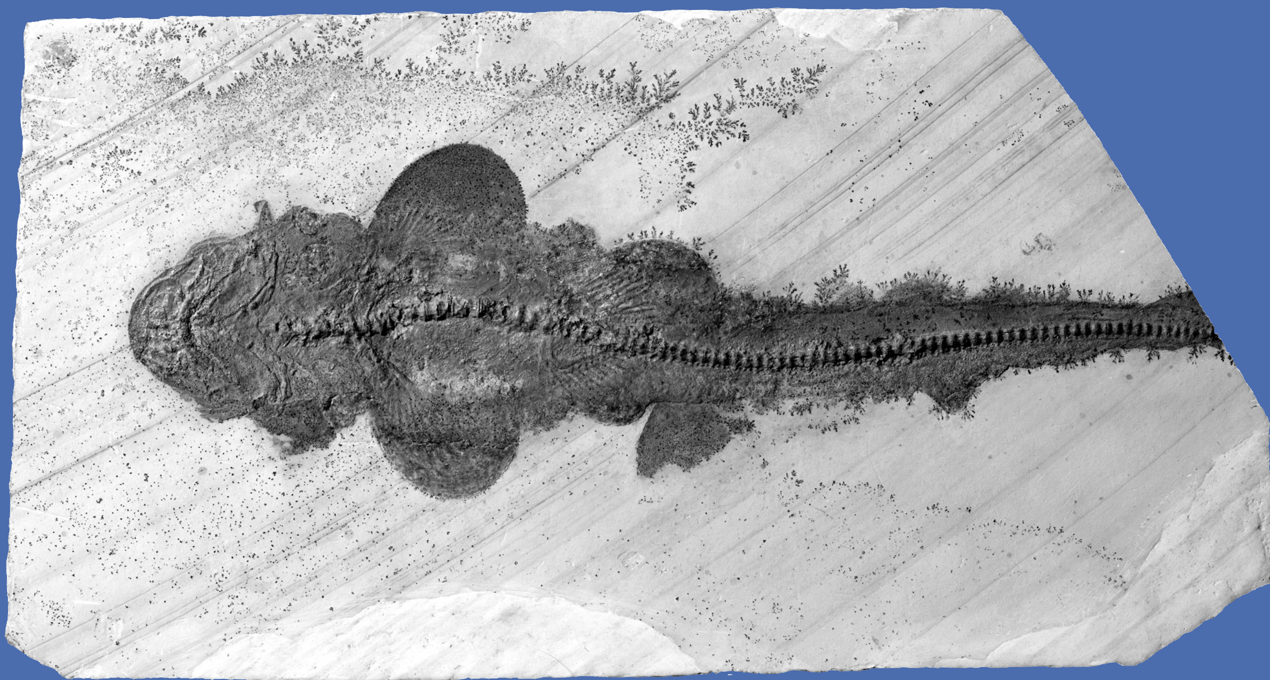
Zitteliana

An International Journal
of Palaeontology and Geobiology

Series A/Reihe A
Mitteilungen der Bayerischen Staatssammlung
für Paläontologie und Geologie

44



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EDITORIAL NOTE

As of in 2003, the journal *Zitteliana* is published in two series.

Series A: *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Geologie* (ISSN 1612-412X) replaces the former „Mitteilungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie" (ISSN 0077-2070). The numbering of issues is continued (last published: Heft 43, 2003).

Series B: *Abhandlungen der Bayerischen Staatssammlung für Paläontologie und Geologie* (ISSN 1612-4138) continues the previous „Zitteliana – Abhandlungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie" (ISSN 0373-9627).

Instructions for authors are included at the end of this volume.

HINWEIS DES HERAUSGEBERS

Vom Jahr 2003 an erscheint die Zeitschrift *Zitteliana* in zwei Reihen.

Die *Reihe A*: *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Geologie* (ISSN 1612-412X) ersetzt die bisherigen „Mitteilungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie" (ISSN 0077-2070). Die Bandzählung (zuletzt erschienen: Heft 43, 2003) wird fortgesetzt.

Die Reihe B: *Abhandlungen der Bayerischen Staatssammlung für aPaläontologie und Geologie* (ISSN 1612-4138) führt die bisherige „Zitteliana – Abhandlungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie" (ISSN 0373-9627) fort.

Hinweise für Autoren beider Reihen sind am Ende dieses Bandes enthalten.

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Bayerische Staatssammlung für Paläontologie und Geologie
Richard-Wagner-Str. 10, D-80333 München, Deutschland
http://www.palaeo.de/zitteliana
email: zitteliana@lrz.uni-muenchen.de

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Cover illustration: *Phorcynis catulina* THIOLLIÈRE, 1854 (BSP 1990 XVIII 51) from the lower Tithonian of Zandt / Denkendorf (Bavaria), ventral view, 25 cm. Photograph: G. JANẞEN (LMU München, Department für Geo- und Umweltwissenschaften, Sektion Paläontologie)

Umschlagbild: *Phorcynis catulina* THIOLLIÈRE, 1854 (BSP 1990 XVIII 51) aus dem unteren Tithon von Zandt / Denkendorf (Bayern), Ventralansicht, 25 cm. Foto: G. JANẞEN (LMU München, Department für Geo- und Umweltwissenschaften, Sektion Paläontologie)

Zitteliana	A 44	17-40	5 Textfigs, 3 Pls, 1 Tab.	München, 30.12.2004	ISSN 1612-412X

Eocene Bryozoa from the Eisenrichterstein beds, Hallthurm, Bavaria

By
Kamil Zágoršek[1] & Robert Darga[2*]

[1]*National Museum, Vaclavske nam. 68, CZ-115 79 Prague 1, Czech Republic*
[2]*Naturkunde- und Mammut-Museum Siegsdorf, Auenstr. 2, D-83313 Siegsdorf, Germany*

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Abstract

Upper Eocene Bryozoa from the Eisenrichterstein in the German Northern Calcareous Alps are described and documented by SEM-photographs. The locality yielded 46 species by a new method of dissolving fossiliferous marl in concentrated acetic acid. Two species are new: *Tubucella elongecia* sp. nov. and *Batopora alpina* sp. nov. The bryozoan fauna from the Eisenrichterstein originally inhabited a shallow environment within a coral reef where the Bryozoa cemented and consolidated the frame of the reef. The bryozoan assemblage is similar to those described from the Waschberg and Molasse zones of Austria.

Key words: Bryozoa, upper Eocene, acetic acid, taxonomy, Northern Calcareous Alps, Bavaria

Zusammenfassung

Aus dem Obereozän des Eisenrichterstein in den bayerischen nördlichen Kalkalpen werden Bryozoen beschrieben und anhand von REM-Bildern dokumentiert. Durch die Anwendung einer neuen Aufbereitungsmethode, bei der fossilführende Mergel in konzentrierter Essigsäure aufgelöst wurden, konnten Reste von 46 verschiedenen Taxa gewonnen werden. Zwei Spezies sind neu: *Tubucella elongecia* sp. nov. und *Batopora alpina* sp. nov. Die Bryozoenfauna des Eisenrichterstein stammt aus einem Flachwasser-Environment innerhalb eines Korallenriffs, in welchem die Bryozoen als Zementierer auftraten und damit das Riffgerüst verfestigten. Die Bryozoengemeinschaft des Eisenrichterstein ist mit den aus der Waschberg- und der Molasse-Zone Österreichs beschriebenen Bryozoenfaunen vergleichbar.

Schlüsselwörter: Bryozoen, Eozän, Taxonomie, Essigsäure, Nördliche Kalkalpen, Bayern

1. Introduction

The Eisenrichterstein beds (Höfling et al. 1993, A4: p. 8) comprise a series of marls and limestones, and are famous for their rich coral fauna. Bryozoa are abundant but have mostly been recognised in thin sections of the limestones on account of their typical cellular structure. The marly intercalations of the limestone beds yield rare and poorly preserved specimens of the bryozoan genera *Tubulipora*, *Chlidoniopsis,* and *Batopora* (Darga 1992). For the first time, acetic acid treatment has been applied to the limestone of the Eisenrichterstein beds. The result is the determination of 46 bryozoan species, hitherto unrecorded from these deposits.

2. Locality and Geological Setting

The Eisenrichterstein hill is located in south-eastern Bavaria, cut on its eastern flank by highway B20 and the railway leading from Bad Reichenhall to Berchtesgaden (coordinates of the hill top on the Topographische Karte von Bayern 1:25.000, Blatt 8343 Berchtesgaden West: RW 4470 380; HW 5283 980; see also Risch 1993).

The marine sequence of the Eisenrichterstein complex shows a development from coarse beach gravels over lagoonal sandstones to micritic coral-bearing limestone, and has been interpreted as a carbonate ramp with small isolated scleractinian patch reefs (Darga 1990, 1992). A lower Priabonian (upper Eocene) age for this reef complex is indicated by the occurrence of *Nummulites* aff. *ptukhiani* Kacharova, *Nummulites striatus* Bruguiere, and *Heterostegina reticulata* Rütimeyer.

The tectonic setting of the Eisenrichterstein is within the Berchtesgaden Decke, which is a part of the Northern Calcareous Alps. The steeply dipping and unevenly bedded limestone has tectonically been 'sandwiched' between two mountains, i.e. the Untersberg and the Lattengebirge, and thus has escaped erosion (Herm 1957; von Hillebrandt 1962).

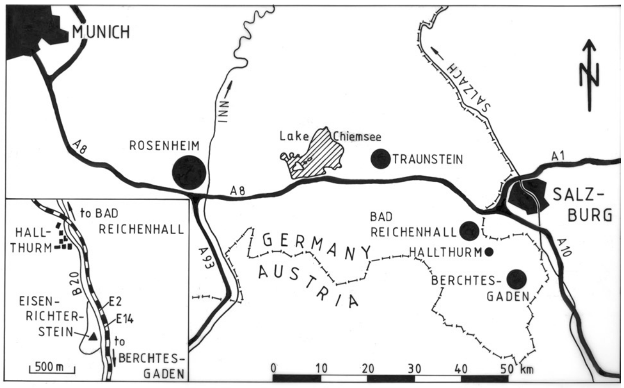
3. Method and Samples

During fieldwork, we collected two samples (E2 and E14, see Textfig. 1) from the Eisenrichterstein. The samples were washed and sieved with sieves that possess a minimum pore-

**Author for correspondence and reprint requests*

diameter of 0.09 mm. Since only a few bryozoan colonies were found initially, we searched for a method to generate a higher yield for a more detailed study. We selected the acetic acid extraction method described by ZÁGORŠEK & VÁVRA (2000), which usually generates good results in limestone with marl intercalations. The samples were divided into three portions, which were treated in acetic acid for 3-, 5-, and 7-week periods, respectively. The best results were obtained from samples treated for 5 or 7 weeks; there were only very small differences of yield between these two samples. The bryozoans were collected under the stereo-microscope, then cleaned in an ultrasonic bath and studied, photographed, and identified by scanning electron microscopy (Jeol type JSM-6400) in the Department of Paleontology of the University of Vienna (Austria). All measurements were made by SemAfore® 3.0 pro Jeol software and all photos were taken digitally.

The identified and figured material, holotypes, and paratypes are deposited in the Bayerische Staatssammlung für Palaeontologie und Geologie in München under accession numbers BSP 2004 III 1-134.



Textfigure 1: Location map. The samples E2 and E14 were taken from the railway cut on the eastern flank of the Eisenrichterstein hill. The layers in this outcrop can be numbered from north (beginning with E1) to south.

4. Systematic Paleontology

A list of bryozoan species is given in Tab. 1. The systematics of the Cyclostomatida mainly follows BASSLER (1953) and VÁVRA (1977), and also incorporates our own studies. The systematics of the Cheilostomatida chiefly follows GORDON (1984, 1989) and our own studies.

Phylum Bryozoa EHRENBERG, 1831

Class Stenolaemata BORG, 1926

Order Cyclostomatida BUSK, 1852

Suborder Articulata BUSK, 1859

Family Crisiidae JOHNSTON, 1838

Genus *Crisia* LAMOUROUX, 1812

Crisia elongata MILNE-EDWARDS, 1838
Pl.1, Fig. 1

* 1838a *Crisia elongata* sp. nov. – MILNE-EDWARDS: p. 203, pl. 7, fig. 2
1920 *Crisia Edwardsii* REUSS, CANU & BASSLER: p. 705, pl. 141, figs 5-7 (cum syn.)
1963 *Crisia edwardsii* REUSS, MAŁECKI: p. 54
1977 *Crisia elongata* MILNE-EDWARDS – VÁVRA: p. 12
1988 *Crisia elongata* MILNE-EDWARDS – BRAGA & BARBIN: p. 505, pl. 1, fig. 2
v 2001a *Crisia elongata* MILNE-EDWARDS – ZÁGORŠEK: p. 23, pl. 1, figs 4, 5 (cum syn.)

Material: Four specimens (BSP 2004 III 10, 11, 113, 114), partly fragments. The width of the colony article (internode) is about 0.3 mm, which is the width of about 4 individual tubes, and is approximately equal to, or slightly smaller than, the distance between apertures (0.25 to 0.35 mm). The frontal wall is smooth and slightly convex. The dorsal wall is smooth, porous and convex. Gonozooecia have not been observed.

Remarks: According to BOBIES (1958), the width of the internode should be equal to the distance between apertures. Although the characteristic granulation of the frontal side is missing, probably due to poor preservation, the presence of the characteristic arrangement pattern of apertures allows the exact determination.

