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# EOCENE ANASCAN BRYOZOA FROM NEW LOCALITIES IN THE WESTERN CARPATHIANS, SLOVAKIA

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**Abstract**: The paper concerns all Eocene anascan Bryozoa known from Slovakia. New bryozoan associations from Štrba and Poluvsie are studied and described. A total of 10 taxa, newly found in Slovakia are described, the remainder are listed.

**Key words:** Western Carpathians, Eocene, Bryozoa, Anasca, systematics.

## Introduction

This paper concerns anascan Bryozoa from Eocene sediments, in the Slovak part of the Western Carpathians (Fig. 1). The associated fieldwork (done within the last two years) was aimed at finding new bryozoan localities not described in the previous paper of Zágoršek (1994). Two localities — Štrba and Poluvsie yielded bryozoan associations.

The bryozoan zoaria mostly occur in well lithified marls. Several techniques have been used to have specimens with observable surface. Most of the techniques are aggressive, which caused bad preservation of the fossils. However, most of the specific features have been preserved and could be observed. Some of the found specimens cannot be listed under any known species, but due to the bad preservation, no new species could be erected.

Most of the Eocene anascan Bryozoa from the Slovak part of the Western Carpathians have been published already (Zágoršek 1996a,b). The remainder are described here.

The holotypes and paratypes of Reuss species as well as of Stoliczka species have been studied in the Vienna Natural History Museum in 1996. The original material has been compared with the material from Slovakia. All observations are commented on, in the "Remarks" within the description of the species.

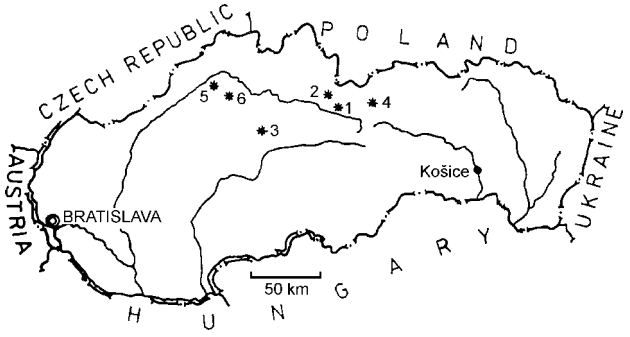



**Fig. 1.** Sketch of the geographical position of the described localities. 1 — Východná, 2 — Hybica, 3 — Partizánska Ľupča, 4 — Štrba, 5 — Rajecké Teplice, 6 — Poluvsie.

## Description of the localities

The Eocene sediments of the Western Carpathians can be divided into four formations (Gross et al. 1984). The studied bryozoans are from the basal Borové Formation (Východná, Partizánska Ľupča, Hybica and Štrba) and from the Zuberec Formation (Rajecké Teplice and Poluvsie).

The lithological content of the Borové Formation in the Liptov Basin is rather varied (Gross & Köhler 1980). It consists of fine-grained calcarenites (Východná), or of yellowish-brown organodetrital clayey limestone (Partizánska Ľupča). Within the formation, there are a thin-bedded, pale-grey to brown bryozoan limestones (Hybica and Štrba).

The locality at **Východná** (Fig. 2) is situated east of the village, in a road-cut near the railway station. The fossils (nummulites, bryozoans and rare molluscs) occur in an organodetrital limestone. Among them are *Nummulites garnieri* Boussac and *N. chavannesi* de la Harpe, from which an Eocene age has been determined (Gross & Köhler 1980). The locality probably represents a shallow marine environment. This can be confirmed by the occurrence of the bryozoan genera *Lacrimula* and *Lunulites* which lived only in shallow marine conditions in the Eocene (Braga & Munari 1972).

The locality at **Partizánska Ľupča** (Fig. 3) is in an abandoned quarry lying about 1.6 km south of the village. Foraminiferal tests (*Discocyclina prattii* (Michelin 1846) and *Nummulites chavannesi* de la Harpe) dominate over other allochems in the sediment. *Nummulites chavannesi* determines the Eocene age (Gross & Köhler 1980). As in the locality Východná, the large quantity of large forams as well as the presence of *Lacrimula* point to a shallow marine environment.

The locality called **Hybica** (see Fig. 2) is situated on the right bank of the Hybica River, about 3.4 km north of the village of Východná. The outcrop represents the upper part of a biogenic (mostly algal) buildup. Bryozoan marl occurs as a lensoid body, probably formed by a slump, in the claystone of the Huty Formation. According to Zágoršek (1996) the original sedimentation area of the bryozoan marls could be a shelf margin with cool water due to the influence of upwelling. Later, marls with bryozoans probably slumped toward the basin and into deeper sediments.

