



Tabulata from the Lower and Middle Devonian of the Holy Cross Mts.

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(Received: 9.04.1996)

The results of studies of corals from the Emsian/Eifelian transitional beds of the northwestern part of the Kielce area (boreholes: Porzecze 5A, Strawczynek 1, Kostomłoty 2) and from the Upper Emsian of the Bodzentyn Syncline (borehole Tarczek 1) are presented. Tabulate assemblages are compared with their analogues from the Grzegorzowice outcrop section. Their stratigraphical ranges are determined in relation to standard conodont divisions. Of Tabulata, a new subspecies (*Alveolites straeleni minor*) and 6 species, including a new

one (*Multithecopora annae*), are described. They belong to 5 families. Of Heliolitida, 4 species belonging to genus *Heliolites* and one species belonging probably to a new ambiguously determined genus, have been recognized. A species belonging to Chaetetida, unknown from the Polish Devonian before, has now been found. *Multithecopora annae* n. sp., representing a genus commonly considered to have been characteristic of the Carboniferous and Permian, is for the first time described from the Devonian.

INTRODUCTION

In 1985 I prepared an unpublished monograph entitled: "Tabulata from the Middle Devonian of the Holy Cross Mountains". It contains the results of studies of corals from the Emsian/Eifelian transitional beds of the northwestern part of the Kielce area as well as from the Upper Emsian of the Bodzentyn Syncline (borehole Tarczek 1). Preliminary characteristics of coral fauna assemblages of the upper part of the Eifelian and Lower Givetian (*kockelianus* and *ensensis* Zones) are also given there.

Part of the results of the studies were presented during the 2-nd International Symposium on the Devonian in Calgary (E. Sarnecka, 1988). The problem of distinguishing tabulate assemblages, which are characteristic of the uppermost Emsian and Lower Eifelian, in relation to conodont zonations were discussed then.

The present paper summarizes the results of the studies conducted in the Holy Cross Mts. It is aimed at showing the descriptions of new species and species which have not been described in Poland before.

STRATIGRAPHICAL BACKGROUND

The Lower/Middle Devonian transitional beds are best recognized in the Łysogóry area of the Holy Cross Mts. (Bodzentyn Syncline) and in the northwestern part of the Kielce area (northwestern part of the Kielce-Łagów Syncline) (Fig. 1). Their complete lithological section as well as that of the younger Eifelian is known from Grzegorzowice (Bodzentyn Syncline). It is considered characteristic of the

whole Łysogóry area. The equivalents of individual beds distinguished by M. Pajchłowa (1957) (Fig. 2) have been recognized in boreholes from this region and from the northwestern part of the Kielce area.

A diversified and quantitatively rich benthic fauna assemblage of Rugosa, Tabulata, Brachiopoda and Tentaculoida occurs as low as in complex II of the Grzegorzowice

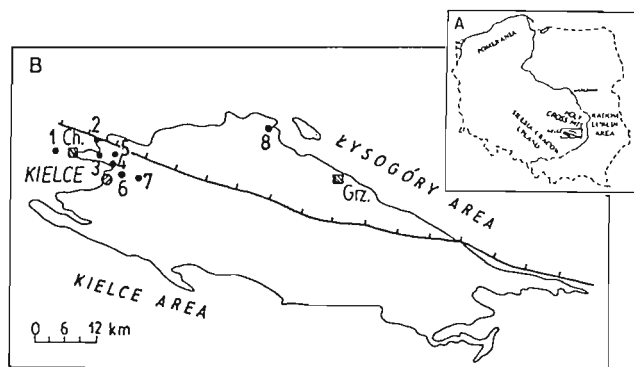


Fig. 1. A. Distribution of the Lower-Middle Devonian strata in Poland

B. Location of boreholes and outcrops

1 — Strawczynek 1, 2 — Porzecze 5A, 3 — Kolejówka 1, 4 — Kostomłoty 1, 5 — Kostomłoty 2, 6 — Stara Góra 1, 7 — Wola Kopcowa 1a, 8 — Tarczek 1, Ch — Chelmece, Grz — Grzegorzowice

A. Regiony występowania dolnego-środkowego dewonu w Polsce

B. Lokalizacja otworów wiertniczych i odsłonięć

section (M. Pajchłowa, 1957) in shales and greywacke shales. The lower part of this section (complexes II–VIII) has been related to the Couvinien Stage (Co) of the Ardennes. M. Pajchłowa (1957) included these deposits into the Lower Eifelian, stating that they are of transitional character between the Lower and Middle Devonian. The upper boundary of the Eifelian was defined in dolomites by the appearance of *Amphipora ramosa* Phillips (complex X).

Studies of the Lower and Middle Devonian foraminifers, ostracods and conodonts, conducted in the Holy Cross Mts. during last years (J. Malec, 1984, 1986, 1991, 1992, 1993), enabled both comparisons with the new subdivision of the Devonian worked out by the International Commission on Stratigraphy (W. Ziegler, D. Klapper, 1982) and recognition

of the *patulus* and *partitus* Zones in this region. This caused the Lower/Middle Devonian boundary to have been changed. Findings of a few index species for the Emsian in the lower complexes of the Grzegorzowice section, the index subspecies *Icriodus corniger retrodepressus* Bultynck in the upper part of complex VIII (Fig. 2) as well as other data resulting from foraminifera and ostracod studies indicate that the Emsian/Eifelian boundary in the Grzegorzowice section should be drawn slightly higher i.e. within complex VIII, at the base of the *Chimaerothyris dombrowiensis* Zone. In the light of conodont studies the upper boundary of the Eifelian has also been changed. Conodonts of the border line between the *ensensis* and *varcus* Zones have been found in complex XX, and so the Eifelian/Givetian boundary seems to run either at the base of complex XX or within it (J. Malec, 1991). These changes necessitated revising the stratigraphical ranges of the Eifelian and Givetian fauna (Fig. 2).

As a result of the faunal studies in borehole sections from the northwestern part of the Kielce area (boreholes: Porzecze 5A, Strawczynek 1, Kostomłoty 1 and 2, Kolejówka 1, Stara Góra 1, Wola Kopcowa 1a) (Fig. 1) a problem arose of comparing the deposits and their faunas from the Lower/Middle Devonian transitional beds and from the Middle Devonian with their equivalent part of the Grzegorzowice section. J. Studencka (1983) recognized the *Chimaerothyris dombrowiensis* Zone in some borehole sections. Index conodonts were also found in borehole Porzecze 5A (J. Malec, 1979, 1986, 1991). These suggest that there are transitional deposits between the Emsian and Eifelian (Figs. 3, 4 and 5). The *Chimaerothyris dombrowiensis* Zone has not been distinguished only in boreholes Kostomłoty 2 and Wola Kopcowa 1a, and fauna assemblages other than of brachiopods, indicate that these are the Eifelian deposits corresponding to the upper complexes of Grzegorzowice (above VIII).

TABULATA OF THE EMSIAN AND EIFELIAN FROM BOREHOLES: PORZECZE 5A, STRAWCZYNEK 1, KOSTOMŁOTY 2 AND TARCZEK 1

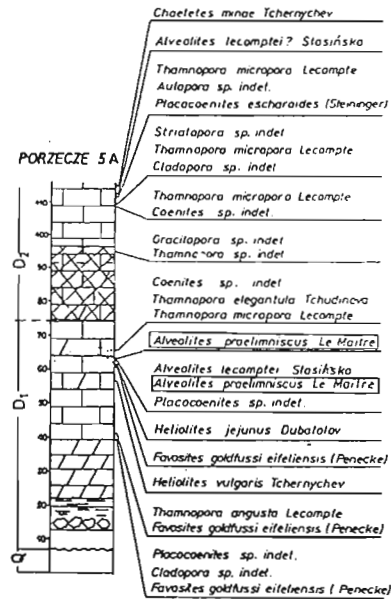
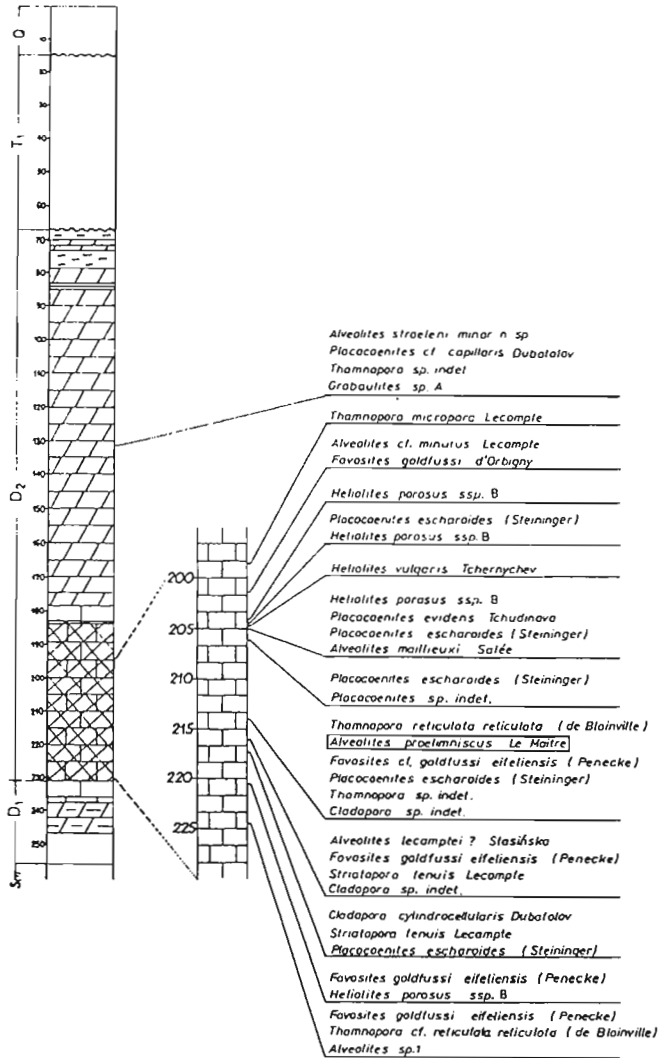
A great amount of taxa and specimens of Tabulata and Heliolitida have been found in the uppermost Emsian and Lower Eifelian from the northwestern part of the Kielce area as well as in the analogous sections of the Bodzentyn Syncline.

