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FRASNIAN TABULATA OF THE SOUTH-EASTERN POLAND

Abstract. — Thirteen tabulate species including 5 new ones from Frasnian bore cores in the Lublin region are described. The fauna belongs to the East-European Platform type rather than to that from Belgium.

INTRODUCTION

The profile of the Devonian is complete in the Lublin region (Pajchłowa 1968; Miłaczewski 1975). It is characterized by predominance of carbonates (especially in the case of Middle and lower Upper Devonian), rich in organic remains, mainly corals (Tabulata, Tetracoralla) and stromatoporoids. Tabulates are most common in the Givetian and Frasnian, occurring in masses in several horizons.

The paper presents further results of studies on Tabulata of the Lublin region, carried out by authors (see Stasińska and Nowiński 1976, for data on Givetian tabulates of this region). The studies covered material derived from the boreholes Tyszowce IG-2, Rachanie IG-1, Korczmin IG-1 and Lublin IG-1 (Table 1). Warm thanks are due to Dr. Miłaczewski and Dr. A. Żelichowski of the Geological Institute, Warsaw, for the loan of the coral material and for making available their unpublished reports. Thanks are also due to M. Nowińska and D. Kościelska from the Institute of Paleobiology, Polish Academy of Sciences in Warsaw for making thin and polished sections and to E. Wyrzykowska for making photos. The Tabulata collection is housed in Warsaw at the Institute of Paleobiology, Polish Academy of Sciences (abbreviated as ZPAL).

FRASNIAN TABULATA OF THE LUBLIN REGION

The Frasnian of the Lublin region is characterized by predominance of carbonate facies rocks such as dolomites, dolomitic limestones and limestones. Tabulates, tetracorals and stromatoporoids sometimes form mass accumulations of the biolite type in several horizons. Among ta-

Table 1
Distribution of the Givetian and Frasnian Tabulata, Heliolitida and Chaetetida
in the Lublin region

BORE—HOLES SPECIES	GIVETIAN					FRASNIAN				
	Bąkowa IG-1	Plusy IG-1	Kock IG-2	Korezmin IG-1	Tyszowce IG-2	Lublin IG-1	Korezmin IG1	Tyszowce IG-2	Lublin IG-1	Rachanie IG-1
<i>Favosites goldfussi</i> d'Orbigny		+								
<i>Reoemerolites lublinensis</i> sp. n.								+		
<i>Gracilopora polonica</i> sp. n.								+		+
<i>Gracilopora vermicularis</i> (Mc Coy)										+
<i>Thamnopora alta</i> (Tchernychev)	+									
<i>Thamnopora boloniensis</i> (Gosselet)		+								
<i>Thamnopora cervicornis</i> (de Blainville)	+			+						
<i>Thamnopora nicholsoni</i> Frech		+								
<i>Thamnopora reticulata reticulata</i> (de Blainville)		+								
<i>Thamnopora reticulata legibilis</i> Sokolov		+								
<i>Alveolites duponti</i> Lecompte										+
<i>Alveolites intermixtus</i> Lecompte								+		
<i>Alveolites maillieuxi</i> Salée in Lecompte		+								
<i>Alveolites parvus</i> Lecompte	+	+								
<i>Alveolites suborbicularis</i> Lamarck	+									
<i>Alveolitella fecunda</i> (Lecompte)	+			+						
<i>Alveolitella rachaniensis</i> sp. n.										+
<i>Crassialveolites crassus</i> (Lecompte)	+									
<i>Caliopora battersbyi</i> (Milne-Edwards & Haime)		+								
<i>Coenites laminosa</i> Gürich	+	+		+						
<i>Coenites variabilis</i> Sokolov							+			
<i>Scoliopora denticulata</i> (Milne-Edwards & Haime)	+	+	+	+	+	+	+	+	+	
<i>Thecostegites bouchardi</i> (Michelin)							+			
<i>Thecostegites evlanensis</i> Ermakova										+
<i>Thecostegites major</i> (Lecompte)								+		
<i>Aulocystis tikh'yiformis</i> sp. n.								+		
<i>Aulocystella devonica</i> sp.n.								+		
<i>Heliolites porosus</i> (Goldfuss)		+								
<i>Chaetetes lonsdalei</i> Etheridge & Foord		+								
<i>Chaetetes yunnanensis</i> (Mansuy) emend. Fontaine				+						

bulates prevail representatives of the families Pachyporidae, Alveolitidae, Coenitidae, Thecostegitidae and Aulocystidae. Frasnian assemblage of tabulates is somewhat less differentiated in specific composition than the Givetian (see Stasińska and Nowiński 1976), whereas the generic composition is roughly the same. The Frasnian assemblage differs from the Givetian also in almost complete lack of representatives of *Thamnopora*, a marked decrease in number of *Alveolites* species, and increase in number of representatives of *Gracilopora* and of syringoporoids (*Thecostegites*) and auloporids (*Aulocystis*, *Aulocystella*), rare in the Lublin Givetian. Only one cosmopolitan species *Scoliopora denticulata*, characterized by wide stratigraphic range, was here recorded in both the Givetian and Frasnian. The tabulate assemblages from the Givetian and Frasnian of the Lublin region highly differ in specific and generic composition. Givetian tabulates are generally closer to the coeval assemblage from Belgium, and the Frasnian are of the East-European Platform type.

The lithofacial characteristics and the composition of tabulate assemblages and accompanying organisms from particular boreholes Tyszowce IG-2, Rachanie IG-1, Korczmin IG-1, Lublin IG-1 are as follows:

Tyszowce IG-2 (1943.5—2356.2 m). — Frasnian is represented by series of limestones with corals and dolomites bearing recrystallized coral skeletons. The limestone series is formed by fine-crystalline, dark-brownish and grey limestones very rich in organic debris. They contain very numerous branching, ramose and massive tabulate colonies, solitary and colonial tetracorals and branching and tabular stromatoporoids. Tabulates are usually represented by large fragments of colonies what, along with stratification of other bioclasts, indicates redeposition. Transport was presumably at a short distance as the fragments of colonies are broken but not abraded. This is further supported by preservation of complete shells of small brachiopods, ostracodes and foraminifers.

The tabulate assemblage comprises: *Roemerolites lublinensis* sp. n., *Gracilopora polonica* sp. n., *Alveolites intermixtus* Lecompte, *Scoliopora denticulata* (Milne-Edwards and Haime), *Thecostegites major* (Lecompte), *Aulocystis tikhyiformis* sp. n., *Aulocystella devonica* sp. n. and *Aulocystis* sp. Corals are accompanied by very numerous (or even occurring in masses) excellently preserved shells of various genera of foraminifers, ostracods, brachiopods, gastropods, bivalves and stems of small crinoids and echinoderm spines. Small, up to 2—3 mm high, colonies of algae, most probably belonging to Rhodophyta, are common.

Korczmin IG-1 (1939.4—2428.5 m). — Frasnian comprises series of knobby, dark grey-brownish, fine-crystalline detrital limestones with thin layers rich in branching and bushy and, sometimes, massive tabulates. There are also found solitary and colonial tetracorals and branching and tabular stromatoporoids. The tabulate assemblage comprises: *Alveolitella fecunda* (Lecompte), *Coenites variabilis* Sokolov, *Scoliopora denticulata*

(Milne-Edwards and Haime), *Thecostegites bouchardi* (Michelin) and *Aulopora* sp. There are also found very numerous complete shells of foraminifers, ostracods, brachiopods, bivalves, crinoid stems, echinoderm spine and rodophyte colonies. The accompanying organic debris occur in large amounts or even in masses.

Rachanie IG-1 (1784.0—2294.0 m). — Frasnian is represented by series of limestones with corals at the top and cellular dolomites at the base. The former comprises dark grey-brownish, fine-crystalline coral limestones nodular or pelitic in places and contains very numerous tabulate, tetracoral and stromatoporoid colonies of diverse morphological types. Tabulates are represented by *Gracilopora vermicularis* (Mc Coy), *Alveolites duponti* Lecompte, *Alveolitella rachaniensis* sp. n., *Thecostegites evlanensis* Ermakova and *Aulocystella* sp. There are also found very numerous remains of other organisms same as those from the Frasnian from the Tyszowce and Korczmin boreholes.

Lublin IG-1 (3835.0—4200.0 m). — Frasnian comprises a series of dark brownish fine-crystalline, slightly nodular limestones with scarce fragments of branching tabulates and stromatoporoids and rare brachiopods. Tabulates are represented by a single cosmopolitic species *Scoliopora denticulata* (Milne-Edwards and Haime). There are also found innumerable shells of foraminifers and ostracods, thick crinoid stems and small rodophyte colonies.

COMPARISON OF TABULATES FROM THE FRASNIAN OF POLAND, BELGIUM AND EAST-EUROPEAN PLATFORM

Poland. — Frasnian tabulate assemblages from the Lublin region are more differentiated generically than those from other regions of Poland (e.g. Holy Cross Mts, Cracow region; see Table 2). Tabulates recorded in these regions lived in different environments what is indicated by differences in lithology of limestones and predominating types of coral colonies. Frasnian tabulates from the Lublin region usually formed layers mainly consisting of branching (*Gracilopora*, *Alveolitella*, *Coenites* and *Scoliopora*) or, sometimes, bushy (*Roemerolites* and *Thecostegites*) and incrusting (*Aulopora*, *Aulocystis*, *Aulocystella*) colonies, or, very rarely, massive colonies (*Alveolites*).