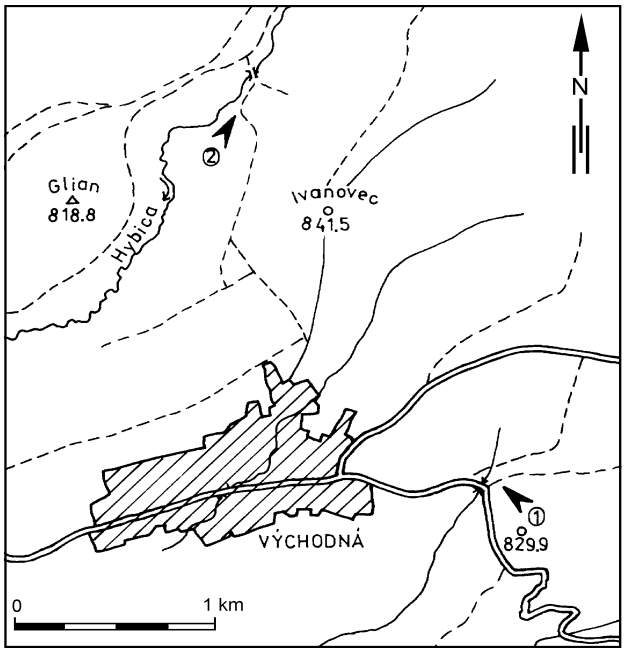



**Fig. 2.** Sketch of the geographical position of Východná (1) and Hybica (2) localities.

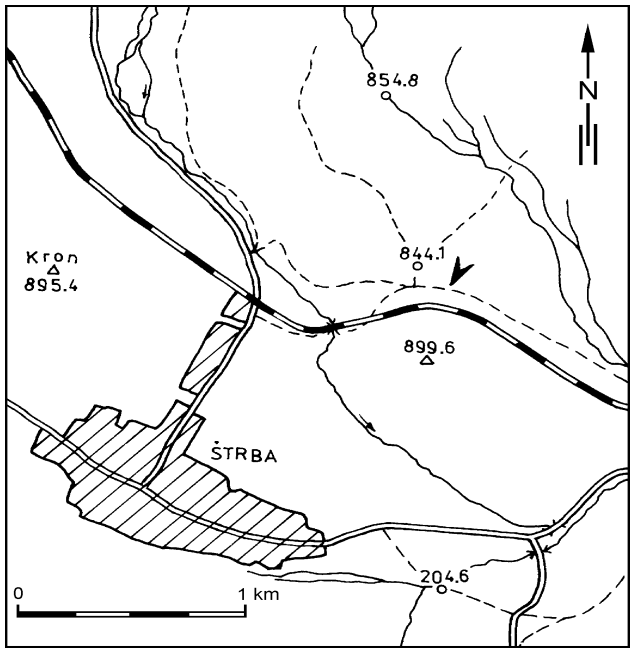



**Fig. 4.** Sketch of the geographical position of Štrba locality (arrow).

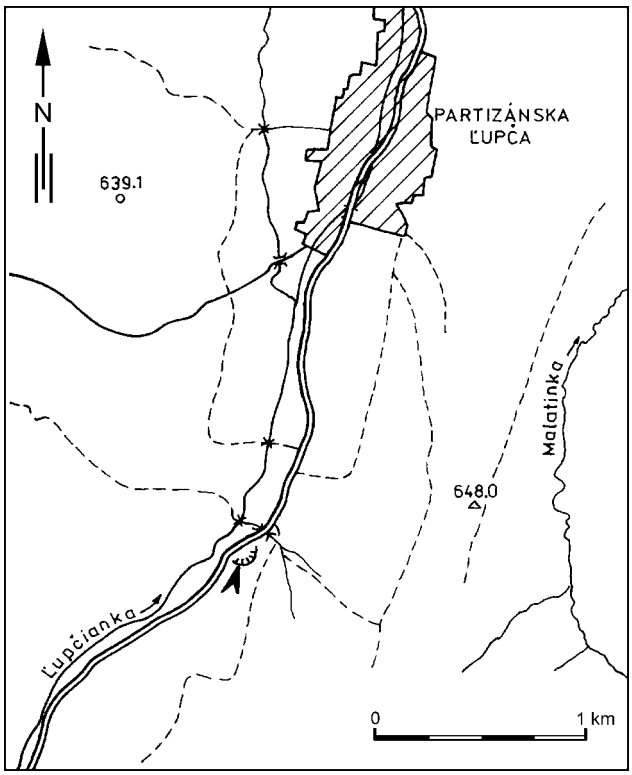



**Fig. 3.** Sketch of the geographical position of Partizánska Ľupča locality (arrow).

The **Štrba** locality lies in the abandoned railway cut, about 100 m north of Kolombiarok Hill (899.6 m) and about 800 m east of the road connecting the villages of Tatranská Štrba and Štrba (see Fig. 4). This locality represents the best example of the bryozoan marl facies. Probably, it is a large lensoidal, slump body originated in a similar environment to the sediments at Hybica. However, abundant large shallow marine molluscs have been found here. In the upper part of the section, *Nummulites boullei* de la Harpe and *Operculina alpina* Douvillé, have been found. These prove an Eocene age (Köhler, personal comm, 1995) of these sediments.

The Zuberec Formation represents flysch type sediments. These are calcareous sandstones interbedded with claystones and rarely with embedded limestones. The Bryozoa occur as grains within the sandstones.

At **Rajecké Teplice** (see Fig. 5), bryozoans occur in a medium-grained calcarenite, exposed above the Bystrička creek, south of the village.

The bryozoans from **Poluvsie** (Fig. 6) were found in rocks collected in the field around the hill called Diel (473.4 m). The rock is similar to that at Rajecké Teplice, an yellowish to brownish medium-grained calcarenite.

The depositional environments of these localities cannot be suggested due to the small amount of remains of bryozoans as well as other fossils.

