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RHAETIAN SCLERACTINIAN CORALS IN THE WESTERN CARPATHIANS

EWA RONIEWICZ[1] and JOZEF MICHALÍK[2]

[1]Paleobiological Institute, Polish Academy of Sciences, Twarda 51/56 , 00-818 Warszawa, Poland; eron@twarda.pan.pl
[2]Geological Institute, Slovak Academy of Sciences, Dúbravská cesta 9, 842 26 Bratislava, Slovak Republic; geolmich@savba.savba.sk

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Abstract: The paper presents the distribution and taxonomy of the Rhaetian coral fauna in the Tatric, Fatric, Hronic and Silicic paleogeographical zones of the Western Carpathians. The taxonomic spectrum of the corals from the Fatric zone is the most typical of the Carpathians, and resembles that of the Alps in the abundance of reimaniphylliid corals and frequent phaceloid growth forms, but it differs from the Alpine spectrum in its lower generic diversity. The assemblage from the northernmost zone, formed by the Tatric Superunit, is closest to the Early Jurassic fauna from the British Isles. Two new species are described: *Zardinophyllum carpathicum* sp.n. and *Stylophyllopsis bobrovensis* sp.n.

Key words: Western Carpathians, Rhaetian, coral build-ups, Scleractinia.

Introduction

The aim of the present paper is to show the composition of the coral fauna of the latest Triassic in the Western Carpathians, and to revise some earlier taxonomic determinations (Roniewicz 1974). Up to now, Late Triassic scleractinians from this region have been described from the High Tatra-, Western Tatra-, Low Tatra-, Malé Karpaty-, Stratená- and Strážov Mts. (Goetel 1917; Kolosváry 1957, 1958a,b, 1963, 1966a,b, 1967; Roniewicz 1974; Roniewicz & Michalík 1991a,b).

In the Carpathians, Triassic Scleractinia are present in Anisian- and younger deposits. The earliest of these corals were described from the Anisian limestones of Aggtelek, Hungary (Scholz 1972), and constitute a sort of biostrome composed mainly of phaceloid skeletons. Some Mid-Triassic corals were described by Kolosváry from the Bükk- and Mecsek Mts. (1958a,b, 1966a). However, in the light of the new stratigraphic data (Riedel et al. 1988), the age of the corals from the Bükk Mts. that were supposed to be Ladinian (Kolosváry 1958a,b) must be changed to the Late Triassic. The reported Mid-Triassic age of corals from the Mecsek Mts. (Kolosváry 1966a) has not been confirmed to date. In addition, the age and taxonomy of the Slovak corals considered by Kolosváry to be of Mid-Triassic age (1958c,d, 1963, 1966b, 1967) still need revision. Recently, some Scleractinia from Slovakia have been collected from the Ladinian/Carnian Wetterstein type limestones from the Malé Karpaty Mts. (Roniewicz & Buček, in preparation). The most interesting aspect of this discovery is that the corals represent solitary and phaceloid forms taxonomically close to the Carnian fauna from the St. Cassian beds of the Dolomites. In the Carpathians, the corals played a minor role only in organogenic constructions dominated by calcareous sponges and hydrozoans (Michalík et al. 1993).

In other parts of the Carpathians, abundant Carnian coral faunas were described by Papp (1911) from the Bakony Mts. (Hungary), and from the Romanian Carpathians (Braşov) by Kuehn (1936).

In Upper Triassic limestone facies of the Western Carpathians, corals show the whole morphological spectrum from solitary and phaceloid to various massive forms (Kolosváry 1957, 1958c,d, 1963, 1966b, 1967; Roniewicz 1974). In this region, Rhaetian Scleractinia constitute a widely distributed and significant component of the fauna (Michalík 1973, 1974, 1977, 1978, 1979, 1980, 1982; Gażdzicki 1974; Roniewicz 1974): these corals will be considered in the present paper. Corals of this age are to be found in the following tectonic superunits: Tatric, Fatric, Hronic and Silicic nappe systems, which crop out in diverse mountains, such as the High Tatra Mts. (annotated simply as the Tatra Mts. in the Polish literature), Western Tatra-, Low Tatra-, Malá Fatra-, Veľká Fatra-, Považský Inovec-, Tribeč-, Strážov-, Malé Karpaty- and Stratená Mts.

Material

The bulk of the material considered here was collected by one of us (J. Michalík, see Michalík 1979, 1982 for sample locations) and is deposited in the Slovak National Museum, Bratislava (abbreviated as SNM; collection of about 170 specimens). Some specimens belong to the collection of S. Buček (Geological Survey of the Slovak Republic, Bratislava). A large collection from the Tatra Mts. (above 100 specimens collected chiefly by A. Gażdzicki, A. Radwański & E. Roniewicz in the 1960s) is housed at the Institute of Paleobiology, Polish Academy of Sciences, Warsaw (ZPAL).

Glossary

Endotheca — vesiculous or tabuloid dissepiments infilling the central and interseptal parts of the corallite.