Frasnian tabulates from the Cracow region formed biostromes (Nowiński 1976) consisting of both branching (*Cladopora* and *Alveolitella*) and massive (*Dictyofavosites*, *Alveolites* and *Tyrganolites*) colonies whereas incrusting colonies (*Aulopora*) were almost completely lacking. In turn, coeval tabulates from the Holy Cross Mts (Stasińska 1953, 1954, 1958) were forming bioherm accumulations mainly consisting of massive colonies (*Alveolites* and *Crassialveolites*) highly differentiated in specific

composition and innumerous branching (*Thamnopora* and *Alveolitella*) and bushy (*Syringopora*) colonies.

Belgium. — From the Frasnian of Belgium (Lecompte 1939) there are known mainly branching colonies (*Thamnopora*, *Cladopora*, *Alveolitella* and *Scoliopora*) and massive colonies (*Alveolites*) whereas bushy ones (*Aulopora*, *Thecostegites*) are very rare. It follows that the Belgian assemblages differ from those from the Lublin region in the lack of *Roemerolites*, *Gracilopora*, *Coenites*, *Aulocystis*, *Aulocystella* which are very common in the latter region; thus they are very similar to those from the Holy Cross Mts. Only 3 species were recorded in both Belgium and the Lublin region: *Alveolites duponti* Lecompte, *Thecostegites bouchardi* (Michelin) and *T. major* Lecompte.

East-European Platform. — Frasnian tabulate assemblages of the Lublin region are very similar to the coeval tabulates from the East-European Platform (Main Devonian Field, SE slope of the Platform and western Ural Mts). The assemblages from these regions are characterized by a marked predominance of species with bushy, branching and crawling colonies (*Gracilopora*, *Coenites*, *Thecostegites*, *Aulopora*, *Aulocystis* and *Aulocystella*) on those with massive colonies. The Lublin region differs from the East-European Platform areas in almost complete lack of the representatives of *Thamnopora* and *Syringopora* and a very small contribution of those of *Alveolites*. In turn, the representatives of *Roemerolites* and *Scoliopora*, known from the Lublin region, are not recorded in the Frasnian From the latter areas.

DESCRIPTIONS

Order **Favositida** Sokolov, 1952

Suborder **Thamnoporina** Sokolov, 1950

Family **Syringolitidae** Waagen and Wentzel, 1889

Genus *Roemerolites* Dubatolov, 1963

Remarks. — The genus *Roemerolites* is primarily characterized by thick-walled corallites of the syringoporoidal type, loosely spaced (as in *Syringopora*) in some parts of colony and crowded, with walls of different individuals closely adjoining one another, in other parts of the same colony. Corallites from the latter parts are polygonal in cross-section and with connecting elements represented by pores and with concentric-lamellar wall microstructure which makes them very similar to corallites of some genera of Syringolitidae, such as *Romeripora* Kraicz (1934), *Neoroemeria* Radugin (1938) and *Pseudoroemeria* Chekhovich (1960). The diagnosis and comparison with other genera were given by Dubatolov (1963) and Hill and Jell (1970). Up to the present there were described only two species, both from the Middle Devonian. This is the first record of that genus from Poland.

Roemerolites lublinensis sp. n.

(pl. 17:1a-c)

Holotype: ZPAL T XI/129; pl. 17:1a-c.

Type locality: Lublin region, borehole Tyszowce IG-2, depth 2036.6—2053.6 m.

Type horizon: Frasnian.

Derivation of the name: coming from Lublin area.

Diagnosis. — Colonies hemispherical, up to 80 mm in diameter and up to 40 mm in height. Corallites short, syringoporoidal, 0.1—1.2 mm distant from one another in loosely-spaced parts of colony or tightly packed in assemblages comprising 10 to 50 individuals. Corallites polygonal to circular in cross-section, 1.8 to 2.0 mm in diameter; walls of polygonal and circular corallites 0.1—0.4 mm and 0.3—0.6 mm thick, respectively. Connecting pores usually 0.25—0.3 mm in diameter; connecting pores and tubes spaced in 0.1—1.2 mm intervals. Septal spines of the syringoporoidal type. Tabulae numerous, funnel-shaped, forming wide axial channel in the center of corallite.

Material. — Only the type specimen is known so far.

Description. — Small hemispherical bushy colonies up to 80 mm in diameter and 40 mm in height. Corallites short, tubular, of the syringoporoidal type, set parallel to one another, loosely spaced in one part of the colony, in 0.1—1.2 mm intervals, and tightly packed in assemblages of 10—50 individuals closely adjoining one another with epitheca in other parts of the same colony. Corallites from loose parts of colony circular to somewhat ovate in cross-section, whereas those from the densely-spaced part—polygonal to rounded polygonal (quadrangular or hexagonal) in outline; corallite diameter is roughly uniform ranging from 1.6 to 2.2 mm, most often 1.8—2.0 mm. Corallites are thick-walled; wall thickness equals 0.3—0.6 mm and 0.1—0.4 mm for circular and polygonal corallites, respectively. Wall microstructure concentric-lamellar, syringoporoidal. Epitheca thin, nonuniform in thickness. Connecting tubes are very short, thick, about 0.8 mm in diameter, rarely found. Connecting pores numerous, circular, 0.2—0.4 mm and most often 0.25—0.3 mm in diameter. Spacing of connecting tubes and pores changing from 0.1 to 1.2 mm. Septal spines short, thick, blunt, deeply embedded in stereoplasma of corallite wall, relatively rare. Tabulae numerous, irregularly funnel-shaped, sometimes bent, thin, often forming wide axial channel in the center of corallite tube.

Remarks. — The new species resembles type species, *R. batschatensis* Dubatolov, only in the diameter of connecting tubes and pores, differing in markedly larger diameter of corallites, thicker corallite walls, better developed septal spines and more numerous clusters of polygonal corallites within the colony.

Family **Pachyporidae** Gerth, 1921

Subfamily **Pachyporinae** Gerth, 1921

Genus *Gracilopora* Tchudinova, 1964

Diagnosis. — See Mironova 1974.

Remarks. — The genus *Gracilopora* is very close to *Cladopora* and *Striatopora* and to finely-branching representatives of *Thamnopora*. Some species of *Gracilopora* were erroneously assigned to the above mentioned genera. This genus is primarily characterized by obscurely radial-fibrous microstructure of corallite wall stereoplasma, visible on well-preserved specimens only. The characteristics and comparisons with related genera were given by Dubatolov (1969, 1972), Yanet (1972) and

Nowiński (1976). Tchudinova (1964) assigned to *Gracilopora* the following species: *Cladopora yavorski* Dubatolov, *C. angusta* Yanet, *C. ivaldensis* Yanet, *C. infirma* Yanet and *C. vermicularis* (Mc Coy) var. *clara* Yanet. Mironova (1974) assigned here: *Thamnopora yavorski* Dubatolov, *T. yavorski* var. *effecta* Dubatolov, *T. nana* Dubatolov and *Cladopora effecta* Dubatolov. Up to the present, 18 species of *Gracilopora* were described from the Lower, Middle and Upper Devonian. It is the first record of its representatives from Poland.

Gracilopora polonica sp. n.

(pl. 18:1a-d)

Holotype: ZPAL T XI/130; pl. 18:1a-d.

Type locality: Lublin area, borehole Tyszowce IG-2, depth 2000.0—2026.6 m and 2158.1—2162.6 m.

Type horizon: Frasnian.

Derivation of the name: coming from Poland.

Diagnosis.—Branching colonies 4.0—7.0 mm in diameter. Corallites rounded polygonal in cross-section, 0.3—0.6 mm in diameter, or elongate polygonal, 0.3—0.5 × 0.6—0.8 mm in size. Corallite wall thickness changing from 0.08—0.12 mm in axial part to 0.3 in peripheral part of colony. Connecting pores 0.1—0.15 mm in diameter, spaced in 0.5—1.0 mm intervals. Tabulae straight to slightly bent, innumerable, with spacing changing from 0.5 to 1.0 mm. Septal spines obscure.

Material.—Six colonies from the borehole Tyszowce IG-2 (depth 2000.0—2026.6 m, 2026.6—2063.6 m, 2158.1—2162.6 m, 2193.7—2199.3 m); ZPAL T XI/130—135.

Description.—Branching colonies. Branches long, cylindrical and somewhat incurved, circular to somewhat ovate in cross-section, 4.0 to 7.0 and most often 5.0 to 6.5 mm in diameter. Corallites long, cylindrical, polygonal rounded in cross-section, 0.25 to 0.7 mm and most often 0.3—0.6 mm in diameter, or polygonal elongate, 0.3—0.5 × 0.6—0.8 mm in size. Corallites set oblique to surface of colony. Visceral chamber of corallites circular to ovate in cross-section, sometimes narrowed in result of local increase in thickness of corallite wall. Calices rounded polyginal, with blunt and rounded edges. Corallite wall thickness changing from 0.05 to 0.15, and most often from 0.1 to 0.2 mm in axial part of colony, and up to 0.3 mm in peripheral zone. Medial line very thin, dark. Corallite wall microstructure obscurely radial-fibrous, typical of that genus. Connecting pores innumerable, circular, 0.1—0.15 mm in diameter, spaced in intervals equal 0.4—1.0 mm and most often 0.5—0.8 mm. Tabulae scarce, thin, straight to slightly bent, horizontal or somewhat oblique, spaced in 0.5—1.0 mm intervals. Septal spines not present.