## Morphology

The anascan Bryozoa have a zooecial frontal surface formed by an uncalcified frontal membrane. Calcified cryptocyst usually lies beneath these membrane, and can be short (Pseudomalacostega and Cribrimorpha) or extend forward towards the aperture (Coilostega and Pseudostega). The space between membrane and cryptocyst forms part of the hydrostatic system used in tentacle protrusion. The system used parietal muscles which depress the frontal membrane and reduce the space between it and the cryptocyst. These parietal muscles are located in various places, mostly being

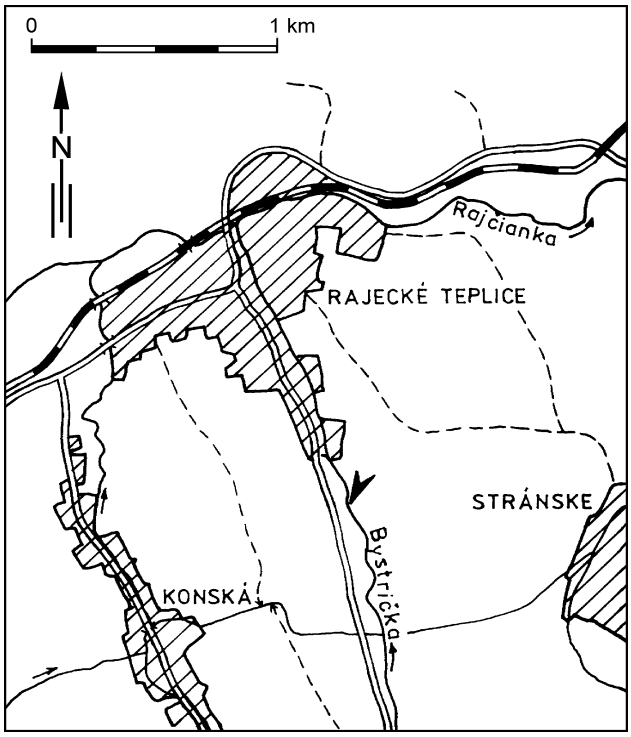



**Fig. 5.** Sketch of the geographical position of Rajecké Teplice locality (arrow).

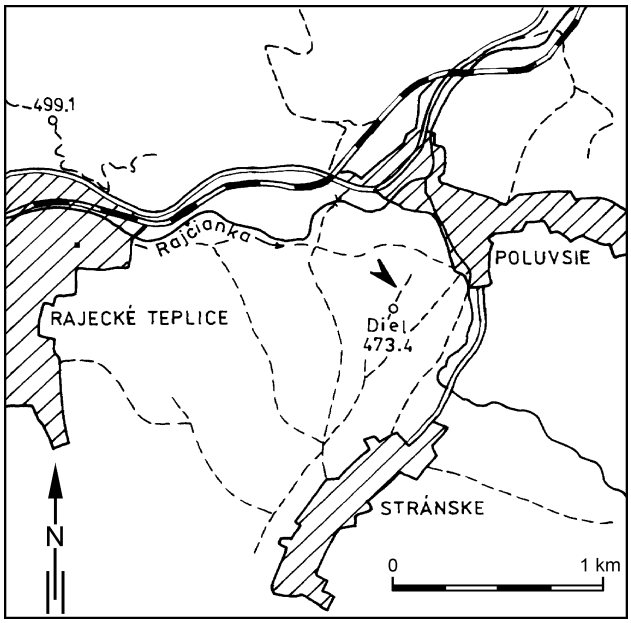



**Fig. 6.** Sketch of the geographical position of Poluvsie locality (arrow).

restricted to the proximal margin of the orifice or passing in pairs through openings in the cryptocyst called opesiules.

The frontal membrane is surrounded by an elevated, calcified margin called the mural rim. In the Cribrimorpha, the membranous frontal is covered by a costal frontal shield (pericyst).

The true opening, where tentacles are protruded is called the orifice. However, when the membranous frontal wall does not fossilize, the preserved opening is called the opesium.

The proximal part of the zooecia, not covered by the frontal membrane, may form a calcified frontal wall called the gymnocyst.

Interzooecial avicularia and/or vibracula and ovicells are generally present.

## Systematics

All of the anascan Bryozoa found have been listed in Table 1 with references to their last description. The higher taxa are listed according to Gordon (1986).

Class **Gymnolaemata** Allman 1896
Order **Cheilostomata** Busk 1852
Suborder **Anasca** Levinsen 1909
Division **Pseudomalacostega** J.& L. d'Hondt 1977
Family **Calloporidae** Norman 1903
Genus **Amphiblestrum** Gray1848

*Amphiblestrum appendiculata* (Reuss 1848)
(Pl. I: Fig. 1)

1848 *Cellepora appendiculata* sp.n., Reuss p. 96, Pl. 11, Fig. 22
1963 *Ramphonotus appendiculatus* (Reuss 1848), Braga p. 23
1974 *Ramphonotus appendiculata* (Reuss 1848), David & Pouyet p. 108, Pl. 1, Figs. 2, 6
1994 *Rhamphonotus monopora* Reuss, Zágoršek tab. 1
1996a *Ramphonotus* sp., Zágoršek p. 125, Pl. 2, Fig. 2

