on the epitheca (Text-Fig. 19 A<sub>d-f</sub>). The development and growth of septa in the bud is a very slow process and for a long time the epitheca between both individuals remains incompletely closed (Text-Fig. 19 A<sub>c-f</sub>).

2. Hystero-neanic stage (Text-Fig. 19 B<sub>f</sub>). After closing of the epitheca a young individual has a few short major septa which sometimes are separated from the epitheca. It still has no minor septa, these appear only at the end of this stage. Then all major septa adhere to the epitheca, and subsequently, they detach from it once more. Columella may occur in the ephebic stage (Text-Figs. 19A, B<sub>a-f</sub>).

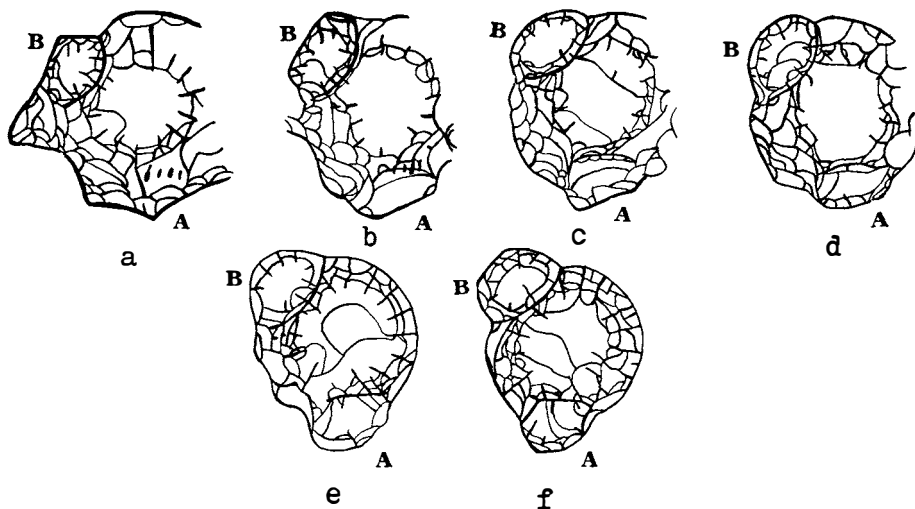


Fig. 19. *Thysanophyllum dubiosum* n.sp. Specimen O.M.  
No. A 25643b. Holotype,  $\times 3$ .

Serial sections of successive stages of blastogenesis.

Bud A, figs. a-f - hystero-nepionic stage. Bud B, figs. a-e - early neanic stage, fig. f - neanic stage.

Individual variability. Corallites of this species are fairly diversiform. There is, however, a rather marked variability of particular individuals, but its range remains identical in all specimens. They may several times change the pattern of their structure which, in various stages of their growth, relates them to the genera *Dorlodotia* or *Campophyllum*. In general, the species described has much in common with the genus *Dorlodotia*, from which it differs in the structure of its tabularium, and in the fact that one of the major septa, often elongated, is never subject to thickening.

Since, as mentioned above, it approaches in character the genera *Dorlodotia* and *Campophyllum*, this species has been assigned to the genus *Thysanophyllum* but with a certain reservation. It is subphaceloid or subcerioid, while typical forms of *Thysanophyllum* are cerioid. Its septa often adhere to the wall and one of them elongates. Besides, its blastogenesis considerably departs from that thus far investigated in the *Thysanophyllum*.

Subclass: Tabulata

Order: Favositida

Family: Syringolitidae WAAGEN & WENTZEL, 1886

Genus: *Roemeripora* KRAICZ, 1934

*Roemeripora wimani wimani* HERITSCH, 1939

Pl. VII, Fig. 1a, b; Text-Fig. 20a, b)

1939 *Roemeripora wimani* HERITSCH; F. HERITSCH, Die Korallen..., pp. 109–116, Pl. VIII, Fig. 4, Pl. XVII, Figs. 4, 5, Pl. XXI, Figs. 1–3.

1960 *Roemeripora wimani* HERITSCH; P. HARKER, Permian Rocks and Faunas..., pp. 48, 49, Pl. XIV, Figs. 6, 7.

Material. Three fragments of coralla, Nos. A 25124, A 25127 from coral horizon 4, and No. A 25132 from coral horizon 6 (F. & H.). Colonies damaged, incomplete, with eroded surface.

Diagnosis. Subcerioid coralla with corallites 2–3 mm in diameter. Neighbouring corallites connected mostly by pores, tabulae deep, funnel-shaped. Peripheral tabellae in 2–3 rows vertically arranged.

Description. Corallites closely adhering to each other. They are 4 to 6 lateral in cross-section. Corallites adjoining syringoporoid tubes are rare, and neighbouring corallites are connected by pores.

Transverse section (Pl. VII, Fig. 1a, Text-Fig. 20a). Corallites with greatly thickened walls composed of concentric layers of sclerenchyme. Concentric sections of numerous tabulae, more closely set near periphery. Septal spines destroyed or lacking.

Longitudinal section (Pl. VII, Fig. 1b, Text-Fig. 20b). Peripheral, flat tabellae arranged in 2–3 vertical rows, locally entering into syringoporoid tubes connecting neighbouring corallites. Axial tabulae funnel-shaped, rarely oblique or flat, irregular. Often densely joined into bundles in connection with pores and syringoporoid tubes.