Most tabulate specimens, collected from the northwestern part of the Kielce area, have been determined to a genus or species. States of preservation of colonies are different. Limestones generally yield better preserved faunas than dolomites. Tectonic processes and mineralization considerably influenced the state of preservation of specimens in the above-described borehole sections. Many skeletons of colonies are fractured and in damaged conditions or secondarily infilled with calcite or dolomite. Hence much problems arise in producing good thin sections and in determining individual specimens to a genus or species. Therefore, the specifications of species from particular borehole sections or regions, deter-

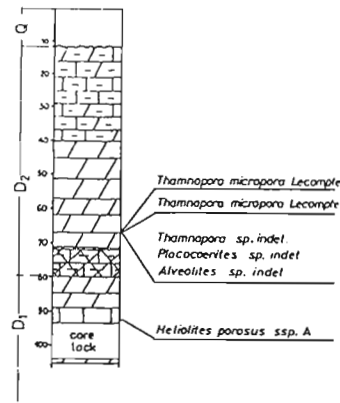
mined basing on thin sections studies, may be very incorrect. Watching the cores, it is easy to notice coral fauna occurring en masse which later can only be determined to higher taxonomic units. Sometimes, during the process of producing thin sections, skeletons are being destroyed. It seems advisable setting up quantitative specifications on the basis of macroscopic observations for each borehole separately (Fig. 4).

Along with species identical for both mentioned areas such as *Thamnopora micropora* Lecompte, *Favosites goldfussi eifeliensis* (Penecke), *Alveolites praelimniscus* Le Maitre and *Squameoalveolites fornicatus* (Schlüter), there are also species that have been described from the upper strata of the Grzegorzowice section such as *Thamnopora reticulata reticulata* (de Blainville) and *Alveolites taenioformis* Schlüter, and a few species that have not been reported from Poland yet. Among these is *Thamnopora elegantula* Tchudinova, known from the Krekovo Beds (Lower Devonian) of

STRAWCZYNEK 1



KOLEJÓWKA 1



KOSTOMEŁY 2

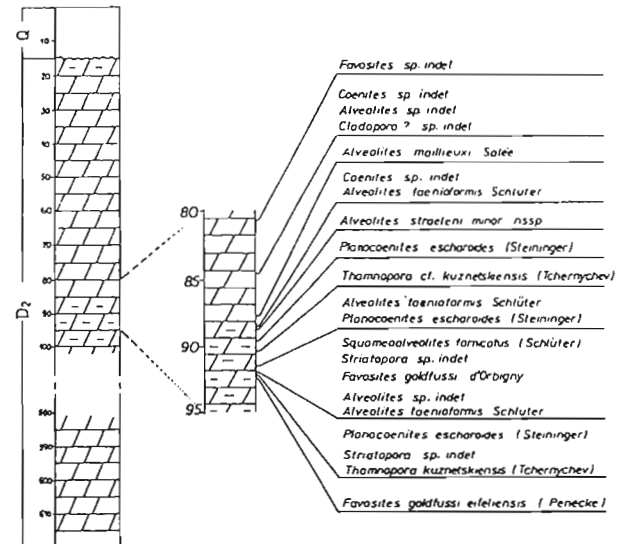


Fig. 3. Distribution of Tabulata, Heliolitida and Chaetetida species in the uppermost Emsian and Eifelian of NW part of the Holy Cross Mts.

For explanations see Fig. 4

Rozmieszczenie Tabulata, Heliolitida i Chaetetida w profilach najwyższego emsu i eiflu Gór Świętokrzyskich

Objaśnienia jak na fig. 4

skeletal elements from the known heliolitids. This likens it to the Ordovician-Silurian family of Proheliolitidae. It is tentatively determined as *?Heliolites (Proheliolites)* sp. A because of scarcity of research material that does not allow producing proper thin sections and establishing a new genus.

A different tabulate assemblage has been recorded in borehole Kostomłoty 1 (Fig. 3). The species characteristic of the Lower/Middle Devonian transitional beds such as *Alveolites praelimniscus* Le Maitre, *Cladopora cylindrocellularis* Dubatolov and *Striatopora tenuis* Lecompte are absent there. The species such as *Thamnopora kuznetskiensis* (Tchernychev) and *Alveolites straeleni minor* n. sp., unknown from other borehole sections, appear instead. They are accompanied by the Eifelian species: *Favosites goldfussi* d'Orbigny, *Alveolites taenioformis* Schlüter and other tabulates of broad stratigraphical ranges. These may represent deposits corresponding to the upper complexes of the Grzegorzowice section. *Favosites goldfussi eifeliensis* (Penecke), occurring in the lower part of the Kostomłoty 2 borehole section, indicates a probable slight shift in age. The deposits with the coral fauna presumably belong to the lower part of the *partitus* Zone.

It is inferred from the conducted studies that the deposits of the *patulus* and *partitus* Zones in the Holy Cross Mts.

contain a tabulate assemblage representing transitional beds between the Lower and Middle Devonian. They are characterized by the following species: *Alveolites praelimniscus* Le Maitre described from the Emsian of Spain and Morocco, *Cladopora cylindrocellularis* Dubatolov found in the Salairka and Shanda Beds of the Kuznetsk Basin, *Favosites goldfussi eifeliensis* (Penecke) occurring in the Co2c and Co2d Zones of the Ardennes and *Striatopora tenuis* Lecompte known from the Co2b and Co2c Zones of the Ardennes (E. Sarnecka, 1988). *Alveolites praelimniscus* Le Maitre which until now has only been recorded below or within the *dombrowski* local zone, may play a role of a stratigraphical marker. At the base of the zone, a boundary between the two conodont zones, i. e. the Emsian/Eifelian boundary, is drawn in the Holy Cross Mts. (J. Malec, 1991). The newly described species *Multithecopora annae* seems not to cross the boundary and still should be related to the *patulus* Zone.

The recognition of coral assemblages characteristic of the D₁/D₂ transitional beds as well as the species indicating the Lower Devonian age, will enable drawing the Emsian/Eifelian boundary, particularly in the case of low frequency or lack of conodonts and other index microfauna.

DESCRIPTION OF NEW SPECIES AND SPECIES EARLIER NOT RECORDED IN POLAND

In relatively new papers, German authors (H. Byra, 1983; R. Birenheide, 1985; A. May, 1993a, b) have changed genus names of Devonian species known and commonly occurring in Poland as a consequence of both a revision of old tabulate collections and new investigations conducted in the Reinisches Schiefergebirge. They have given a new taxonomy of chaetetes and tabulates. For example: *Platyaxum (Platyaxum) escharoides* (Steininger) = *Planocoenites escharoides* (Steininger), *Platyaxum (Roseoporella) teanioforme* (Schlüter) = *Alveolites taenioformis* Schlüter, *Rhaphidopora grzegorzowicensis* (Stasińska) = *Chaetetes grzegorzowicensis* Stasińska and so on.

However, I have applied hitherto existing taxonomy (D. Hill, 1981) because I am convinced that the use of the new nomenclature requires a revision of Tabulata occurring in Devonian deposits of Poland.

Phylum **Anthozoa** Ehrenberg, 1834

Subphylum **Tabulata** Milne-Edwards et Haime, 1850

Order **Favositida** Sokolov, 1962

Family **Pachyporidae** Gerth, 1921

Genus *Thamnopora* Steininger, 1831

Thamnopora elegantula Tchudinova, 1958

(Pl. I, Fig. 2)

1959 *Thamnopora elegantula* n. sp.; I. I. Tchudinova: p. 71–72, pl. XXX, figs. 2–4; pl. XXXI, fig. 1a–b.

1959 *Thamnopora elegantula* Tchudinova; W. N. Dubatolov: p. 78–79, pl. XXI, fig. 4a–b.

Diagnosis: I. I. Tchudinova (1958).

Material: 2 fragments of colony from borehole Porzecze 5A (depth 65.6 m; PGI Kielce NBS 2615, 2617).

Description. — Branching colonies, 3 mm in diameter. Polygonal and polygonal-rounded corallites, 0.2–0.6 mm in diameter. Corallites parallel to axis in central part, bending aside and deflecting at an angle of 80–90°. Calyces 0.5–0.8 mm in diameter. Walls 0.08–0.1 mm thick. Spherical pores 0.1 mm in diameter. Septal spines absent.

Remarks. — The above-described colony differs in thinner walls from typical specimens of the Krekovo Beds, Kuznetsk Basin.

Occurrence. — Poland: Holy Cross Mts. — Emsian (*patulus* Zone); Russia: Kuznetsk Basin — Lower Devonian (Krekovo Beds).

Thamnopora kuznetskiensis (Tchernychev, 1951)

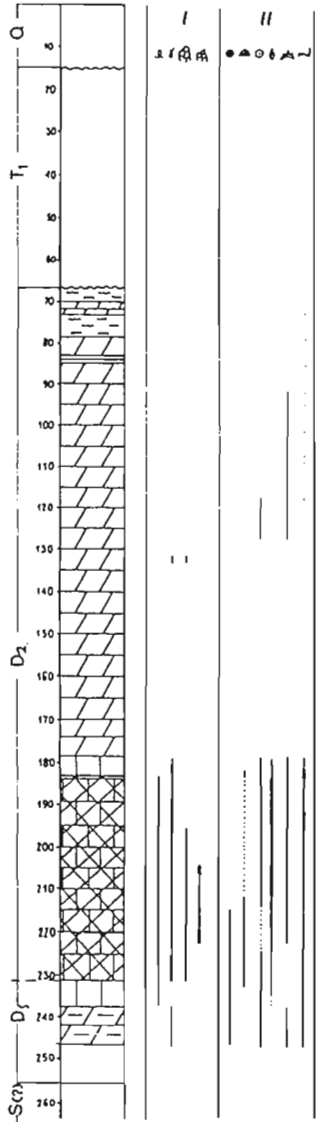
(Pl. I, Figs. 3, 4)

1959 *Thamnopora kuznetskiensis* (Tchernychev); I. I. Tchudinova: p. 92–94, pl. XXIX, figs. 4–6; pl. XXX, fig. 1 (cum synonymica).