Distribution in time and space:
Lutetian: Paris (CANU & BASSLER 1920)
Priabonian: Vicentin (REUSS 1869a), South Carolina (CANU & BASSLER 1920), Poland (MAŁECKI 1963), FRANCE (BOBIES 1958), Italy (BRAGA 1980), Slovakia (ZÁGORŠEK 1992), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Rupelian: Germany (REUSS 1866), France – Gaas (REUSS 1869b), Italy (BOBIES 1958)
Burdigalian: Gard (CANU & BASSLER 1920), France (MAŁECKI 1963)
Serravallian: Italy (CANU & BASSLER 1920), Gard (CANU & BASSLER 1920)
Tortonian: Austria & Hungary (REUSS 1848), Italy (CANU & BASSLER 1920), Poland (BOBIES 1958), France (BOBIES 1958), Czech (VÁVRA 1977)
Zanclean: Italy (CANU & BASSLER 1920)
Piacenzian: Italy (CANU & BASSLER 1920)
Quaternary & Recent: Mediterranean (MAŁECKI 1963), Mexico Gulf (BRAGA & BARBIN 1988), Red Sea (VÁVRA 1977)

Crisia eburnea (LINNAEUS, 1758)

1958 *Crisia eburnea* (LINNAEUS) – BOBIES: p. 151, pl. 12, figs 2, 3
1985 *Crisia eburnea* (LINNAEUS) – HAYWARD & RYLAND: p. 49, fig. 13
v 2001a *Crisia eburnea* (LINNAEUS) – ZÁGORŠEK: p. 23, pl. 1, fig. 1 (cum syn.)

Material: A single almost complete specimen (BSP 2004 III 9) with very narrow branches (internodes). The maximum width of the colony is 0.287 mm, which is only the width of

Taxa	E 2	E 14
Alderina subtilimargo (REUSS)	X	
Amphiblestrum appendiculata (REUSS)		X
Batopora alpina sp. n.		X
Caberoides continua (WATERS)		X
Castanopora calomorpha (REUSS)		X
Ceriopora sp.		X
Crisia eburnea (LINNAEUS)	X	
Crisia elongata MILNE-EDWARDS		X
Disporella coronula (REUSS)	X	
Disporella grignonensis MILNE-EDWARDS	X	X
Disporella radiata (SAVIGNY-AUDOUIN)		X
Ditaxipora pannonensis BRAGA	X	X
Ditaxiporina septentrionalis (WATERS)		X
Escharella sp.		X
Exidmonea atlantica D., M. & P.		X
Exidmonea hoernesi (STOLICZKA)	X	X
Hemicyclicopora parajuncta CANU & BASSLER	X	
Hippomonavella stenosticha (REUSS)		X
Hornera verrucosa REUSS	X	X
Chlidoniopsis vavrai ZÁGORŠEK	X	X
Lagenipora urceolaris (GOLDFUSS)		X
Lunulites quadrata (REUSS)		X
Margaretta cereoides (ELLIS-SOLANDER)	X	X
Mecynoecia proboscidea (MILNE-EDWARDS)		X
Mollia patellaria (MOLL)		X
Nellia cf. *tenella* (LAMARCK)	X	X
Nematifera susannae ZÁGORŠEK		X
Oncousoecia biloba (REUSS)	X	X
Polyascosoecia cancellata (CANU)	X	X
Porina duplicata (REUSS)	X	X
Proboscina sp.		X
Puellina (Cribrilaria) radiata (MOLL)		X
Reteporella subovata (STOLICZKA)	X	X
Reteporella tuberculata (REUSS)		X
Rosseliana rosselii (AUDOUIN)	X	
Smittina cervicornis (PALLAS)	X	
Sparsiporina elegans (REUSS)	X	X
Steginoporella haidingeri (REUSS)		X
Trochiliopora beyrichii (REUSS)	X	X
Tubucella elongecia sp. n.	X	
Tubucella mammillaris (MILNE-EDWARDS)	X	
Tubucella papillosa (REUSS)	X	
Tubulipora dimidiata (REUSS)		X
Tubulipora flabellaris (FABRICIUS)		X
Vincularia subsymmetrica (CANU)	X	X
Ybselosoecia typica (MANZONI)		X
Total species 46	**23**	**37**

Table 1: List of the Bryozoa species from the Eisenrichterstein locality.

the two individual tubes. The tubes are about 0.75-1 mm long. Gonozooecia not observed.

Distribution in time and space:

Priabonian: Buda Marl – Hungary (ZÁGORŠEK 2001a), Romania (GHIURCA 1987), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Serravallian: France (BOBIES 1958)
Helvetian: France (VÁVRA 1977)
Tortonian: France (BUGE 1957), Italy, Poland, Austria, Hungary (BOBIES 1958), Russian (VÁVRA 1977)
Messinian: Italy (BOBIES 1958), Greece (VÁVRA 1977)
Quaternary & Recent: Mediterranean & north Atlantic (BOBIES 1958), North see (HAYWARD & RYLAND 1985)

Suborder Tubuliporina MILNE-EDWARDS, 1838

Family Diastoporidae Gregory, 1899

Genus *Proboscina* Audouin, 1826

Proboscina sp.

Pl. 1, Fig. 2

? 1920 *Proboscina anceps* sp. nov. – CANU & BASSLER p. 661, pl.120, figs 4-6
? 1977 *Diaperoecia echinata* (MUNSTER) – VÁVRA: p. 43

Material: A single encrusting colony (BSP 2004 III 76) with zooecia arranged in irregular, chaotic rows. The zooecial tubes are nonporous, short with short peristomes oriented slightly distally. Basal part of the colony is porous and about two times wider than the part carrying the zooecial tubes. Gonozooecia not observed.

Remarks: The studied specimen is very similar to *Proboscina anceps* CANU & BASSLER, 1920 and *Diaperoecia echinata* (MUNSTER), which have been described by VÁVRA (1977). Due to the poor preservation and absence of gonozooecia, the species determination remains uncertain. Based on the monoserial budding pattern with 2-3 parallel rows of zooecial tubes, this specimen is referred to *Proboscina*. *Proboscina* is very common in Cretaceous sediments, but the here described colony represents the first record from the Eocene of the Alpine Carpathian region.

Family Tubuliporidae JOHNSTON, 1838

Genus *Tubulipora* LAMARCK, 1816

Tubulipora flabellaris (FABRICIUS, 1780)

v 1848 *Diastopora plumula* m. – REUSS: p. 51, pl. 7, figs 11-13
1985 *Tubulipora flabellaris* (FABRICIUS) – HAYWARD & RYLAND: p. 88, fig. 30
v 1977 *Tubulipora flabellaris* (FABRICIUS) – VÁVRA: p. 23 (cum syn.)

Material: Two complete semilunar colonies (BSP 2004 III 109-110) with zooecia arranged in regular, monoserial, radial fascicles. The fascicles are salient, irregular. The tubes are long and circular. Gonozooecia not observed.

Remarks: This species is very similar to *Tubulipora dimidiata* (REUSS, 1848) in general view, but differs in having circular, monoserial zooecial fascicles. *Tubulipora dimidiata* (REUSS, 1848) has rectangular zooecial tubes and biserial or triserial fascicles. According to VÁVRA (1974), *Diastopora plumula* REUSS, 1848 is a junior synonym of *Tubulipora flabellaris* (FABRICIUS, 1780).

Distribution in time and space:

Priabonian: Buda Marl – Hungary (ZÁGORŠEK 2001a), Romania (GHIURCA 1987), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b).
Burdigalian: France, Italian, Austria and Czech (VÁVRA 1977)
Zanclean: Italy and England (VÁVRA 1977)
Quaternary & Recent: Cosmopolitan mainly in north Atlantic (HAYWARD & RYLAND 1985)

Tubulipora dimidiata (REUSS, 1848)

Pl. 1, Fig. 3

*v 1848 *Defrancia dimidiata* m. – REUSS: p. 39, pl. 6, fig. 6
v 1977 *Tubulipora dimidiata* (REUSS) – VÁVRA: p. 22 (cum syn.)

Material: Three well preserved complete colonies (BSP 2004 III 106-108) with zooecia arranged in regular, biserial or triserial, radial fascicles. The fascicles are very prominent and regular. The tubes are long and rectangular. Small irregularly arranged tubes occur in the centre of the colony. Gonozooecia not observed

Remarks: Some of the studied specimens have more zooecial rows in each fascicle than usually encountered in this species. Studied specimens usually possess 3 rows, more rarely 4 rows of zooecia in the one fascicle. Reuss (1848) and Vávra (1974) described specimens with only 2 rows of zooecia in each fascicle. Such differences are probably due to intraspecific variability.

Distribution in time and space:
Priabonian: Slovakia (Zágoršek 1992), Poland (Małecki 1963), Alpine Molasse Zone – Austria (Zágoršek 2001b).
Burdigalian: France, Austria, Romania and Czech (Vávra 1977)
Zanclean: Italy (Vávra 1977)
Quaternary & Recent: Mediterranean (Vávra 1977)

Genus *Ceriopora* Goldfuss, 1827

Ceriopora sp.

? 1848 *Ceriopora cylindrica* m. – Reuss: p. 33, pl. 5, fig. 11
? 1977 *Ceriopora cylindrica* Reuss – Vávra: p. 63

Material: Three fragments (BSP 2004 III 6-8) of colonies of columnar to globular shape. Zooecial tubes polygonal to oval with few mesopores, not arranged in fascicles. Gonozooecia not observed.

Remarks: The studied specimens are similar to *Ceriopora cylindrica* Reuss, 1848, but they do not develop gonozooecia and the shape of the colonies is indistinct. The presence of polygonal tubes with few mesopores allows us to assign the specimens to *Ceriopora*, but it is not possible to refer them to any particular species.

Genus *Eximonea* David, Mongereau & Pouyet, 1972

Exidmonea atlantica David, Mongereau & Pouyet, 1972

1920 *Idmonea atlantica* Johnston – Canu & Bassler: p. 778, pl. 140, figs 1-13 (cum syn.)
1969 *Exidmonea atlantica* Auct. – Mongereau: p. 216, pl. 16, figs 1-11, pl. 17, fig. 1 (cum syn.)
1985 *Idmidronea atlantica* (Forbes) – Hayward & Ryland: p. 90, fig. 31
v 2001a *Exidmonea atlantica* David, Mongereau & Pouyet – Zágoršek: p. 24, pl. 1, figs 8, 9 (cum syn.)

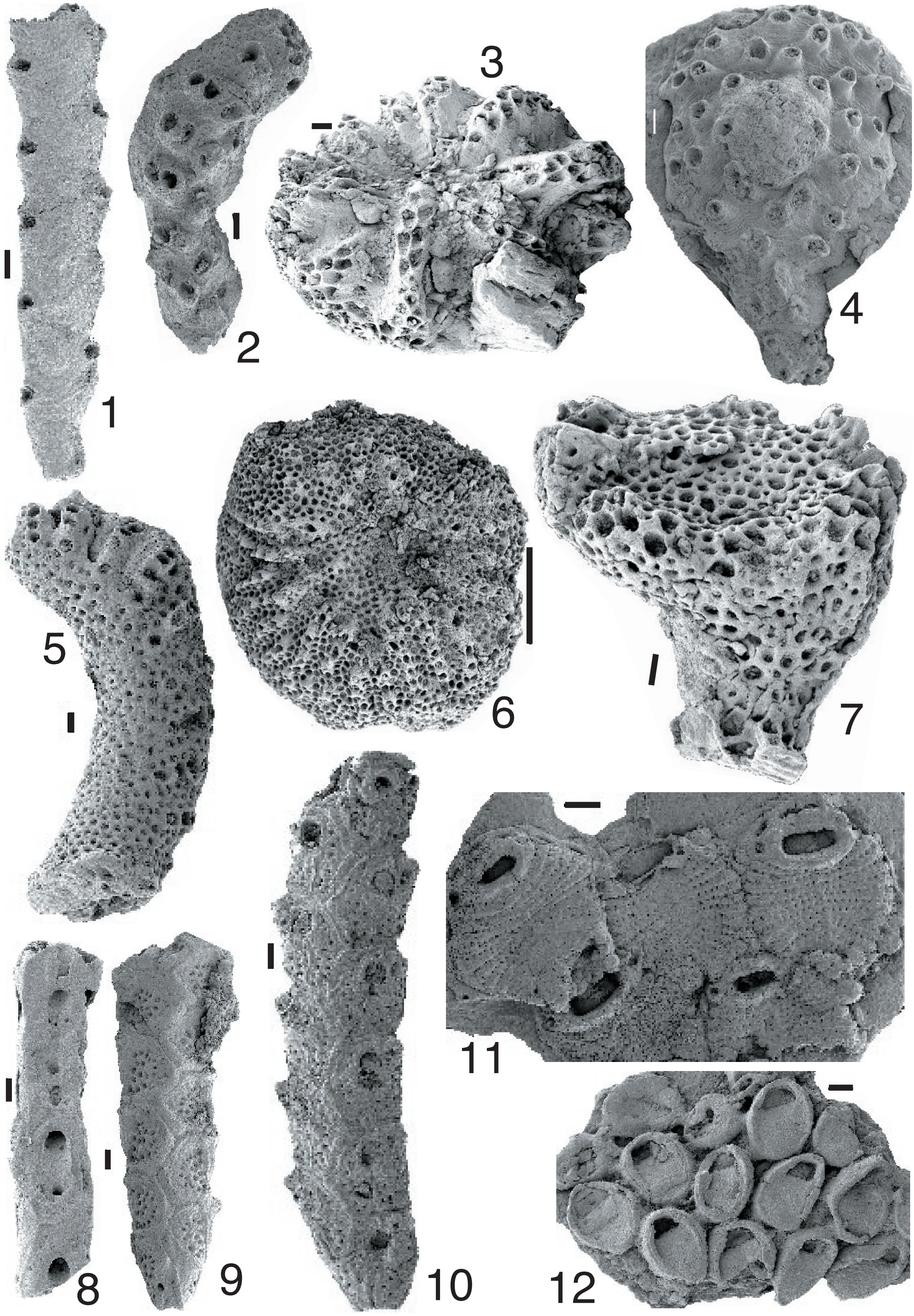
Material: Three well-preserved colonies (BSP 2004 III 30-32) with triangular transverse cross section. The angle between the frontal sides is acute, ~60°. Usually 3 to 5 zooecia are arranged in each fascicular row. The fascicles are arranged alternately on each side of the frontal part of the colony, protruding beyond the colonial margin. The aperture is rectangular to oval. The dorsal side of the colony is smooth or slightly ribbed and convex or flat. Gonozooecia not observed.