Fig. 20. *Roemeripora wimani wimani* HERITSCH. Specimen O.M. No. A15127.  
a – transverse section,  $\times 2$ . b – longitudinal section,  $\times 2$ .



Remarks. The specimens discussed do not differ from the holotype, described from the Central Vestspitsbergen layers, considered by F. HERITSCH (1939) to be the Upper Carboniferous, in either their measurable properties or their morphology.

A more detailed description and discussion concerning *Roemeripora* and its species *R. wimani* can be found in the paper of HERITSCH, 1939. He has stated that the Spitsbergen specimens certainly belong to the genus *Roemeripora*, but it is uncertain whether this genus belongs to Tabulata or to Bryozoa.

P. HARKER (1960) describes the cited species from Grinnel Peninsula (Canadian Arctic Archipelago), Permian, and tentatively places it among Tabulata.

This is also maintained by B. S. SOKOLOV, 1962, in *Osnovy Paleontologii*, and the present author shares his opinion.

*Roemeripora wimani minor* HERITSCH, 1939  
(Pl. VII, Figs. 2a, b, 3a, b)

1939 *Roemeripora wimani* var. *minor* HERITSCH; F. HERITSCH, *Die Korallen...*, pp. 116, 117, Pl. XV, Fig. 11.

Material. Two specimens, No. A 25123 from coral horizon 4 and No. A 25176 from coral horizon 20 (F.& H.), have been included in this subspecies.

Diagnosis. This subspecies differs from *R. wimani wimani* HERITSCH by its minor corallite diameter (2 mm the greatest diameter), by a broader peripheral zone of tabellae, and by the presence of more numerous tabellae.

Description. Coralla cerioid with parallel corallites connected by numerous pores. The horizontal sections (Pl. VII, Figs. 2a, 3a) of tabulae are concentric. The wall is thickened, forming a stereozone, or it is thin. Septal spines short on periphery and on tabulae.

Longitudinal section (Pl. VII, Figs. 2b, 3b). Peripheral tabellae zone narrow, tabellae arranged vertically in 2–3 rows. Axial tabulae in bundles in connection with pores – and then distally concave funnel-shaped. Above these bundles there are some flat tabulae. Knobs on tabulae may be the base of septal spines.

Remarks. The specimens discussed have diameters reaching 2 mm, that is the same as those determined by F. HERITSCH (1939) for the subspecies holotype, and a similar structure. They differ from each other in the thickness of the wall and in the frequency of the occurrence of pores which are much more numerous in specimen No. A 25176. The latter is distinguished in longitudinal section by a considerably looser structure, and in its axial part there are more horizontal and widely scattered tabulae as in the specimen No. A 25123. Perhaps this specimen should be isolated from the subspecies under study.

Family: Micheliniidae WAAGEN & WENTZEL, 1886

Genus: *Michelinopora* YABE & HAYASAKA, 1915

*Michelinopora abnormis* (HUANG), 1932

(Pl. VII, Fig. 4a, b)

1932 *Michelinia abnormis* HUANG; T. K. HUANG, Permian Corals. . . , pp. 97, 98, Pl. XI, Figs. 4, 5.

1962 *Michelinopora abnormis* (HUANG); B. S. SOKOLOV, «Tabulata» in Osnovy Paleontologii, Pl. VII, Fig. 1a, b.

Material. A specimen No. A 25626 from horizon 4 (F.& H.) from Treskelodden. Colony partially destroyed, with proximal part damaged.

Diagnosis. Corallum cerioid with narrow base and hence radially arranged corallites. Corallites 13 mm in diameter in the largest individuals; septal spines lacking; mural pores irregularly distributed; tabulae complete, horizontal.

Description and remarks. Corallites large, 4–6 lateral, closely adhering to each other. In the young part of the colony they diverge radially from the colony axis. Many fine pores irregularly scattered in walls. Tabulae horizontal or slightly convex, complete, sometimes with accessory plates. This colony differs from the holotype in slightly larger dimensions of corallites. This species is known from the Lower Permian of Eastern Asia (HUANG, 1932).

Order: Syringoporida.

Family: Syringoporidae NICHOLSON, 1879

Genus: *Syringopora* GOLDFUSS, 1826

*Syringopora* cf. *ramulosa* GOLDFUSS, 1826

(Pl. VII, Fig. 5a, b; Text-Fig. 21a, b)

Material. Three specimens, No. A 25 138 from coral horizon 1, and Nos. A 25121 and A 25665 from coral horizon 4 from Treskelodden (F.& H.), have been assigned to this species.

Diagnosis. Syringopora with corallites 2–2,5 mm in diameter, up to 4 mm distant, rarely closely set, connected by numerous transverse stolons. Tabulae infundibuliform.

Description. Colony of a loose structure, with corallites parallel to each other. Connecting channels numerous. Corallite diameters usually somewhat shorter than those given by F. HERITSCH, 1939 (2,5–3,0 mm), A. STUCKENBERG, 1895 (2–3 mm) and others, that is within limits of 2 and 2.5 mm.

Transverse sections of tabulae concentric (Pl. VII, Fig. 5a; Text-Fig. 21a), larger at periphery, denser in axial field. No septal spines have been remarked in the studied material.

In the longitudinal section (Pl. VII, Fig. 5b; Text-Fig. 21b) tabulae are infundibuliform, sometimes forming a continuous axial tube. Peripheral tabulae parts arranged in one vertical row of flat vesicles. The axial tabulae may form bundles in connection with transverse stolons. Some tabulae are flat and horizontal, entering into hollow stolons.