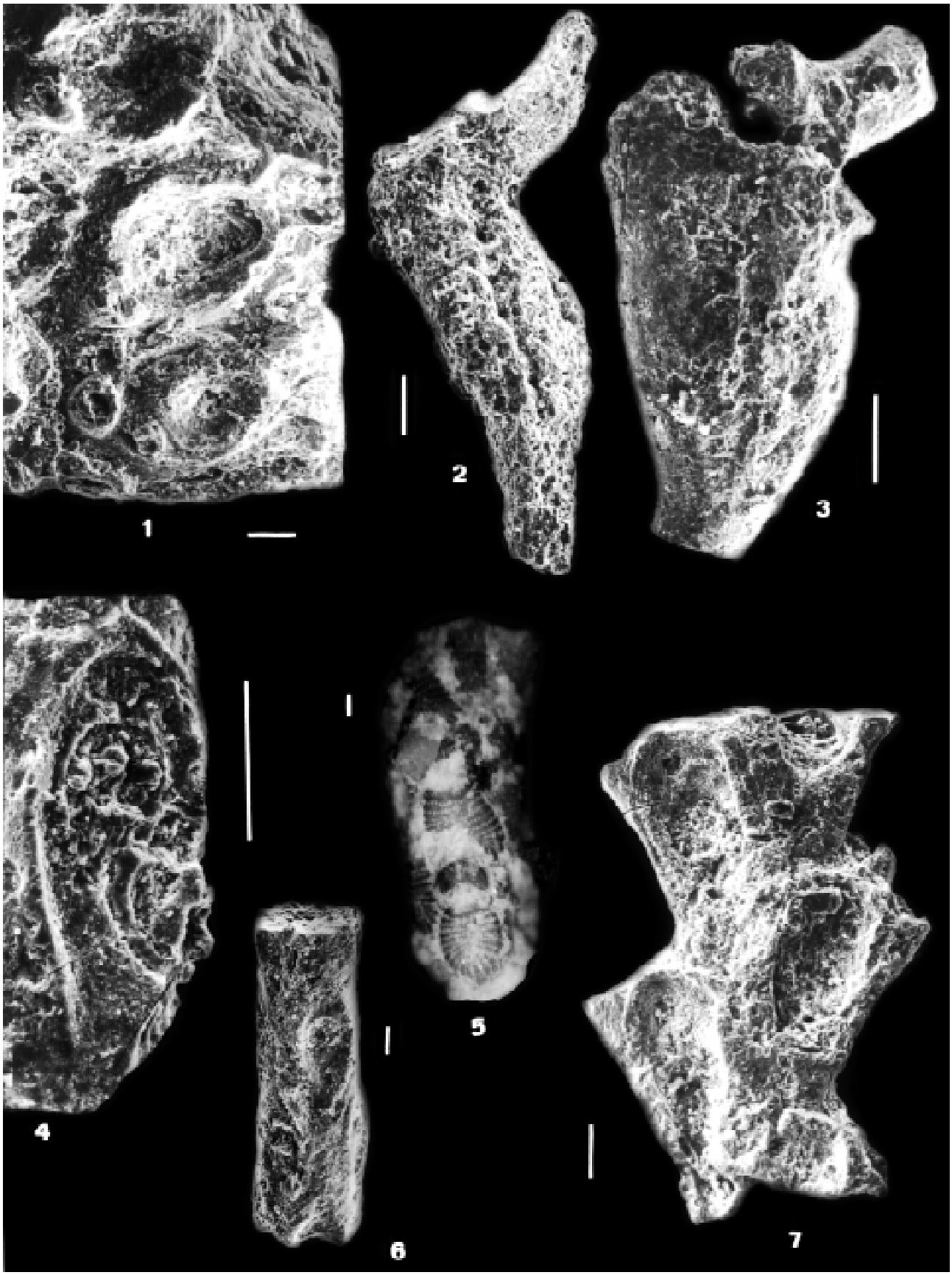
**Description:** Zoaria encrusting. Zooecia membraniporiform, oval to triangular, with very short cryptocyst. Opesia triangular. A shallow, narrow furrow separates neighboring zooecia. No gymnocyst. Mural rim narrow, same width around all zooecium, smooth. Vibracula rare, usually situated among three or four autozooecia, small, tube-like, with circular orifice.
**Remarks:** The described specimens are identical in shape of the zooecia and shape and location of the vibracula with the holotype deposited in the Natural History Museum in Vienna. However the holotype mural rim is slightly ribbed.

Gordon (1984) considered *Ramphonotus* to be a junior synonym of *Amphiblestrum.* Small gymnocyst, development of the cryptocyst and position of the avicularia characterized genus *Amphiblestrum.* Presence of these features in the described specimens allow us to list this species under the genus *Amphiblestrum.*
**Occurrence:** Štrba locality, probably also in the Poluvsie and the Partizánska Ľupča localities.

Division **Coilostega** Levinsen 1902
Family **Lunulitidae** Lagaaij 1952
Genus **Lunulites** Lamarck 1816

*Lunulites quadrata* (Reuss 1848)
(Pl. II: Fig. 5)

1848 *Cellepora quadrata* sp.n., Reuss p. 95, Pl. 11, Fig. 17
1869 *Lunulites quadrata* (Reuss 1848), Reuss p. 278, Pl. 28, Fig. 16
1963 *Lunulites quadrata* (Reuss 1848), Braga p. 25, Pl. 2, Fig. 8
1980 *Lunulites quadrata* (Reuss 1848), Braga p. 47, Fig. 37.
1988 *Lunulites quadrata* (Reuss 1848), Braga & Barbin p. 518.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**Description:** Zoaria free, conical, cupuliform disk in shape. Preserved are about one third of the whole colony. Rectangular zooecia arranged in radial rows. Orifice oval to circular. Mural rim narrow. The cryptocyst developed. Ovicell endozooecial, have not been observed. Avicularia as well as vibracula present small, oval.
**Remarks:** Only a fragment of a zoarium has been found. However, the shape and morphology of the zooecia allow us to determine the most probable species, but many of the specific features have not been preserved (mainly the ovicells). *Lunulites quadrata* (Reuss 1848) is the most common species of the genus in other Eocene sediments.
**Occurrence:** Východná

Family **Cothurnicellidae** Bassler 1935
Genus **Chlidoniopsis** Harmer 1957

*Chlidoniopsis vindobonensis* (Reuss 1848)
(Pl. I: Figs. 2-3)

1848 *Crisidia vindobonensis* sp.n., Reuss p. 54, Pl. 7, Fig. 25
1869 *Unicrisia tenerrima* sp.n., Reuss p. 279, Pl. 34, Fig. 7
1891 *?Catenaria tenerrima* (Reuss), Waters p. 5, Pl. 1, Fig. 11
1963 *Catenicella tenerrima* (Reuss), Braga p. 40, Pl. 4, Fig. 2
1980 *Chlidoniopsis vindobonensis* (Reuss 1848), Braga p. 49, Figs. 40, 41
1988 *Chlidoniopsis tenerrima* (Reuss), Braga & Barbin p. 519, Pl. 6, Figs. 5, 8