Remarks: The studied specimens are slightly more porous on their dorsal side and their peristomes are less protruding than in Mongereau's specimens. According to Mongereau (1969) and Hayward & Ryland (1985), *Exidmonea atlantica* is a taxon with high microenvironmental variation; as a result, these features cannot be regarded as specific.

Distribution in time and space:
Lutetian: Argentina (Vávra 1977)
Priabonian: Poland (Małecki 1963), Alpine Molasse Zone – Austria (Zágoršek 2001b) , Buda Marl – Hungary

Plate 1. Eocene Bryozoa from the Eisenrichterstein beds.

Fig. 1. *Crisia elongata* Milne-Edwards, 1838. Compare the width of the colony with the width of the zooecial tubes (here the widths of the colony is about 3 zooecial tubes). BSP 2004 III 10.
Fig. 2. *Proboscina sp.* Note the wide and porous basal part. BSP 2004 III 76.
Fig. 3. *Tubulipora dimidiata* (Reuss, 1848). Note biserial prominent fascicles. BSP 2004 III 107.
Fig. 4. *Oncousoecia biloba* (Reuss, 1848). Frontal view showing gonozooecium with nonporous frontal wall. Oeciopore, situated on the upper right margin of the gonozooecium (between two zooecial tubes), without peristome. BSP 2004 III 62.
Fig. 5. *Polyascosoecia cancellata* Canu, 1920. Lateral view of colony showing very abundant, large mesopores and gonozooecium with porous frontal walls in the upper part of the colony. BSP 2004 III 73.
Fig. 6. *Disporella grignonensis* Milne-Edwards, 1838. Frontal view showing large, porous central area and uniserial, short fascicles. The scale bar = 1 mm. BSP 2004 III 115.
Fig. 7. *Trochiliopora beyrichi* (Reuss, 1851). Lateral view showing flat central area and typical pedunculate shape of the colony. BSP 2004 III 97.
Fig. 8. *Vincularia subsymmetrica* (Canu, 1907). Poorly preserved colony showing zooecia with opesia and well-developed cryptocyst. BSP 2004 III 112.
Fig. 9. *Ditaxipora pannonensis* Braga, 1980. Dorsal view showing typical porous walls and zigzag structure made by jointing zooecial lateral walls. BSP 2004 III 24.
Fig. 10. *Ditaxipora pannonensis* Braga, 1980. Frontal view showing typical "T" shape gymnocystal ridge. BSP 2004 III 23.
Fig. 11. *Castanopora calomorpha* (Reuss, 1866). Frontal view showing typical zooecia with pair of oral spines. BSP 2004 III 5.
Fig. 12. *Mollia patellaria* (Moll, 1803). Well preserved colony with zooecia typically not jointed close to each other. BSP 2004 III 53.
Unless otherwise indicated, all scale bars = 100 μm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(Zágoršek 2001a), Italy (Braga & Barbin 1988), Slovakia (Zágoršek 1992), North Carolina & Georgia & Florida & Alabama (Canu & Bassler 1920), France (Mongereau 1969), Romania (Ghiurca 1987) and Waschberg zone – Austria (Zágoršek 2003).
Tortonian: Austria (Vávra 1977), France, Czech and Australia (Vávra 1977)
Zanclean: Mexico (Vávra 1977)
Quaternary & Recent: cosmopolitan (Hayward & Ryland 1985)

Eximonea hoernesi (Stoliczka, 1862)

*v 1862 *Idmonea Hörnesi* sp. nov. – Stoliczka: p. 82, pl. 1, fig. 7
1969 *Eximonea hörnesi* (Stoliczka) – Mongereau: p. 235, pl. 18, figs 8, 9 (cum syn.)
v 2001a *Eximonea hoernesi* (Stoliczka) – Zágoršek: p. 25, pl. 2, fig. 12 (cum syn.)

Material: Three almost complete colonies (BSP 2004 III 33-35) with about 3 to 4 zooecia in each fascicular row; fascicles paired. The frontal wall is strongly porous. The apertures are rectangular, with a long and narrow peristome. The dorsal side of the colony is ribbed, slightly convex or flat. Gonozooecia not observed.

Remarks: The described specimens have somewhat triangular transverse sections (angle between frontal walls ~40°), whereas the specimens described by Mongereau (1969) have a more circular or a triangular transverse section with angles of about 60°. These differences are here regarded as an intraspecific variation.

Distribution in time and space:
Priabonian: Italy (Stoliczka 1862), Poland (Małecki 1963), Slovakia (Zágoršek 1992), France (Mongereau 1969), Romania (Ghiurca 1987), Buda Marl – Hungary (Zágoršek 2001a), Alpine Molasse Zone – Austria (Zágoršek 2001b) and Waschberg zone – Austria (Zágoršek in print).
Oligocene: Germany (Mongereau 1969)

Family Oncousoeciidae Canu, 1918
Genus *Oncousoecia* Canu, 1918

Oncousoecia biloba (Reuss, 1848)
Pl. 1, Fig. 4

*v 1848 *Hornera biloba* sp. nov. – Reuss: p. 43, pl. 6, fig. 21
1988 *Oncousoecia biloba* (Reuss) – Braga & Barbin: p. 508, pl. 2, fig. 12 (cum syn.)
v 2001a *Oncousoecia biloba* (Reuss) – Zágoršek: p. 26, pl. 2, fig. 6 (cum syn.)

Material: Six complete encrusting specimens (BSP 2004 III 57-62) with preserved 5 to 20 zooecial tubes obliquely parallel to each other. The tubes are short with a nonporous frontal wall and short but wide peristome. Three specimens developed gonozooecia. The gonozooecia are usually situated in the middle of the colony spread between 3 to 6 individual tubes. The outer shape is usually circular to oval, rarely irregular, and the frontal wall is nonporous. The inner space of the brood chamber is narrow. The slit-like oeciopore does not develop a peristome and is situated on the side of the gonozooecium.

Remark: The species seems to be very variable in shape and length of zooecial tubes, but the tubes are always obliquely parallel to each other and developed gonozooecia are large with a shallow inner space.

Distribution in time and space:
Tertiary: Germany, France, Italy, North America, Romania and Russia (Vávra 1977)
Lutetian: France (Canu & Bassler 1920)
Priabonian: Vicentin (Reuss 1869a), Romania (Ghiurca 1987), Poland (Małecki 1963), Italy (Braga & Barbin 1988), Buda Marl – Hungary (Zágoršek 2001a), Alpine Molasse Zone – Austria (Zágoršek 2001b) and Waschberg zone – Austria (Zágoršek 2003)
Rupelian: France (Canu & Bassler 1920)
Serravallian: Gard & Italy (Canu & Bassler 1920)
Tortonian: Austria & Hungary (Reuss 1848), Italy (Canu & Bassler 1920), Russia (Canu & Bassler 1920), Czech (Vávra 1977)
Zanclean: Italy (Canu & Bassler 1920)
Piacenzian: Italy (Canu & Bassler 1920), France (Canu & Bassler 1920)
Quaternary & Recent: Mediterranean (Braga & Barbin 1988)

Family Entalophoridae Reuss, 1863
Genus *Mecynoecia* Canu, 1918

Mecynoecia proboscidea (Milne-Edwards, 1838)

1838a *Pustulopora proboscidea* sp. nov. – Milne-Edwards: p. 219, pl. 12, fig. 2
1920 *Mecynoecia proboscidea* (Milne-Edwards) – Canu & Bassler: p. 726, pl. 108, figs 1-15 (cum syn.)
v 2001a *Mecynoecia proboscidea* (Milne-Edwards) – Zágoršek: p. 26, pl. 2, figs 7, 8 (cum syn.)

Material: Two well-preserved colonies (BSP 2004 III 51-52) with 3 to 5 zooecial tubes around the colonial axis. The tubes are very long, usually more than 1 mm, with circular to oval aperture. Some apertures are situated on short peristomes. The frontal walls are convex, strongly porous. Gonozooecia not observed.

Remarks: The studied colonies are longer and their frontal walls protrude to shorter peristomes than in the specimens described by Milne-Edwards (1838a). The specimens described by Canu & Bassler (1920) are, however, almost identical, with the exception that the American specimens have a more porous frontal wall. Canu & Bassler (1920) also mentioned a high degree of variability in the length of the tubes for this species.

Therefore, the differences could be explained by variability within the species. The specimens have the same micrometric characters as the species described from the Hungarian Eocene, but are less porous (Zágoršek 2001a).

This species represents one of the most common Cyclostomatida in the Eocene Bryozoa worldwide. Based on the easily recognizable specific features (distance between apertures more than 1 mm), the specimens could be determined although most of the colonies are only preserved as fragments with four to six tubes.

Distribution in time and space:
Cretaceous: cosmopolitan in Europe and America (Canu & Bassler 1920)
Tertiary: France (Vávra 1977)
Lutetian: Arkansas (Canu & Bassler 1920)
Priabonian: Poland (Małecki 1963), cosmopolitan in USA (Canu & Bassler 1920), Italy (Braga & Barbin 1988), Slovakia (Zágoršek 1992), Buda Marl – Hungary (Zágoršek 2001a), Alpine Molasse Zone – Austria (Zágoršek 2001b), Romania (Ghiurca 1987) and Waschberg zone – Austria (Zágoršek 2003)
Tortonian: Austria (Vávra 1977)
Quaternary & Recent: cosmopolitan in Europe and America (Canu & Bassler 1920)

Genus *Nematifera* Canu & Bassler, 1922

Nematifera susannae Zágoršek, 1992

*v 1992 *Nematifera susannae* sp. nov. – Zágoršek: p. 240, pl. 3, figs 1-7
v 2001a *Nematifera susannae* Zágoršek – Zágoršek: p. 27, pl. 2, fig. 11

Material: A single poorly preserved specimen (BSP 2004 III 56) with circular cross section. The zooecial tubes are long, with large orifices. The frontal wall has a slightly convex bend and is densely perforated by small pores. No gonozooecium preserved on studied specimen.

Distribution in time and space:
Priabonian: Slovakia (Zágoršek 1992), Buda Marl – Hungary (Zágoršek 2001a), Alpine Molasse Zone – Austria (Zágoršek 2001b) and Waschberg zone – Austria (Zágoršek 2003).

Family Annectocymidae Hayward & Ryland, 1985
Genus *Ybselosoecia* Canu & Lecointre, 1933

Ybselosoecia typica (Manzoni, 1878)

1878 *Filisparsa typica* sp. nov. – Manzoni: p. 10, pl. 8, fig. 30
v 1977 *Ybselosoecia typica* (Manzoni) – Vávra: p. 48 (cum syn.)
1997 *Ybselosoecia typica* (Manzoni) – Pouyet: p. 26, pl. 1, figs 1-4

Material: Three fragments of erect colonies (BSP 2004 III 128-130) with semilunar cross section. The zooecial tubes developed apertures only on one side of the colonial stern. The apertures are arranged in 5 to 10 irregular rows with short peristomes. The frontal wall is slightly porous. The dorsal side is concave, smooth, and sometimes with parallel ribs. The gonozooecium is not preserved.

Distribution in time and space:
Lutetian: Europe (Buge 1957)
Priabonian: Poland (Małecki 1963), France (Mongereau 1965), Romania (Ghiurca 1987), USA (Buge 1957) and Waschberg zone – Austria (Zágoršek 2003)
Oligocene: USA (Vávra 1977)
Tortonian: Austria (Vávra 1974), Poland (Pouyet 1997), France (Buge 1957)
Messinian: Italy (Vávra 1977)
Quaternary & Recent: Italy (Braga & Barbin 1988)

Suborder Cancellata Gregory, 1899
Family Horneridae Gregory, 1899
Genus *Hornera* Lamouroux, 1821

Hornera verrucosa Reuss, 1866

*v 1866 *Hornera verrucosa* m. – Reuss: p. 197, pl. 9, fig.9
1972 *Hornera verrucosa* Reuss – Mongereau: p. 352 (cum syn.)
v 2001b *Hornera verrucosa* Reuss – Zágoršek: p. 522 (cum syn.)

Material: Four colonies (BSP 2004 III 120-123) with circular cross section and 3 to 5 zooecial tubes arranged one to each other on the frontal side. The vacuoles are abundant and of varying size. One smaller vacuole is located distally from the aperture; one or two larger vacuoles are positioned proximally from the aperture and on the dorsal side. Gonozooecia are not known.

Distribution in time and space:
Priabonian: Poland (Małecki 1963), France (Mongereau 1972), Romania (Ghiurca 1987), Italy (Braga & Barbin 1988), Alpine Molasse Zone – Austria (Zágoršek 2001b) and Waschberg zone – Austria (Zágoršek 2003).
Rupelian: Germany (Reuss 1866)
Tortonian: Italy (Braga & Barbin 1988), Austria, Poland, Czech, Hungary (Vávra 1977)

Family Petaloporidae Gregory, 1899
Genus *Polyascosoecia* Canu, 1920

Polyascosoecia cancellata Canu, 1920 (=*Polyascosoecia coronopus* Canu & Bassler, 1920)

Pl. 1, Fig. 5

part.*v 1848 *Idmonea cancellata* Goldfuss – Reuss: p. 46, pl. 5,

figs 25-27, pl. 6, fig. 33
1920 *Polyascosoecia cancellata* REUSS – CANU: p. 206
v 2001a *Polyascosoecia coronopus* CANU & BASSLER – ZÁGORŠEK: p. 28, pl. 3, figs 4, 6 (cum syn.)

Material: Eleven rod-like colonies (BSP 2004 III 63-73) rarely bifurcated. Between 3 and 5 zooecial tubes form each fascicle. One aperture occurs outside of the regular fascicle, and is located slightly more proximally. The gonozooecium is spread over 2 to 3 fascicles and has slightly porous frontal wall situated on the frontal side of the colony, near the place of a bifurcation.