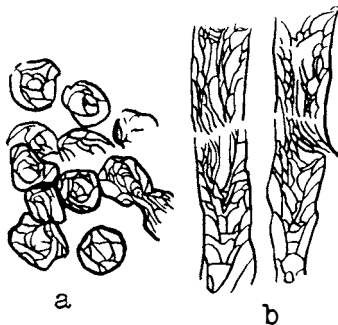


Fig. 21. *Syringopora cf. ramulosa* GOLDFUSS.  
Specimen O.M. No. A 25665,  $\times 2$ .  
a – transverse section. b – longitudinal section.

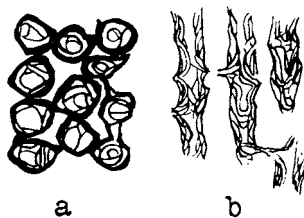


Fig. 22. *Hayasakaia profunda* n. sp.,  $\times 2$ .  
Holotype.  
a – transverse section.  
Specimen O.M. No. A 25182.  
b – longitudinal section.  
Specimen O.M. No. A 25182.

Remarks. In comparison with the holotype our specimens have a more complex axial structure, with more tabulae. Longitudinal rows of spines, mentioned by among other authors, A. STUCKENBERG, (1895), F. HERITSCH (1939), B. S. SOKOLOV (1962), have not been recorded. Therefore the present author has with some reservation, identified his specimens as *S. ramulosa* GOLDFUSS.

Family: Tetraporellidae SOKOLOV, 1950

Genus: *Hayasakaia* LANG, SMITH & THOMAS, 1940

*Hayasakaia profunda* n. sp.

(Pl. VII, Fig. 6a, b; Text-Fig. 22a, b)

1939 *Tetrapora elegantula* YABE & HAYASAKA; F. HERITSCH, Die Korallen..., pp. 108, 109, Pl. XI, Fig. 4, Pl. 20, Fig. 22.

Holotype: The specimen P.M.O. No. A 25182.

Type locality: Treskelodden, Vestspitsbergen.

Type stratum: Coral horizon 20 (F.& H.), Lower Permian.

Name derivation: profunda – from their concave tabulae.

Material. One fragment of phaceloid corallum with a spheric shape, No. A 25182 from coral horizon 20 (F.& H.), from Treskelodden.

Diagnosis. Corallites parallel, up to 2 mm distant, 1,5–2,5 mm in diameter. Peripheral tabulae vesicular, axial tabulae funnel-shaped, often with flat bottom.

Description. Corallite tubes parallel, straight, with thickened walls connected by closely set stolons, arranged in vertical rows. Corallites in transversal section not always quadrate, but also oval. In cross section (Pl. VII, Fig. 6a; Text-Fig. 22a) more numerous than in other species, concentric tabulae, rarely transversal. Septal spines lacking.

In longitudinal section (Pl. VII, Fig. 6b; Text-Fig. 22b) vesicular flattened tabellae near wall, arranged in vertical rows. Axial parts of tabulae funnel-shaped like in *Syringopora*, but often with a flattened bottom. In connection with stolons tabulae grouped in bundles. Closely set short stolons arranged in vertical rows.

Remarks. The species described fits the description of *Tetrapora elegantula* YABE & HAYASAKA, given by F. HERITSCH (1939). But specimens described by HERITSCH and by the present author differ from the holotype *Hayasakaia elegantula* YABE & HAYASAKA by somewhat greater corallite diameter, and especially by funnel-shaped axial tabulae. These are not found in the description of *Hayasakaia* LANG, SMITH & THOMAS, 1940, but are similar to *Syringopora* GOLDFUSS, 1826, and *Roemeripora* KRAICZ, 1934. It differs from them by its stolons arranged in vertical rows and in having polygonal corallites. Specimens *Tetrapora elegantula*, described by HERITSCH (1939) from Bellsund, Vestspitsbergen, the present author has included in his new species *Hayasakaia profunda*.

Paleozoological Institute of the Polish Academy of Sciences, Poznań Branch.

Poznan, September, 1964.

Manuscript corrected June, 1966.

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# PLATES

(All figures about  $\times 2$ )

PLATE I

Fig. 1. *Caninophyllum ovibos* (SALTER). Specimen O. M. No. A 25178.

a – transverse section, slide No. 3.

b – longitudinal section, slide No. 2.

Fig. 2. *Caninophyllum kokscharowi* (STUCKENBERG). Specimen O.M. No. A 25148.

Transverse sections of adult and juvenile corallites.

Fig. 3. *Svalbardphyllum* sp. Specimen O.M. No. A 25146.