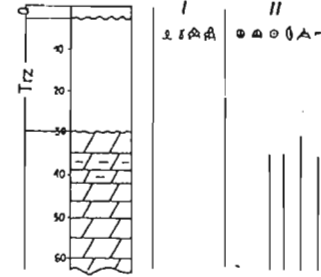
1959 *Thamnopora kuznetskiensis* (Tchernychev); W. N. Dubatolov: p. 94, pl. XXX, fig. 1a–b.

Diagnosis: I. I. Tchudinova (1959).

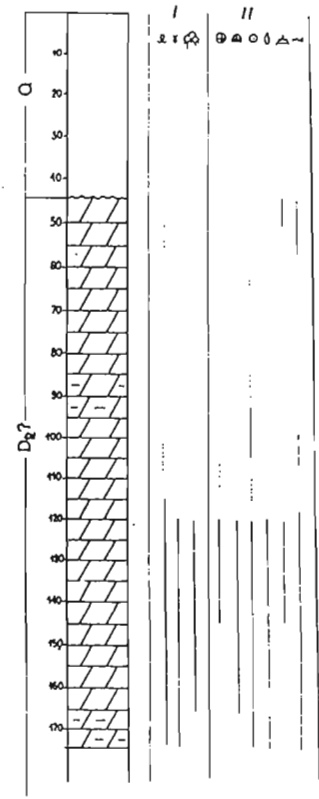
STRAWCZYNEK 1



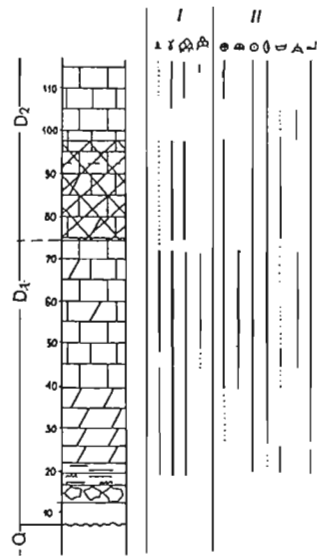
STARA GÓRA 1



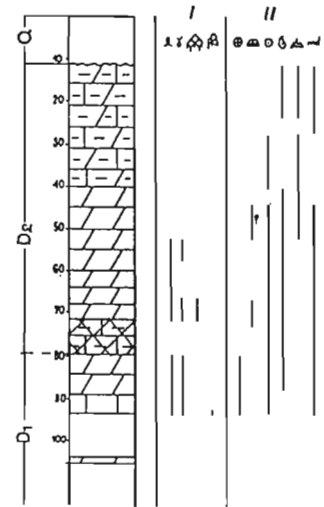
WOLA KOPCOWA 1a



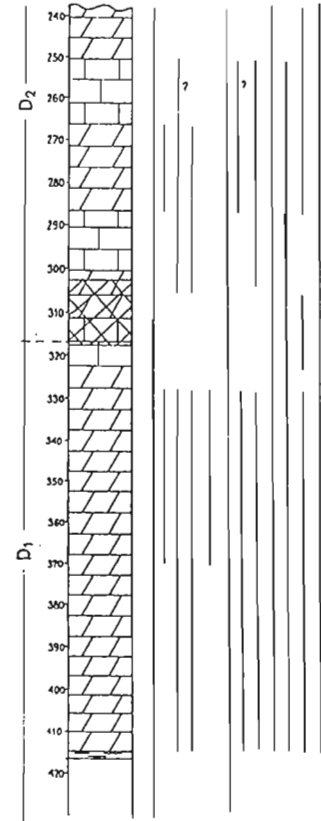
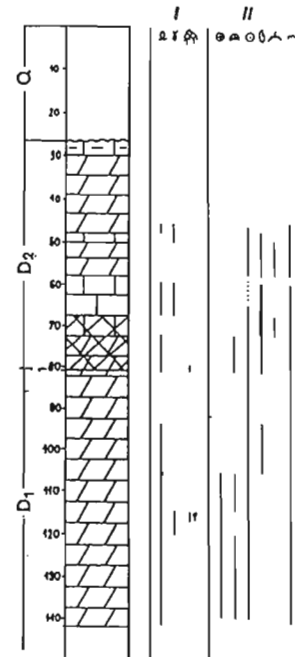
PORZECZE 5 A



KOLEJÓWKA 1



KOSTOMŁOTY 1



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Material: 2 specimens (6 thin sections) from borehole Kostomłoty 2 (depth 92.1–92.2 and 90.4 m; PGI Kielce NBS 2966–2968, 2932–2934).

Description. — Branching colony, 8.5 mm in diameter. Polygonal corallites. Inner sections of corallites are narrowed and rounded off by walls thickened with stereoplasma. Corallites usually 0.8–1.4 mm in diameter. Deep calyces, 1.2 mm in diameter. Walls 0.2–0.25 mm thick in axial part and 0.3–0.4 mm at margins. Large spherical pores, 0.2 mm in diameter, 0.7–0.9 mm spaced in single line. Tabulae rare, flat, thickened. Numerous distinct septal spines, 0.2–0.4 mm in length, 0.3 mm wide at the base. Sometimes wider, but in that case spines are shorter.

Remarks. — Specimens from Kostomłoty do not essentially differ from those described by I. I. Tchudinova (1959) from South Siberia. It seems that the former have rarer tabulae but the spaces between them have not been measured.

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Eifelian; Russia: Kuznetsk Basin — Emsian/Eifelian (Salairka, Shanda, Mamontovo and Safonov Beds).

Suborder *Alveolitina* Sokolov, 1950
Family *Alveolitidae* Duncan, 1872
Genus *Alveolites* Lamarck, 1801
Alveolites straeleni minor n. ssp.
(Pl. I, Figs. 6, 7)

Holotypus: One specimen from borehole Kostomłoty 2 (depth 88.7 m; PGI Kielce NBS 2917–2919).

Stratum typicum: Lower Eifelian (?*partitus* Zone).

Locus typicus: Holy Cross Mts. (Miedziana Góra Syncline), borehole Kostomłoty 2, depth 88.7 m.

Derivatio nominis: *minor* = in Latin: small; corallites smaller than those of typical *Alveolites straeleni* Lecompte representatives.

Diagnosis: Massive colonies. Rhomboidal, loaflike and oval corallites, dimensions 0.5–0.8 x 0.3–0.6 mm. Walls 0.05–0.15 mm thick.

Material: One fragment of colony from borehole Kostomłoty 2 (depth 88.7 m; holotype PGI Kielce NBS 2917–2919); one fragment of colony from borehole Strawczynek 1 (depth 131.4 m; PGI Kielce NBS 2802–2806).

Description. — Massive colonies. Rhomboidal, loaflike and sometimes oval corallites, 0.5–0.8 up to 1.0 mm in width, 0.3–0.6 mm in height. Median suture invisible. Walls of corallites 0.05–0.15, sometimes 0.2 mm thick.

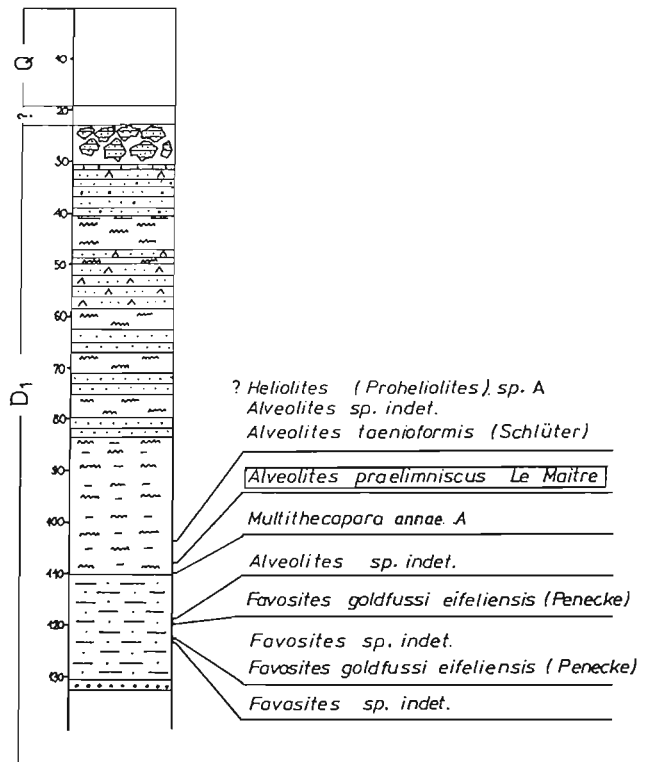


Fig. 5. Distribution of Tabulata, Heliolitida and Chaetetida species in the uppermost Emsian and Eifelian of the Tarczek 1 profile
For explanations see Fig. 4

Rozmieszczenie Tabulata, Heliolitida i Chaetetida w utworach najwyższego emsu i eiflu w profilu Tarczek 1

Objaśnienia jak na fig. 4

Spherical pores, 0.15–0.2 mm in diameter, 0.6–0.7 mm spaced. Thin, flat and slightly deflated, rarely oblique tabulae (0.3) 0.4–0.5 mm spaced. Septal apparatus in a form of spines and tubercles. One of the spines is occasionally longer. Spines of wider bases are sometimes visible in longitudinal sections.