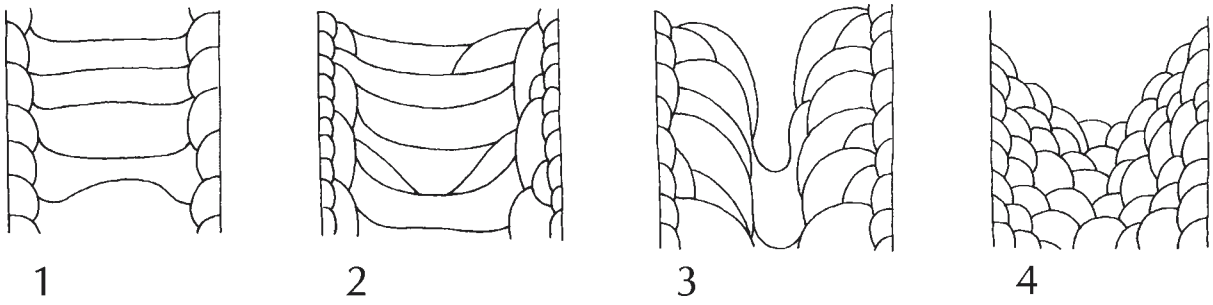


Fig. 1. Sketch drawings showing differences in arrangement of endothecal elements in individual species of *Retiophyllia*: **1.** *R. gracilis* Roniewicz, **2.** *R. gosaviensis* Roniewicz, **3.** *R. paraclathrata* Roniewicz, **4.** *R. clathrata* (Emmrich).

Growth form — shape of coral skeleton resulting from the mode of life. The *solitary* mode produces various corallum shapes: cylindrical, conical, etc. The phaceloid form, considered to be a result of a *pseudocolonial* mode of life (Coates & Jackson 1987), shows skeletons built of subcylindrical branches (=corallites) each branch ending with a calice lacking connections with others with the exception of the site of budding. The *colonial* mode produces colonies of various structural types based on the different relationships between neighbouring corallites: (1) cerioid-corallites isolated by walls; (2) thamnasterioid-corallites lacking walls and interconnected by septa; (3) meandroid-corallites arranged into series; (4) plocoid-corallites divided from each other by coenosteum, which is a common colonial skeletal tissue. The shapes of colonies may be massive, lamellate or branching.

Ornamentation — microarchitectural structures on the septal flanks: *granulations, pennules* (Gill 1967: structures in the form of balconies) or *menianes* (Gill 1967: structures in the form of long or short ledges paralleling the distal septal margin).

Septal spines — thick trabecula-like elements, differing from trabeculae in lacking radial structure, and in being formed from bundles of fibres; constitute septa in the suborder Stylophyllina (see also Roniewicz 1989).

Trabecula — a structural element of septa having fibres radially arranged in relation to the central axis (centre of calcification). Trabeculae may be differentiated into small trabeculae (from ca. 20 to 50 micrometres in diameter) and thick trabeculae (above 50 micrometres, usually 100–200 micrometres; Roniewicz 1989; Morycowa & Roniewicz 1995).

Preservation of the material

The material considered consists of ca. 270 fragments of corals from more than 100 localities distributed throughout the above-mentioned mountain chains. The original aragonite skeletons have been completely calcified, and, in the majority of specimens, the internal structure has been destroyed. The phaceloid corals especially show extensively changed skeletons, their corallites being filled with blocky calcite or deformed by pressure. The best preserved specimens were selected for preparing thin sections, and the paper presents the results based on investigation of ca. 270 thin sections. Although poorly preserved, the skeletons display many structural details enabling reconstruction of their morphology; taxonomically significant features may be observed in fragments of skeletons.

We consider the entire collection as a faunistic sample that is representative of the region constituting the west-central part of the Carpathians.

Relationships of the Rhaetian coral faunas of the Western Carpathian paleogeographical zones

Tatric paleogeographical zone. In the limestones that form part of the Tatric Superunit, corals have been found at a few localities, in dark limestones cropping out in the Western Tatra Mts. (Bobrovec Valley and the SW part of the Chochołow Valley: Radwański 1968; Roniewicz 1974: Fig. 1, Table 1).

Colonies of lamellate and phaceloid form constitute a small patch at a single locality (Za Kýčerou), while isolated branches of *Stylophyllopsis media* and lamellate colonies of *Rhaetiastraea tatrica* may be found at a number of localities in the Chochołow Valley (e.g. Skorusi Žleb stream section, Kulawiec Hill).

In contrast to the assemblages from the Fatric and Hronic zones, the corals from the Tatra Superunit show, up to now, only one species common to any of the other Carpathian faunas, namely *Phacelostylophyllum medium* (now *Stylophyllopsis media)* in the Fatra Formation (Michalík 1982, Pl. 18: Fig. 6). The fauna contains *Pamirophyllum,* a genus common to the Norian/Rhaetian fauna of the Pamirs in Central Asia (Melnikova & Roniewicz 1990), and the ubiquitous genus *Stylophyllopsis,* which is known from both Eurasia and America from the uppermost Triassic–lowermost Jurassic. Another element, of the fauna is *Heterastrea,* a genus hitherto not known earlier than the Lower Jurassic (cf. Taxonomy, p. 394 and Table 1). The genus *Rhaetiastraea,* described for the first time from the Tatric, is known in the West Tethyan Liassic deposits (see p. 398).

This small fauna from the High-Tatra unit significantly differs at suprageneric level from the other Tethyan Triassic faunas. Although three genera represent the order Stylophyllina *(Stylophyllopsis, Pamirophyllum* and *Heterastraea),* characterized by non-trabecular septa built of septal spines, and typical of the Triassic–Liassic interval, only one genus, *Rhaetias-*

Table 1: Rhaetian Scleractinia in the Western Carpathians. Distribution of considered taxa in the Tatric (T), Fatric (F), Hronic (H) and Silicic (S) paleogeographical zones, and in the Alps; brackets indicate forms of morphology similar to the Alpine taxon (cf.). Measurements: *d* — diameter of the corallite measured from the middle of the wall; *e.* — estimated; *s* — number of septa. The column entitled 'Septal apparatus organization' presents some examples of a variable arrangement of septa in *Retiophyllia: S1, S2* — septa of succeeding size orders (which may or may not correspond to order of appearance).