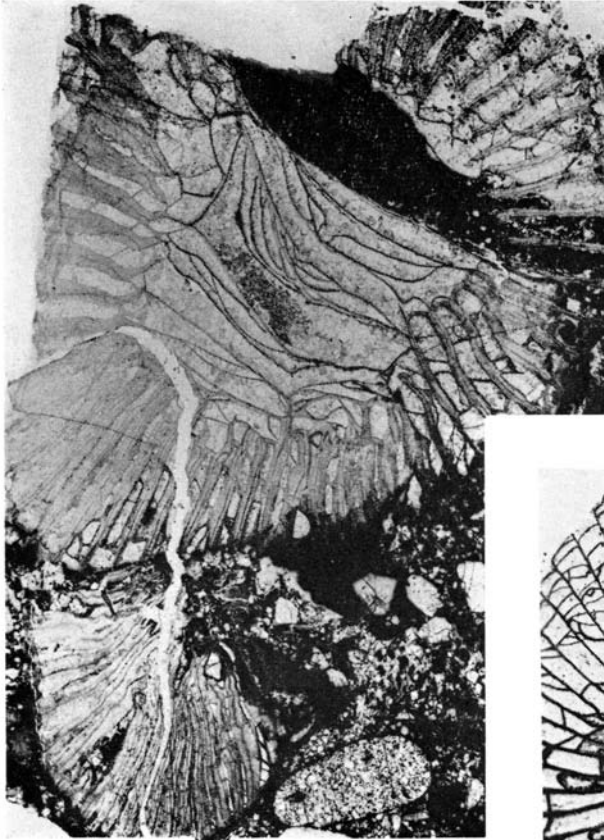
Transverse section (fragment).

Fig. 4. *Leintzella svalbardensis* (FEDOROWSKI). Specimen O.M. No. A 25534.

a – transverse section, slide No. 2.

b – longitudinal section, slide No. 3.





2



4a



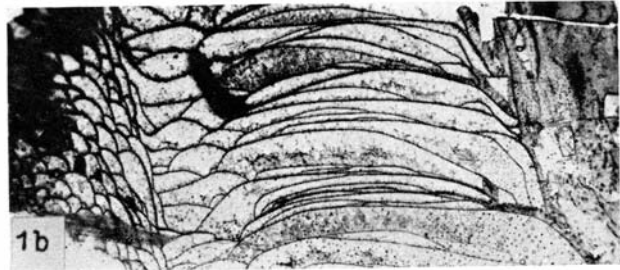
1a



4b



3



1b

PLATE II

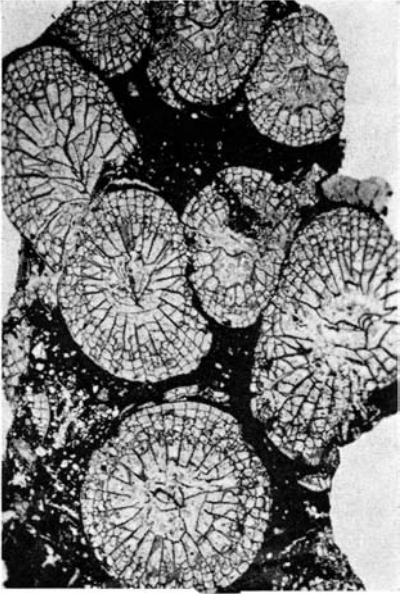
Fig. 1. *Heintzella svalbardensis* (FEDOROWSKI). Specimen O.M. No. A 25534.  
Transverse section, slide No. 1.

Fig. 2. *Heintzella multiseptata* n.sp. Specimen O.M. No. A 25158. Holotype.  
a, b - transverse sections, slides Nos. 1, 2.  
c - longitudinal section, slide No. 3.

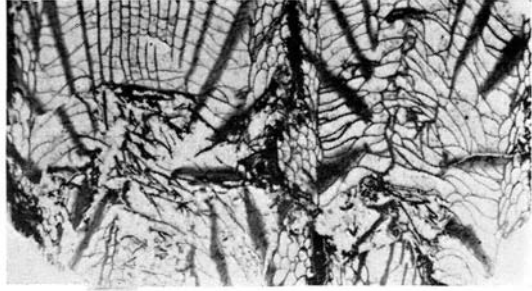
Fig. 3. *Heintzella multiseptata* n.sp. Specimen O.M. No. A 25671.  
Transverse section, slide No. 2.

Fig. 4. *Stylastraea toulai* (STUCKENBERG). Specimen O.M. No. A 25185.  
Transverse section, slide No. 1.

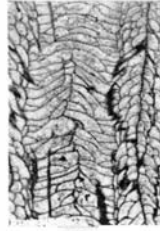
Fig. 5. *Kleopatrina (Kleopatrina) pseudoelegans* (DOBROLYUBOVA). Specimen O.M. No. A 25659.  
Longitudinal section, slide No. 2.



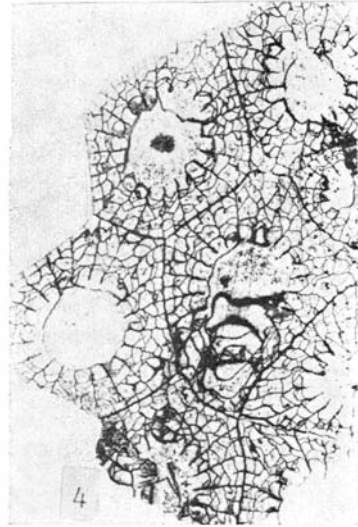
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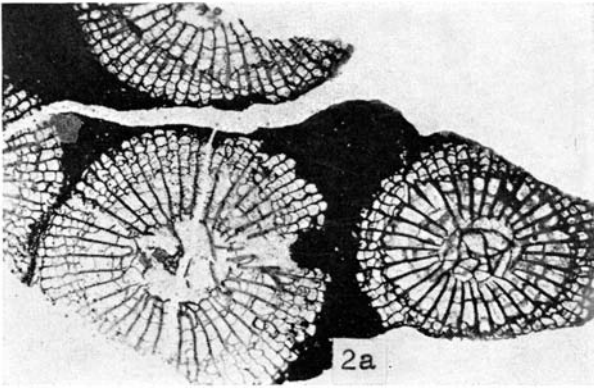
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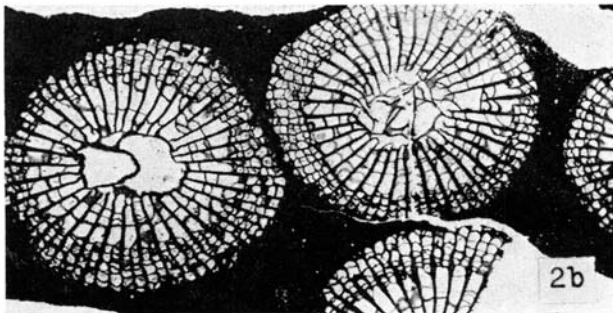
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4