Remarks: Studied colonies are identical with those described by REUSS (1848), which was probably chosen by CANU (1920) as the type species of *Polyascosoecia*. For details with regard to the problems of the systematics of the type species and validity of *Polyascosoecia* see ZÁGORŠEK (2003).

Distribution in time and space:
Cretaceous: Germany (VOIGT 1984)
Priabonian: Poland (MAŁECKI 1963), Italy (BRAGA & BARBIN 1988), Slovakia (ZÁGORŠEK 1992), France (MONGEREAU 1969), Romania (GHIURCA 1987), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Zanclean: Germany (VÁVRA 1977)
Tortonian: Austria & Hungary (REUSS 1848), France, Italy, Poland, Czech (VÁVRA 1977)
Piacenzian: America (CANU & BASSLER 1920)
Pliocene: United Kingdom, Nederland (VÁVRA 1977)

Suborder Rectangulata WATERS, 1887
Family Lichenoporidae SMITT, 1866
Genus *Disporella* GRAY, 1848

Disporella coronula (REUSS, 1848)

*v 1848 *Defrancia coronula* m. – REUSS: p. 38, pl. 6, fig. 5
v 2001a *Disporella coronula* (REUSS) – ZÁGORŠEK: p. 29, pl. 3, fig. 5 (cum syn.)

Material: One colony (BSP 2004 III 12) encrusting a coral branch. The colony developed six zooecial triserial to multiserial fascicles. The colonial centre is concave, with polygonal pores (cancelli).
Remark: The studied specimen is larger and has fascicles less prominent than the syntypes in the Museum of Natural History in Vienna. However, these differences could be regarded as intraspecific variation.

Distribution in time and space:
Priabonian: Poland (MAŁECKI 1963), Romania (GHIURCA 1987), Slovakia (ZÁGORŠEK 1992), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Tortonian: Austria & Hungary (REUSS 1848), France, Czech (VÁVRA 1977)

Disporella grignonensis MILNE-EDWARDS, 1838
Pl. 1, Fig. 6

1838b *Tubulipore de Grignon* sp. nov. – MILNE-EDWARDS: p. 333, pl. 13, figs 2-2d
v 2001a *Disporella grignonensis* MILNE-EDWARDS – ZÁGORŠEK: p. 29, pl. 3, fig. 10 (cum syn.)

Material: Three specimens (BSP 2004 III 13, 14, 115) with thick basal lamella and cancelli developed on the central area. The fascicles are short, uniserial, and never reach the margins of the colony. The dorsal side of the colony is slightly ribbed. A gonozooecium is developed on one specimen in the central area. It is small with flat, slightly porous frontal wall.

Remarks: The original illustration from MILNE-EDWARDS (1838b) shows only indistinct uniserial fascicles and long zooecial tubes. However, other features are identical (polygonal cancelli, thick basal lamella and zooecial tubes never reaching colonial margin). Therefore, all these specimens may be conspecific.

Distribution in time and space:
Lutetian: Germany (STOLICZKA 1862), America (CANU & BASSLER 1920), France (CANU & BASSLER 1920)
Priabonian: America (CANU & BASSLER 1920), Poland (MAŁECKI 1963), Romania (GHIURCA 1987), Italy (BRAGA & BARBIN 1988), Slovakia (ZÁGORŠEK 1992), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).

Disporella radiata (SAVIGNY-AUDOUIN, 1826)

v 1848 *Defrancia prolifera* m. – REUSS: p. 37, pl. 6, fig. 1
v 2001a *Disporella radiata* (SAVIGNY-AUDOUIN) – ZÁGORŠEK: p. 30, pl. 3, fig. 8 (cum syn.)

Material: Two colonies (BSP 2004 III 116, 117) with thin basal lamella and very small central area. The fascicles are triserial, very long, occupying almost the entire central area. No gonozooecia are known from fossil material.

Remark: From a study of the syntypes of the REUSS collection in NHM in Vienna, it is clear that *Defrancia prolifera* REUSS, 1848 is a junior synonym for *Disporella radiata* (SAVIGNY-AUDOUIN, 1826).

Distribution in time and space:
Lutetian: Germany (STOLICZKA 1862), Egypt (ZIKO 1985)
Priabonian: Poland (MAŁECKI 1963), Slovakia (ZÁGORŠEK 1992), Romania (GHIURCA 1987), Italy (BRAGA & BARBIN 1988), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Rupelian: Germany (CANU & BASSLER 1920)
Tortonian: Austria & Hungary (REUSS 1848), New Zealand (ZIKO 1985), Italy, Czech (VÁVRA 1977)
Pliocene: Italy (VÁVRA 1977)
Quaternary & Recent: Philippine (CANU & BASSLER 1929),

Mediterranean (ZIKO 1985), Japan, Red Sea, Italy, Greece (VÁVRA 1977)

Genus *Trochiliopora* GREGORY, 1909

Trochiliopora beyrichi (REUSS, 1851)
Pl. 1, Fig. 7

*v 1851 *Pelagia Beyrichi* m. – REUSS: p. 176, pl. 9, figs 23, 24
v 2001a *Trochiliopora beyrichi* (REUSS) – ZÁGORŠEK: p. 30, pl. 3, fig. 3 (cum syn.)

Material: Five almost complete erect colonies (BSP 2004 III 94-97 and 125) with 8 to 12 prominent, biserial to multilaminar fascicles situated on an apical part of the colony. The colonial centre is depressed; only where a gonozooecium is developed, the centre is more flat. However, no gonozooecia have been observed on the studied specimens.

Remarks: The described specimens have fascicles smaller and less prominent; the central area is less depressed and has wider colonial cones than the syntypes in the Museum of Natural History in Vienna. These features are, however, perhaps not specific. Other features are identical with the syntypes.

Distribution in time and space:
Priabonian: Poland (MAŁECKI 1963), Romania (GHIURCA 1987), Slovakia (ZÁGORŠEK 1992), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Rupelian: Germany (REUSS 1866)
Tortonian: Poland (POUYET 1997), Austria & Hungary (REUSS 1851)

Class Gymnolaemata ALLMAN, 1896
Order Cheilostomatida BUSK, 1852
Suborder Flustrina SMITT, 1868
Superfamily Calloporoidea NORMAN, 1903
Family Calloporidae NORMAN, 1903
Genus *Alderina* NORMAN, 1903

Alderina subtilimargo (REUSS, 1864a)

*v 1864a *Membranipora subtilimargo* m. – REUSS: p. 630, pl. 9, fig. 5
v 2001b *Alderina subtilimargo* (REUSS) – ZÁGORŠEK: p. 525 (cum syn.)

Material: One poorly preserved specimen (BSP 2004 III 1) with large opesia, occupying almost the entire frontal area. The gymnocyst is very short, smooth or sometimes not developed. The mural rim is thick and smooth. No ovicell developed.

Remarks: The specimen from the Eisenrichterstein has a wider mural rim than that seen in the holotype in the Museum of Natural History in Vienna. Although the studied specimen is not well preserved, the characteristic features (i.e. large opesia, very short gymnocyst and smooth mural rim) allow it to be placed in this species. Furthermore, *Alderina subtilimargo* (REUSS, 1864a) is a very common species in the Eocene of the Alpine Carpathian region.

Distribution in time and space:
Lutetian: Germany (REUSS 1864a)
Priabonian: Vicentin (REUSS 1869a), Poland (MAŁECKI 1963), Carolina USA (CANU & BASSLER 1920), Italy (BRAGA & BARBIN 1988), Romania (GHIURCA 1987), Slovakia (ZÁGORŠEK 1996), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b), Tunisian (VÁVRA 1977) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Oligocene: Italy, Germany (VÁVRA 1977)
Tortonian: Austria & Hungary (DAVID & POUYET 1974), Serbia (VÁVRA 1977)

Genus *Amphiblestrum* GRAY, 1848

Amphiblestrum appendiculatum (REUSS, 1848)

*v 1848 *Cellepora appendiculata* m. – REUSS: p. 96, pl. 11, fig. 22
v 2001a *Amphiblestrum appendiculatum* (REUSS) – ZÁGORŠEK: p. 32, pl. 4, figs 5, 6 (cum syn.)

Material: Two fragments of encrusting colonies (BSP 2004 III 2-3) with oval to triangular zooecia with a very short cryptocyst. A shallow, narrow furrow separates neighbouring zooecia. The gymnocyst is missing. The mural rim is narrow and smooth, and has the same width around the entire zooecium. The avicularia are rare, small, tube-like, with circular orifice, situated usually on the gymnocyst or between individuals. No ovicelled zooecia have been observed.

Remarks: The described specimens are almost identical with syntypes of *Cellepora appendiculata* REUSS, 1848, which are deposited in the Museum of Natural History in Vienna. The syntypes, however, have grown in regular rows.

Distribution in time and space:
Lutetian: Germany (REUSS 1864a)
Priabonian: Poland (MAŁECKI 1963), Italy (BRAGA 1963), Romania (GHIURCA 1987), Slovakia (ZÁGORŠEK 1997), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone - Austria (ZÁGORŠEK 2003).
Oligocene: Germany (VÁVRA 1977)
Tortonian: Austria & Hungary (REUSS 1848, DAVID & POUYET 1974), Poland, Hungary (VÁVRA 1977)

Family Vinculariidae BUSK, 1852
Genus *Vincularia* DEFRANCE, 1829

Vincularia subsymmetrica (CANU, 1907)
Pl. 1, Fig. 8

1966 *Vincularia subsymmetrica* (CANU) – CHEETHAM: p. 54

v 1988 *Vincularia subsymmetrica* (CANU) – BRAGA & BARBIN: p. 515, pl. 4, fig. 7

Material: Two complete specimens (BSP 2004 III 111-112) with zooecia arranged in four longitudinal rows. The zooecia are dimorphic, but ovicelled zooecia are not developed in studied specimens. The ordinary zooecia have a small opesium and a large cryptocyst. No adventitious avicularia are developed.

Remark: Studied specimens are not well preserved, but due to the erect, quadriserial colonial growth form and presence of small opesia the specimens are identified as *Vincularia subsymmetrica* (CANU, 1907), a common species in the Eocene of the Alpine Carpathian region.

Distribution in time and space:
Priabonian: United Kingdom (CHEETHAM 1966), Romania (GHIURCA 1987), Italy (BRAGA & BARBIN 1988) and Waschberg zone – Austria (ZÁGORŠEK 2003).

Superfamily Microporoidea GRAY, 1848

Family Microporidae GRAY, 1848

Genus *Mollia* LAMOUROUX, 1821

Mollia patellaria (MOLL, 1803)

Pl. 1, Fig. 12

v 1848 *Cellepora formosa* m. – REUSS: p. 95, pl. 11, fig. 18
v 1977 *Floridinella formosa* (REUSS) – VÁVRA: p. 89 (cum syn.)
1989 *Mollia patellaria* (MOLL) – SCHMID: p. 18, pl. 3, figs 1-7 (cum syn.)

Material: One well-preserved colony (BSP 2004 III 53) with zooecia of regular shape, oval, easily separable and connected to neighbouring individuals by short tubes. The remains of this tube are seen laterally as a large pore chamber. The cryptocyst is extended and granular, occupying almost the whole frontal area. The mural rim is developed mostly in the distal part of zooecia, proximally almost absent. The opesia are small, circular with rounded corners for parietal muscles. No ovicell has been observed.

Remarks: The studied specimen is identical with *Cellepora formosa* REUSS, 1848 from the Museum of Natural History in Vienna and, according to SCHMID (1989), exhibits all features of *Mollia patellaria* (MOLL, 1803). Therefore, also specimens mentioned by VÁVRA (1977) and transferred to the genus *Floridinella* are identical with *M. patellaria* (MOLL, 1803).

The extant specimens (e.g. those described by ZABALA & MALUQUER 1988) have, however, long connecting tubes and resemble “running” colonies. In the fossil forms the zooecia grow close to each other and form more encrusting colonies.

Distribution in time and space:
Priabonian: Poland (MAŁECKI 1963) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Tortonian: Austria & Hungary (REUSS 1848, DAVID & POUYET 1974, SCHMID 1989), Czech (VÁVRA 1977)
Quaternary & Recent: Mediterranean (ZABALA & MALUQUER 1988)

Genus *Rosseliana* JULLIEN, 1888

Rosseliana rosselii (AUDOUIN, 1826)

v 1996 *Rosseliana rosselii* (AUDOUIN) – ZÁGORŠEK: p. 529, pl. 3, fig. 6 (cum syn.)

Material: One encrusting colony (BSP 2004 III 85) with preserved eleven oval to drop-like zooecia. The cryptocyst is smooth and sometimes slightly granular. The opesia are semilunar, large. The enlarged proximo-lateral corners are large, oval to circular and usually situated more laterally than proximally. The endozooecial ovicell has not been found.

Remarks: Although no ovicell has been found, all other features allow us to identify the specimens. *Rosseliana rosselii* (AUDOUIN) is similar to *Mollia patellaria* (MOLL) mainly in its general shape. The main difference is the type and size of ovicells (*Mollia* has hyperstomial ovicell, *Rosseliana* endozooecial). When no ovicells occur, the main difference is the development of enlarged proximo-lateral corners in the opesium. In *Mollia,* the openings for the parietal muscles are located more proximal, whereas in *Rosseliana* they are more laterally situated and are rounder. The genera differ also with respect to the lateral communication pores: *Mollia* has zooecia connected by short tubes, but *Rosseliana* has closely oppressed zooecia.