Species	Diametres (mm); nr of septa	Septal apparatus organization S1+S2+S3+S4	growth form	West Carpathian paleogeographical zones: T,F,H,S	Alps	Remarks	Material
1. *Zardinophyllum carpathicum* sp.n.	d 2–2.5 s <16		solit	**F**			**Tatra Mts**: SNM 9,11; Low **Tatra / Veľká Fatra Mts**: SNM 10, 12, 13
2. *Pinacophyllum lejowae* Roniewicz 1974	d 7–8 s ca. 35		phac	**F H**			**Tatra Mts**: SNM 1, 2; ZPAL HVI / 113–116, 120–122; **Strážovské Vrchy**: SNM 3, 8; **Malé Karpaty Mts**: SNM 5
3. *Stylophyllum robustum* Roniewicz 1974	d 16–22 s 50–60		phac	**F H**	+		**Tatra Mts**: ZPAL HVI / 41, 79, 86, 108, 129, 130, 145. **Low Tatra / Veľká Fatra Mts**: SNM 151
4. *Stylophyllopsis media* Roniewicz 1974	d 9–11 s 45 (56)		phac	**T F**		removed from *Stylophyllum* to *Stylophyllopsis* due to solid septa	**Tatra Mts**: ZPAL HVI / 1–7, 14, 73
5. *Stylophyllopsis bobrovensis* sp.n.	d 20–25 s ca. 80		phac	**T**			**Tatra Mts**: ZPAL HVI / 141–144
6. *Stylophyllopsis* cf. *polyactis* Frech 1890	d 25		solit	[F]	+	fragmentary corallite, septa relatively solid, septal spines of max. 0.6 mm	**Malá Fatra Mts**: SNM 16
7. *Heterastrea gracilis* (Roniewicz 1974)	d 6–8 s 40–60		cerio	**T**		resembling *H. stricklandi* Dunc. and *H. tomesi* Dunc. from the Lias of England (comp. Beauvais 1976)	**Tatra Mts**: ZPAL HVI / 137
8. *Pamirophyllum tatricum* Ron. In Melnikova & Roniewicz1990	d(7)10–25 s 50–ca. 80		cerio	**T**			**Tatra Mts**: ZPAL HVI / 138–143
9. *Meandrostylophyllum vesiculare* Roniewicz & Michalik 1991	d 10–15		mean	**F**			**Tatra Mts**: SNM Z 20075
10. *Retiophyllia fenestrata* (Reuss 1854)	d 4.5–6.0 s ca. 45	12+12+ca 20 10+10+13+5	phac	**F**	+		**Tatra Mts**: ZPAL HVI/46
11. *Retiophyllia frechi* Roniewicz 1989	d 5.5–7 s 32–45	6+6+12+21 8+8+16+0	phac	F	+		**Malá Fatra Mts** : SNM Z 54
12. *Retiophyllia gosaviensis* Roniewicz 1989	d 7–10 s 50–80	6+6+12+23 8+9+32	phac	**F H**	+	Alpine form has up to 120 septa due to high number of septa S4	**Strážovské Vrchy**: SNM 94, 95. **Veľká Fatra Mts**: thin section 258/6. **Tatra Mts**: ZPAL HVI / 15
13. *Retiophyllia gracilis* Roniewicz 1989	d 4–4.5 s 31–41	11+11+19 6+6+12+7	phac	**F**	+		**Tatra Mts**: ZPAL HVI/49
14. *Retiophyllia clathrata* (Emmrich 1854)	d 7–10 s 70–80	9+9+18+32 12+12+24+32	phac	**F**	+		**Tatra Mts**: ZPAL HVI / 21, 28, 67, 72; **Veľká Fatra Mts**: SNM 113, 114, 117; **Malé Karpaty Mts**: SNM, Buček´s Coll. 535/86
15. *Retiophyllia* cf. *oppeli* (Reuss 1865)	d 3.5–4.5 s < 40	5+5+10+7 6+6+12+3	phac	**[F]**	+	Alpine form has more than 50 septa arranged into 7–8 systems	**Tatra Mts**: SNM 41,46,71; **Strážovské Vrchy**: SNM 39; **Malé Karpaty**: SNM 44
16. *Retiophyllia paraclathrata* Roniewicz 1989	d 4.5–6.5 s 32–56	5+5+10+18 7+7+14+20	phac	**F H**			Zigzag septa**: Tatra Mts**: ZPAL HVI/ 35–38, 66, 119, 123, 132;. **Strážovské Vrchy Mts**: SNM 83; **Malá Fatra Mts**: SNM 93. straight septa: **Veľká Fatra Mts**: SNM 38. **Malé Karpaty Mts**: Buček Coll. Nos.1–3
17. *Retiophyllia* sp. 1	d 12.5–15 s > 80		phacel	**F**		Fragmentary corallites	**Malá Fatra Mts**: SNM 119
18. *Distichophyllia* sp.	d e. 20		solit	**S**		Fragmentary corallite	**Stratenská Hornatina**: SNM 120
19. *Chondrocoeania schafhaeutli* (Winkler 1861)	d 2.5–3 s 20–36		ploco	**F H**	+		**Tatra Mts**: ZPAL HVI/ 45, 78, 80–83, 109, 125; SNM 17, 19; **Malá Fatra Mts**: SNM 18, 20
20. *Pamiroseris rectilamellosa* (Winkler 1861)	d ca. 5 s 24–35 (max. 45)		thamn	**F H**	+		**Tatra Mts**: ZPAL HVI/ 47, 48, 50, 51, 61, 69, 74–76, 126; SNM 31, 36; **Malá Fatra Mts**: SNM 32
21. *Rhaetiastraea tatrica* Roniewicz 1974	d 2.3–3.5 s < 45		cerio	**T**		Liassic Moroccan form with 45–65 septa (compare Beauvais 1986)	**Tatra Mts**: ZPAL HVI / 8, 10, 12, 13, 134–136
22. *Astraeomorpha confusa* (Winkler 1861)	d 1.5–2 s < 16		thamn	**F H**	+		**Tatra Mts**: ZPAL HVI / 25, 26, 94–98, 118, 133. SNM 46