**Description:** Zoaria erect, not articulated. Zooecia drop-like, narrow, very long with enormously elongated proximal part — canda. The canda is as long as the rest of zooecium, sometimes even longer. Orifice terminal, with wide sinus on the proximal border. No avicularia or ovicells.
**Remarks:** The described specimens are identical with holotype of *Crisidia vindobonensis* Reuss 1848 as well as of the holotype of *Unicrisia tenerrima* Reuss 1869 deposited in the Natural History Museum in Vienna. Because *Crisidia vindobonensis* Reuss 1848 is the first description of this species it should be used instead of *Chlidoniopsis tenerrima* (Reuss). Braga (pers. comm, 1997) argues, that Reuss (1869) himself changed the name *vindobonensis* to *tenerrima*, because the species does not occur in the Vienna Basin but in Val di Lonte in Italy. However the name of species cannot be changed even by the author himself (according to Intern. Code of Nomencl.). So the occurrence of the species is not a reason for changing the species name, neither is it incorrect.
**Occurrence:** Štrba

Division **Pseudostega** Levinsen 1909
Family **Cellariidae** Hincks 1880
Genus **Cellaria** Ellis & Solander 1786

*Cellaria reussi* d'Orbigny 1851
(Pl. I: Figs. 4, 6)

1869 *Salicornaria Reussi* d'Orbigny 1851, Reuss p. 261, Pl. 29, Fig. 5
1963 *Cellaria reussi* d'Orbigny 1851, Braga p. 26
1980 *Cellaria reussi* d'Orbigny 1851, Braga p. 50, Fig. 43
1988 *Cellaria reussi* d'Orbigny 1851, Braga & Barbin p. 519, Pl. 6, Fig. 7

**Description:** Zoarium articulated, with cylindrical segments (internodes). Zooecia in four longitudinal rows, alternating with each other. Zooecia drop-like in shape, proximally tapering. Mural rim narrow, smooth. Cryptocyst concave, extensive, smooth. Orifice semilunar with enlarged proximo-lateral corners for parietal muscles. No avicularia. Ovicell endozooecial, small, have not been observed.
**Remarks:** Each zoarium can yield huge numbers of internodes, which is the reason for the large abundance of *Cellaria* fragments in the fossil record.
**Occurrence:** This is a common species at Štrba locality and is rarely found also at Hybica.

Family **Scrupocellariidae** Levinsen 1909
Genus **Scrupocellaria** van Beneden 1845

*Scrupocellaria brendolensis* Waters 1891
(Pl. I: Fig. 7; Pl. II: Figs. 3–4)

1891 *Scrupocellaria brendolensis* sp.n., Waters p. 7, Pl. 1, Figs. 14, 15
1975 *Scrupocellaria brendolensis* Waters 1891, Braga p. 146, Pl. 2, Figs. 1, 2
1988 *Scrupocellaria brendolensis* Waters 1891, Braga & Barbin p. 520, Pl. 6, Figs. 2–3

**Description:** Zoaria erect unilamellar (cellariiform), with two rows of zooecia. Zooecia with opesia as long as one half of the zooecial length. On the proximal margin of opesia, there is a triangular to oval avicularium with pivotal bar. A small, circular vibraculum is attached near the distal margin of the opesia. On the dorsal surface, each zooecium has a vibraculum.
**Remarks:** The specimens described by Braga & Barbin (1988) from Bressana have narrower zoaria and a small furrow separating adjacent zooecia on the dorsal surface of the zoarium. These features are not described by Waters (1891), however it could be explained by within species variation.

Two specimens found in Štrba have no frontal avicularia. *Scrupocellaria brendolensis* Waters 1891 differs from *Scrupocellaria elliptica* (Reuss 1848) mainly in having avicularia on the frontal surface of the zoarium. However the avicularia could be missed due to the bad presevation of the specimens. So these two specimens more probably belong to *Scrupocellaria brendolensis* Waters 1891 than to *Scrupo-*