Remarks. — In transverse cross-sections shape of corallites is typical of this species. Dimensions of corallites, almost twice as small, make the authoress to establish a new subspecies *Alveolites straeleni minor*. C. Iven (1980) includes the species *A. straeleni* Lecompte into genus *Squameoalveolites* Mironova. The occurrence of wide-base septal spines and the lack of typical squamulae do not allow to include the

Fig. 4. Occurrence of Tabulata, Heliolitida, Chaetetida and accompanying fauna in the profiles of uppermost Emsian and Eifelian of the NW part of the Holy Cross Mts.

1 — limestones, 2 — marly limestones, 3 — dolomites, 4 — marly dolomites, 5 — mudstones, 6 — clays, 7 — shales, 8 — sandstones, 9 — quartzitic sandstones, 10 — breccia, 11 — *Chimaerothyris dombrowiensis* Zone; I — Hydrozoa: 12 — corals, 13 — branching Tabulata; 14 — massive Tabulata; 15 — Chaetetida i Heliolitida; II — accompanying fauna: 16 — tetracorals, 17 — stromatoporoids, 18 — crinoids, 19 — brachiopods, 20 — ostracods, 21 — conodonts, 22 — detritus of makrofauna and indefinite mikrofauna; occurrence: 23 — single, 24 — medium common and common, 25 — very common and abundant; S — Silurian, D₁ — Upper Emsian, D₂ — Lower Eifelian, T₁ — Lower Triassic, Trz — Tertiary, Q — Quaternary

Występowanie Tabulata, Heliolitida, Chaetetida i fauny towarzyszącej w profilach najwyższego emsu i eiflu NW części Gór Świętokrzyskich

1 — wapień, 2 — wapień margliste, 3 — dolomity, 4 — dolomity margliste, 5 — mułowce, 6 — ility, 7 — łupki ilaste, 8 — piaskowce, 9 — piaskowce kwarcytowe, 10 — brekcja, 11 — poziom *Chimaerothyris dombrowiensis*; I — jamochłony: 12 — korale, 13 — Tabulata gałązkowe, 14 — Tabulata masywne, 15 — Chaetetida i Heliolitida; II — fauna towarzysząca: 16 — rugozy, 17 — stromatoporojdy, 18 — liliowce, 19 — ramienionogi, 20 — małżoraczkki, 21 — konodonty, 22 — detrytus makrofauny i mikrofauna nieoznaczona; występowanie: 23 — sporadyczne, 24 — średnio liczne i liczne, 25 — bardzo liczne i obfite; S — sylur, D₁ — ems górny, D₂ — eifel dolny, T₁ — trias dolny, Trz — trzeciorzęd, Q — czwartorzęd

Results of measurements of diagnostic characteristics of species belonging to genus *Heliolites*

Species	Sites of occurrences of colony	Diameter of corallites [mm]	Number of corallites in 1 cm ²	Diameter of coenenchymal tubulae [mm]	Number of tubulae in corallites in 5 mm	Number of tubulae in coenenchymal tubulae in 5 mm	Spaces between tubulae in corallites [mm]	Spaces between tubulae in coenenchymal tubuli [mm]	Distances between corallites [mm]	Number of tubulae between corallites	Thickness of a corallite walls [mm]	Thickness of a coenenchymal tubulae walls [mm]	Septal apparatus
<i>Heliolites porosus</i> ssp. A	Chełmce (16)*	1.5–1.6	13–14	(0.4–0.5)** 0.3–0.6	7–8	11–14	0.3–0.7	0.2–0.5	0.6–1.8	2–4	0.03–0.1	0.02–0.08	lack
	Chełmce (22)	1.5–1.6	12–16	(0.3) (0.2–0.5)	–	–	–	–	0.9–2.5	2–6	0.03–0.05	0.02–0.08	septa?
	Kolejówka 1; 92.8 m	1.5–1.6	14–16	(0.4) 0.3–0.4	5–6	9–11	0.6–1.2	0.4–0.6	0.5–1.2	2–4	0.08–0.1	0.01–0.08	lack
<i>Heliolites porosus</i> ssp. B	Chełmce (20)	1.3–1.7	13–14	0.2–0.4	5–6	9	(0.5–1.0) 0.2–1.1	0.3–0.5	0.8–2.2	2–5	0.02–0.03	0.01–0.02	lack
	Strawczynek 1; 204.3 m	(1.4) 1.3–1.5	17–19	(0.3–0.4) 0.2–0.5	7–10	11–14	(0.8) 0.3–1.0	0.2–0.5	0.3–1.7	1–7	0.02–0.1	0.01–0.1	12 short septas
	Strawczynek 1; 204.0 m	(1.5) 1.3–1.7–1.8	13–18	0.3–0.5	–	–	–	–	(1.3–1.4) 0.5–1.7	1–4	0.03–0.05	0.01–0.02	
	Strawczynek 1; 205.0 m	1.3–1.5	–	0.3–0.5	–	–	–	–	(0.8–1.4) 0.5–2.1	1–5	0.03–0.08	0.01–0.03	lack
	Strawczynek 1; 220.5 m	1.3–1.6	–	0.3–0.4	7–8	9–12	0.3–1.3	0.3–0.5	–	–	–	–	lack
<i>Heliolites vulgaris</i> Tchernychev	Strawczynek 1; 204.8 m	1.8–1.9–2.0	10–12	(0.5) 0.3–0.6	5–6	10–11	(0.8–0.9) 0.4–1.0	0.4–0.55	0.6–2.0	1–5	0.06–0.11	0.03–0.06	
	Strawczynek 1; 204.9 m	1.4–1.9	8–12	(0.5) 0.3–0.6	5–6	9–10	(1.0) 0.4–0.9	(0.5) 0.3–0.6	1.3–2.0	3–5	0.03–0.08	0.01–0.05	lack
	Porzeczce 5A; 56.3 m	1.4–1.8	about 10	0.4–0.6	6–7	11–15	(0.4–0.7) 0.4–1.1	0.3–0.4–0.7	1.4–2.3	2–5	0.02–0.05	0.01–0.03	–
	Chełmce (19)	1.4–1.9	8–9	0.3–0.5	5–6	8–9	0.8–1.5	(0.5) 0.3–0.6	0.8–2.0	3–5	about 0.05	about 0.05	–
<i>Heliolites</i> sp. C	Chełmce (15)	1.3–1.4	9–10	0.3–0.5	9–12	13–17	0.3–0.5	0.2–0.3	0.6–2.0	3–6	about 0.08	about 0.03	lack
<i>Heliolites jejunos</i> Dubatolov	Porzeczce 5A; 61.8 m	(1.2) 1.1–1.3	16–18	(sometimes 0.7 x 0.5) 0.2–0.5	6–8	11–13	0.4–1.0	0.2–0.6	1.0–1.8	3–5	0.01–0.03	0.01–0.02	lack
	Chełmce (18)	1.0–1.2 (rare 1.5)	19–20	(0.3–0.4) 0.3–0.5	5–9	9–13	(0.3–0.9) 0.3–1.2	(0.3–0.4) 0.2–0.4	(1.0–1.5) 0.5–2.5	2–4	0.04–0.08	0.01–0.03	lack
? <i>Heliolites</i> (<i>Proheliolites</i>) sp. A	Tarczek 1; 103.4 m	0.3–0.4	–	(sometimes 0.2 x 0.3) 0.1–0.3	–	–	0.08–0.3	(rare 0.2–0.5) 0.07–0.1	0.1–0.2	0–2	0.01	–	lack

* — in brackets — number of thin section; ** — in brackets — most frequent size

species *A. straeleni* Lecompte into the genus *Squameoalveolites*. This opinion is shared by R. Birenheide (1985) and A. May (1993a, b).

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Eifelian.

Family **Coenitidae** Sardeson, 1896

Genus *Planocoenites* Sokolov, 1950

Planocoenites cf. *capillaris* (Dubatolov, 1972)

(Pl. I, Fig. 5)

Material: One fragment of colony from borehole Strawczynek 1 (depth 131.4 m; PGI Kielce NBS 2809, 2810).

Description. — Lamellar colonies, 2.0 mm thick. Crescent-shaped and falcate corallites, dimensions 0.1 x 0.3 mm. Other measurements cannot be made.

Remarks. — The specimen is similar to *Planocoenites capillaris* described by N. W. Dubatolov (1972).

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Lower Eifelian.

Planocoenites evidens (Tchudinova, 1964)

(Pl. I, Fig. 1)

1964 *Planocoenites evidens* n. sp.; I. I. Tchudinova: p. 55–56, pl. XXVI, fig. 1.

Diagnosis: I. I. Tchudinova (1964).

Material: One fragment of colony from borehole Strawczynek 1 (depth 205.0 m; PGI Kielce NBS 2840).

Description. — Lamellar colonies, 2–3 mm thick, reaching 10 mm at embranchment. Small, falcate calyces. The corallites lumen 0.2 x 0.4 and 0.1 x 0.3 mm. Walls become thicker towards outside of the colony. Rare spherical pores, 0.1 mm in diameter. Rare flat tabulae, 0.2 mm spaced. Septal spines absent. The colony is strongly tangled.

Remarks. — The colony does not differ from typical specimens described by I. I. Tchudinova from Salairka Beds of the Kuznetsk Basin.

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Emsian/Eifelian; Russia: Kuznetsk Basin — Emsian (Salairka Beds).

Order **Syringoporida** Sokolov, 1962

Family **Multithecoporidae** Sokolov, 1950

Genus *Multithecopora* Yoh, 1927

Multithecopora annae n. sp.

(Pl. IV, Figs. 1–4)

Holotypus: One specimen from borehole Tarczek 1 (depth 109.5 m; PGI Kielce NBS 3075, 3076).

Stratum typicum: Upper Emsian (*patulus* Zone).

Locus typicus: Holy Cross Mts. — Bodzentyn Syncline (borehole Tarczek 1).

Derivatio nominis: *annae* — after dr Anna Stasińska's first name, an expert on tabulates.