2a



2b



3

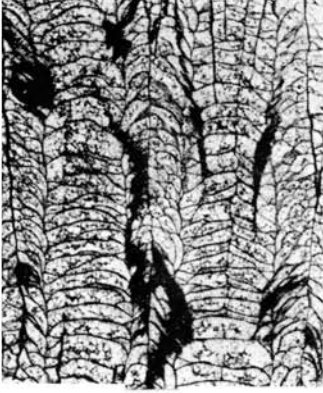
PLATE III

Fig. 1. *Stylastraea toulai* (STUCKENBERG). Specimen O.M. No. A 25185.  
Longitudinal section, slide No. 2.

Fig. 2. *Stylastraea tenuiseptata* FEDOROWSKI. Specimen O.M. No. A 25677.  
a – transverse section, slide No. 1.  
b – longitudinal section, slide No. 2.

Fig. 3. *Stylastraea minima* n. sp. Specimen O.M. No. A 25163. Holotype.  
a – transverse section, slide No. 1.  
b – longitudinal section, slide No. 2.

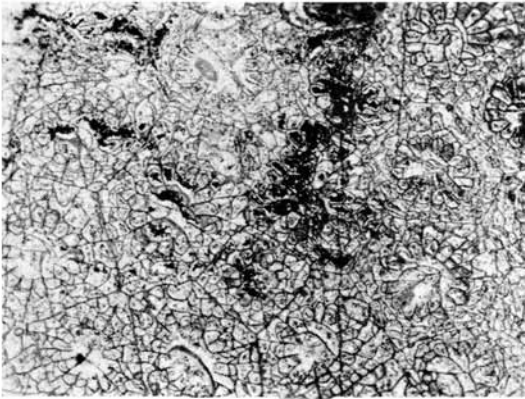
Fig. 4. *Kleopatrina (Porfirievella) vesiculosa* n. sp. Specimen O.M. No. A 25635.  
a – transverse section, slide No. 1.  
b – longitudinal section, slide No. 2.



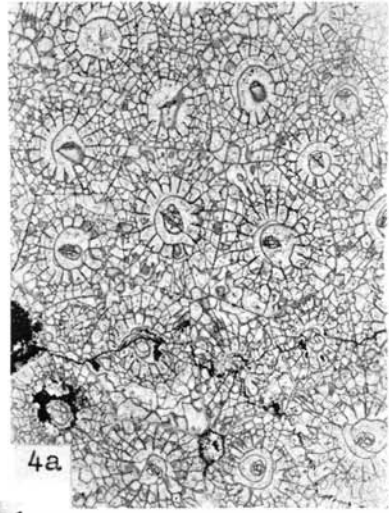
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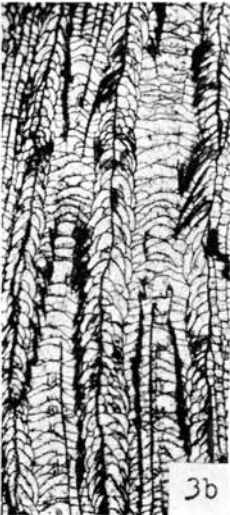
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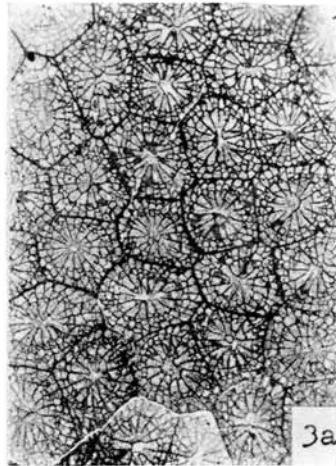
2a



4a



3b



3a



4b

PLATE IV

Fig. 1. *Kleopatrina (Porfiriavella) vesiculosa* n. sp. Specimen O.M. No. A 25170.

a – transverse section, slide No. 1.

b – longitudinal section, slide No. 2.

Fig. 2. *Kleopatrina (Kleopatrina) pseudoelegans* (DOBROLYUBOVA). Specimen O.M. No. A 25697.

a – transverse section, slide No. 1.

b, c – longitudinal sections, slides Nos. 2, 3.

Fig. 3. *Kleopatrina (Kleopatrina) pseudoelegans* (DOBROLYUBOVA). Specimen O.M. No. A 25695.

Transverse section, slide No. 1.

Fig. 4. *Kleopatrina (Kleopatrina) różkowskæ* n. sp. Specimen O.M. No. A 25682. Holotype.

a – transverse section, slide No. 1.