Distribution in time and space:
Priabonian: Austria & Hungary (REUSS 1869), Poland (MAŁECKI 1963), Italy (BRAGA & BARBIN 1988), Slovakia (ZÁGORŠEK 1996), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone - Austria (ZÁGORŠEK 2003).
Quaternary & Recent: Mediterranean (BRAGA & BARBIN 1988), Atlantic (RYLAND & HAYWARD 1977)

Family Lunulitidae GREGORY, 1893

Genus *Lunulites* LAMARCK, 1816

Lunulites quadrata (REUSS, 1848)

*v 1848 *Cellepora quadrata* m. – REUSS: p. 95, pl. 11, fig. 17
v 2001a *Lunulites quadrata* (REUSS) – ZÁGORŠEK: p. 38, pl. 7, fig. 7 (cum syn.)

Material: One poorly preserved fragment (BSP 2004 III 119) with characteristic trapezoidal or rectangular individuals arranged in radial rows. Orifice is oval to circular with narrow mural rim. A cryptocyst is developed and slightly granular. Avicularia as well as vibracularia are present. Both are small, circular to drop like.

Remarks: The shape and morphology of the individuals allow determination as the most probable species, although many species diagnostic features have not been preserved. *Lunulites quadrata* (REUSS, 1848) is a common species in shallow water Eocene sediments.

Distribution in time and space:
Priabonian: Vicentin (REUSS 1869a), Poland (MAŁECKI 1963), Romania (GHIURCA 1987), Italy (BRAGA & BARBIN 1988), Buda Marl – Hungary (ZÁGORŠEK 2001a), Slovakia (ZÁGORŠEK 1996) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Rupelian: Italy (BRAGA & BARBIN 1988)
Tortonian: Austria & Hungary (REUSS 1848),

Family Steginoporellidae HINCKS, 1884
Genus *Steginoporella* SMITT, 1873

Steginoporella haidingeri (REUSS, 1848)

*v 1848 *Cellaria haidingeri* m. – REUSS: p. 60, pl. 7, fig. 30
v 1996 *Steginoporella haidingeri* (REUSS) – ZÁGORŠEK: p. 531, pl. 4, figs 6, 7 (cum syn.)

Material: Two large fragments of erect multilamellar colony (BSP 2004 III 92-93) with oval to circular transverse section. The zooecia are arranged in 6 to 8 regular axial rows. The zooecia are elongated oval with a thick, smooth mural rim. The cryptocyst is strongly porous and little concave. The adventitious avicularia (B-zooecia) are significantly larger than regular individuals and have much bigger orifice. The width of the palate is approximately two times larger than the width of the regular zooecia. The palate is smooth, concave and narrow.

Remarks: *Steginoporella haidingeri* (REUSS) has mostly bilamellar colonies (VÁVRA, pers. com. 2001) however all characteristic features are preserved in studied specimens, which are almost identical with those described by REUSS (1848) as *Cellaria haidingeri*. Eocene specimens (Italy, Slovakia, Hungary etc.) are usually developed as multilamellar colonies (ZÁGORŠEK 2001b).

Distribution in time and space:
Priabonian: Poland (MAŁECKI 1963), Italy (BRAGA & BARBIN 1988), Slovakia (ZÁGORŠEK 1996), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Rupelian: Italy (POUYET & DAVID 1979)
Tortonian: Austria & Hungary (REUSS 1848, DAVID & POUYET 1974),

Suborder Ascophorina LEVINSEN, 1909
Infraorder Acanthostegomorpha LEVINSEN, 1902
Superfamily Cribrilinoidea HINCKS, 1879
Family Cribrilinidae HINCKS, 1879
Genus *Puellina* JULLIEN, 1886
Subgenus *Cribrilaria* CANU & BASSLER, 1929

Puellina (Cribrilaria) radiata (MOLL, 1803)

1920 *Puellina radiata* MOLL – CANU & BASSLER: p. 294, fig. 84/G-J, pl. 41, figs 14-18 (cum syn.)
v 1997 *Cribrilaria radiata* (MOLL) – ZÁGORŠEK: p. 407, pl. 2, figs 6-7 (cum syn.)

Material: Two encrusting colonies (BSP 2004 III 77-78) with 6 and 7 zooecia preserved respectively. The zooecia are oval without gymnocyst and with frontal wall consisting of 6-8 pairs of costae. Very narrow lateral costal fusions are developed. No median lamella is developed. The aperture is semilunar and has a very small lacuna. The oral spines are sometimes missing. Only one large, intrazooecial avicularium is observed with a long and acute palate, but without any pivot. The ovicell is not developed.

Remarks: The specimens are poorly preserved and do not exhibit ovicells. The preservation of 6-8 pairs of costae with very narrow lateral costal fusions and large, intrazooecial avicularium show these specimens are *Puellina (Cribrilaria) radiata* (MOLL, 1803), one of the most common cribrimorph species in the Eocene of the Alpine Carpathian region.

Distribution in time and space:
Lutetian: Europe (CANU & BASSLER 1920)
Bartonian – Belgium (CHEETHAM 1966)
Priabonian: Carolina, Georgia, Mississippi – USA (CANU & BASSLER 1920), Poland (MAŁECKI 1963), France (DAVID, MONGEREAU & POUYET 1972), Romania (GHIURCA 1987), Italy (BRAGA & BARBIN 1988), Slovakia (ZÁGORŠEK 1997), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Oligocene: Italy (VÁVRA 1977)
Tortonian: Poland (MAŁECKI 1963), Austria, Italy Czech (VÁVRA 1977)
Pliocene: Italy (VÁVRA 1977)
Quaternary & Recent: Mediterranean (MAŁECKI 1963), cosmopolitan (CANU & BASSLER 1920)

Genus *Castanopora* LANG, 1916

Castanopora calomorpha (REUSS, 1866)
Pl. 1, Fig. 11

*v 1866 *Lepralia calomorpha* m. – REUSS: p. 178, pl. 11, fig. 10
v 2001a *Castanopora calomorpha* (REUSS) – ZÁGORŠEK: p. 44, pl. 9, fig. 4
v 2001b *Castanopora calomorpha* (REUSS) – ZÁGORŠEK: p. 531

Material: One well-preserved colony (BSP 2004 III 5) consisting of 5 individuals. The costal shield is flat with numerous costae (about 20 to 30) each with 7 to 9 lacunae and an equivalent number of lateral costal fusions. The orifice is oval, two times wider than long. The apertural bar is flat and as wide as two regular costae. One pair of small avicularia is situated near the aperture. Oral spines are rare, usually about 2 spines located on the distal margin of the aperture, sometimes missing. The ovicell is small, globular, located on the distal neighbouring individual. The ovicell frontal wall is convex, smooth and nonporous, open to the aperture.

Remark: All features, especially size and type of ovicell, are identical with the holotype in the Natural History Museum in Vienna.

Distribution in time and space:
Priabonian: Buda Marl – Hungary (ZÁGORŠEK 2001a) and Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b).
Rupelian: Germany (REUSS 1866),

Superfamily Catenicelloidea BUSK, 1852
Family Catenicellidae BUSK, 1852
Genus *Caberoides* CANU, 1908

Caberoides continua (WATERS, 1891)

* 1891 *Catenicella continua* sp. nov. – WATERS: p. 6, pl. 1, figs 9-10
1994 *Caberoides continua* (WATERS) – GORDON & BRAGA: p. 62, fig. 3c-f.

Material: One small unilamellar colony (BSP 2004 III 4) with zooecia arranged in two alternating rows in zigzag fashion. The zooecia are oval to elongate oval, with a smooth well-developed gymnocyst and a small costal area with 5-7 costae. The aperture is semilunar with a straight proximal margin. The avicularia are suboral and small, drop-like with a pivotal bar. The ovicell is unknown. The dorsal side of the colony has semilunar and narrow pore chambers.

Remark: The frontal side of the colony is very poorly preserved, but the well preserved dorsal side of the colony with its characteristic semilunar and narrow pore chambers is sufficient to identify the material.

Distribution in time and space:
Priabonian: Italy (WATERS 1891) and Waschberg zone - Austria (ZÁGORŠEK 2003).

Superfamily Catenicelloidea BUSK, 1852
Family Catenicellidae BUSK, 1852
Genus *Ditaxipora* MACGILLIVRAY, 1895

Ditaxipora pannonensis BRAGA, 1980
Pl. 1, Figs 9-10

* 1980 *Ditaxipora pannonensis* sp. nov. – BRAGA: p. 60, figs 63-64
1994 *Ditaxipora pannonensis* BRAGA – GORDON & BRAGA: p. 68, fig. 6a-c
v 2001b *Ditaxipora pannonensis* BRAGA – ZÁGORŠEK: p. 532, pl. 8, fig. 3

Material: Ten rod-like colonies (BSP 2004 III 15-24) with alternating rectangular to rhomboidal individuals. The frontal wall consists of the median gymnocystal ridge and two (asymmetrical) cryptocystal areas with one row of pores. The gymnocystal ridge is similar in shape to a deformed letter "T". The cryptocystal area, which is connected with the adjacent individual, is always smaller than the outer cryptocystal area. The avicularium is suboral and has pivotal bar and triangular palate. The ovicell is not observed.

Remark: This species seems to be very common in the studied material, but no specimen has ovicells.

Distribution in time and space:
Priabonian: Italy (GORDON & BRAGA 1994) and Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b).

Genus *Ditaxiporina* STACH, 1935

Ditaxiporina septentrionalis (WATERS, 1891)
Pl. 2, Fig. 1

* 1891 *Catenicella septentrionalis* sp. nov. – WATERS: p. 5, pl. 1, figs 1-8
1994 *Ditaxiporina septentrionalis* (WATERS) – GORDON & BRAGA: p. 75, fig. 10a-d
v 2001a *Ditaxiporina septentrionalis* (WATERS) – ZÁGORŠEK: p. 48, pl. 15, fig. 1 (cum syn.)

Material: Four separated zooecia (BSP 2004 III 25-28) and one fragment of a colony (BSP 2004 III 29). The colony is unilamellar and erect with zooecia arranged in a zigzag pattern. The zooecia are oval with a strongly porous frontal wall. The proximal part of the frontal wall is smooth and perforated by small pores. The aperture is oval with a proximal margin formed by a pair of short costae. Each costa has a small central pore. The avicularia are large, suboral, arranged in pairs and have a pivot. The ovicell has not been observed.

Remarks: No ovicells have been found, but other features are sufficient for an accurate identification. The colonies are easily separable to individuals. The presence of an aperture with the proximal margin formed by a pair of short costae with small central pore, and the presence of the suboral avicularia arranged in pairs allows the specimens to be determined without doubt.

Distribution in time and space:
Priabonian: Italy (WATERS 1891), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).

Infraorder Umbonulomorpha GORDON, 1989
Superfamily Lepralielloidea VIGNEAUX, 1949
Family Romancheinidae JULLIEN, 1888
Genus *Hemicyclicopora* NORMAN, 1909

Hemicyclicopora parajuncta CANU & BASSLER, 1917

* 1917 *Hemicyclicopora parajuncta* sp. nov. – CANU & BASSLER:

p. 69, pl. 6, fig. 6
1920 *Hemicyclicopora parajuncta* Canu & Bassler – Canu & Bassler: p. 586, pl. 74, figs 2, 3

Material: A single encrusting colony (BSP 2004 III 36) with 16 individuals. The zooecia are drop-like and narrow with a smooth, nonporous, convex frontal wall. Marginal pores are very small and rare. The aperture is semicircular with oral spines on top of a short peristome. The ovicell is globular, very small and deeply immersed in the distally adjacent zooecium.

Remarks: Although *Hemicyclicopora parajuncta* was to date known only from the North American Eocene, all features described and depicted by Canu & Bassler (1917) are identical with the specimens from the Eisenrichterstein. Similar specimens have been found also in the Waschberg zone of Austria (Zágoršek 2003).

Distribution in time and space:
Priabonian: Carolina USA (Canu & Bassler 1920) and Waschberg zone – Austria (Zágoršek 2003).

Family Escharellidae Levinsen, 1909
Genus *Escharella* Gray, 1848

Escharella ? sp.

? 1999 *Escharella variolosa* (Johnston) – Hayward & Ryland: p. 132, fig. 41

Material: A single poorly preserved encrusting colony (BSP 2004 III 54). The zooecia are oval with a nonporous frontal and well-developed 15-17 areolar pores. The areolar pores are narrow and slit-like. The aperture is oval with straight proximal margin and lyrula. The oral spines are seldom, about one or two pairs laterally from the aperture, or are not visible. No ovicell and no avicularia are observed.

Remarks: Based on the presence of marginal areolar pores and oral spines, the most similar genus seems to be *Escharella*. The most similar species to studied specimen is *Escharella variolosa* (Johnston, 1838) as described by Hayward & Ryland (1999), in having only few oral spines and slit-like areolar pores. The preservation of the studied specimen, however, does not allow a precise determination.

Superfamily Chlidoniopsoidea Harmer, 1957
Family Chlidoniopsidae Harmer, 1957
Genus *Chlidoniopsis* Harmer, 1957

Chlidoniopsis vavrai (Zágoršek, 2003)
Pl. 2, Figs 2-4

*v 2003 *Chlidoniopsis vavrai* sp. nov. – Zágoršek: p. 162, pl. 22, figs 4-7

Material: Eight well-preserved specimens (BSP 2004 III 39-45, 118) with oval and wide individuals and short stolon. The colony is originally uniserial, articulated, and unizooidal, but no jointed individuals were found. The individuals are drop-like, about 0.75 mm long and 0.43 mm wide and proximally tapering to the stolon. The frontal wall is flat, slightly convex and has large marginal areolar pores. There are about 8 to 10 areolar pores on each side of the zooecium. The dorsal wall is extremely convex and has about 5 marginal areolar pores on each side. From the lateral view, the marginal areolar pores form a well-developed lateral ornamentation consisting of two rows of pores (8-10 frontal and 5 dorsal pores). The most distal pore belonging to the dorsal wall is usually slightly larger than the other pores. The convexity of the dorsal wall forms a prominent hump, which is visible in lateral view. A large pore is situated distally on the dorsal wall where the neighbour-individual was attached during the life of the colony. No remains of the distal stolon are visible. The aperture is large, circular; the wide sinus is poorly visible.