Diagnosis: Bushy colonies. In transverse cross-sections corallites are circular, 1.2–1.4 mm in diameter. Walls 0.3–0.5 mm thick. Connecting tubules 0.7–1.0 mm in length and 0.6–0.7 mm in diameter. Rare, slightly deflected or flat tabulae, 0.3–0.4 mm spaced. Numerous septal tubercles, arranged in a few lines, visible on walls thickened with sclerenchyme.

Material: 2 colonies from Chełmce village (coll. P. Filonowicz; PGI Kielce NBS 3015, 3016, 3124, 3129, 3133, 3134) and from borehole Tarczek 1 (depth 109.5 m; PGI Kielce NBS 3074–3076).

Description. — Small-sized bushy colonies. Cylindrical thick-walled corallites, irregularly and loosely spaced, connected by connecting tubules. Corallites 1.1–1.6 mm in diameter, largely 1.2–1.4 mm (1.75 mm in one of the thin sections). Visceral chamber 0.3–0.4 mm in diameter, rarely 0.5–0.6 mm (it is about one third of the diameter of corallites). Walls 0.4–0.5 mm thick. Graininess of sclerenchyme and its characteristic “crumpling” and wrinkling is visible (particularly in specimens from borehole Tarczek 1). Rarely preserved connecting tubules, 0.9–1.0 mm in length, sometimes much shorter (0.3 mm), 0.6–0.7 mm in diameter. Rarely preserved, slightly deflated or flat thin tabulae. Septal apparatus in a form of numerous tubercles arranged in a few lines on walls infilled with sclerenchyme. Distinct long spines, bent towards inside of corallite are visible on walls in longitudinal sections at places where a visceral chamber is preserved. In some corallites with indistinct, poorly developed epitheca, only sclerenchyme is visible.

Remarks. — The studied colonies show features typical of this genus. Dimensions of their skeletal elements differ from those of known species of this genus. Thick wrinkled sclerenchyme is characteristic.

Occurrence. — Poland: Holy Cross Mts. (Bodzentyn Syncline, Miedziana Góra Syncline) — Emsian (*patulus* Zone).

Order **Auloporida** Sokolov, 1950

Family **Aulocystidae** Sokolov, 1950

Genus *Grabaulites* Sokolov, 1962

Grabaulites sp. A

(Pl. II, Fig. 6)

Material: One fragment of colony from borehole Strawczynek 1 (depth 131.4 m; PGI Kielce NBS 2811).

Description. — Cylindrical corallite with the characteristic axial canal and funnel-shaped tabulae. Corallite 3.8–4.0 mm in diameter. Walls 0.4–0.5 mm thick. Axial canal 0.9 mm in diameter. Short and sharply pointed septal spines.

Remarks. — Dimensions of the above-described specimen are similar to those of the species *Grabaulites annexus* Tchudinova, described from Salairka Beds of the Kuznetsk Basin (I. I. Tchudinova, 1964). It differs in greater sizes of corallites from those described by A. Stasińska (1974) from the Givetian of Skały and Jurkowice.

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Eifelian.

Subphylum (Suborder?) **Heliolitida** Frech, 1897

Family **Heliolitidae** Lindström, 1876

Genus *Heliolites* Dana, 1846

Heliolites porosus ssp. A

(Pl. II, Figs. 8, 9)

Material: 3 fragments of colony from outcrops at Chelme village (PGI Kielce NBS 2986-2988, 3011-3014) and borehole Kolejówka 1 (depth 92.8 m; PGI Kielce NBS 2792, 2793, 3135).

Description. — Massive colonies. Circular corallites in a transverse cross-section. Polygonal coenenchymal tubulae. For detailed measurements see Table 1.

Remarks. — All *Heliolites porosus* ssp. A specimens differ in constant sizes of corallites diameters from known colonies of the species.

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Emsian/Eifelian.

Heliolites porosus ssp. B

(Pl. III, Figs. 1, 2)

Material: 5 fragments of colony from outcrops at Chelme village (PGI Kielce NBS 3007-3010) and borehole Strawczynek 1 (depth 204.0, 204.3, 205.0 and 220.5 m; PGI Kielce NBS 2822-2827, 2844-2846, 2891).

Description. — Large massive colonies. Circular corallites, 1.3–1.8 mm in diameter. Polygonal coenenchymal tubulae. Septal spines are only seen in single corallites in transverse sections of colonies from borehole Strawczynek 1 (depth 204.3 m). For detailed measurements see Table 1.

Remarks. — The colonies are characterized by a strong variability of corallite diameters. In general, their dimensions resemble those of subspecies *H. porosus porosus* (Goldfuss). The lack of septal spines (secondary?) in most corallites as well as considerably rare tubulae in corallites and tubulae suggest establishing a new subspecies.

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Emsian/Eifelian.

Heliolites vulgaris Tchernychev, 1951

(Pl. III, Figs. 7, 8)

1963 *Heliolites vulgaris* Tchernychev; W. N. Dubalotov: p. 115–116, pl. XLII, fig. 2a–w (cum synonymica).

Material: 4 fragments of colony from boreholes: Strawczynek 1 (depth 204.8–204.9 m; PGI Kielce NBS 2831–2839), Porzecze 5A (depth 56.3 m; PGI Kielce NBS 2598, 2599) and from Chelme village (coll. P. Filonowicz; PGI Kielce NBS 3002–3006).

Description. — Massive colonies. Circular corallites. Polygonal coenenchymal tubulae of different shapes and sizes. Septal spines are absent. For detailed measurements see Table 1.

Remarks. — The colonies differ in thinner walls from typical ones from the Emsian? Eifelian? of the Kuznetsk Basin.

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Emsian, Emsian/Eifelian; Russia: Kuznetsk Basin, the Altai, Central Asia — Emsian? Eifelian?

Heliolites sp. C

(Pl. III, Figs. 3, 6)

Material: One colony from Chelme village, poorly preserved (PGI Kielce NBS 2984, 2985).

Description. — Massive colonies. Relatively small corallites — 1.3–1.4 mm, variably spaced (0.6–2.0 mm). Relatively densely spaced tubulae in both corallites and coenenchymal tubulae. Septal spines are absent. For detailed measurements see Table 1.

Remarks. — Dimensions of skeletal elements of the colony do not correspond to any of the *Heliolites* species described from the Devonian.

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Emsian/Eifelian.

Heliolites jejunos Dubalotov, 1963

(Pl. III, Figs. 4, 5)

1963 *Heliolites jejunos* n. sp.; N.W. Dubalotov: p. 117, pl. XLIII, fig. 1a–w.

Diagnosis: N. W. Dubalotov (1963).

Material: 2 fragments of colony from borehole Porzecze 5A (depth 61.8 m; PGI Kielce NBS 2993–3001) and from Chelme village (PGI Kielce NBS 2605–2607).

Description. — Massive colonies consisting of thin-walled corallites, 1.0–1.3 mm in diameter. Polygonal prismatic coenenchymal tubulae. Rare tubulae. Septal spines absent. For detailed measurements see Table 1.

Remarks. — The colonies differ in longer spaces between corallites from species *Heliolites jejunos* described by N.W. Dubalotov (1963) from the Emsian/Eifelian of the Kuznetsk Basin.

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Emsian; Russia: Kuznetsk Basin — Emsian? (Shanda Beds).

?Heliolites (Proheliolites) sp. A
(Pl. II, Fig. 7)

Material: One fragment of colony from borehole Tarczek 1 (depth 103.4 m; PGI Kielce NBS 3066).

Description. — Small massive colony covering Rugosa skeleton and overgrown with *Alveolites* sp. Very small and densely packed corallites, circular in a transverse cross-section. Coenenchymal tissue composed of multiangular tubulae is between corallites. Tubulae large in relation to corallites, sometimes of similar diameters. They are in places arranged regularly around corallites. Elsewhere, they form irregular tissue. Tubulae of corallites deflated, oblique, irregularly distributed. Tubulae are densely spaced in tubulae, sometimes they form irregular “dissepiment tissue”, largely flat, delfated or oblique. Septal spines absent. For detailed measurements see Table 1.

Remarks. — Colonies of *Heliolites* of such small diameters of corallites and so densely packed have not been recorded from Devonian deposits before. The smallest dimensions of corallites are displayed by *Heliolites praeporosus* Kettnerova (0.8–1.1 and 0.2–1.2 mm spaced) (A. Galle, 1973), but the structure of the above-described colony does not correspond to *H. praeporosus* Kettnerova but resembles that of the skeletons of the Lower Palaeozoic family Proheliolitidae.

Occurrence. — Poland: Holy Cross Mts. (Bodzentyn Syncline) — Emsian (*patulus* Zone).

Phylum **Anthozoa? Bryozoa? Porifera?**
Order **Chaetetida**

Family **Chaetetidae** Milne-Edwards et Haime, 1849
Genus *Chaetetes* Fischer v. Waldheim in Eichwald, 1829
Chaetetes ninae Tchernychev, 1951

1959 *Chaetetes ninae* Tchernychev; W. N. Dubatolov: p. 214, 215, pl. XXV, fig. 5a–w.

Diagnosis: W. N. Dubatolov (1959).

Material: One of colony from borehole Porzecze 5A (depth 114.4 m; PGI Kielce NBS 2638, 2639).

Description. — Small, massive, semispherical colony. Polygonal, sometimes elongated, regularly spaced corallites, 0.8–0.9 mm in diameter. Walls 0.08–0.1 mm thick, at places only 0.05 mm. Thin, flat tabulae, 0.5–0.6 mm spaced, rarely 0.3 mm. Short, equally thick, well developed pseudo-septal spines.

Remarks. — The Porzecze 5A specimens differ in smaller diameters of corallites and slightly thinner walls from colonies described by W. N. Dubatolov (1959). Their general structure resembles the species *Chaetetes magnus* Lecompte (M. Lecompte, 1939) from the Givetian of the Ardennes, but the studied specimen has a better developed “septal apparatus”.