Remarks.—*Gracilopora polonica* sp. n. is most similar to *G. vermicularis* (Mc Coy), known from the Givetian and Frasnian of the western Europe and the USSR (Mc Coy 1851; Lecompte 1939; Sokolov 1952; Dubatolov 1959; Dubatolov and Mironova 1960; Yanet 1959) in corallited diameter and thickness of walls in axial part of colony; it differs in larger diameter of colony, markedly wider connecting pores and thinner corallite walls in peripheral zone of the colony.

Gracilopora vermicularis (Mc Coy, 1850)

(pl. 18:2; pl. 19:1a, b)

1851. *Alveolites vermicularis* Mc Coy: 377.

1952. *Cladopora vermicularis* (Mc Coy); Sokolov: 71, pl. 15:1 (with synonymy).

1972. *Gracilopora vermicularis* (Mc Coy); Yanet: 67, pl. 20:2—4 (with synonymy).

Diagnosis. — See Yanet 1972.

Material. — Eleven colonies from the borehole Rachanie IG-1 (depth 1805.5—1821.2 m); ZPAL T XI/136—146.

Description. — Branching colonies; branches long, cylindrical or weakly incurved, circular to somewhat ovate in cross-section, 3.5—7.5 mm and most often 5.0—6.0 mm in diameter. Corallites long, polygonal in cross-section, 0.25—0.5 mm and most often 0.3—0.4 mm in diameter, set oblique to surface of colony. Calices rounded to elongate polygonal in cross-section, with circular or ovate section of visceral chamber. Corallite walls relatively thick, in axial zone of colony (secondary stereoplasmatic thickening) 0.02—0.05 mm thick, thickening to 0.2 mm in the peripheral zone. Medial zone thin, poorly visible. Wall microstructure obscurely radial-fibrous. Connecting pores not very numerous, circular, up to 0.1 mm in diameter, arranged in single rows in 0.5—0.9 mm intervals. Tabulae rare, thin, horizontal or oblique, straight or concave, 0.3—1.0 mm distant from one another. Septal spines obscure.

Remarks. — Original specimens of *Gracilopora vermicularis* (Mc Coy) were very inadequately described and the knowledge of structure of their skeleton is insufficient (Mc Coy 1850; Milne-Edwards and Haime 1853). The differentiation of two subspecies within *Gracilopora vermicularis* (Mc Coy), that is *G. vermicularis vermicularis* (Mc Coy) and *G. vermicularis clara* (Yanet 1959), does not seem fully justified as this species was presumably highly variable, depending on environment. The observed internal structure markedly depends on preservation of specimens. The above described colonies of *Gracilopora vermicularis* from the Lublin area display features typical of this species except for somewhat larger and more widely spaced connecting pores.

Occurrence. — Poland: Frasnian (Lublin region — Rachanie borehole). Western Europe: Middle Devonian — lower Upper Devonian (Frasnian). USSR: Middle Devonian — lower Upper Devonian (Frasnian) (central Asia, Altai Kuzneck Basin); Frasnian (The Urals).

Suborder Alveolitina Sokolov, 1950
Family Alveolitidae Duncan, 1872
Genus Alveolites Lamarck, 1801

Diagnosis. — See Dubatolov 1962.

Alveolites duponti Lecompte, 1939
 (pl. 19:2a-b)

1939. *Alveolites duponti* Lecompte: 37, pl. 5:1—7.

1952. *Alveolites duponti* Lecompte; Sokolov: 99, pl. 28:1—2.

Material. — Three colonies from the borehole Rachanie IG-1 (depth 1805.5—1821.2 m); ZPAL T XI/147—149.

Description. — Small branching, digitate or irregularly elongate colonies 15.0—30.0 mm in diameter, often with knobby-like projections. Corallites long, cylindrical, somewhat twisted, bending in the form of gentle arc and opening normally to the surface in peripheral zones of branching and digitate colonies. Corallites polygonal to elongate polygonal in cross-section in axial part of colony, and rounded polygonal and slightly semicrescent, with a single, distinct, large septal spine in the peripheral part, ranging 0.4—1.0 mm and most often 0.6—0.8 mm in diameter in both axial

and peripheral zones. Corallite wall thickness variable, changing from 0.05—0.1 mm in the axial zone to 0.2 mm in the peripheral part of colony. Wall microstructure radial-fibrous, indistinct. Medial suture bipartite, dark. Connecting pores large, 0.2—0.25 mm in diameter, circular or weakly ovate, 0.8—1.4 mm distant from one another. Septal spines thick, conical, blunt, limited to peripheral part of colony. Tabulae numerous, thin, straight or somewhat bent, spaced at 0.3—2.0 mm and most often 0.5—1.2 mm intervals.

Remarks.—The specimens from the borehole Rachanie IG-1 differ from the representatives of the species *Alveolites duponti* from the Frasnian of the Ardennes (Lecompte 1939) in larger and more widely spaced connecting pores, more variable spacing of tabulae and better developed septal apparatus from peripheral zone of colony. The Polish specimens differ from those from the Frasnian of the Central Devonian Field in the USSR (Sokolov 1952) in the larger connecting pores only.

Occurrence.—Poland: Frasnian (Lublin area, Rachanie borehole). Belgium: Frasnian F₂j (Ardennes). USSR: Frasnian (Central Devonian Field).

Alveolites intermixtus Lecompte, 1939

(pl. 20:3)

1939. *Alveolites intermixtus* Lecompte; 50, pl. 9:4—5.

1958. *Alveolites intermixtus* Lecompte; Stasińska: 208, pl. 19.

Material.—Large fragment of a colony from the borehole Tyszowce IG-2 (depth 2127.0—2143.0 m); ZPAL T XI/150.

Description.—Small hemispherical colony 50 mm in diameter and up to 40 mm in height. Corallites long, trapezoidal to rounded polygonal in cross-section, 0.5—0.8 mm or, sometimes up to 1.0 mm in diameter. Calices almost circular in cross-section. Corallite walls nonuniform in thickness. Pores numerous, circular, about 0.25 mm in diameter, distributed in single rows at 0.25—0.45 mm intervals on corallite walls. Septal spines large, club-shaped, 0.5—0.7 mm long, attaining a third of calice height. Usually only one spine is visible in calice. Tabulae scarce, straight to slightly bent.

Occurrence.—Poland: Upper Givetian — Frasnian (Holy Cross Mts, Lublin region — Tyszowce borehole). Belgium: Givetian (the Ardennes, the Dinant).

Genus *Alveolitella* Sokolov, 1952

Remarks.—The diagnosis and comparison with closely related genera as given by Sokolov (1952, 1955) and Nowiński (1976).

Alveolitella rachaniensis sp. n.

(pl. 20:1, 2)

Holotype: ZPAL T XI/151; pl. 20:1.

Type locality: Lublin area, borehole Rachanie IG-1, depth 1805.5—1821.1 m.

Type horizon: Frasnian.

Derivation of the name: from the locality Rachanie.

Diagnosis.—Branching and digitate colonies 6.0—15.0 mm in diameter. Corallites long, elongate and rounded polygonal in cross-section, 0.6—0.7 mm in diameter.

Calices elongate polygonal, semicrescent and often meandering, with a single septal spine. Corallite wall thickness changing from 0.05—0.1 mm in the axial zone to 0.12—0.2 mm in the peripheral zone. Connecting pores circular, 0.2 mm in diameter, spaced at 1.0—1.2 mm intervals. Tabulae thin, straight to slightly bent, spaced at 0.3—0.8 mm intervals.

Material. — Two colonies from the borehole Rachanie IG-1, depth 1805.5—1821.2 m; ZPAL T XI/151—152.

Description. — Colonies branching or digitate, circular to weakly ovate in cross-section, 6.0—15.0 mm in diameter. Corallites long, weakly bent, rounded polygonal to elongate polygonal in cross-section, elongate polygonal and sometimes semicrescent in peripheral zone of colony, 0.4—0.8 mm and most often 0.6—0.7 mm in diameter, reaching surface of colony at right or almost right angle. Calices polygonal, elongate, semicrescent, croissant-like, sometimes meandering, with a single, large blunt spine and rounded margin. Corallite wall thickness changing from 0.05—0.1 mm in axial part of colony to 0.12—0.2 mm in the peripheral part. There is no clear-cut difference in thickness between corallite walls from axial and peripheral zones, which is typical of this genus. Wall microstructure radial-fibrous, poorly visible. Medial line dark, thin, broken. Connecting pores numerous, circular, 0.2 mm in diameter, or elliptical, 0.2×0.3 mm in size, spaced at 1.0—1.2 mm intervals. Tabulae thin, straight or concave, horizontal or oblique, spaced at 0.3—0.8 mm intervals.

Remarks. — *Alveolitella rachaniensis* sp. n. is most close to *A. fecunda* (Lecompte 1939; Stasińska 1953; Dubatolov 1959; Nowiński 1976) in corallite diameter and thickness of corallite walls, differing in the lack of clearly marked peripheral zone with thick-walled corallites and the presence of strongly developed septal spines in peripheral parts of colony and larger connecting pores.