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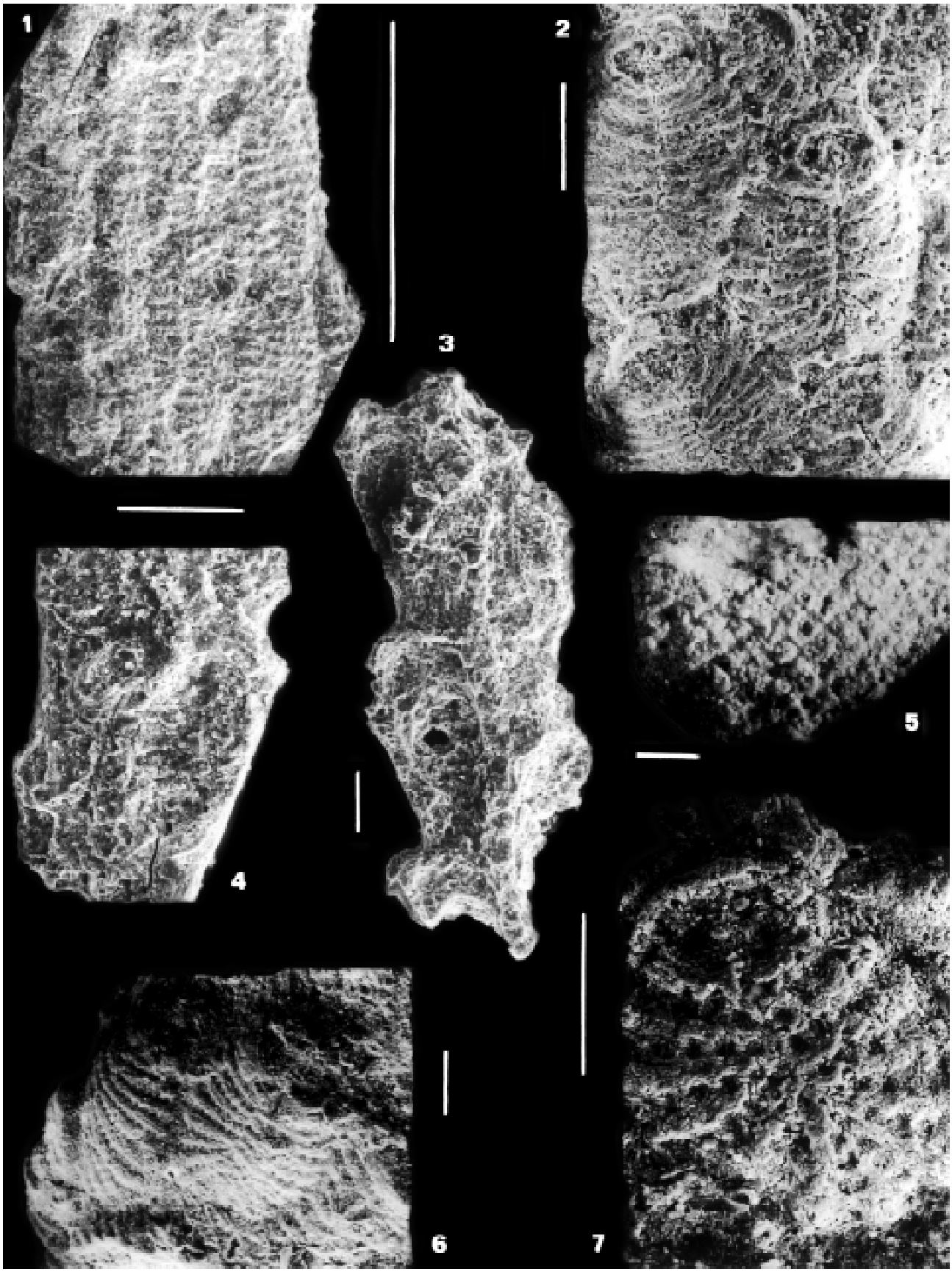
**Plate I: Fig. 1.** *Amphiblestrum appendiculata* (Reuss 1848) — Štrba locality, SEM BS 300, photo by I. Holický. **Figs. 2–3.** *Chlidoniopsis vindobonensis* (Reuss 1848) — Štrba locality, SEM BS 300, photo by I. Holický. **Fig. 4**. *Cellaria reussi* d'Orbigny 1851 — Štrba locality, SEM BS 300, photo by I. Holický. Detail of the zooecium showing orifice with enlarged proximo-lateral corners and cryptocyst. **Fig. 5.** *Puellina (Cribrilaria) scripta* (Reuss 1848) — Hybica locality, photo by the author. **Fig. 6.** *Cellaria reussi* d'Orbigny 1851 — Hybica locality, SEM Jeol, photo by J. Kulich. **Fig. 7.** *Scrupocellaria brendolensis* Waters 1891 — Štrba locality, SEM BS 300, photo by I. Holický. The specimens with no frontal avicularia. The bad preservation does not allow us to judge, if it is a *Scrupocellaria brendolensis* Waters 1891 or *Scrupocellaria elliptica* Reuss 1848. Scale bars represent 0.1 mm.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*cellaria elliptica* (Reuss 1848), which is the Miocene species (Schmid 1989).
**Occurrence:** Štrba locality

Division **Cribrimorpha** Lang1916
Family **Cribrilinidae** Hincks 1880
Genus **Cribrilaria** Canu & Bassler 1929

*Cribrilaria radiata* (Moll 1803)
(Pl. II: Figs. 6–7)

1920 *Puellina radiata* Moll, Canu & Bassler p. 294, Fig. 84/G-J, Pl. 41, Figs. 14–18
1974 *Cribrilaria radiata* (Moll), David & Pouyet p. 136
1980 *Cribrilaria radiata* (Moll), Braga p. 51, Fig. 50a
1988 *Cribrilaria radiata* (Moll), Braga & Barbin p. 521

**Description:** Zoaria encrusting. Zooecia oval with semilunar aperture. The width of the zooecium ranges from 0.146 mm to 0.261 mm and length is from 0.232 mm to 0.322 mm. Frontal wall consists of 6–8 pair of costae with very narrow lateral costal fusions. Median lamella not developed. Aperture semilunar. Oral spines sometimes missing, sometimes developed. Avicularium large, intrazooecial, with long rostrum, without pivotal bar. Hyperstomial ovicell with smooth frontal surface.
**Remarks:** According to David & Pouyet (1974) *Cellepora scripta* Reuss 1848 and *Cellepora megacephala* Reuss 1848 are junior synonyms of *Eschara radiata* Moll 1803. However Schmid (1989) pointed out that *Cellepora scripta* Reuss 1848 (and *Cellepora megacephala* Reuss 1848 as a junior synonym) is a different species — thus named *Puellina (Cribrilaria) scripta* Reuss 1848. Studying the holotype of Reuss material and reading the description of *Cribrilaria radiata* (Moll) by David & Pouyet (1974) I agree with Schmid's (1989) opinion and do not list *Cellepora scripta* Reuss 1848 and *Cellepora megacephala* Reuss 1848 among the synonyms of *Cribrilaria radiata* (Moll).
**Occurrence:** A common species at Hybica and Štrba localities