Occurrence. — Poland: Holy Cross Mts. (Miedziana Góra Syncline) — Emsian (*partitus* Zone); Russia: Kuznetsk Basin — Emsian/Eifelian (Shanda Beds).

Acknowledgements. The drafting works are by Mr J. Turczynowicz and Mrs J. Wojak, the photographs were taken by Mrs J. Modrzejewska from the Marketing and Promotion Department, who are sincerely acknowledged.

This paper is dedicated to the late Mrs Maria Pajchlowa in token of great respect and gratitude.

Translated by Krzysztof Leszczyński

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TABULATA DOLNEGO I ŚRODKOWEGO DEWONU GÓR ŚWIĘTOKRZYSKICH

Streszczenie

W ramach prac planowych PIG w 1985 r. opracowano monografię nt. „Tabulata dewonu środkowego Gór Świętokrzyskich”, w której przedstawiono wyniki badań koralowców z osadów pogranicza emsu i eiflu północno-wschodniej części regionu kieleckiego oraz górnego emsu synkliny bodzentyńskiej (otwór Tarczek 1). W pracy tej zawarto też wstępną charakterystykę zespołów koralowców wyższej części eiflu i dolnego żywetu (zony *kockelianus* i *ensensis*). Częściowe wyniki tych badań przedstawiono w referacie zgłoszonym na II Międzynarodowe Sympozjum Dewońskie w Calgary (E. Sarnecka, 1988). Omówiono w nim zagadnienia dotyczące wydzielenia tabulatowych zespołów charakterystycznych dla najwyższego emsu i dolnego eiflu w nawiązaniu do podziałów konodontowych.

Znalezienie gatunków indeksowych dla emsu w niższych kompleksach profilu grzegorzowickiego oraz indeksowego podgatunku *Icriodus corniger retrodepressus* Bultynck w wyższej części kompleksu VIII (fig. 2), a także inne przesłanki, wynikające z obserwacji otwornic i małżoraczek (J. Malec, 1991), wykazały, że granica ems/eifel w profilu Grzegorzowic przebiega wyżej (kompleks VIII) w spągu poziomu *Chimaerothyris dombrowiensis*. W kompleksie XX znaleziono konodonty z pogranicza *zon ensensis* i *varcus*, tak więc granica eifel/żywet wydaje się przebiegać bądź u podstawy kompleksu XX, bądź też w tym kompleksie (J. Malec, 1991). Te zmiany spowodowały konieczność zrewidowania zasięgów stratygraficznych cytowanej fauny z osadów eiflu i żywetu w poprzednio przyjmowanych granicach.

Badania fauny w profilach północno-zachodniej części regionu kieleckiego (otwory: Strawczynek 1, Porzecze 5A, Kolejówka 1, Kostomłoty 1, Kostomłoty 2, Stara Góra 1, Wola Kopcowa 1a — fig. 1) wykazały jej podobieństwo do zespołów fauny z warstw przejściowych między dewonem dolnym i środkowym, a co za tym idzie konieczność porównania z profilem Grzegorzowic. Stwierdzenie przez J. Studencką (1983) poziomu *Chimaerothyris dombrowiensis* w niektórych z cytowanych profili oraz indeksowych konodontów w profilu Porzecze 5A (J. Malec, 1986, 1991) sugeruje, że są to głównie osady przejściowe między emsem i eiflem (fig. 3, 4). Tylko w profilach Kostomłoty 2 i Wola Kopcowa 1a nie stwierdzono poziomu *Chimaerothyris dombrowiensis*, a i zespoły innej fauny niż brachiopodowa wskazują, iż mamy tu do czynienia z osadami eiflu odpowiadającymi nieco wyższym (powyżej VIII) kompleksom z Grzegorzowic.

W północno-zachodniej części regionu kieleckiego w osadach najwyższego emsu i dolnego eiflu stwierdzono liczne taksony i okazy Tabulata, podobnie jak w analogicznych profilach synkliny bodzentyńskiej. Obok gatunków opisywanych z Grzegorzowic występują taksony dotychczas w Polsce nie stwierdzone, jak *Thamnopora elegantula* Tchudinova, znana z warstw krekowskich (D₁) z basenu kuźnickiego. Najbardziej zbliżony do zespołu Tabulata z niższej części warstw grzegorzowickich (kompleks VIII i niższe) jest zespół koralowców z otworu Porzecze 5A. Wraz z tabulatami występują kolonijne Rugosa z rodzaju *Xystriphyllum* (J. Fedorowski, inf. ustna) nie znane z innych profili.

Nieco odmienny zespół koralowców został stwierdzony w profilu Strawczynek 1. Obok gatunków znanych z Grzegorzowic i profilu Porzecze 5A występują tu gałązkowe kolonie *Cladoporacylindrocellularis* Dubatolov opisane z eiflu otworu Ostalów 1 (E. Sarnecka, 1986), jak również *Alveolites maillieuxi* Salée znany z osadów żywetu i franu Gór Świętokrzyskich. Charakterystyczne dla tego profilu jest występowanie dużych kolonii z rodzaju *Heliolites* (50 okazów). Bogata kolekcja heliolitów pochodzi także z odsonień w Chełmcach (kolekcja P. Filonowicza) położonych na zachodnim brzegu wychodni dewonu synkliny kielecko-lagowskiej w niewielkiej odległości od otworu Strawczynek 1. Z tych odsonień pochodzą również krzaczaste kolonie rodzaju *Multithecopora* zaliczone do nowego gatunku *M. annae* n. sp. Gatunek ten został ustalony na podstawie okazów znalezionych w otworze wiertniczym Tarczek 1 (synklina bodzentyńska). Osady występujące w tym otworze odpowiadają najniższemu kompleksom z Grzegorzowic (I, II), czyli należą do emsu (zona *patulus*). W mulowcowo-iłastych osadach profilu Tarczek 1 stwierdzono masywne kolonie *Favosites goldfussi eifeliensis* (Pennecke) i *Alveolites praelimniscus* Le Maitre oraz wspomniane już krzaczaste kolonie *Multithecopora annae* n. sp., należące do rzędu Siringoporida. Gatunki tego rodzaju występują powszechnie w karbonie i permie Europy, Azji i Ameryki. Jeden gatunek był opisany z syluru Norwegii i z eratykowna przez A. Stasińską (1967). Jego przynależność do rodzaju była kwestionowana (I. I. Tchudinova, 1986), wydaje się, że głównie z powodu braku znalezisk przedstawicieli *Multithecopora* poniżej dolnego karbonu. W osadach górnego emsu profilu Tarczek 1 znaleziono także kolonię należącą do Heliolitida różniącą się od znanych dotychczas heliolitów środkowego dewonu. Zdecydowanie mniejsze rozmiary jej elementów szkieletowych zbliżają ją do

sylurskiej rodziny Proheliolitidae. Wstępnie oznaczono ją jako ?*Heliolites* (*Proheliolites*) sp. A, gdyż skąpość materiału badawczego nie pozwala na ustalenie prawdopodobnie nowego rodzaju.

Odmienne zespoły Tabulata stwierdzono w profilu Kostomłoty 2. Brak tu gatunków charakterystycznych dla warstw przejściowych między dewonem dolnym i środkowym, pojawiają się natomiast gatunki nie opisywane z innych profili, jak *Thamnopora kuznetskiensis* (Tchernychev) i *Alveolites straeleni minor* n. ssp. oraz tabulaty o szerokich zasięgach stratygraficznych. Być może są to osady odpowiadające wyższemu (powyżej VIII) kompleksom w profilu Grzegorzowic, chociaż *Favosites goldfussi eifeliensis* (Penecke), występujący w dolnej części profilu Kostomłoty 2, wskazuje, że to przesunięcie w „górze” tabeli stratygraficznej jest niewielkie. Prawdopodobnie osady z koralami w tym profilu należą do niższej części zony *partitus*.

Z przeprowadzonych obserwacji wynika, że w Górach Świętokrzyskich osady zony *patulus* i *partitus* zawierają zespół Tabulata reprezentujący warstwę przejściową między dewonem dolnym i środkowym. Charakterystycznymi gatunkami są tu: *Alveolites praelimniscus* Le Maitre, opisany z emsu Hiszpanii i Maroka, *Cladopora cylindrocellularis* Dubatolov, opisana

z warstw sałairskich i szandyjskich basenu kuźnickiego, *Favosites goldfussi eifeliensis* (Penecke), występujący w Ardenach w poziomie Co2c i Co2d, oraz *Striatopora tenuis* Lecompte, znana z poziomów Co2b i Co2c w Ardenach (E. Sarnecka, 1988). Rolę wskaźnika stratygraficznego może odegrać *Alveolites praelimniscus* Le Maitre, który dotychczas w Polsce był stwierdzany wyłącznie poniżej lub w poziomie *dombrowiensis*, w spagu którego w Górach Świętokrzyskich prawdopodobnie przebiega granica tych dwóch zon konodontowych, a więc granica emsu i eiflu (J. Malec, 1991). Nowo opisany gatunek *Multithecopora annae* wydaje się natomiast tej granicy nie przekraczać i jak na razie należy go wiązać z zoną *patulus*.

Z omawianych rejonów z osadów najwyższego emsu i dolnego eiflu oznaczono z podgromady Tabulata 28 taksonów. Opisano tylko gatunki dotychczas w polskiej literaturze nie znane. Zastosowano systematykę podaną przez D. Hill (1981) nie wprowadzając tymczasem zmian nazw rodzajowych (H. Byra, 1983; R. Birenheide, 1985; A. May, 1993a, b), gdyż według autorki użycie nowej nomenklatury wymaga całościowych badań rewizyjnych Tabulata w osadach dewonu Polski.