Family **Coenitidae** Sardeson, 1896
Subfamily **Coenitinae** Sokolov, 1950
Genus **Coenites** Eichwald, 1829

Remarks. — Diagnosis as given by Dubatolov (1972); see also characteristics and comparison with closely related genera given by Sokolov (1952, 1955, 1962) and Nowiński (1976).

Coenites variabilis Sokolov, 1952
(pl. 21:1a, b, 2)

Material. — Ten colonies from the borehole Korczmin IG-1 (depth 1942.0—1960.0 m, 1962.0—1966.0 m, 1971.0—1990.0 m, 2008.0 m, 2025.0—2029.0 m); ZPAL T XI/153—162.

Description. — Small branching colonies circular to ovate in cross-section, 3.0—12.0 mm in diameter, often flattened and laterally intergrown with neighbouring branches. Corallites small, bent, opening obliquely to surface of colony, rounded polygonal in cross-section, 0.2—0.5 mm in diameter and thin-walled (with wall thickness equal 0.05—0.08 mm) in the axial zone of colony. Thickness of corallite walls increases up to 0.1—0.3 mm and corallite cross-section changes to rounded polygonal and often strongly elongate in the peripheral zone. Calices shallow, with rounded margins and narrow, slit-like aperture. Septal spines poorly developed in calices. Wall microstructure radial-fibrous, poorly visible. Medial line

thin, dark, broken, visible only in axial part of colony. Connecting pores circular, 0.1 mm in diameter, spaced at 0.6—0.8 mm intervals. Septal spines poorly developed, limited to most peripheral zone of colony and to calices. Tabulae thin, horizontal to transversal, straight or concave, spaced at 0.1—0.6 mm intervals.

Remarks.—The Lublin specimens of *Coenites variabilis* differ from those described from the Frasnian of the East-European Platform by Sokolov (1952) in higher variability in corallite diameter only.

Occurrence.—Poland: Frasnian (Lublin region — borehole Korczmin IG-1). USSR: Frasnian (East-European Platform).

Subfamily Natalophyllinae Sokolov, 1950
Genus *Scoliopora* Lang, Smith and Thomas, 1940

Remarks.—Diagnosis as given by Dubatolov (1959). See also characteristics and comparisons with closely related genera given by Nowiński (1976).

Scoliopora denticulata (Milne-Edwards and Haime, 1851)
(pl. 21:3a, b)

1851. *Alveolites denticulatus* Milne-Edwards and Haime: 258, pl. 16:4, 4a.

1976. *Scoliopora denticulata* (Milne-Edwards and Haime); Nowiński: 75, pl. 11:3; pl. 12:1—5 (with synonymy).

Diagnosis.—See Dubatolov 1959.

Material.—Eight colonies from the borehole Tyszowce IG-2 (depth 2000.0—2026.0 m); ZPAL T XI/163—170; five colonies from the borehole Korczmin IG-1 (depth 1971.0—1990.0 m, 2008.0 m and 2025.0—2029.0 m), ZPAL T XI/171—175; ten colonies from the borehole Lublin IG-1 (depth 3839.0—3891.0 m), ZPAL T XI/176—185.

Description.—Branching colonies. Branches cylindrical, 7.5—14.0 mm in diameter, or weakly flattened, 8.0—9.0 × 10.0—12.0 mm in size. Calices ovate, flattened, horseshoe or bean-like in outline, with a single, large septal spine, sometimes meandering. Axial zone of colony variable in diameter, with corallites irregularly polygonal in cross-section and 0.4—0.7 mm and most often 0.5—0.6 mm in diameter, or irregularly elongate, 0.4—0.5 × 0.5—0.8 mm in size. Visceral chamber of corallites strongly narrowed, ovate in outline or slit-like. Corallite walls thick, 0.05—0.1 and most often 0.05—0.08 mm thick in that zone. Corallites irregularly polygonal and 0.5—0.7 × 0.6—1.1 mm in size in the peripheral zone. The thickness of corallite walls increasing up to 0.25 mm in that zone. Wall microstructure radial-fibrous, poorly visible. Medial suture indistinct. Connecting pores circular, 0.12—0.2 mm and most often 0.12—0.15 mm in diameter, arranged in vertical rows at 0.6—1.0 mm intervals. Septal spines short, thick, most common in peripheral zone of colony and in calices. Tabulae oblique, concave or, rarely, horizontal and straight, spaced at 0.3—0.8 mm intervals, most common in peripheral zone of the colony.

Remarks.—Colonies of *S. denticulata* are often overgrown by massive cenostea of stromatoporoids. Spherical algal structures are often found within corallite walls.

Occurrence.—Poland: Givetian — Frasnian (Lublin region), Eifelian (Holy Cross Mts), Givetian (Cracow region, NE Poland — borehole Miasto IG-1), Middle Devonian (Sudety Mts). West and East Europe: common in Eifelian — Frasnian. China: Famennian (Yunnan).

Order **Syringoporida** Sokolov, 1962
 Family **Thecostegitidae** Sokolov, 1950
 Genus *Thecostegites* Milne-Edwards and Haime, 1849

Remarks.—Diagnosis as given by Dubatalov (1972). Characteristics and comparisons with closely related genera were previously given by Lecompte (1939) and Jell and Hill (1970). Up to the present, there were described 18 species of that genus from Upper Silurian—Upper Devonian strata. This is the first record of this genus from Poland.

Thecostegites major Lecompte, 1939
 (pl. 22:1; pl. 7:1)

1939. *Thecostegites bouchardi* (Michelin) praemutatio *major* Lecompte: 174, pl. 23:4.

Supplemented diagnosis.—Small colonies. Corallites short, cylindrical, 1.5–2.0 mm in diameter and spaced at 0.2–0.6 mm intervals. Corallite walls 0.2–0.3 mm thick. Connecting elements 0.6–0.8 mm thick, spaced at 2.5–3.5 mm intervals. Connecting channels 0.2–0.4 mm in diameter. Septal spines thick, nonuniformly distributed. Tabulae numerous, thin, spaced at 0.15–0.4 mm intervals.

Material.—A single colony from the borehole Tyszowce IG-2 (depth 2173.7–2178.6 m), ZPAL T XI/186.

Description.—Bushy colonies, up to 80 mm high, consisting of short, spindle-shaped or, sometimes, cylindrical corallites 0.2–0.6 mm distant from one another. In some parts of colony, groups of corallites adjoin one another with walls and form coherent corallite systems. Corallites circular to weakly ovate in cross-section, 1.5–2.0 mm and most often 1.7–1.8 mm in diameter. Calices shallow, conical or cup-shaped, with blunt, rounded margins, calice diameter equal to that of corallites. Walls of individual corallites variable in thickness, 0.15 to 0.4 and most often 0.2 to 0.3 mm thick, and with concentric-lamellar structure of the syringoporoidal type. Epitheca dark, relatively thick, up to 0.05 mm thick, with radial microstructure. Connecting elements 0.6–1.2 mm thick and most often 0.8–1.0 mm thick, distributed at the same level between neighbouring corallites at 2.0–4.0 mm and most often 2.5–3.5 mm intervals. Connecting channels 0.2–0.4 mm in diameter. Septal spines numerous, very thick, shallowly plunged in wall stereoplasma and randomly distributed on corallite walls. Tabulae numerous, thin, arcuately bent, not funnel-shaped, spaced at 0.05–0.5 mm and most often 0.15–0.4 mm intervals, in cross-sections arranged in more or less concentric rings.

Occurrence.—Poland: Frasnian (Lublin region). Belgium: Frasnian F_{2g} (the Dinant, the Ardennes).

Thecostegites bouchardi (Michelin, 1847)
 (pl. 22:1a, b)

1847. *Harmodites bouchardi* Michelin: 185, pl. 48:3a, 3b).

1939. *Thecostegites bouchardi* (Michelin); Lecompte: 171, pl. 23:1–3.

1952. *Thecostegites bouchardi* (Michelin); Sokolov: 136, pl. 35:3–4 (with synonymy).

Diagnosis.—As given by Lecompte (1939).

Material.—Two colonies from the borehole Korczmin IG-1 (depth 1947.1–1964.6 m), ZPAL T XI/187–188.

Description.—Bushy, ovate or ellipsoidal colonies about 100 mm in diameter and up to 80 mm high. Corallites very long, cylindrical, straight or weakly bent, radially arranged in colony. Corallites 0.1–0.5 mm distant from one another or adjoining with walls; corallites regularly circular or, sometimes, somewhat ovate in cross-sections, 0.9–1.3 mm and most often 1.0–1.2 mm in diameter. Corallite walls 0.1–0.25 mm and most often 0.15–0.2 mm thick, with concentric-lamellar microstructure of the syringoporoidal type. Epitheca dark, up to 0.5 mm thick, with radial microstructure. Connecting elements 0.4–0.6 mm thick, spaced at 0.8–1.5 mm intervals. Connecting channels 0.2–0.4 mm in diameter. Septal spines numerous, thick, thorn-like, arranged in vertical rows on corallite walls; singular spines sometimes found on thick tabulae. Tabulae numerous, thin or sometimes thickened, arcuately bent, sometimes funnel-shaped, spaced at 0.1–0.5 mm intervals, forming usually asymmetric axial channel inside corallite tube.