traea, belongs to the trabecular corals, the minitrabecular reimaniphylliids, a group typical of the Upper Triassic (Roniewicz 1989), being absent.

The composition of the fauna from the Tatric zone indicates that the coralliferous series may be Hettangian–Sinemurian in age. In its being dominated by stylophylline corals, it resembles the lowermost Jurassic coral fauna from Great Britain (Beauvais 1976).

Fatric paleogeographical zone. The most common Rhaetian corals originate from the Fatric paleogeographical zone (formed by a homonymous superunit) from dark-coloured limestones of the Fatra Formation.

The corals occur mainly in two coralliferous horizons of the Fatra Formation, named the lower and upper biostromatic members, respectively (Michalík et al. 1979). The limestones of this formation constitute part of the Krížna tectonic unit.

The scleractinians from the widely distributed Krížna Unit belong to the most typical of the West-Carpathian coral faunas, and are also close to the fauna from other regions of the Tethyan belt. These are corals that were relatively often described in geological and paleontological papers (Goetel 1917; Gaździcki 1974; Roniewicz 1974; Roniewicz & Michalík 1991a,b). The coralliferous beds in the Fatra Formation are widely distributed (Michalík 1973, 1974, 1977).

The most typical members of this fauna belong to the specifically well diversified genus *Retiophyllia*. The skeletons of these branching, phaceloid corals either form biostromes or, together with lamellate corals (*Astraeomopha, Pamiroseris*), contribute to the formation of small patches. Determination of these corals at the specific level is usually impossible due to recrystallization of the skeletons. Other common species are *Pamiroseris rectilamellosa* and *Astraeomorpha confusa.* A very interesting faunistic element found in the lagoonal part of this zone, is the solitary, dwarfish coral *Zardinophyllum carpathicum* sp.n., the only known Rhaetian representative of the genus (Roniewicz & Michalík 1991a). Another coral genus known up to now only from this zone is *Meandrostylophyllum,* which belongs to the here poorly represented stylophylline corals.

Hronic paleogeographical zone. Corals are known in light coloured limestone facies of the Norovica Formation, constituting the Mojtín Limestone Member, and in the Hybe Beds (Gaździcki & Michalík 1980). The limestones of this zone form part of the Choč tectonic unit. The proportion of corals in this zone is smaller than in the Fatric zone. Coral communities cited in earlier literature (e.g. Zázvorka & Prantl 1936), yielded a number of coral species (Table 1).

In general, the taxonomic composition of the coral fauna from the Hronic zone is similar to that from the Fatric zone. The poor state of preservation of the corals renders impossible any quantitative comparison between the faunas of the two zones.

Silicic paleogeographical zone. This zone yielded a small number of coral finds in the Silicic tectonic unit (*sensu lato*). The corals in the collection, determined only to generic level due to their uncomplete preservation, represent reimaniphylliid phaceloid *Retiophyllia* sp. and solitary *Distichophyllia* sp. Due to the scarcity of material any detailed comparison with the faunas of the two preceding zones is impossible.

General characteristics of the Rhaetian Scleractinia from Western Carpathians

In general, the taxonomic spectrum of the Rhaetian corals from the Fatric and Hronic zones corresponds to that of the Alpine Rhaetian ones, although the numbers and proportions of species are different in the Carpathians and in the Alps. The corals from the Western Tatra Mts. either constitute a rather isolated, endemic Rhaetian fauna, or they represent an Early Jurassic assemblage.

The most striking feature of the Rhaetian corals in the Carpathians is their morphology, or, more precisely, the growth forms of their skeleton (Table 1). These are mainly branching, phaceloid forms, which are abundant and dominate the assemblages, 180 specimens being represented in the collections considered here. The phaceloid corals are well diversified taxonomically (e.g. *Pinacophyllum*, *Stylophyllum,* and above all, the abundant and specifically diverse genus *Retiophyllia*). Then, in descending order of numbers, there are lamellate colonies of the thamnasterioid (ca. 40 specimens), cerioid (10 specimens), plocoid (10 specimens) and meandroid types (1 specimen). Each of five genera (*Heterastrea, Pamirophyllum, Pamiroseris, Rhaetiastraea, Astraeomorpha*) of the above colonial corals is represented by only one species. Of the colonial corals, the thamnasterioid and plocoid types are rather common, while the cerioid and meandroid corals are known only from single localities.

The solitary corals are rare and poorly diversified, in comparison with the Alpine Rhaetian ones. Hitherto, only one species has been described as locally abundant (*Zardinophyllum carpathicum* sp.n.), while two others (*Distichophyllia* sp. and *Stylophylliopsis* cf. *polyactis*) are represented by single specimens.