Remarks: The most similar species is *Chlidoniopsis vindobonensis* (Reuss, 1848) in respect to its general view. It differs, however, mainly in having a flat dorsal wall (developing no prominent hump), small areolar pores and a long peristome. *Chlidoniopsis vindobonensis* (Reuss, 1848) has usually preserved the remains of the distal stolon and its lateral ornamentation is developed also on the stolon.

Distribution in time and space:
Priabonian: Waschberg zone – Austria (Zágoršek 2003)

Family Quadricellariidae Gordon, 1984
Genus *Nellia* Busk, 1852

Nellia cf. *tenella* (Lamarck, 1816)

1988 *Nellia tenella* (Lamarck) – Braga & Barbin: p. 519, pl. 7, fig. 2 (cum syn.)

Material: Two complete specimens (BSP 2004 III 55, 124) with rectangular cross section. The zooecia are arranged in four rows, each one on one side of the colony branch. They have very large opesia with two pairs of avicularia placed distally. The ovicell has not been observed.

Remark: The studied specimens are poorly preserved, but presence of large opesia and distally placed circular avicularia identify this species with high probability.

Distribution in time and space:
Late Cretaceous: Cosmopolitan (Bock 2004)
Priabonian: Poland (Małecki 1963), Italy (Braga & Barbin 1988)
Tortonian: Italy (Bock 2004)
Pliocene: Belgium, Italy, Holland, Portugal (Vávra 1977)
Messinian: Venezuela (Bock 2004)
Quaternary & Recent: South Pacific and Australia (Bock 2004)

Infraorder Lepraliomorpha Gordon, 1989

Superfamily Smittinoidea LEVINSEN, 1909
Family Smittinidae LEVINSEN, 1909
Genus *Smittina* NORMAN, 1903

Smittina cervicornis (PALLAS, 1766)

1920 *Porella cervicornis* (PALLAS) – CANU & BASSLER: p. 483, fig. 136a -q (cum syn.)
v 2001a *Smittina cervicornis* (PALLAS) – ZÁGORŠEK: p. 55, pl. 18, figs 7, 9, 10 (cum syn.)

Material: A single erect, multilamellar colony (BSP 2004 III 86) with 6 to 7 rows of zooecia. The cross section of the colony is narrowly rectangular. The zooecia are elongated to oval with strongly porous frontal wall and oval, large aperture. The peristome is wide and smooth, usually slightly prominent, sometimes even immersed. The avicularium is rarely developed, very small and situated inside the aperture. No ovicells observed.

Remarks: This species is one of the most common species among Eocene bryozoan faunas in the Alpine-Carpathian region. The avicularia in the described specimens are usually very small, and even sometimes missing, probably due to preservation.

Distribution in time and space:
Priabonian: Poland (MAŁECKI 1963), Romania (GHIURCA 1987), Slovakia (ZÁGORŠEK & KÁZMÉR 1999), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003)
Oligocene: Italy (VÁVRA 1977)
Thanetian – France (DEBOURLE 1974)
Tortonian: Austria & Hungary (DAVID & POUYET 1974), Spain (REGUANT & MALUQUER 1992), France (BUGE 1957), Italy, Germany, Poland, Portugal, Romania, Czech (VÁVRA 1977)
Pliocene: Belgium, Italy, Holland, Portugal, (VÁVRA 1977)
Messinian: Algeria (MOISSETTE 1988)
Quaternary & Recent: Mediterranean (ZABALA & MALUQUER 1988)

Family Bitectiporidae MACGILLIVRAY, 1895
Genus *Hippomonavella* CANU & BASSLER, 1934

Hippomonavella stenosticha (REUSS, 1848)

*v 1848 *Cellaria stenosticha* m. – REUSS: p. 64, pl. 8, fig. 10
v 2001a *Hippomonavella stenosticha* (REUSS, 1848) – ZÁGORŠEK: p. 59, pl. 21, fig. 12 (cum syn.)

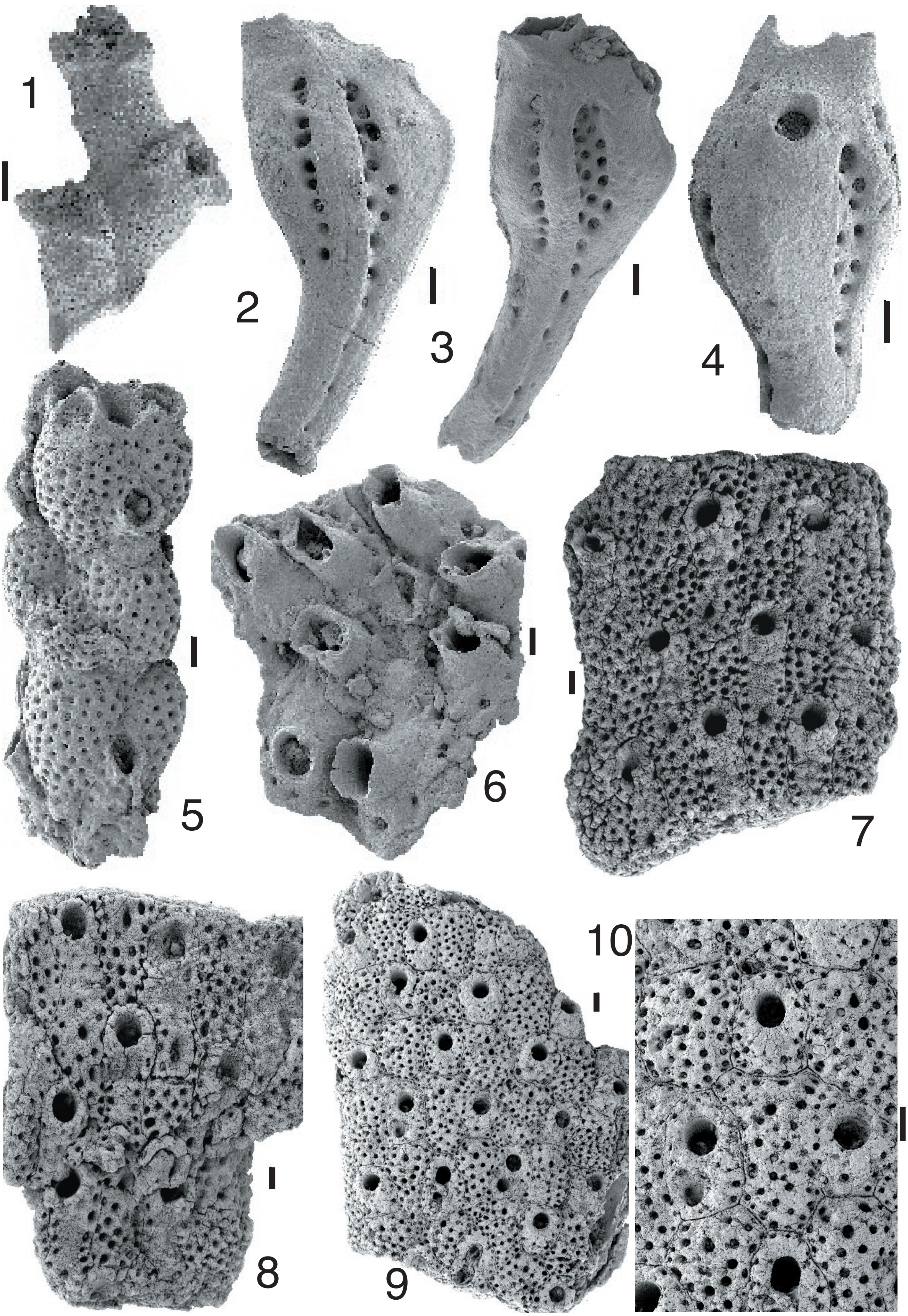
Material: Two fragments of erect, multilamellar colonies (BSP 2004 III 37-38) with 3 and 4 zooecial rows on one side. The cross section of the colony is oval. The zooecia are elongated with a flat or little convex, nonporous frontal wall and with 10 to 18 large marginal areolar pores. The aperture is oval to circular with condyles and without a peristome. The proximal margin of the aperture is slightly concave. The avicularia are rarely developed, very small and situated on the frontal wall below the aperture. The palate is laterally tapering. The ovicell is deeply immersed to proximal individual and has nonporous frontal wall.

Remarks: The holotype, deposited in the Museum of Natural History in Vienna, lacks ovicells, but other features are identical with the studied specimens. The specimens described from Buda Marl, Hungary (ZÁGORŠEK 2001a), and the Waschberg zone, Austria (ZÁGORŠEK, 2003), developed more marginal areolar pores. This difference, however, may represent an intraspecific variation.

Distribution in time and space:
Priabonian: Vicentin (REUSS 1869a), Italy (WATERS 1891), Slo-

Plate 2. Eocene Bryozoa from the Eisenrichterstein beds.

Fig. 1. *Ditaxiporina septentrionalis* (WATERS, 1891). Part of the colony showing the arrangement of the zooecia and suboral, large and paired avicularia. BSP 2004 III 29.
Fig. 2. *Chlidoniopsis vavrai* ZÁGORŠEK, 2003. Lateral view of the zooecium showing characteristically developed hump on the dorsal wall, a long stolon, and a well developed ornamentation consisting of two rows of large pores. BSP 2004 III 40.
Fig. 3. *Chlidoniopsis vavrai* ZÁGORŠEK, 2003. Lateral view of the zooecium showing prominent hump, a very long stolon and the absence of a peristome. BSP 2004 III 41.
Fig. 4. *Chlidoniopsis vavrai* ZÁGORŠEK, 2003. View of the dorsal wall of the zooecium showing the large pore, where probably a stolon was attached connecting this zooecium to the distal neighbour. Well-developed marginal areolar pores belong to the dorsal wall. BSP 2004 III 39.
Fig. 5. *Margaretta cereoides* (ELLIS & SOLANDER, 1786). Part of the colony with zooecia showing characteristic small ascopore. BSP 2004 III 50.
Fig. 6. *Lagenipora urceolaris* (GOLDFUSS, 1862). Small part of the colony showing zooecia with long peristomes and median oral avicularium. BSP 2004 III 46.
Fig. 7. *Tubucella elongecia* sp. nov. Holotype showing long zooecia with nonporous part between aperture and ascopore. BSP 2004 III 98.
Fig. 8. *Tubucella elongecia* sp. nov. Paratype showing long zooecia with drop-like ascopore. BSP 2004 III 99.
Fig. 9. *Tubucella mammillaris* (MILNE-EDWARDS, 1836). General view of the colony. BSP 2004 III 105.
Fig. 10. *Tubucella mammillaris* (MILNE-EDWARDS, 1836). Detail of the colony from Fig. 9., showing separation of the zooecia on two parts and ascopore situated very close to the aperture. BSP 2004 III 105.
All scale bars = 100 μm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vakia (ZÁGORŠEK & KÁZMÉR 1999), Buda Marl – Hungary (ZÁGORŠEK 2001a) and Waschberg zone –Austria (ZÁGORŠEK 2003).
Tortonian: Austria & Hungary (REUSS 1848),
Quaternary & Recent: cosmopolitan (BRAGA & BARBIN 1988)

Family Porinidae D'ORBIGNY, 1852
Genus *Porina* D'ORBIGNY, 1852

Porina duplicata (REUSS, 1869a)

*v 1869a *Acropora duplicata* m. – REUSS: p. 290, pl. 34, fig. 6
v 2001a *Porina duplicata* (REUSS) – ZÁGORŠEK: p. 64, pl. 25, figs 4, 5 (cum syn.)

Material: Two erect and columnar colonies (BSP 2004 III 74-75) with 3 to 5 rows of elongated zooecia. The aviculiferous peristome is not well developed; it is short but wide and carries only one large and one small avicularium. The large avicularium is circular, without pivot and situated proximally from the aperture. The ascopore is very small, sometimes as large as regular pores on the frontal wall and does not perforate the peristome. The ovicell is unknown.

Remark: The preservation of studied specimens allows precise determination because of visible aperture with one big and one small avicularium situated on the aviculiferous peristome and the small ascopore.

Distribution in time and space:
Priabonian: Vicentin (REUSS 1869a), Poland (MAŁECKI 1963), Italy (BRAGA & BARBIN 1988), Poland (MAŁECKI 1963), Hungary (ZÁGORŠEK 2001a) and Waschberg zone – Austria (ZÁGORŠEK 2003).

Family Margarettidae HARMER, 1957
Genus *Margaretta* GRAY, 1843

Margaretta cereoides (ELLIS & SOLANDER, 1786)
Pl. 2, Fig. 5

v 2001a *Margaretta cereoides* (ELLIS & SOLANDER) – ZÁGORŠEK: p. 65, pl. 26, figs 5-7 (cum syn.)

Material: Four well-preserved fragments of the columnar colonies (BSP 2004 III 47-50) with a circular cross section. The zooecia are arranged in 4 to 8 longitudinal rows, elongated oval with a strongly porous, convex frontal wall. The aperture is circular to oval and placed on a short peristome. The peristome is very narrow. The median ascopore is well observable, usually two times larger than regular pores on the frontal wall. The ovicell has not been observed.

Distribution in time and space:
Priabonian: Poland (MAŁECKI 1963), Romania (GHIURCA 1987), Italy (BRAGA & BARBIN 1988), Buda Marl – Hungary (ZÁGORŠEK 2001a), Slovakia (ZÁGORŠEK & KÁZMÉR 1999), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Oligocene: Germany (VÁVRA 1977)
Tortonian: Austria & Hungary (REUSS 1848, DAVID & POUYET 1974), France (BUGE 1957), Poland, Romania, Czech (VÁVRA 1977)
Piacenzian: Panama (BUGE 1957), Italy, USA (VÁVRA 1977)
Quaternary & Recent: Mediterranean (BRAGA & BARBIN 1988), Pacific (VÁVRA 1977)

Superfamily Siphonicytaroidea HARMER, 1957
Family Siphonicytaridae HARMER, 1957
Genus *Tubucella* CANU & BASSLER, 1917

Tubucella papillosa (REUSS, 1848)

*v 1848 *Eschara papillosa* m. – REUSS: p. 68, pl. 8, fig. 22
v 2001a *Tubucella papillosa* (REUSS) – ZÁGORŠEK: p. 67, pl. 28, fig. 1 (cum syn.