Occurrence.—Poland: Frasnian (Lublin region). Belgium: Frasnian F₂i (the Dinant, the Ardennes). France: Frasnian. USSR: Middle Frasnian (Central Devonian Field).

Thecostegites evlanensis Ermakova, 1960
(pl. 23:2)

1960. *Thecostegites evlanensis* Ermakova: 85, pl. 6:3–4.

Material.—Two colonies from the borehole Rachanie IG-1 (depth 1805.5–1821.2 m); ZPAL T XI/189–190.

Description.—Bushy, hemispherical or flattened colonies up to 60 mm in diameter, consisting of relatively long, straight, cylindrical corallites spaced at 0.2–0.5 mm intervals or adjoining one another with walls. Corallites circular to weakly ovate in cross-section, 1.4–1.7 and most often 1.5–1.6 mm in diameter. Calices shallow, funnel- or cup-shaped, with blunt and rounded margins and of the same diameter as corallites. Corallite walls 0.3–0.4 mm thick, with concentric-lamellar structure of the syringoporoidal type. Epitheca thin, dark, with radial microstructure. Connecting elements 0.6–0.9 mm and sometimes up to 1.2 mm thick, distributed at the same level between neighbouring corallites at 1.0–1.4 mm intervals. Septal spines rare, short, thick and blunt. Tabulae numerous, thin, arcuately bent, not funnel-shaped, spaced at 0.1–0.4 mm and most often 0.2–0.3 mm intervals.

Remarks.—The specimens of *Thecostegites evlanensis* from the borehole Rachanie IG-1 differ from those described from the Frasnian of the East-European Platform by Ermakova (1960) in somewhat smaller diameter of corallites and less developed septal apparatus.

Occurrence.—Poland: Frasnian (Lublin region). USSR: Frasnian (East-European Platform).

Order **Auloporida** Sokolov, 1962
Family **Aulocystidae** Sokolov, 1950
Genus *Aulocystis* Schlüter, 1885

Remarks.—The genus *Aulocystis* is similar to *Aulocystella* in the type of corallite structure and the lack of connecting tubes, differing in shorter corallites and poorly developed axial channel without tabulae. The diagnosis and comparisons

with other closely related genera were given by Sokolov (1952, 1955, 1962), Watkins (1959) and others. Up to the present, there were described more than 10 species of this genus from the Middle and Upper Devonian. This is the first record of this genus from Poland.

Aulocystis tykhyiformis sp. n.

(pl. 24:1—3)

Holotype: ZPAL T XI/191; pl. 24:3.

Type locality: Lublin region, borehole Tyszowce IG-2 (depth 2000.0—2147.6 m).

Type horizon: Frasnian.

Derivation of the name: *tykhyiformis* — similar to *Aulocystis tykhyi* Sokolov.

Diagnosis.—Colonies irregular or flat, up to 80 mm in diameter. Corallites short, cylindrical, 1.2—1.6 mm in diameter. Calices deep, funnel-shaped, with sharp margins. Corallite walls 0.2—0.4 mm thick. Epitheca thick. Axial channel poorly differentiated. Tabulae strongly bent, variable in thickness. Septal spines lacking.

Material.—Five colonies from the borehole Tyszowce IG-2 (depth 2000.0—2026.6 m, 2085.9—2090.3 m, 2106.4—2110.7 m and 2143.0—2147.6 m); ZPAL T XI/191—195.

Description.—Bushy, flattened, or irregular colonies up to 80 mm in diameter and consisting of short, cylindrical, often bent and dichotomically branching (budding zones) corallites. Corallites set more or less parallel to one another, at highly irregular intervals or occurring in sets of about a dozen tightly packed individuals. Corallites circular to ovate in cross-section, 1.0—1.8 mm and most often 1.2—1.6 mm in diameter, connected only in budding zones. Connecting tubes not present. Calices funnel-shaped, very deep, with sharp margins. Corallite walls thick, 0.15—0.5 mm most often 0.2—0.4 mm thick, with concentric-lamellar microstructure of the syringoporoidal type. Epitheca thick, with radial microstructure. Axial channel poorly differentiated, present only in very short section of corallite tube, usually occupying eccentric position in cross-section. Tabulae variable in thickness, with shape characteristic of the genus, strongly bent and sometimes funnel-shaped. Septal spines not present.

Remarks.—*Aulocystis tykhyiformis* sp. n. resembles most closely *A. tykhyi* Sokolov, described from the Frasnian of the Voronezh district by Sokolov (1952), differing in somewhat smaller corallite diameter, markedly thicker corallite walls and thicker epitheca.

Genus *Aulocystella* Kuzina in Sokolov, 1955

Remarks.—Corallites of the genus *Aulocystella* resemble those of the genus *Syringopora* in general skeletal structure, differing in the lack of connecting tubes and the presence of well developed and usually eccentrically located axial channel with diaphragms of simple structure. The characteristic of the former genus was given by Sokolov (1955, 1962) and Mironova (1960). *Aulocystella devonica* sp. n. is the first species of that genus recorded so far in Poland and in Devonian as the other species were hitherto known from Silurian (Mironova 1960) and Lower Carboniferous (Sokolov 1955; Kathanov 1964; Lin-Bao Yui 1963).

Aulocystella devonica sp. n.

(pl. 25:1—4)

Holotype: ZPAL T XI/196; pl. 25:2.

Type locality: Lublin region, borehole Tyszowce IG-2 (depth 2000.0—2026.0 m) and Rachanie IG-1 (depth 1878.4—1896.5 m).

Type horizon: Frasnian.

Diagnosis.—Irregular colonies up to 100 mm in diameter. Corallites short, diverging in different directions, 1.6—2.0 mm in diameter. Calices deep, funnel-shaped, with sharp margins. Corallite walls 0.1—0.4 mm thick. Axial channel distinct, eccentric, 0.6—0.9 mm in diameter. Diaphragms spaced at 0.2—0.9 mm intervals. Tabulae funnel-shaped, syringoporoidal, not forming vesicular tissue. Septal spines very rarely found on corallite walls and tabulae.

Material.—Four colonies from the borehole Tyszowce IG-2 (depth 2000.2—2026.6 m, and 2166.8—2169.8 m), ZPAL T XI/196—199, and two others from the borehole Rachanie IG-1 (depth 1878.4—1896.5 m), ZPAL T XI/200—201.

Description.—Bushy colonies irregular in shape and up to 100 mm in diameter, consisting of short, bent corallites diverging in all directions, irregularly distributed throughout the colony. Corallites cylindrical, circular to ovate in cross-section, 1.4—2.1 mm and most often 1.6—2.0 mm in diameter, connected with one another in budding zones only. Connecting tubes lacking. Calices funnel-shaped, deep, usually with flat bottom and sharp margins. Corallite walls thin, 0.1—0.4 mm thick, with concentric-lamellar microstructure of the syringoporoidal type. Epitheca very thin, indistinct. Axial channel thin-walled, well-developed, located eccentrically or, sometimes, concentrically in corallite tube, circular to ovate in cross-section, with diameter changing from 0.5—1.3 mm and most often from 0.6—0.9 mm. Axial channel cut by numerous horizontal or somewhat oblique diaphragms which are straight or convex in relation to the outlet of corallite. Spacing of diaphragms is irregular in different parts of corallite, changing from 0.2—0.9 mm and most often equal 0.2—0.5 mm. Tabulae thin, long, regularly funnel-shaped, syringoporoidal, not forming vesicular tissue in peripheral zone of corallite. Septal spines short, thick, extremely rare on both corallite walls and tabulae.

Remarks.—*Aulocystella devonica* sp. n. differs from the other species of that genus in: markedly larger colony, corallites markedly narrower and diverging in various directions, axial channel highly variable in diameter and extremely scarce septal spines.

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TABULATA Z FRANU POŁUDNIOWO-WSCHODNIEJ POLSKI

Streszczenie

Materiały do pracy pochodzą z kilku otworów wiertniczych (Tyszowce IG-2, Rachanie IG-1, Korczmin IG-1, Lublin IG-1) obszaru lubelskiego. Ogółem opisano 13 gatunków Tabulata, w tym 5 gatunków nowych. W porównaniu z zespołem żyweckim (Stasińska i Nowiński 1976) zespół Tabulata z franu tego obszaru jest nieco uboższy gatunkowo, charakteryzuje się niewielkim udziałem przedstawicieli rodzaju *Thamnopora* i znacznie mniejszą liczbą gatunków rodzaju *Alveolites*. Licznie natomiast występują tu przedstawiciele rodzajów *Gracilopora*, *Thecostegites*, *Aulocystis* i *Aulocystella*, które są nieliczne w żywocie tego obszaru. Zespół frańskich Tabulata obszaru lubelskiego jest najbardziej podobny do równowiekowego zespołu Platformy wschodnio-europejskiej.