The most typical element of the Rhaetian fauna in the Carpathians consists of corals of the family Reimaniphylliidae (genus *Retiophyllia*, ca. 150 specimens). This is the most ubiquitous and opportunistic group, which is known, in both marly and calcareous facies, from the Alps and from other regions of the Tethyan belt (Central Asia: Melnikova 1975; Northern Australia: Sarti et al. 1992). On the other hand, corals belonging to the Stylophyllidae did not find in the Carpathians an environment as favourable for them as that of the Alpine Zlambach Beds, from which over 10 species have been described (Roniewicz 1989). The exception to this is the development of the stylophylline corals in the Tatric zone in the Western Tatra Mts., but this fauna may belong to a younger sedimentary cycle than those from the remaining paleogeographical zones.

The diversity of the Carpathian coral fauna considered here comprises 20 species belonging to 13 genera. The above statistics show that, in comparison with the rich assemblage of Rhaetian corals of the Alpine region comprising at least 64 species belonging to 30 genera (Roniewicz 1989), the Carpathian corals are only moderately diversified.

Taxonomy

The systematics follow Chevalier & Beauvais (1987). Synonymy is reduced to recent bibliography. All measurable

features of the taxa discussed as well as the material here examined have been shown in the Table 1.

Suborder **Pachythecalina** Eliášová 1978
Family **Zardinophyllidae** Montanaro-Gallitelli 1975
Genus *Zardinophyllum* Montanaro-Gallitelli 1975
Zardinophyllum carpathicum sp.n.

199b *Zardinophyllum* sp. A: Roniewicz & Michalík, p. 362, Pl. 1: Figs. 1–6, and Pl. 2: Figs. 3–5.

Syntypes: specimen SNM-[13], illustrated in Roniewicz & Michalík 1991b, Pl. 1, Figs. 1–4.

Type locality: Baranie at Svätý Jakub, Low Tatra Mts.

Type horizon: Rhaetian Fatra Formation limestones, Krížna Nappe (Fatric paleogeographical zone).

Diagnosis. Elongated vermicular corallites with diameters 1–2.5 mm; number of septa irregular, estimated at about 16.

Material. Several dozen specimens, Table 1.

Remarks. The species differs from *Zardinophyllum zardini* Montanaro-Gallitelli (type species; Montanaro-Gallitelli 1975) in far smaller corallite dimensions. The species belongs to the pachythecalines of the smallest diametres (*Pachydendron microthallos* Cuif shows corallites 2 mm in diametres: Cuif 1975).

Suborder **Stylophyllina** Beauvais 1981
Family **Stylophyllidae** Frech 1890

The continuous series of transitions from solitary to phaceloid coralla, which may be observed in *Stylophyllopsis* and *Stylophyllum* (compare Frech 1890), weakens the usefulness of the phaceloid growth form for the taxonomy of this group of corals. For the above reason, the taxon established for phaceloid stylophyllids, *Phacelostylophyllum* Melnikova 1972, has been rejected here (see below at the synonymies of *Stylophyllum* and *Stylophyllopsis* species).

Genus *Pinacophyllum* Frech 1890
Pinacophyllum lejowae Roniewicz 1974

1974 *?Pinacophyllum lejowae* Roniewicz: p. 101, Pl. 1: Figs. 1, 2; Fig. 2.

Genus *Stylophyllum* Reuss 1854
Stylophyllum robustum (Roniewicz 1974)

1974 *Phacelostylophyllum robustum* Roniewicz: p. 105, Pl. 3: Figs. 1–3.
1984 *Stylophyllum robustum* (Roniewicz): Fantini-Sestini & Motta, p. 358, Pl. 30, Fig. 4.

Genus *Stylophyllopsis* Frech 1890
Stylophyllopsis media (Roniewicz 1974)

1974 *Phacelostylophyllum medium* Roniewicz: p. 106, Pl. 3: Fig. 5; Figs. 5, 6.
1982 *Phacelostylophyllum medium* Roniewicz: Michalík, Pl. 18, Fig. 6.

Stylophyllopsis bobrovensis sp.n.

1974 *?Phacelostylophyllum* sp.: Roniewicz, p. 107, Pl. 3: Fig. 4.

Syntypes: ZPAL H.VI/141-144; figured as above.

Type locality: Za Kýčerou Site at Bobrovec Valley in the Western Tatra Mts., Slovakia.

Type horizon: Rhaetian limestones, Tatric cover sequence (Tatric paleogeographic zone).

Derivation of the name: After the type locality.

Diagnosis. Phaceloid skeletons built of few corallites; corallite diameters ca. 25 mm; septa nearly solid, ca. 80 in number, differentiated into 5 size orders. Endothecal elements numerous, wide, slightly deepened at the corallite centre.

Material. The type material only. In the samples, the species occurs together with *Pamirophyllum tatricum*.

Remarks. It differs from the similar *S. zitteli* Frech 1890 by having larger corallite diameters and numerous densely arranged septa.

Stylophyllopsis cf. *polyactis* Frech 1890

Material consists of a fragmentary, solitary corallum resembling *Stylophyllopsis polyactis* in the diameter of the calice and in relatively solid septa S1 built of regular, rather thin septal spines (ca. 600 micrometres in diameter). *Stylophyllopsis polyactis* is a common Rhaetian taxon in the Alps (Roniewicz 1989).