Material: Two poorly preserved specimens (BSP 2004 III 126-127) with 4 to 6 longitudinal rows of zooecia. The frontal wall is strongly porous and slightly convex. The apertures are circular, with a short and narrow peristome. The ascopore is as large as regular frontal pores, sometimes slightly larger. It is situated on the distal third of the length of the zooecium. The avicularia and ovicells are unknown.

Remarks: *Tubucella papillosa* (REUSS, 1848) is one of the common species within Alpine - Carpathian Eocene sediments. Despite the poor preservation of the studied specimens, the observable features allow precise determination.

Distribution in time and space:
Priabonian: Vicentin (REUSS 1848), Poland (MAŁECKI 1963), Romania (GHIURCA 1987), Egypt (ZIKO 1985), Italy (BRAGA & BARBIN 1988), Slovakia (ZÁGORŠEK 1994), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Rupelian: Italy (BRAGA & BARBIN 1988)

Tubucella mammillaris (MILNE-EDWARDS, 1836)
Pl. 2, Figs 9-10

1966 *Tubucella mammillaris* (MILNE-EDWARDS) – CHEETHAM: p. 85, figs 62-64
v 2001a *Tubucella mammillaris* (MILNE-EDWARDS) – ZÁGORŠEK: p. 67, pl. 28, figs 2, 3, 5 (cum syn.)

Material: Six well-preserved large colonies (BSP 2004 III 100-105) with narrow oval cross section. There are about 10 to 15 irregularly alternating rows of zooecia on each side of the colony. The zooecia are divided into two parts of about equal length: the distal part (so called peristomial part) carries the peristome and avicularium, the proximal part (so called frontal part) is formed by the frontal wall and bears the ascopore. These two zooecial parts are separated by narrow, shallow threads. The peristomial part is convex, oval to circular and sometimes rounded hexagonal. The aperture is circular to oval arranged on the top of a short and thick peristome. The frontal part is much flatter than the peristomial part. The ascopore is circular and little larger than the regular frontal pores. The ovicell is unknown. The avicularium is small, rarely developed and arranged near the aperture.

Distribution in time and space:
Lutetian: France & Egypt (ZIKO 1985), Belgium (CHEETHAM 1966)
Priabonian: Carolina (CANU & BASSLER 1920), United Kingdom (CHEETHAM 1966), France (ZIKO 1985), Buda Marl – Hungary (ZÁGORŠEK 2001a), Slovakia (ZÁGORŠEK & KÁZMÉR 1999), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003)
Rupelian: France (CHEETHAM 1966)
Chattian – France (ZIKO 1985)
Aquitanian – France (ZIKO 1985)

Tubucella elongecia sp. nov.
Pl. 2, Figs 7-8

Diagnosis: The colony is large and has a narrow oval cross section. There are about 6 to 15 irregularly alternating zooecial rows on each side of the colony. The zooecia are very long and narrow. The ascopore is situated approximately in the middle of the zooecial length. The ascopore is circular and little larger than the regular frontal pores. The aperture has a peristome but no oral spines. Avicularia and ovicell absent.

Holotype: The specimen depicted in Pl. 2, Fig. 7, from layer E2 of the Eisenrichterstein locality, deposited in the Bayerische Staatssammlung für Palaeontologie und historische Geologie München under the number BSP 2004 III 98

Paratypes: 1 specimen from layer E2 of the the Eisenrichterstein locality, deposited in the Bayerische Staatssammlung für Palaeontologie und historische Geologie München under the number BSP 2004 III 99

Derivatio nominis: Due to its very elongated individuals (zooecia = ecium)

Locus typicus: Eisenrichterstein

Stratum typicum: Eocene – Priabonian.

Dimensions: (in µm; x = average, details in Textfig. 2):
width of the colony: 519-3639, x = 1548
length of the colony: 1800-5158, x = 2504
length of zooecia: 500-1247, x = 769
width of zooecia: 119-303, x = 205
diameter of aperture: 68-133, x = 103
diameter of ascopore 26-54, x =40
diameter of regular pores 18-36, x = 25
distance between ascopore and aperture: 202-551, x = 328

Description: The colony is erect, bilamellar and rigid with circular to oval transversal section. Zooecia are arranged in alternating longitudinal rows, there are at least three and maximally eight rows of each side of the colony. The zooecia are very long comparing other known species of *Tubucella*. The ascopore is circular and little larger than the regular frontal pores and perforates the frontal wall approximately in the middle of the frontal wall. The frontal wall is generally porous by large pores, but according to the pattern of distribution of the pores, the frontal wall can be divided into two parts. The part between aperture and ascopore is not so intensively perforated by larger pores than the part between ascopore and the proximal margin. Narrow, shallow elongated threadlike depression sometimes separate these two parts of zooecial frontal wall. The pores situated distally from the ascopore perforate mostly the margin of the frontal wall and therefore the centre of the frontal wall is more smooth and nonporous. The circular to oval aperture is arranged on the top of a short and thick peristome. Primary orifice is semi-circular with almost straight proximal margin, very hardly visible due to the thick peristome. No oral spines are developed around the aperture. Avicularia are absent. The ovicell is unknown.

Comparison: *Tubucella mammillaris* (MILNE-EDWARDS, 1836) is the most similar species to *T. elongecia* sp. nov. in having also zooecia separated in two parts. *Tubucella mammillaris* (MILNE-EDWARDS, 1836) differs mainly in having very short and wide zooecia (approximately about 530 µm long and 400 µm wide).

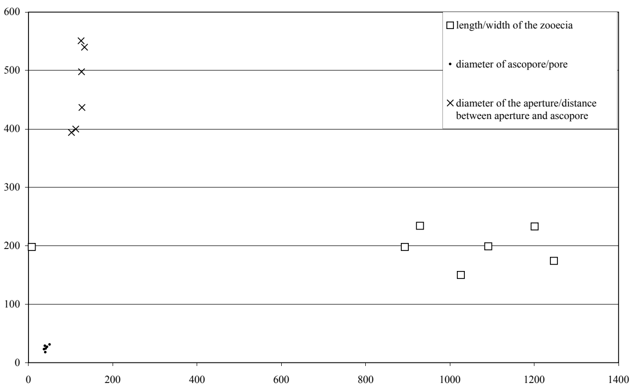
Very similar is also *Tubucella papillosa* (REUSS, 1848), which however typically developed rod like colonies and its ascopore is situated very close to aperture.

Remarks: *Tubucella elongecia* sp. nov. develops zooecia with strongly porous frontal wall perforated by ascopores. Apertures are situated on the short peristome without oral spines. Therefore the described species is placed in *Tubucella*.

Superfamily Celleporoidea JOHNSTON, 1838
Family Celleporidae JOHNSTON, 1838
Genus *Lagenipora* HINCKS, 1877

Lagenipora urceolaris (GOLDFUSS, 1862)
Pl. 2, Fig. 6

1862 *Cellepora urceolaris* GOLDFUSS: p. 25, pl. 9, fig. 2



Textfigure 2: Chart of important measurements of *Tubucella elongecia* sp. nov. (values in µm)

* 1864b *Lepralia urceolaris* Goldfuss – Reuss: p. 634, pl. 12, fig. 8

Material: One well preserved colony (BSP 2004 III 46) with characteristically bottle-shape and large zooecia. Frontal wall is strongly convex and smooth. Marginal pores are small, rare and indistinct. Primary aperture is circular. Peristome is well developed, smooth and without oral spines. Avicularia are small, paired and usually circular. Ovicell not seen.

Remarks: The original description as well as the illustration by Goldfuss (1862) and also the description by Reuss (1864b) are identical with the specimen described here. Due to the presence of bottle-shaped zooecia with weakly visible marginal pores, and a well-developed peristome with small avicularia this species is placed in *Lagenipora*.

Distribution in time and space:
Priabonian: Germany (Reuss 1864b) and Waschberg zone – Austria (Zágoršek 2003)

Family Phidoloporidae Gabb & Horn, 1862
Genus *Reteporella* Busk, 1884

Reteporella subovata (Stoliczka, 1862)
Pl. 3, Fig. 2

*v 1862 *Eschara subovata* sp. nov. – Stoliczka: p. 87, pl. 2, fig. 9
v 2001b *Reteporella subovata* (Stoliczka) – Zágoršek: p. 558, pl. 20, fig. 2 (cum syn.)

Material: Three well-preserved specimens (BSP 2004 III 79-81) of non-reticulate, erect colonies. Zooecia are arranged in 2 to 5 longitudinal rows. Aperture is circular, large and with condyles. Frontal wall is reduced, very short, smooth and convex. Marginal areolar pores small and rare. Spiramen small. Avicularium is small, circular without pivot and situated proximally from the aperture. Ovicell not preserved. Dorsal surface of colony is smooth. Occasionally, small avicularia may be developed on the dorsal wall of the colony.

Remarks: The syntypes in the Museum of Natural History in Vienna are poorly preserved specimens. The preserved features are however almost identical with the specimens described here.

Distribution in time and space:
Priabonian: Germany (Stoliczka 1862), Buda Marl – Hungary (Zágoršek 2001a), Alpine Molasse Zone – Austria (Zágoršek 2001b) and Waschberg zone – Austria (Zágoršek 2003)

Reteporella tuberculata (Reuss, 1869a)
Pl. 3, Fig. 1

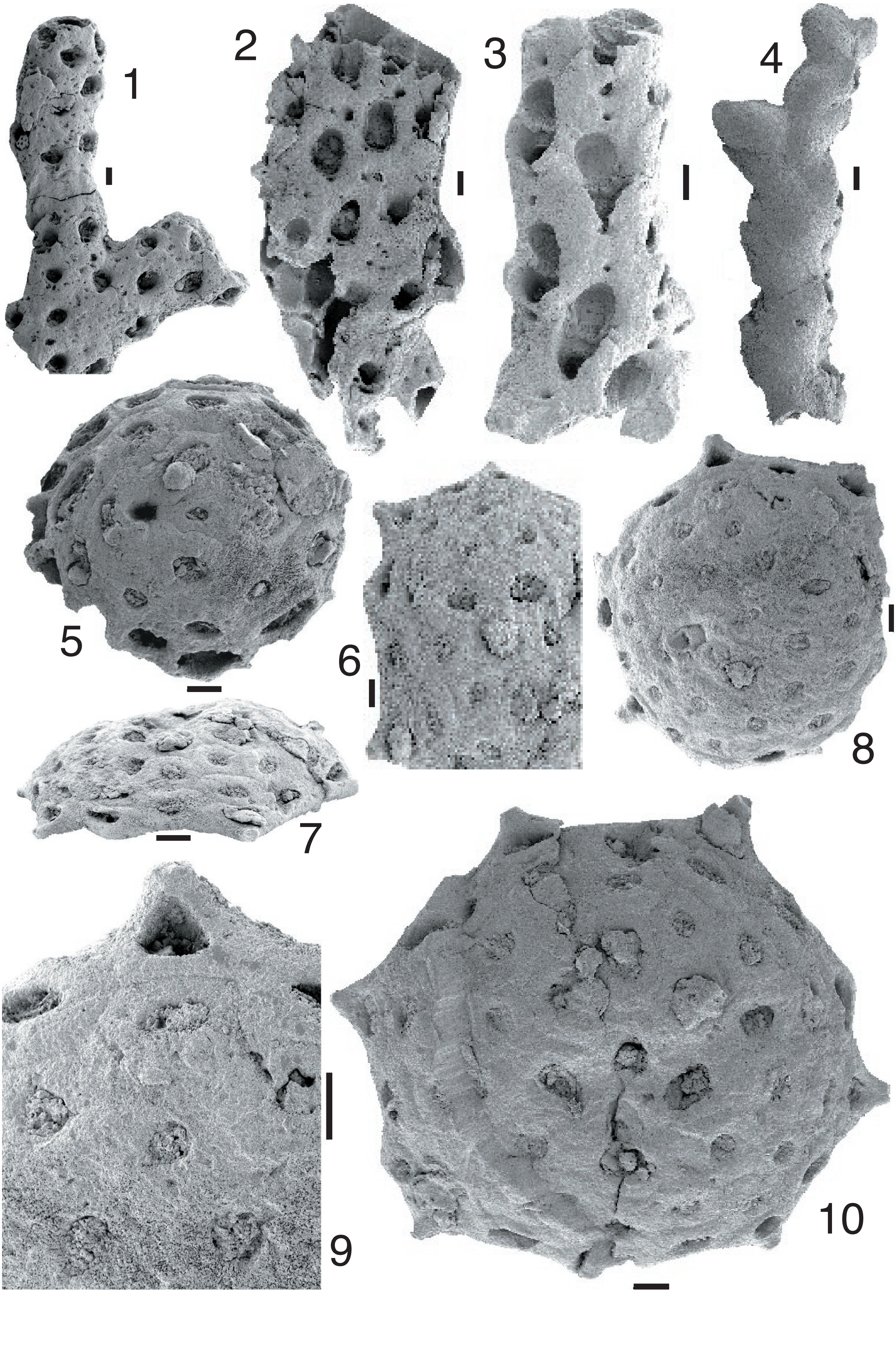
*v 1869a *Retepora tuberculata* m. – Reuss: p. 267, pl. 31, figs 9, 10
v 2001b *Reteporella tuberculata* (Reuss) – Zágoršek: p. 557, pl. 20. fig. 1 (cum syn.)

Material: Three well-preserved fragments of reticulate colonies (BSP 2004 III 82-84) with biserial or rarely triserial branches. The frontal wall is smooth and very short with rare small marginal areolar pores. The aperture is circular to oval and has small condyles. The spiramen is large, remarkable. The avicularium is small, very rare. A peristome is not developed. The ovicell has not been observed. The dorsal surface of the colony is smooth, convex and lacks avicularia.