ТАБУЛЯТЫ ФРАНСКОГО ЯРУСА ЮГО-ВОСТОЧНОЙ ПОЛЬШЫ

Резюме

В основу работы положены материалы из буровых скважин (Tyszowce IG-2, Rachanie IG-1, Koczmin IG-1, Lublin IG-1) по лубельском районе. Всего описано 13 видов. Пять видов найдены в франском ярусе Польши впервые. Изученная фауна табулят указывает на заметные различия в родовом и видовом состоянии этих кораллов в франском и живетском ярусах лубельского района. Численность видов франского яруса заметно уменьшается по сравнению с видами живетского яруса (Stasińska, Nowiński 1976). Комплекс франских табулят характеризуется небольшим количеством видов *Thamnopora* и значительно меньшим чем в живетском ярусе количеством видов *Alveolites*. В то время доминируют виды *Gracilopora*, *Thecostegites*, *Aulocystis* и *Aulocystella*, которые редко встречаются в живетском ярусе этого района. Франский комплекс табулят является сходным с комплексом этого возраста восточно-европейской платформы (главного девонского поля, юго-восточного склона платформы и западного склона Урала).

EXPLANATION OF THE PLATES

All specimens are from Frasnian of Lublin area, SE Poland

Plate 17

Roemerolites lublinensis sp. n.: a longitudinal section, $\times 5$; b cross-section, part of colony with loosely arranged corallites, $\times 5$; c cross-section, part of colony with densely arranged corallites, $\times 5$; holotype; ZPAL T XI/129, Tyszowce IG-2 borehole, depth 2036.6—2053.6 m.

Plate 18

1. *Gracilopora polonica* sp. n.: a longitudinal section, $\times 5$; b longitudinal section, $\times 5$; c tangential section, $\times 5$; d cross-section, $\times 5$; holotype, ZPAL T XI/130, Tyszowce IG-2 borehole, depth 2000.0—2026 m.
2. *Gracilopora vermicularis* (Mc Coy, 1850): tangential section, $\times 5$; ZPAL T XI/136, Rachanie IG-1 borehole, depth 1805.5—1821.2 m.

Plate 19

1. *Gracilopora vermicularis* (Mc Coy 1850): *a* longitudinal section, $\times 5$; *b* cross-section, $\times 5$; ZPAL T XI/136, Rachanie IG-1 borehole, depth 1805.5—1821.2 m.
2. *Alveolites duponti* Lecompte, 1939: *a* longitudinal section, $\times 5$; *b* cross-section, $\times 5$; ZPAL T XI/147, Rachanie IG-1 borehole, depth 1805.5—1821.2 m.

Plate 20

1. *Alveolitella rachaniensis* sp. n.: longitudinal section, $\times 5$; holotype, ZPAL T XI/151, Rachanie IG-1 borehole, depth 1805.5—1821.2 m.
2. Same species: cross-section, $\times 5$; ZPAL T XI/152, Rachanie IG-1 borehole, depth 1805.5—1821.2 m.
1. *Alveolites intermixtus* Lecompte 1939: longitudinal and cross-section, $\times 5$; Tyszowce IG-2 borehole, depth 2127.0—2143.0 m, ZPAL T XI/150.

Plate 21

1. *Coenites variabilis* Sokolov 1952: *a* longitudinal section, $\times 10$; *b* cross-section, $\times 10$; ZPAL T XI/158, Korczmin IG-1 borehole, depth 1978.1—1993.6 m.
2. Same species: cross-section, $\times 10$; ZPAL T XI/153, Korczmin IG-1 borehole, depth 1947.1—1962.6 m.
3. *Scoliopora denticulata* (Milne-Edwards and Haime, 1851): *a* longitudinal section, $\times 10$; *b* tangential section, $\times 10$; ZPAL T XI/163, Tyszowce IG-2 borehole, depth 2000.0—2026.0 m.

Plate 22

1. *Thecostegites bouchardi* (Michelin, 1847): *a* longitudinal section, $\times 5$; *b* cross-section, $\times 5$; ZPAL T XI/187, Korczmin IG-1 borehole, depth 1947.1—1964.6 m.
2. *Thecostegites major* Lecompte, 1939: longitudinal section, $\times 5$; ZPAL T XI/186, Tyszowce IG-2 borehole, depth 2173.7—2178.6 m.

Plate 23

1. *Thecostegites major* Lecompte 1939: cross-section, $\times 5$; ZPAL T XI/186, Tyszowce IG-2 borehole, depth 2173.7—2178.6 m.
2. *Thecostegites evlanensis* Ermakova, 1960: cross-section, $\times 5$; ZPAL T XI/189, Rachanie IG-1 borehole, depth 1805.5—1821.2 m.

Plate 24

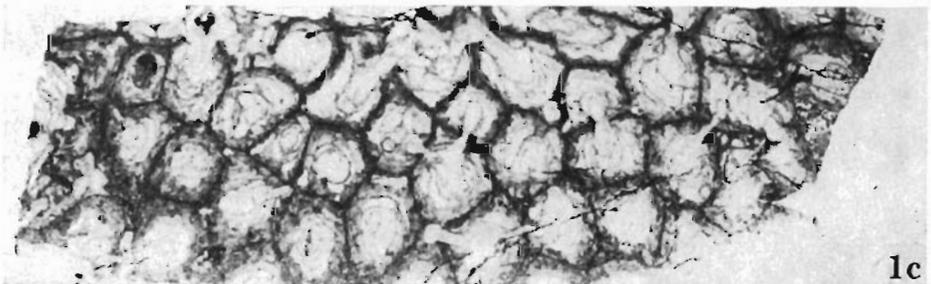
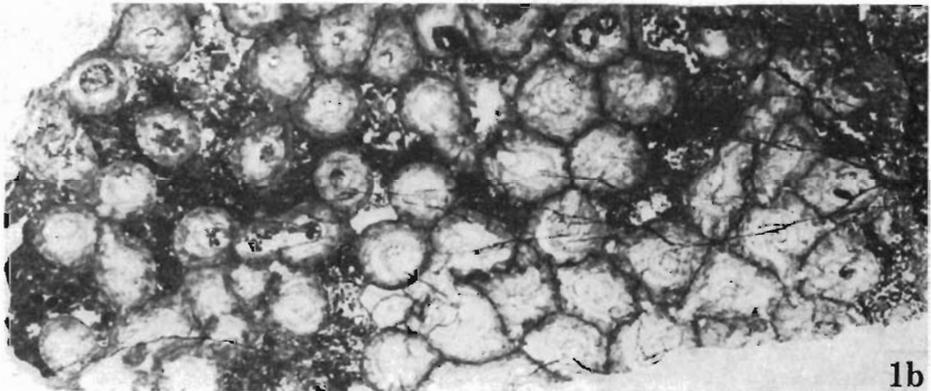
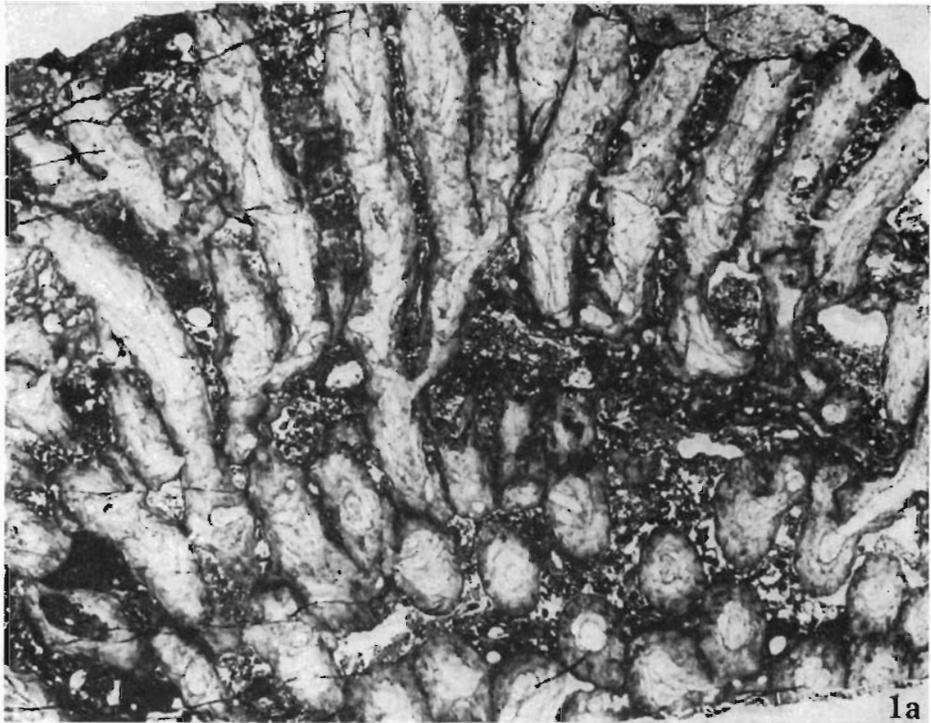
Aulocystis tykhyiformis sp. n.