EXPLANATIONS OF PLATES

PLATE I

Fig. 1. *Planocoenites evidens* (Tchudinova)

Strawczynek 1, depth 205.0 m, PGI Kielce NBS 2840, x 5

Fig. 2. *Thamnopora elegantula* Tchudinova

Porzecze 5A, transversal section (przekrój poprzeczny), depth 65.6 m, PGI Kielce NBS 2615, x 5

Figs. 3, 4. *Thamnopora kuznetskiensis* (Tchernychev)

Kostomłoty 2, depth 92.0–92.2 m; Fig. 3 — longitudinal section, septal spines and connecting pores clearly visible (przekrój podłużny, dobrze widoczne kolce septalne i pory łączące), PGI Kielce NBS 2968, x 5; Fig. 4 — transversal section, PGI Kielce NBS 2967, x 7

Fig. 5. *Planocoenites cf. capillaris* (Dubatolov)

Strawczynek 1, depth 131.4 m, PGI Kielce NBS 2810, x 5

Figs. 6, 7. *Alveolites straeleni minor* n. ssp.

Holotyp, Kostomłoty 2, depth 88.7 m, x 5; Fig. 6 — transversal section, PGI Kielce NBS 2918; Fig. 7 — longitudinal section, PGI Kielce NBS 2919

Fig. 8. *Alveolites praelimniscus* Le Maitre

Strawczynek 1, depth 214.0 m, PGI Kielce NBS 2855, x 5

PLATE II

Figs. 1, 2. *Cladopora cylindrocellularis* Dubatolov

Strawczynek 1, depth 217.3 m, NBS 2885, x 8; Fig. 1 — longitudinal section; Fig. 2 — transversal section

Figs. 3, 4. *Thamnopora micropora* Lecompte

Porzecze 5A, depth 108.7 m, PGI Kielce NBS 2625, x 5

Fig. 5. *Striatopora tenuis* Lecompte

Strawczynek 1, depth 216.2 m, PGI Kielce NBS 2879, x 8

Fig. 6. *Grabaulites* sp. A

Longitudinal section, Strawczynek 1, depth 131.4 m, PGI Kielce NBS 2811, x 4

Fig. 7. ?*Heliolites* (*Proheliolites*) sp. A

Tarczek 1, depth 103.4 m, PGI Kielce NBS 3066, x 2

Figs. 8, 9. *Heliolites porosus* ssp. A

Chełmce (coll. P. Filonowicz); Fig. 8 — transversal section, PGI Kielce NBS 2986, x 4.3; Fig. 9 — longitudinal section, PGI Kielce NBS 2987, x 5

PLATE III

Figs. 1, 2. *Heliolites porosus* ssp. B

Strawczynek 1; Fig. 1 — transversal section, depth 205.0 m, PGI Kielce NBS 2845, x 5; Fig. 2 — longitudinal section, depth 220.5 m, PGI Kielce NBS 2891, x 4

Figs. 3, 6. *Heliolites* sp. C

Chełmce (coll. P. Filonowicz); Fig. 3 — transversal section, PGI Kielce NBS 2984, x 5; Fig. 6 — longitudinal section, PGI Kielce NBS 2985, x 4.5

Figs. 4, 5. *Heliolites jejunos* Dubatolov

Chełmce (coll. P. Filonowicz); Fig. 4 — longitudinal section, PGI Kielce NBS 2995, x 4.4; Fig. 5 — transversal section, PGI Kielce NBS 3000, x 4.4

Figs. 7, 8. *Heliolites vulgaris* Tchernychev

Strawczynek 1; Fig. 7 — transversal section, depth 204.8 m, PGI Kielce NBS 2835, x 4; Fig. 8 — longitudinal section, depth 204.9 m, PGI Kielce NBS 2837, x 5

PLATE IV

Figs. 1, 2. *Multithecopora annae* n. sp.

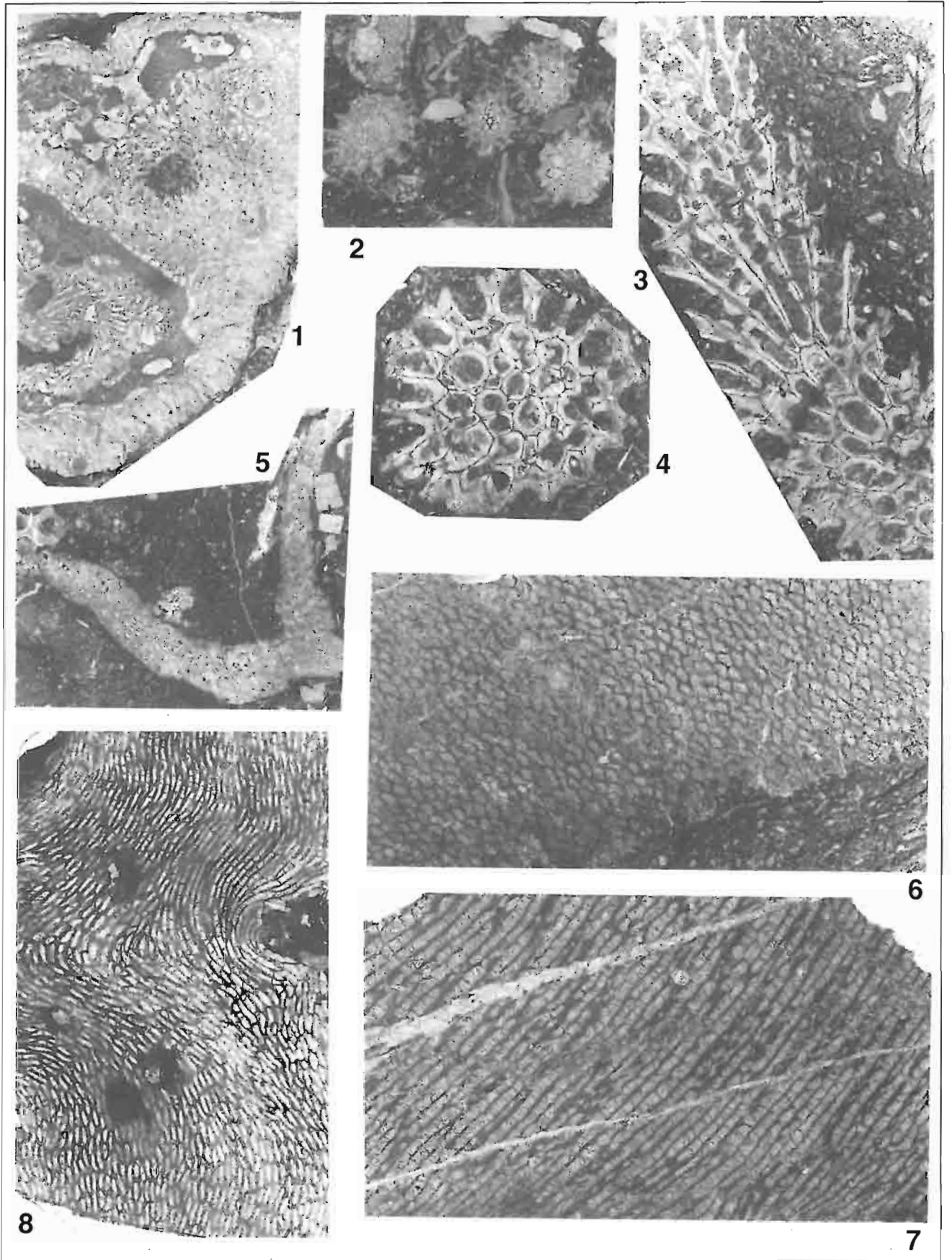
Tarczek 1, holotyp, transversal sections, depth 109.5 m, PGI Kielce NBS 3076; Fig. 1 — x 5; Fig. 2, 2a–d — corallites with clearly visible graininess of sclerenchyme and its characteristic wrinkling (korality z dobrze widoczną stoistością sklerenchymy i jej charakterystyczne „pomarszczenie”), x 15

Figs. 3, 4. *Multithecopora annae* n. sp.