*Cribrilaria haueri* (Reuss 1848)
(Pl. II: Fig. 1)

1848 *Cellaria haueri* sp. n., Reuss p. 63, Pl. 8, Fig. 9
1848 *Eschara crenatimargo* sp.n., Reuss p. 72, Pl. 8, Fig. 38
1869 *Eschara haueri* (Reuss 1848), Reuss p. 271, Pl. 32, Figs. 14–16
1963 *Cribrilaria haueri* (Reuss), Braga p. 29, Pl. 3, Figs. 9–10
1988 *Cribrilaria haueri* (Reuss), Braga & Brabin p. 521, Pl. 7, Fig. 1

**Description:** Zoaria adeoniform, bifoliate, with 3 to 8 rows of zooecia. Zooecia elongate, two times longer than wide. Frontal wall consists of about 10 pairs of smooth costae. Lateral costal fusions are developed, producing 5 to 6 pores between each two costae. Median lamella not developed. Gymnocyst very short or not developed. Aperture semicircular to oval with apertural spines. Ovicell hyperstomial, oval, little elongated, with smooth surface. No avicularia.
**Remarks:** According to Braga (1991) *Eschara crenatimargo* Reuss 1848 is the junior synonym of this species. The described specimens are identical with the holotype deposited in the Natural History Museum in Vienna.
**Occurrence:** Hybica locality

Genus **Puellina** Jullien 1886

*Puellina (Cribrilaria) scripta* (Reuss 1848)
(Pl. I: Fig. 5)

1848 *Cellepora scripta* sp.n., Reuss p. 82, Pl. 9, Fig. 28
1848 *Cellepora megacephala* sp.n., Reuss p. 83, Pl. 10, Fig. 5
1989 *Puellina (Cribrilaria) scripta* (Reuss 1848), Schmid p. 26, Pl. 6, Fig. 10 (cum. syn.)

**Description:** Zoaria encrusting. Zooecia oval to circular. The average width of the zooecium is 0.224 mm and average length 0.491 mm. Frontal wall formed by 15 to 18 costae and lateral costal fusions producing 8 to 10 pores between each two costae. Median area small, porous. Aperture semilunar, narrow. No oral spines Avicularia large, intrazooecial, with long rostrate and pivotal bar. Hyperstomial ovicell semilunar, narrow, strongly convex, smooth, nonporous with smooth, low, median rib.
**Remarks:** The described specimens are very similar in shape of the ovicells and construction of the frontal shield to the holotype deposited in the Natural History Museum in Vienna. The size of the holotype is little larger (0.32×0.48 mm). However Schmid (1989) shows range of width of the zooecium from 0.20 to 0.48 mm and range of length of zooecium from 0.32 to 0.52 mm.
**Occurrence:** Štrba locality, with one probable specimen from Hybica locality.

Family **Pelmatoporidae** Lang 1916
Subfamily **Castanoporinae** Lang 1916
Genus **Anornithopora** Lang 1916

*Anornithopora pretiosa* (Reuss 1866)
(Pl. II: Fig. 2)

1866 *Lepralia pretiosa* sp.n., Reuss p. 175, Pl. 8, Fig. 4
1994 *Anornithopora*? *polygona* Voigt, Zágoršek p. 372, Fig. 6c

**Description:** Zoaria encrusting. Zooecia cribrimorph, oval, small. Frontal wall slightly convex, with about 20 costae. Areolar pores small, clearly visible. The costae form wrinkles in the median area of frontal wall. The median area is more than half as long again as the length of zooecium. Gymnocyst usually missing. Orifice oval, with wide peristome. No secondary aperture. Apertural bars wide, straight. No avicularia. Ovicells have not been observed.
**Remarks:** The described specimens are identical with *Lepralia pretiosa* described by Reuss 1866. According to Lang (1922) the genus *Anornithopora* has small zooecia, with

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**Plate II: Fig. 1.** *Cribrilaria haueri* (Reuss 1848) — Štrba locality, SEM BS 300, photo by I. Holický. **Fig. 2.** *Anornithopora pretiosa* (Reuss 1866) — Hybica locality, SEM BS 300, photo by I. Holický. **Figs. 3–4.** *Scrupocellaria brendolensis* Waters 1891 — Štrba locality, SEM BS 300, photo by I. Holický. (Fig. 4 detail of the frontal avicularium.) **Fig. 5.** *Lunulites quadrata* (Reuss 1848) — Východná locality, photo by the author. **Figs. 6–7.** *Cribrilaria radiata* (Moll 1803) — Hybica locality, SEM BS 300, photo by I. Holický. Scale bars represent 1 mm (Fig. 1 and 5) and 0.1 mm (remaining figures).