Genus *Heterastrea* Tomes 1888

Genus *Heterastrea* is known from the lowermost Jurassic beds. For more on the genus see Beauvais (1976).

Heterastrea gracilis (Roniewicz 1974)

1974 *Stylophyllum gracile* Roniewicz: p. 104, Pl. 2: Fig. 2; Fig. 4.

Genus *Pamirophyllum* Melnikova & Roniewicz 1990
Pamirophyllum tatricum Roniewicz in Melnikova & Roniewicz 1990

1974 *?Stylophyllum* sp.: Roniewicz, p. 105, Pl. 2: Fig. 1.
1974 *?Elysastrea* sp.: Roniewicz, p. 111, Pl. 8: Figs. 1, 2.
1990 *Pamirophyllum tatricum* Roniewicz: in Melnikova & Roniewicz, p. 87, Pl. 22: Figs. 1–4.

Genus *Meandrostylophyllum* Roniewicz & Michalík 1991
Meandrostylophyllum vesiculare Roniewicz & Michalík 1991

1991a *Meandrostylophyllum vesiculare:* Roniewicz & Michalík, p. 159, Figs. 3–5.

Suborder **Caryophylliina** Vaughan & Wells 1943
Family **Reimaniphylliidae** Melnikova 1974
Genus *Retiophyllia* Cuif 1966

Hitherto, more than 10 species of Rhaetian *Retiophyllia* have been described from the western Tethys, differing primarily in

their corallite diameters, structure of endotheca, and ornamentation of septal faces (Roniewicz 1989). Commonly, the corals with diameters ca. 5 mm and a ring of large peripheral dissepiments observed in cross section were determined as *Retiophyllia sellae* (Stoppani 1865) (see also Frech 1890; Roniewicz 1974; Fantini-Sestini & Motta 1984). However, recent studies (Roniewicz 1989, and present paper) show that the species of similar corallite diameter and appearance of calicular cross-section may differ in the ornamentation of septal faces and the structure of endotheca. Unfortunately, the structure of the endotheca in the *R. sellae* type material has never been examined. To avoid misinterpretations, corals having granular septal ornamentation and dissepiments traversing the lumen have been included either in *R. fenestrata* (Reuss 1854) (diameters about 5–6 mm) or *R. gracilis* Roniewicz 1989 (diameters about 3–4 mm), while the corals with comparable diameters, but having short menianes and a lumen filled with vesiculous dissepiments were determined either as *R. multiramis* Roniewicz 1989 or *R. paraclathrata* Roniewicz 1974, depending on the arrangement and size of dissepiments and the septal number.

In the Carpathian collections (High Tatra-, Low Tatra-, Strážov-, Malá Fatra Mts.), the corals of the *sellae*-like pattern are frequent. This group contains at least four species (*gracilis, fenestrata, paraclathrata,* and *oppeli*) which may be distinguished from each other only when their endothecal features are investigated (Fig. 1).

Some of the taxa discussed here were originally described from the High Tatra Mts. under the name of *Parathecosmilia* Roniewicz 1974 which included forms with straight septa and an apparently parathecal wall (i.e. dissepimental in origin). Recent observations of the Alpine reimaniphylliid corals, perfectly preserved in aragonite, proved that the shape of septa in this group has no taxonomical significance (Roniewicz 1989). This allows us to synonymize *Parathecosmilia* with *Retiophyllia*. In addition, recent observations show that in all these corals the wall is purely epithecal, and not parathecal (Roniewicz 1989; Roniewicz & Stolarski 1999).

The species presented below are ordered in the 1st group, representing corals with septa ornamented by granulations, and with large, tabuloid dissepiments traversing the central part of the corallite and the 2nd group comprising the corals with septa ornamented by short menianes, and lacking tabuloid dissepiments in the central part of the corallite. In corals of both groups, synapticular projections may develop at the corallite periphery.

1st group:

Retiophyllia fenestrata (Reuss 1854)

pars 1974 *Parathecosmilia sellae* (Reuss): Roniewicz, p. 110, Pl. 6: Figs. 1–3, Pl. 7: Figs 1, 2; Figs. 9, 10.
1989 *Retiophyllia fenestrata* (Reuss): Roniewicz, p. 59, Pl. 9: Fig. 6, Pl. 10: Fig. 1, Pl. 13: Fig. 1.

Retiophyllia frechi Roniewicz 1989
Pl. I: Fig. 1

1989 *Retiophyllia frechi* Roniewicz: p. 48, Pl. 7: Figs. 1–8, Pl. 9: Fig. 5, Pl. 13: Fig. 2.

Retiophyllia gosaviensis Roniewicz 1989
Pl. I: Fig. 2; Fig. 1.2

?1974 *Parathecosmilia* sp.: Roniewicz, p. 111, Pl. 6: Fig. 4.
1989 *Retiophyllia gosaviensis* Roniewicz: p. 55, Pl. 9: Fig.1, Pl. 11: Figs. 4, 5.

Retiophyllia gracilis Roniewicz 1989
Fig. 1.1

1989 *Retiophyllia gracilis* Roniewicz: p. 58, Pl. 9: Fig. 9, Pl. 10: Fig. 2, Pl. 13: Fig. 3.