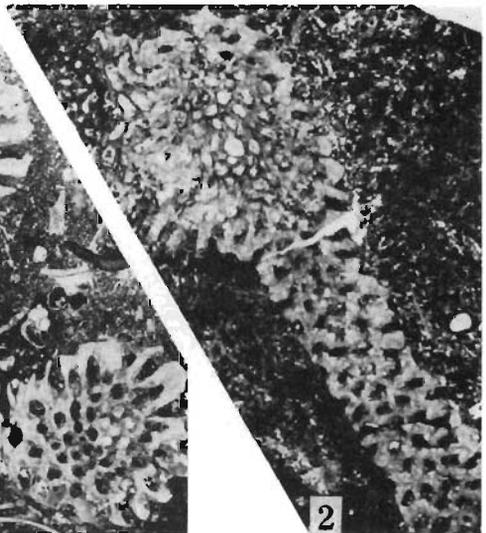
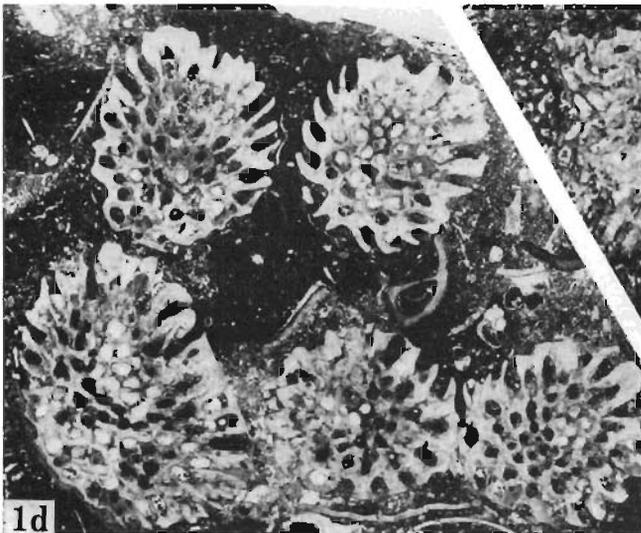
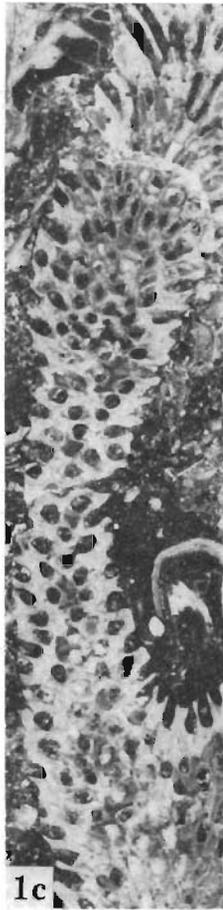
1. Young colony, cross-section, $\times 5$; ZPAL T XI/195, Tyszowce IG-2 borehole, depth 2143.0—2147.6 m.
2. Longitudinal and cross-section, $\times 5$; holotype, ZPAL T XI/193, Tyszowce IG-2 borehole, depth 2106.4—2110.7 m.
3. Longitudinal section, $\times 5$; ZPAL T XI/191, Tyszowce IG-2 borehole, depth 2000.0—2026.6 m.

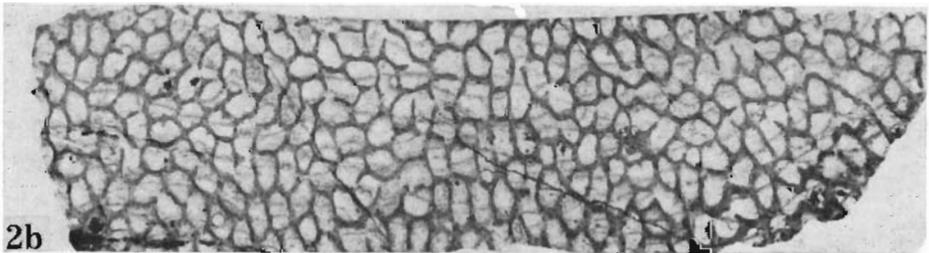
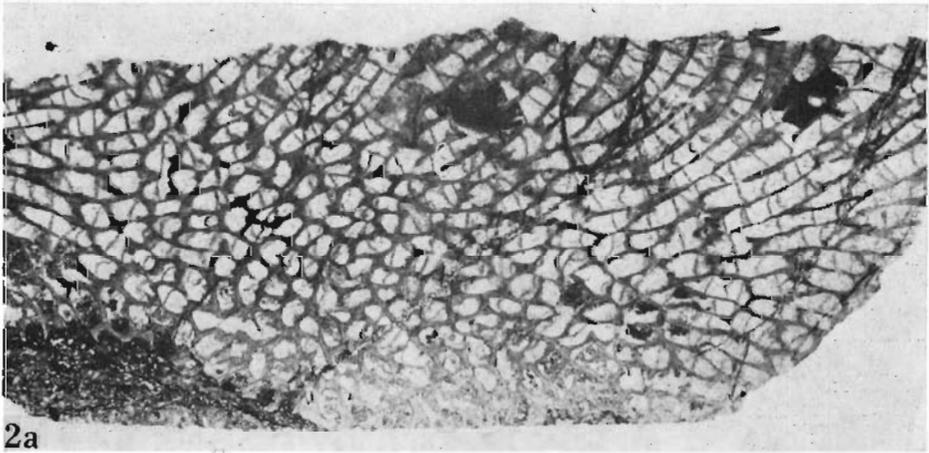
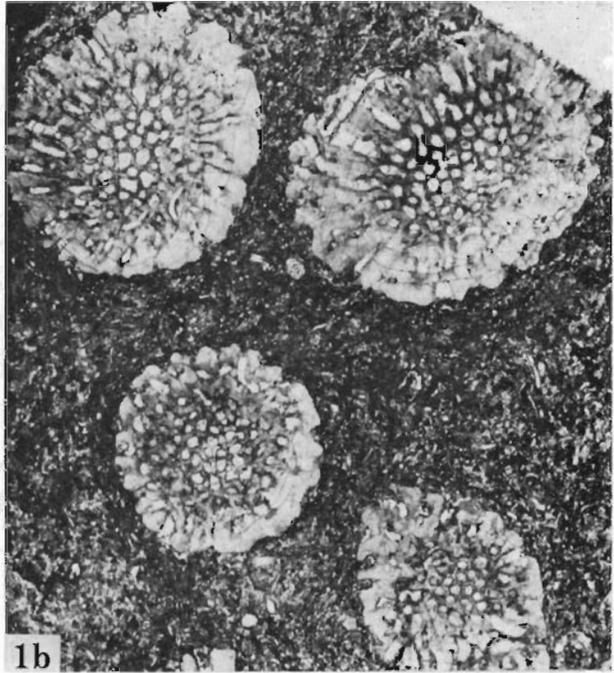
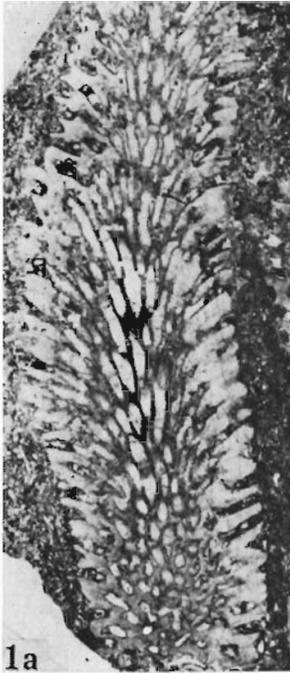
Plate 25

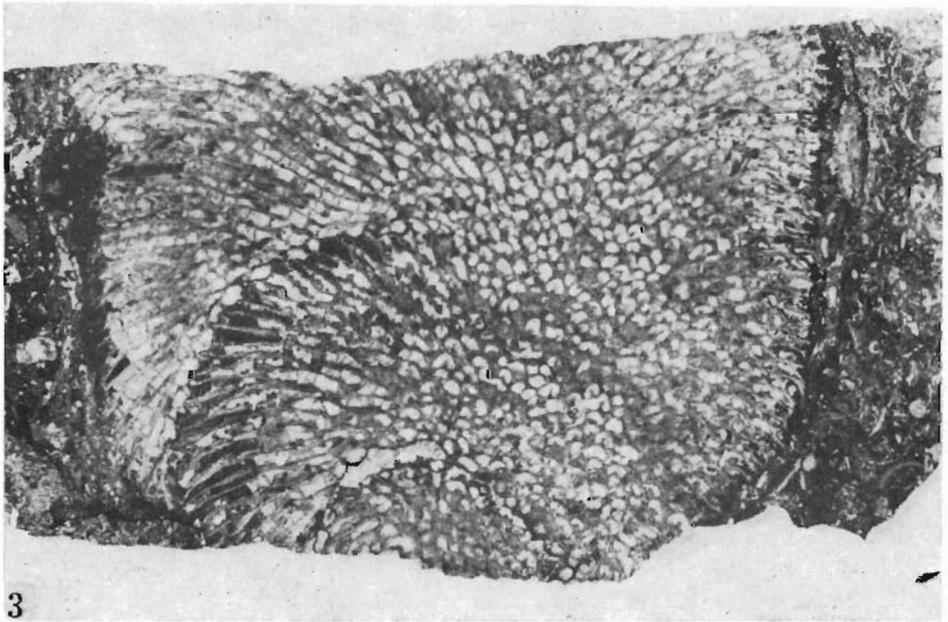
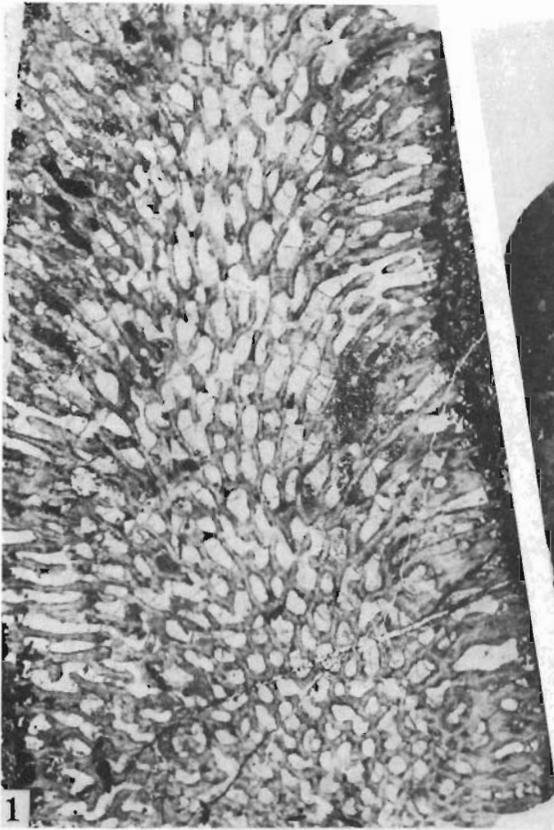
Aulocystella devonica sp. n.