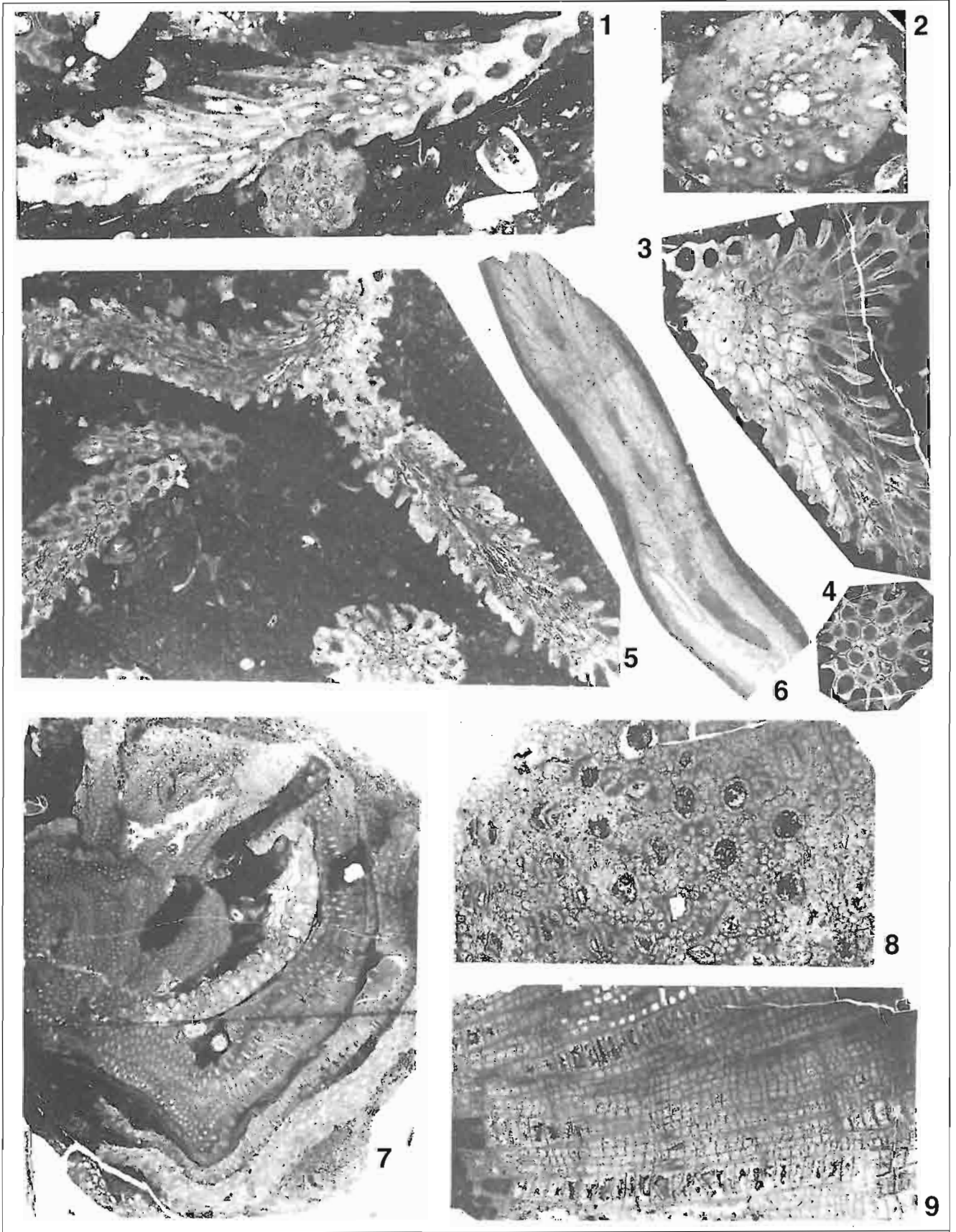
Tarczek 1, holotyp, longitudinal sections, depth 109.5 m, PGI Kielce NBS 3075; Fig. 3 — x 5; Fig. 4 — thin, slightly deflated tabulae and septal tubercles are seen (widoczne cienkie, lekko wgięte denka i guzki septalne), x 15

Fig. 5. *Multithecopora annae* n. sp.

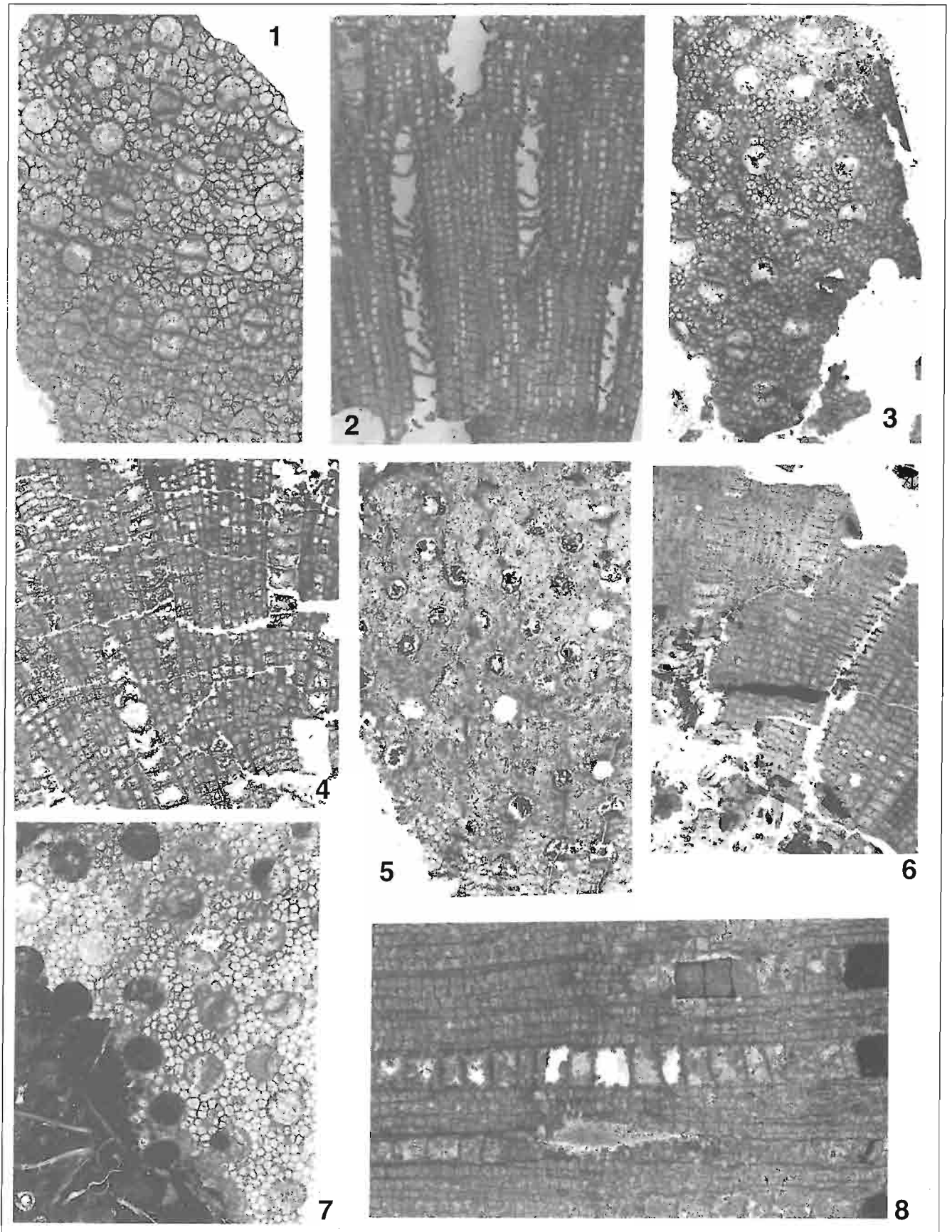
Chełmce (coll. P. Filonowicz); PGI Kielce NBS 3134, x 5



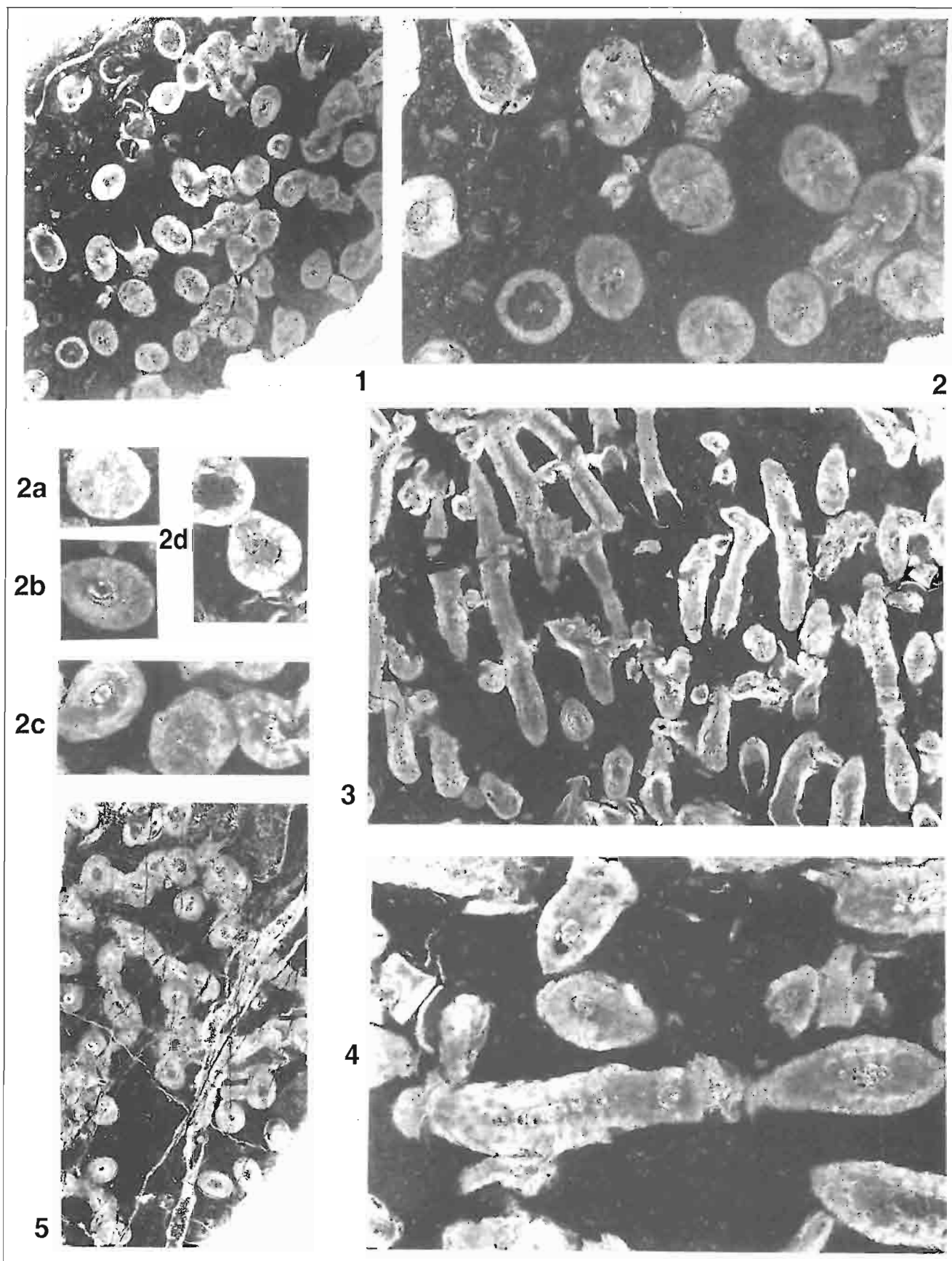
Elzbieta SARNECKA — Tabulata from the Lower and Middle Devonian of the Holy Cross Mts.



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