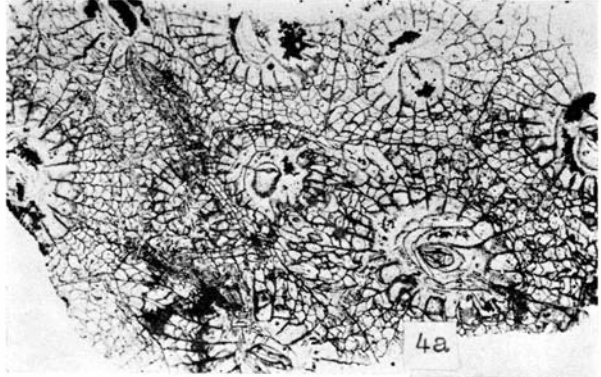
b – longitudinal section, slide No. 4.

Fig. 5. *Kleopatrina (Kleopatrina) różkowskæ* n. sp. Specimen O.M. No. A 25673.

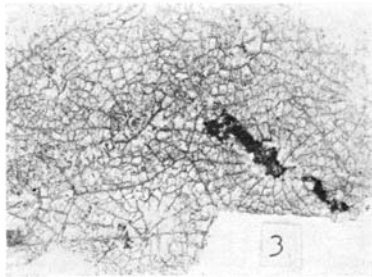
a, b – longitudinal sections, slides Nos. 1, 2.



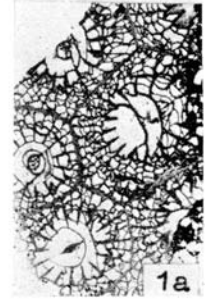
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4a



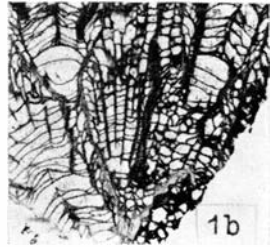
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1a



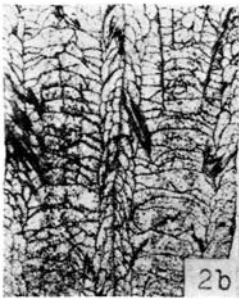
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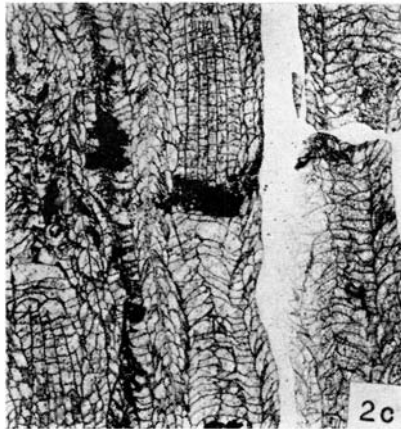
1b



4b



2b



2c



5b

PLATE V

Fig. 1. *Kleopatrina (Kleopatrina) magnifica* (PORFIRIEV). Specimen O.M. No. A 25629.

a – transverse section, slide No. 1.

b – longitudinal section, slide No. 2.

Fig. 2. *Thysanophyllum cf. cystosum* DOBROLYUBOVA. Specimen O.M. No. A 25166.

a – transverse section, slide No. 1.

b – longitudinal section, slide No. 2.

Fig. 3. *Thysanophyllum cf. cystosum* DOBROLYUBOVA. Specimen O.M. No. A 25180.

a – transverse section, slide No. 1.

b – longitudinal section, slide No. 2.

Fig. 4. *Thysanophyllum cf. cystosum* DOBROLYUBOVA. Specimen O.M. No. A 25666.

a – transverse section, slide No. 1.

b – longitudinal section, slide No. 3.

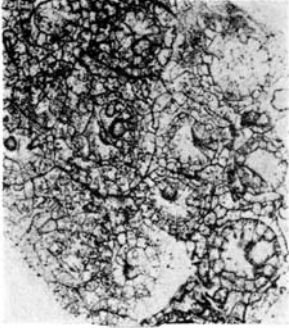
Fig. 5. *Protolonsdaleiastraea composita* n. sp. Specimen O.M. No. A 25129.

Longitudinal section, slide No. 2. Holotype.

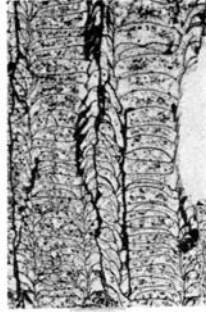
Fig. 6. *Protolonsdaleiastraea composita* n. sp. Specimen O.M. No. A 25131.

Longitudinal section, slide No. 2.