Remark: Although no avicularia and ovicells have been found among the studied material, due to the presence of other features this material is confidently referred to this species.

Plate 3. Eocene Bryozoa from the Eisenrichterstein beds.

Fig. 1. *Reteporella tuberculata* (Reuss, 1869a). General view showing reticulated shape of the colony and circular apertures with small condyles and a large spiramen. BSP 2004 III 84.
Fig. 2. *Reteporella subovata* (Stoliczka, 1862). General view showing circular aperture with cardelles, rare and small marginal areolar pores and deeply immersed hyperstomial or probably recumbent ovicell. BSP 2004 III 81.
Fig. 3. *Sparsiporina elegans* (Reuss, 1848). Frontal view showing deeply immersed zooecia and ovicels. BSP 2004 III 91.
Fig. 4. *Sparsiporina elegans* (Reuss, 1848). Dorsal view showing characteristic ornamentation. BSP 2004 III 90.
Fig. 5. *Batopora alpina* sp. nov. General view of the paratype BSP 2004 III 133.
Fig. 6. *Batopora alpina* sp. nov. Detail of the holotype showing arrangement of zooecia and development of the marginal calcified toe. BSP 2004 III 131.
Fig. 7. *Batopora alpina* sp. nov. Lateral view of the holotype showing vaulting of the colony. BSP 2004 III 131.
Fig. 8. *Batopora alpina* sp. nov. Paratype showing marginal calcified toe overlapping the outline of the colony. BSP 2004 III 132.
Fig. 9. *Batopora alpina* sp. nov. Detail of the calcified toe with slightly triangular aperture overlapping the outline of the colony. BSP 2004 III 132.
Fig. 10. *Batopora alpina* sp. nov. General view of the holotype showing that each second zooecium developed the calcified toe overlapping the outline of the colony. BSP 2004 III 131.
All scale bars = 100 µm.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Distribution in time and space:
Priabonian: Vicentin (REUSS 1869a), Poland (MAŁECKI 1963), Romania (GHIURCA 1987), Italy (BRAGA & BARBIN 1988), Slovakia (ZÁGORŠEK & KÁZMÉR 1999), Buda Marl – Hungary (ZÁGORŠEK 2001a), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).

Genus *Sparsiporina* D'ORBIGNY, 1852

Sparsiporina elegans (REUSS, 1848)
Pl. 3, Fig. 3-4

*v 1848 *Retepora elegans* m. – REUSS: p. 48, pl. 6, fig. 38
v 2001b *Sparsiporina elegans* (REUSS) – ZÁGORŠEK: p. 558 (cum syn.)

Material: Five colonies (BSP 2004 III 87-91) with biserial branches and elongated individuals. The frontal wall is incompletely preserved; the fragments are smooth and perforated by very small, scattered pores. The apertures are circular to oval with oral spines arranged distally from the aperture. The ascopore is circular and located close to the proximal margin of the aperture. No ovicell was found. The dorsal side of the colony is fibrous, with elevated lateral walls of individuals forming a typical zigzag pattern.

Remarks: The specimens from the Eisenrichterstein exhibit all the diagnostic features of this species except for the ovicells and the frontal wall, which are not preserved. Other features however allow precise determination, mainly because of the characteristic development of the branches on the dorsal side.

Distribution in time and space:
Priabonian: Italy (WATERS 1891, BRAGA & BARBIN 1988), Buda Marl – Hungary (ZÁGORŠEK 2001a), Slovakia (ZÁGORŠEK & KÁZMÉR 1999), Alpine Molasse Zone – Austria (ZÁGORŠEK 2001b) and Waschberg zone – Austria (ZÁGORŠEK 2003).
Rupelian: Italy (BRAGA & BARBIN 1988)

Superfamily Biporidae GREGORY, 1893
Family Batoporoidea NEVIANI, 1900
Genus *Batopora* REUSS, 1867

Batopora alpina sp. nov.
Pl. 3, Figs 5-10

Diagnosis: The colony is free, discoidal to very shallow conical with a flat base. The zooecia are arranged in a single layer, tube-like with a circular, terminal aperture. Marginal zooecia developed calcified toe overlapping the margin of the colony. A central kenozooecium may be developed. The ovicell was not observed.

Holotype: The specimen from the Eisenrichterstein, depicted in Pl. 3, Figs 6, 7, 10 deposited in the Bayerische Staatssammlung für Paläontologie und historische Geologie München under the number BSP 2004 III 131.

Paratypes: 3 specimens from the locality Eisenrichterstein are deposited in the Bayerische Staatssammlung für Paläontologie und historische Geologie München under the number BSP 2004 III 132-134.

Derivatio nominis: Due to its occurrence at Calcareous Alps.

Locus typicus: Eisenrichterstein, sample E 14

Stratum typicum: Eocene - Priabonian.

Dimensions: (in µm; x = average, details in Textfig. 3):
diameter of the colony: 876×968-1258×1400; x = 1065×1180
height of the colony: 423
diameter of the zooecia: 183-279, x = 229
diameter of the opesia: 61-94, x = 73
extension of the toe from the margin of the colony: 56-107, x = 84

Description: The colony, a compound of about 20-30 zooecia arranged in many superposed layers, is free, discoidal and slightly conical. The zooecia are tube-like, with a circular, terminal aperture and are surrounded by scattered marginal pores. A very shallow peristome is developed on each zooecium. The aperture is circular, no sinus seen. The most marginal zooecium develops a calcified toe overlapping the outline of the colony. From the top view it seems, that each second zooecium developed the toe, but it is because, each second zooecium is the most marginal. The toes are triangular to trapezoidal and the zooecium developing the toe has slightly triangular aperture. The base (the periphery - late astogenetic region) is always flat, nonporous with dorsal walls of the zooecia being visible. Neither avicularia nor ovicell have been observed.

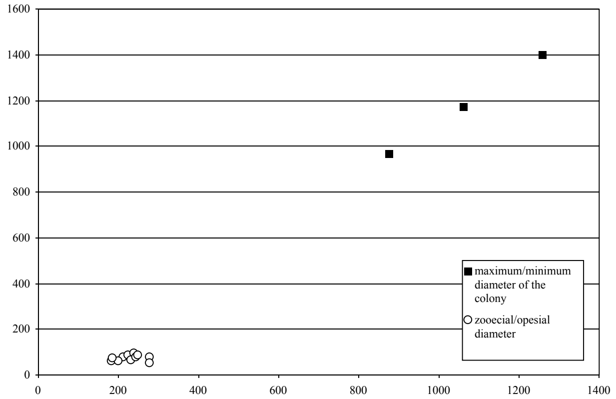
Comparison: *Batopora multiradiata* REUSS, 1869a is most similar to *Batopora alpina* sp. nov. It differs mainly in having 70-90 zooecia and in having enlarged central kenozooecia. Also very similar is *Batopora rosula* REUSS, 1848, but which occurs only in Miocene strata. *Batopora rosula* REUSS, 1848 has also zooecia in many layers and its base is strongly porous and granular. No hitherto known species of *Batopora* developed the overlapping toe.

Stenosipora reussi (STOLICZKA, 1862) is also similar to *Batopora alpina* sp. nov. in having zooecia in only a single layer and in a general budding pattern. The zooecia of *S. reussi* , however developed marginal pores and the dorsal side is concave.

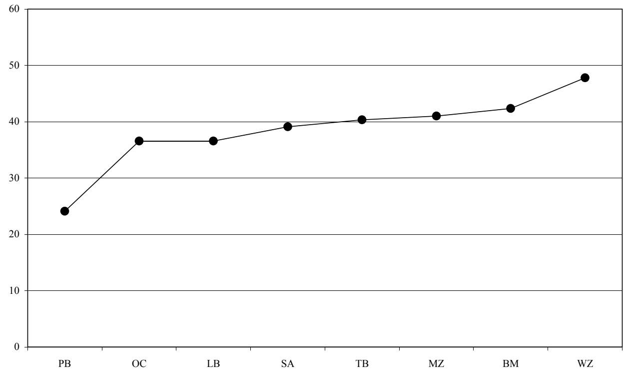
Remark: Because the circular aperture and the colony have a conical shape and flat dorsal side, the described species is placed in *Batopora*.

5. Comparison

The similarity between Eocene bryozoan associations within the Alpine Carpathian region was determined using Kojumdgieva similarity coefficient (BRAGA et al. 1995).



Textfigure 3: Chart of important measurements of *Batopora alpina* sp. nov. (values in µm)



Textfigure 4: The Kojumdgieva similarity coefficient between Eocene bryozoan associations within the Alpine Carpathian region. Explanation of the abbreviations: PB = Podhale basin (Slovakia), OC = Outer Carpathians (Poland), LB = Liptov basin (Slovakia), SA = Southern Alps (Italy), TB = Transylvanian basin (Rumania), MZ = Molasse Zone (Austria), BM = Buda marls (Hungary), WZ = Waschberg zone (Austria).

$$K = (Ca\% + Cb\%)/2$$

where

$$Ca\% = C/A * 100$$
$$Cb\% = C/B * 100$$

where

A = number of species from locality a
B = number of species from locality b
C = number of species common both to a and b

The number of common species, number of joint species and results of Kojumdgieva similarity coefficient for each of the localities is given in Textfig. 4.

The most similar Eocene association within Alpine Carpathian region is in the Waschberg zone (ZÁGORŠEK 2003), where about 70% of species are common to both faunas (Kojumdgieva similarity coefficient = 47,8; see Textfig. 4).

With respect to the common occurrence of both bryozoans and corals, the Eisenrichterstein bryozoan assemblage is unlike any other Eocene association within the Alpine Carpathian region. However, similar biotopes can be found today. SPALDING et al. (2001) describe numerous bryozoans from most of the World's reefs. These authors also note that bryozoans are among the first organisms to colonize newly exposed areas, and play an important role in cementing fragments and consolidating the reef structure.

6. Interpretation

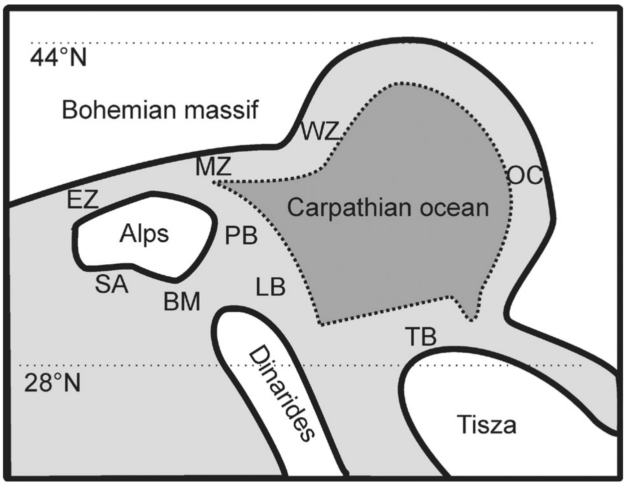
Bryozoan radiation had a peak in the Eocene (TAYLOR & LARWOOD 1990), as spectacularly illustrated by the large number of high-diversity faunas in the Alpine-Carpathian region. The region underwent significant tectonic deformation and displacement of terranes immediately after deposition of the bryozoan-containing sediments during the Late Eocene (KÁZMÉR & KOVÁCS 1985). A palaeogeographic map based on the reconstruction of palaeolatitudinal history of the displaced terranes (MÁRTON 1993; KÁZMÉR et al. 1999; ZÁGORŠEK & KÁZMÉR 1999) illustrates the Priabonian position of the bryozoan faunas in the Alpine-Carpathian region. According to this palaeogeographic reconstruction, the Eisenrichterstein is situated between the Alpine orogen and the Bohemian massive (Textfig. 5). The closest neighbouring Eocene bryozoa-bearing locality is the borehole Helmberg 1 and Waschberg-Zone. During the Eocene, these localities were situated east of the depositional position of the Eisenrichterstein sediments. The probable location of other areas with Eocene bryozoan assemblages is given in Textfig. 5.

Similarity indices suggest that similarity of the faunas is independent of their regional environmental conditions, and is probably determined by large-scale dispersal history rather than by the distance. The associations in nearby localities are therefore more similar than in far-away localities, even when the sediments are more similar with these of the more distant locality (Textfig. 5). The fauna from the Eisenrichterstein Zone is more similar to those from Molasse zone (Helmberg-1 and Perwang-1) and Waschberg Zone than to Southern Alps, though this locality has a more similar sediment (algal limestone), and therefore probably also represents a more similar environment. Similar situation was observed also in other studied Eocene localities. For a detailed discussion of this topic, see ZÁGORŠEK & KÁZMÉR (1999).

The outcrop in the Eisenrichterstein yields two kinds of sediments, marly layers and limestone. The studied bryozoan fragments occur in the marly layers, which are interpreted as the result of storm events. During storms mainly coral detritus was mixed up with the marl of the nearby basin and deposited on the foot of a coral-dominated carbonate ramp (DARGA 1990). Bryozoans generally indicate deeper environments (TAYLOR & ALLISON 1998), so we can suppose that the studied bryozoan assemblage originally occupied the basin neighbouring the coral reef.

7. Summary

A total of 46 species of bryozoa have been obtained from the sediments of the Eisenrichterstein, Bavaria. Of these, 28 are cheilostomatous, and 18 belong to the order Cyclostomatida. Two new species have been described in detail.



Textfigure 5: A palaeogeographic map illustrates the Priabonian position of the bryozoan faunas in the Alpine-Carpathian region (according to Kázmér et al. 1999; Zágoršek & Kázmér 1999 modified). Explanation of the abbreviations see Textfig. 4. EZ = Eisenrichterstein Zone

The distribution of bryozoan skeletons was probably influenced by secular storms inducing a periodical mass transport - moving shallow water coral rubble downward and deep water basin marl upward.

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