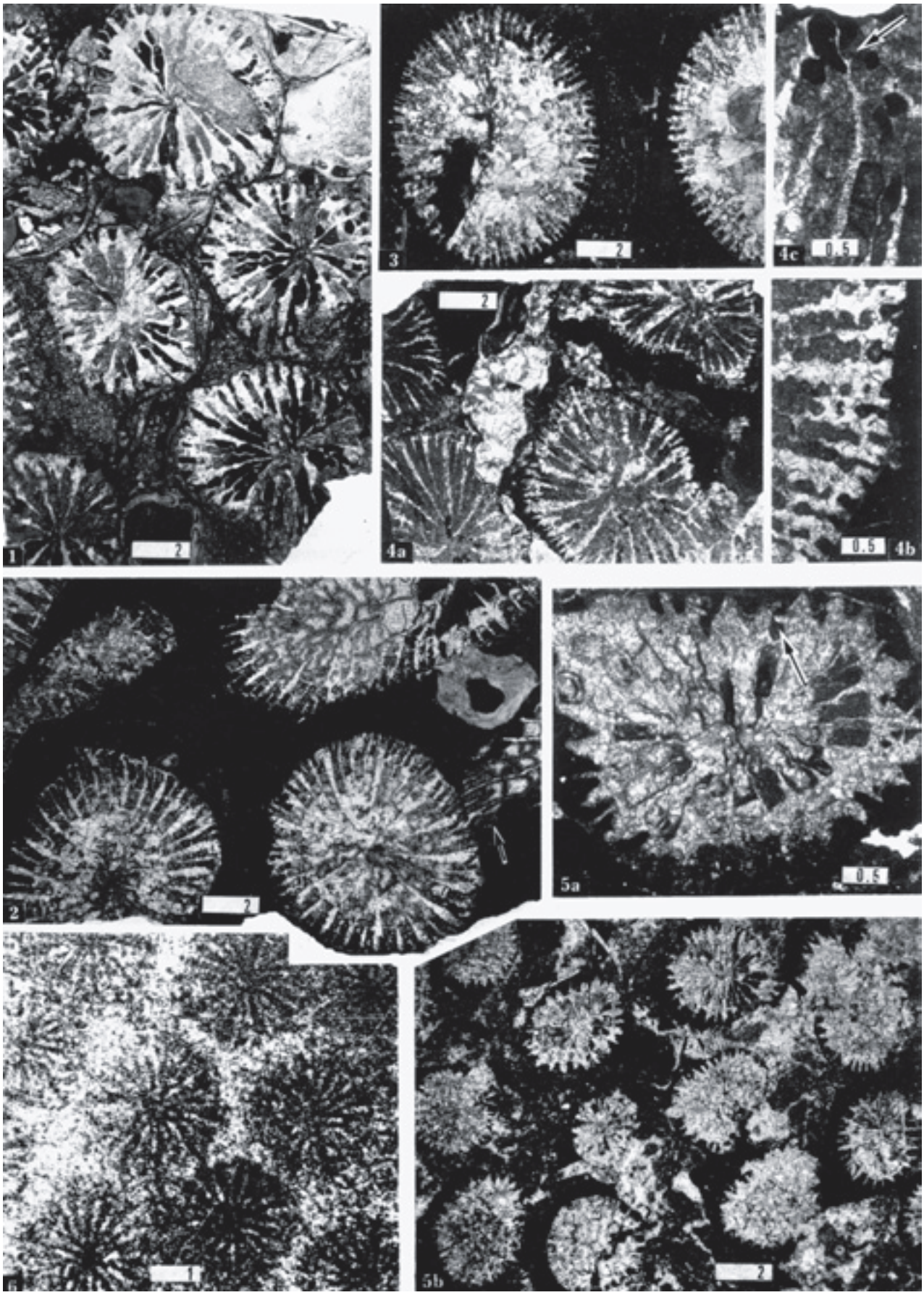
2nd group:

Retiophyllia clathrata (Emmrich 1853)
Pl. I: Figs. 3, 4a–c; Fig. 1.4

1890 *Thecosmilia clathrata* Emmrich: Frech, p. 15, Pl. 4: Figs. 1, 5, 7.
1974 *Retiophyllia clathrata* (Emmrich): Roniewicz, p. 108, Pl. 4: Fig. 1, Pl. 5: Fig. 3; Fig. 7.

Nomenclatural note: In the Emmrich collection housed at the Geiseltal Museum, Halle, three specimens determined as *Thecosmilia clathrata* Emmrich represent the large-corallite form (Frech 1890, Pl. 4: Figs. 1, 5, 7: d 7.0–9.5 mm, locality Wundergraben in vicinity of Ruhpolding and Schwarzachen near Ber-

Plate I: Fig. 1. *Retiophyllia frechi* Roniewicz 1989: phaceloid corallites in cross-section showing rare, thick septa. Specimen No. SNM-[54], Istebné Valley. **Fig. 2.** *Retiophyllia gosaviensis* Roniewicz 1989: phaceloid corallites in cross-section. Septa numerous and subequal in thickness, large dissepiments crossing the axis (at upper right corner), epitheca preserved, apophyses present (arrow). Synapticulae are lacking. Tectonically deformed corallite is visible at the upper left side. Specimen SNM-[95], Domanižské Stráne Hill. **Figs. 3, 4a,b,c.** *Retiophyllia clathrata* (Emmrich 1854): 3 — phaceloid corallites in cross-section. Septa thin and numerous, synapticulae numerous, axial space filled with blocky calcite; specimen SNM-[114], Rohožník Valley. 4a — cross-section of corallites showing well marked internal synapticular wall; 4b — cross-section, internal portion of septum showing obliquely arranged menianes (arrow); 4c — a fragment showing numerous synapticulae constituting a sort of incomplete synapticular wall, traces of a very thin epithecal wall covering the septal ends are to be noticed at right lower corner; specimen from the Buček collection No. 535/86. Malé Karpaty Mts. **Fig. 5a,b.** *Retiophyllia* cf. *oppeli* (Reuss 1865): 5a — a calice in cross-section showing septa peripherally enlarged and provided with thick synapticular projections (arrow), pellicular epitheca has been destroyed; 5b — phaceloid corallites in cross-section; some corallites with peripherally thickened septa and other corallites with thin septa; pellicular epitheca partially preserved; specimen No. SNM-[71], Bobrovček, Smoliacke Hrádky Hill. **Fig. 6.** *Chondrocoenia schafhaeutli* (Winkler 1861). A plocoid colony in cross-section. Intercalicular, perithecal space is very narrow as the calices are densely crowded; thick columella and characteristic anastomosis of septa (at left) are to be noticed. Specimen No. SNM-[17], Trnovec Valley. All the specimens were derived from the Rhaetian Fatra Formation, Western Carpathians. Scale bars in mm.