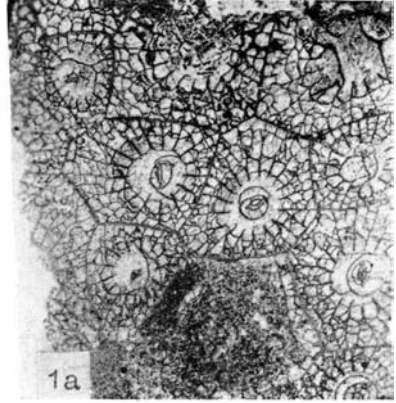




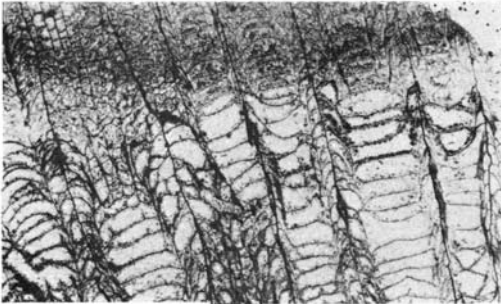
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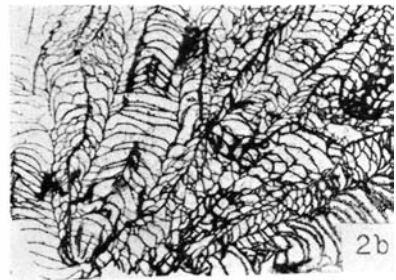
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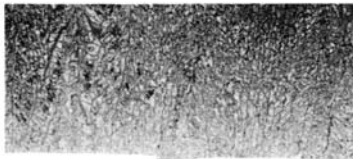
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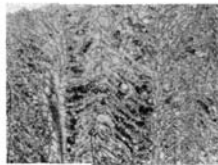
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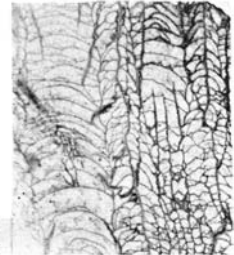
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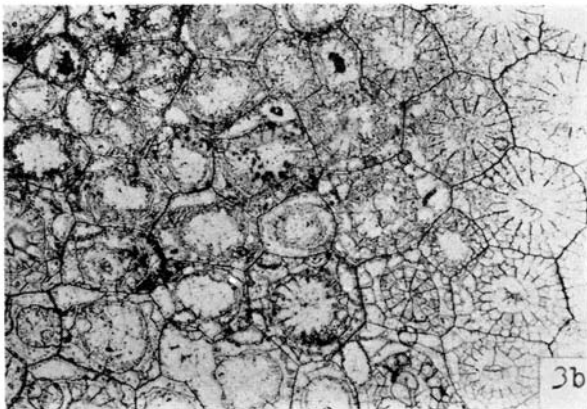
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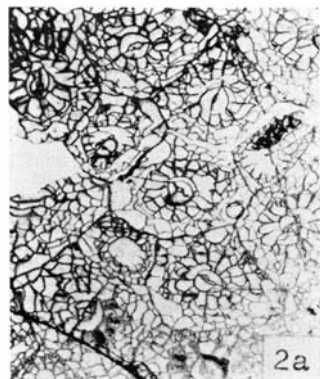
6



1b



3b



2a

PLATE VI

Fig. 1. *Thysanophyllum dubiosum* n. sp. Specimen O.M. No. A 25643-b.

a – transverse section, slide No. 1. Holotype.

b – longitudinal section, slide No. 2. Holotype.

Fig. 2. *Kleopatrina (Porfirievella) permica* (FEDOROWSKI). Specimen O.M. No. A 25656.

a – transverse section, slide No. 1.

b – longitudinal section, slide No. 2.

Fig. 3. *Protolonsdaleiastraea complexa* (DOBROLYUBOVA). Specimen O.M. No. A 25130.

a – transverse section, slide No. 1.

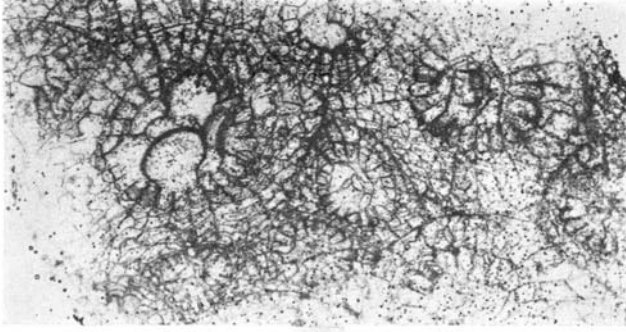
b – longitudinal section, slide No. 2.

Fig. 4. *Protolonsdaleiastraea composita* n. sp. Specimen O.M. No. A 25129.

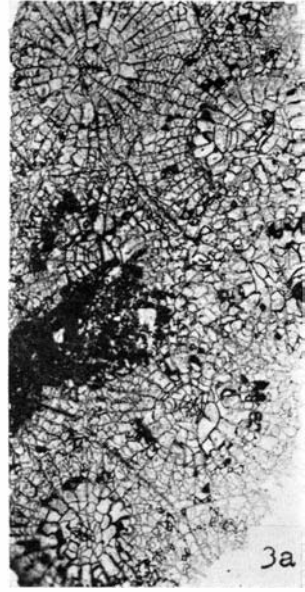
Transverse section, slide No. 1. Holotype.

Fig. 5. *Protolonsdaleiastraea composita* n. sp. Specimen O.M. No. A 25131.

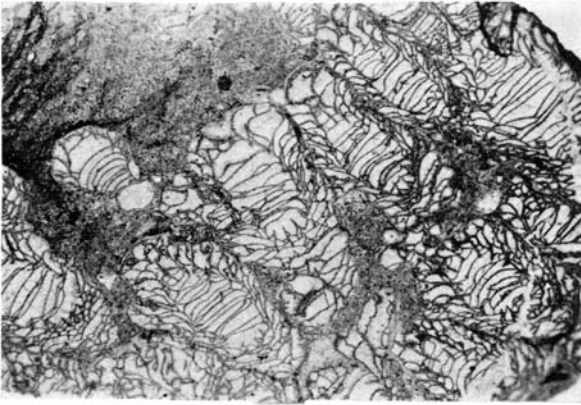
Transverse section, slide No. 1.