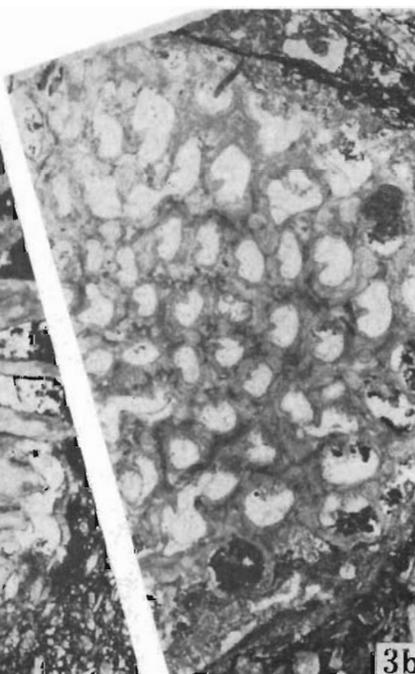
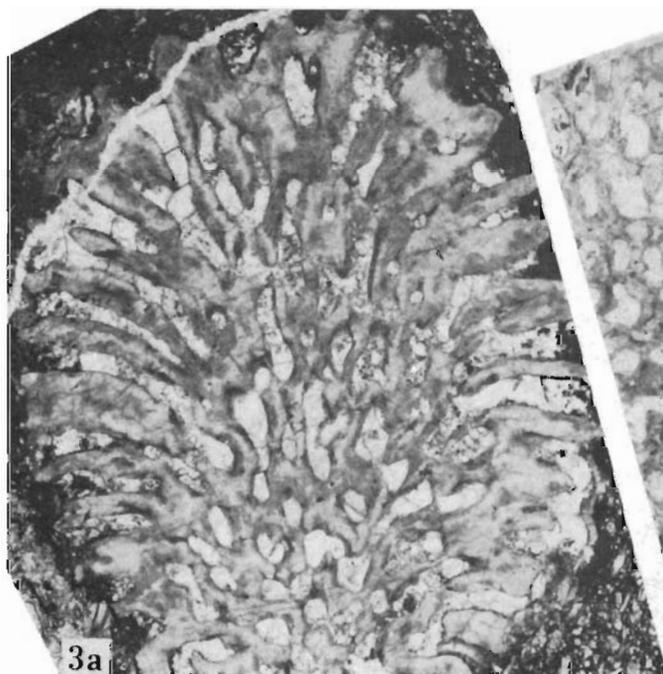
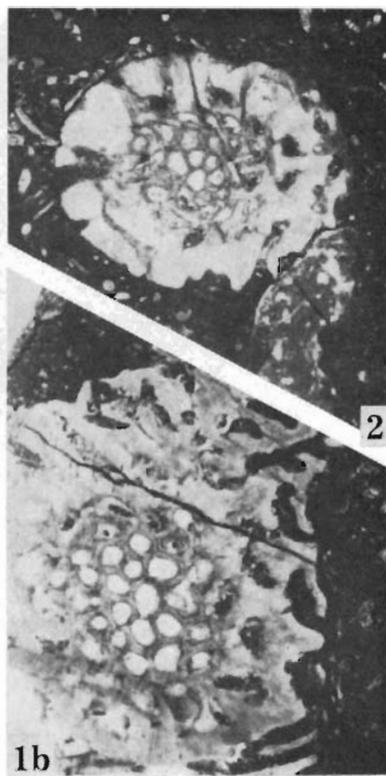
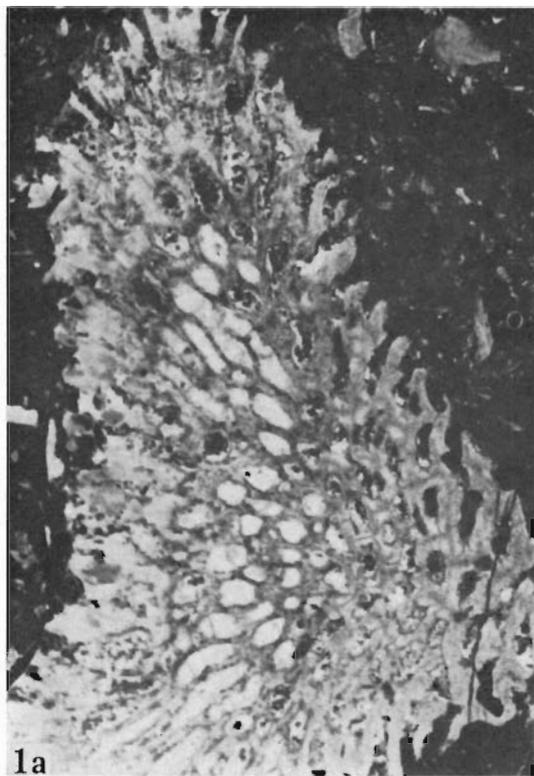
1. Longitudinal and cross-section, $\times 5$; ZPAL T XI/199, Tyszowce IG-2 borehole, depth 2166.8—2169.8 m.
2. Longitudinal section, $\times 5$; holotype, ZPAL T XI/196, Tyszowce IG-2 borehole, depth 2000.0—2026.6 m.
3. Cross-section, $\times 5$; ZPAL T XI/200, Rachanie IG-1 borehole, depth 1878.4—1896.5 m.
4. Longitudinal section, $\times 5$; ZPAL T XI/198, Tyszowce IG-2 borehole, depth 2166.8—2169.8 m.





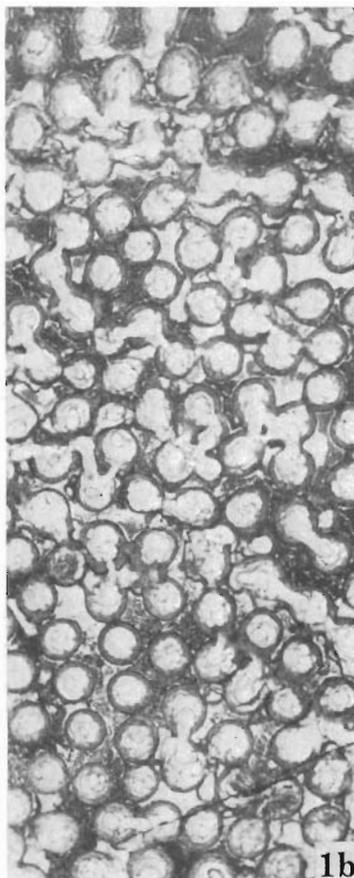




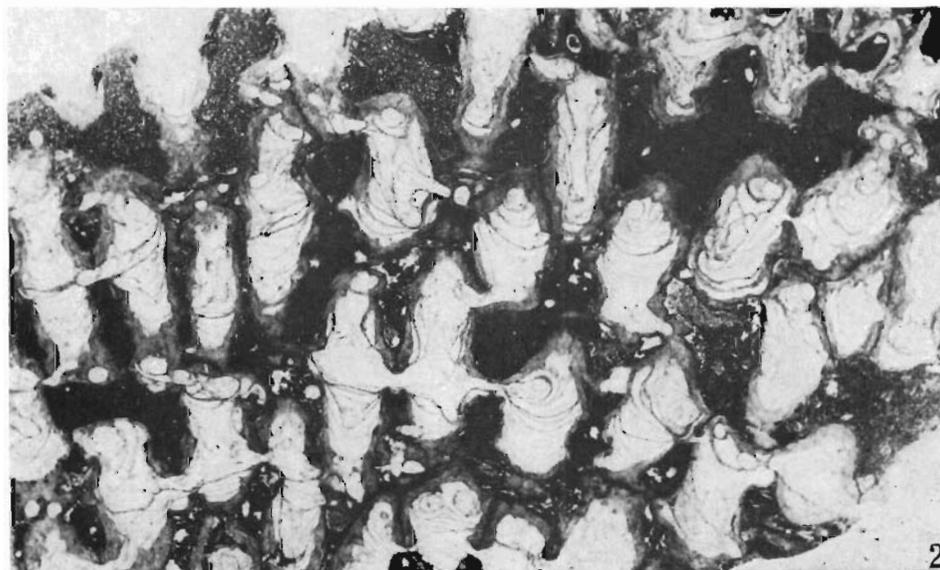




1a



1b



2