1
2
3
4a
4b
4c
5a
5b
0.5
1
2

gen) and one belongs to the small-corallite form (unfigured, d 5.5–6.0 mm; Schwarzachen near Bergen). The series of specimens of larger diameters, well illustrated by Frech, is here established as the type series of *R. clathrata* (Emmrich).

Description. Thin radial elements with sharp costal edges equal in thickness. Septa S1 subequal to S2, approaching to the axis, S3 longer than half the length of S1, S4 usually longer than 1/3 of the radius, but in some systems rudimentary or absent, S5 sporadical. Internal septal portion thin, zigzag in shape, with prominent menianes. Peripheral parts with numerous lateral projections which may link the septa to form the synapticulae. Endotheca formed by thin and rather uniform, not extended dissepiments, which slope axialward from the periphery.

Retiophyllia cf. *oppeli* (Reuss 1865)
Pl. I: Fig. 5a,b

The form presented here resembles one of the Alpine Rhaetian *Thecosmilia oppeli* Reuss forms described by Frech from Grosser Zlambachgraben (Frech 1890, Pl. 3: Fig. 4E), and *R. oppeli* (Reuss) described by Roniewicz (1989, Pl. 10: Fig. 3) from Fischerwiese.

Retiophyllia paraclathrata Roniewicz 1974
Fig. 1.3

1974 *Retiophyllia paraclathrata* Roniewicz: p. 108, Pl. 4: Fig. 2, Pl. 6: Figs. 1, 2; Fig. 8.

In the collection, the specimens differ in the shape of septa which may be either zigzag, or straight. Corals with zigzag septa and a prominent lateral ornamentation resemble the holotype. The corals with straight septa have *sellae*-like corallite pattern in cross section.

Retiophyllia sp. 1
A fragmentary coral similar to *R. defilippi* (Stoppani).

Genus *Distichophyllia* Cuif 1975
?Distichophyllia sp.

Large *Distichophyllia*-like coral, associated with a retiophyllian coral of the diameter of 5–6 mm.

Suborder **Archaeocoeniina** Alloiteau 1952
Family **Actinastreidae** Alloiteau 1952
Genus *Chondrocoenia* Roniewicz 1989
Chondrocoenia schafhaeutli (Winkler 1861)
Pl. I: Fig. 6

1974 *Cyathocoenia alpina* (Guembel): Roniewicz, p. 103, Pl. 1: Figs. 3, 4; Fig. 3.
1989 *Chondrocoenia schafhaeutli* (Winkler): Roniewicz, p. 104, Pl. 33: Figs. 1–3, 5 (here additional synonymy included).

Suborder **Faviina** Vaughan & Wells 1943
Family **Pamiroseriidae** Melnikova 1984
Genus *Pamiroseris* Melnikova 1971
Pamiroseris rectilamellosa (Winkler 1861)

1974 *Pamiroseris rectilamellosa* (Winkler): Roniewicz, p. 114, Pl. 8: Fig. 3, Pl. 10: Figs. 1–3.
1989 *Pamiroseris rectilamellosa* (Winkler): Roniewicz, p. 111, Pl. 34: Figs. 3–5 (here additional synonymy included).

Family unknown
Genus *Rhaetiastrea* Roniewicz 1974

The genus, described originally from the Tatric Superunit, in addition to the type species, contains the Liassic (Dommerian) species from Morocco described under the name of *Trigerastrea minima* Beauvais (Beauvais 1986, p. 47, Pl. 12: Fig. 1). The Moroccan species resembles *Rhaetiastraea tatrica* morphologically (cerioid colony and high density of septal apparatus) and microstructurally (thin septa formed by trabeculae provided with granulations). It differs from the Tatric species by having a higher number of septa (45–65 in the Moroccan species, while 34–45 in the Tatric species).

Rhaetiastrea tatrica Roniewicz 1974

1974 *Rhaetiastrea tatrica* Roniewicz: p. 113, Pl. 9: Figs. 1–3; Fig. 12.

Suborder **Fungiina** Verrill 1865, *faute de mieux*
Family **Astraeomorphidae** Frech 1890
Genus *Astraeomorpha* Reuss 1854
Astraeomorpha confusa (Winkler 1861)

1974 *Astraeomorpha crassisepta* Reuss: Roniewicz, p. 113, Pl. 8: Figs. 4, 5.
1989 *Astraeomorpha confusa* (Winkler): Roniewicz, p. 96, Pl. 28: Figs. 1, 2, Pl. 29: Figs. 1–3 (additional synonymy included).

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