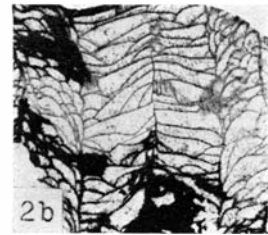
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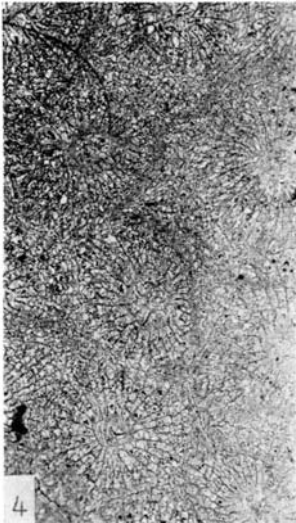
3a



1b



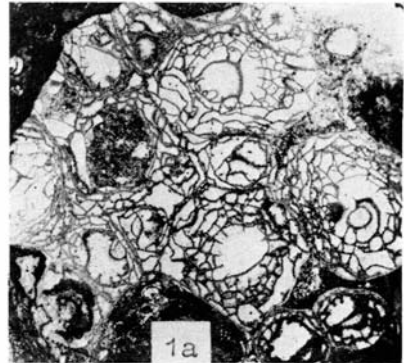
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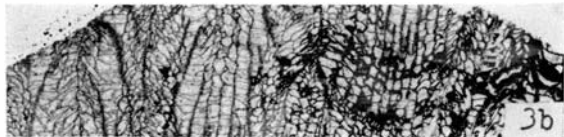
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5



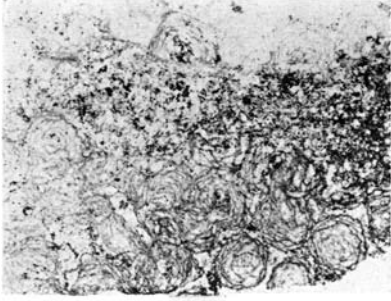
1a



3b

PLATE VII

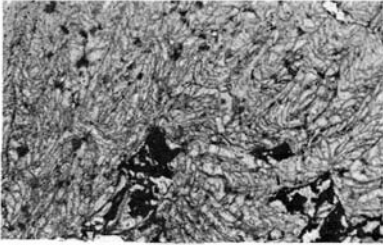
- Fig. 1. *Roemeripora wimani wimani* HERITSCH. Specimen O.M. No. A 25127.  
a – transverse section, slide No. 1.  
b – longitudinal section, slide No. 2.
- Fig. 2. *Roemeripora wimani minor* HERITSCH. Specimen O.M. No. A 25123.  
a – transverse section, slide No. 1.  
b – longitudinal section, slide No. 2.
- Fig. 3. *Roemeripora wimani minor* HERITSCH. Specimen O.M. No. A 25176.  
a – transverse section, slide No. 1.  
b – longitudinal section, slide No. 2.
- Fig. 4. *Michelinopora abnormis* (HUANG). Specimen O.M. No. A 25626.  
a – transverse section, slide No. 1.  
b – longitudinal section, slide No. 2.
- Fig. 5. *Syringopora cf. ramulosa* GOLDFUSS. Specimen O.M. No. A 25665.  
a – transverse section, slide No. 1.  
b – longitudinal section, slide No. 2.
- Fig. 6. *Hayasakaia profunda* n. sp. Specimen O.M. No. A 25182.  
a – transverse section, slide No. 1. Holotype.  
b – longitudinal section, slide No. 2. Holotype.



1a



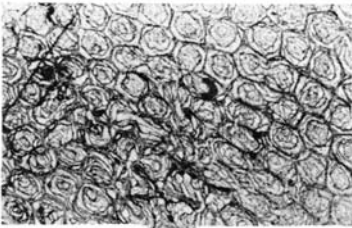
4a



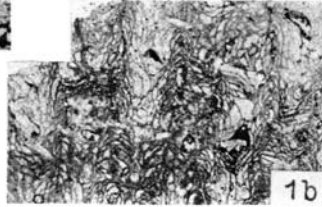
2b



4b



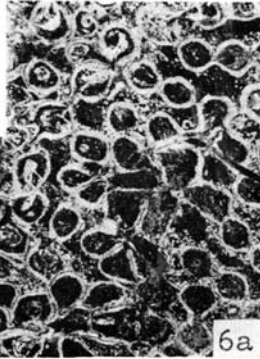
2a



1b



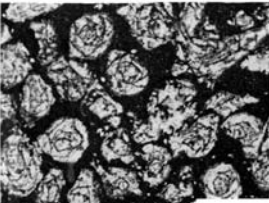
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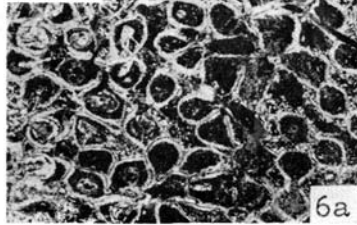
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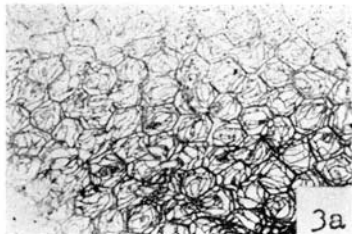
6b



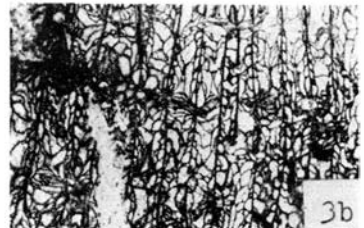
5a



3a



3a



3b



## SKRIFTER

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