**Table 1:** List of the Anascan Bryozoa from the Western Carpathains (Slovakia).

| Taxa | RT | P | PL | H | S | V | Last description |
|---|---|---|---|---|---|---|---|
| *Alderina subtilimargo* (Reuss 1864) | * | * | * | * | | * | Zágoršek 1996a, p. 123, Pl. I, Fig. 3 - 5 |
| *Anornithopora pretiosa* (Reuss 1866) | | | | * | | | - |
| *Biflustra savartii texturata* (Reuss 1848) | | | * | | | * | Zágoršek 1996a, p. 123, Pl. I, Fig. 1 - 2 |
| *Calpensia gracilis* (Münster in Goldfuss 1826) | * | | | | | * | Zágoršek 1996b, p. 529, Pl. I, Fig. 7 |
| *Calpensia hexagona* Zágoršek 1994 | | | * | * | | | Zágoršek 1996b, p. 531, Pl. IV, Fig. 1, 2, 4 |
| *Calpensia polysticha* (Reuss 1848) | * | *? | | | * | | Zágoršek 1996b, p. 531, Pl. III, Fig. 7 |
| *Cellaria reussi* d'Orbigny 1851 | | | | * | * | | - |
| *Crassimarginatella macrostoma* (Reuss 1848) | * | * | * | * | * | * | Zágoršek 1996a, p. 123, Pl. I, Fig. 6, Pl. II, Fig. 1 |
| *Cribrilaria haueri* (Reuss 1848) | | | | * | * | | - |
| *Cribrilaria radiata* (Moll 1803) | | | | * | | | - |
| *Chaperia spinella* Zágoršek 1994 | | | * | | * | | Zágoršek 1996a, p. 125, Pl. II, Fig. 4 - 7 |
| *Chlidoniopsis vindobonensis* (Reuss 1848) | | | | | * | | - |
| *Lunulites quadrata* (Reuss 1848) | | | | | | * | - |
| *Onychocella subpyriformis* (d'Archiac 1846) | * | * | * | * | * | * | Zágoršek 1996b, p. 525, Pl. I, Fig. 1 - 6 |
| *Puellina (Cribrilaria) scripta* (Reuss 1848) | | | | *? | * | | - |
| *Amphiblestrum appendiculata* (Reuss 1848) | | *? | *? | | * | | - |
| *Rosseliana rosselii* (Audouin 1826) | | | | * | | | Zágoršek 1996b, p. 529, Pl. III, Fig. 6 |
| *Scrupocellaria brendolensis* Waters 1891 | | | | | * | | - |
| *Smittipora grandiconis* Zágoršek 1996 | | | | | | * | Zágoršek 1996b, p. 527, Pl. II, Fig. 1 - 5, Pl. IV, Fig. 3 |
| *Smittipora tenuis* (Canu & Bassler 1920) | | | * | | | | Zágoršek 1996b, p. 527, Pl. III, Fig. 1 - 3 |
| *Steginoporella cellariiformis* Cheetham 1963 | | | * | | | | Zágoršek 1996b, p. 533, Pl. IV, Fig. 5 |
| *Steginoporella haidingeri* (Reuss 1848) | * | | * | * | * | | Zágoršek 1996b, p. 531, Pl. IV, Fig. 6 - 7 |
| *Vibracella trapezoidea* (Reuss 1848) | | | * | | * | | Zágoršek 1996b, p. 529, Pl. III, Fig. 4 |

few costae (20 or fewer), no secondary aperture and very few or no avicularia. The described specimens are coherent with the genus *Anornithopora* in forming a median lamella, the apertural bar and in the absence of avicularia.

The new specimens from Štrba allow a more precise determination than the specimens from Hybica (Zágoršek 1994).
**Occurrence:** Štrba and Hybica localities

## Conclusions

Six Eocene localities with Bryozoa have been newly discovered in the Slovak part of the Western Carpathians. A total of 24 Eocene anascan Bryozoa (see Table 1) are known from the Slovak part of the Western Carpathians. The richest bryozoan associations are found at the Hybica and Štrba localities which have similar lithology. They also have the most species in common (six).

The environment of the localities is of two different types. First, shallow marine with *Lunulites* (and *Lacrimula*) where Bryozoa are common (Východná, Partizánska Ľupča localities, and probably also Rajecké Teplice and Poluvsie localities).

The second, neritic, margin of the shelf influenced by upwelling, where the bryozoan zoaria are only represented by allochems in the sediments (Zágoršek 1996).

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## References

Braga Gp., 1963: I Briozoi del Terziario Veneto. *Boll. Soc. Pal. It.,* 2, 1, 16–55.

Braga Gp., 1975: Briozoi dell'Eocene di Possagno. *Schweiz. Paläont. Abh.,* 97, 141–148.

Braga Gp., 1980: Paleontology. In: Antolini P., Braga G.& Finotti F. (Eds.): *I Briozoi dei dintorni di Rovereto. Monte Baldo settentrionale e Valle di Gresta. Mus. Civ. Rovereto,* 82, 1–103.

Braga Gp., 1991: Reuss' collection of Cheilostome Bryozoans from Venetia stored in Natur-Historisches Museum Wien: A Proposed Revision. In: Bigey: *Bryozoa living and fossil. Bull. Soc. Sci. Nat. Ouest Fr., Mem. HS,* 1, 49–59.

Braga Gp. & Barbin G., 1988: Les Bryozoaries du Priabonien Stratotypique (Province Vicenza, Italie). *Revue de Paleobiologie,* 7, 2, 495–556.

Braga Gp. & Munari M., 1972: Studi biometrici su due popolazioni di *Conescharellina* (*C. perfecta* Accordi e *C. veronensis* Accordi) dell'Eocene superiore del Veneto. *Studi Trent. Sc. Nat. sec. A,* 49, 111–126.

Canu F. & Bassler R.S., 1920: North American Early Tertiary Bryozoa. *U.S. Nat. Mus. Bull.,* 106, 1–879.

David L. & Pouyet S., 1974: Revision des Bryozoaires Cheilostomes miocenes du Bassin de Vienne (Autriche). *Doc. Lab. Geol. Fac. Si. Lyon,* 60, 83–257.

Gordon D., 1984: The Marine Fauna of New Zealand: Bryozoa: Gymnolaemata from the Kermadec Ridge. *New Zealand Oceanographic Institute Memoir 91, Wellington,* 1–198.

Gordon D., 1986: The Marine Fauna of New Zealand: Bryozoa: Gymnolaemata (Ctenostomata and Cheilostomata Anasca) from the Western South Island Continental Shelf and Slope. *New Zealand Oceanographic Institute Memoir 95, Wellington,* 1–121.

Gross P., Köhler E. & Samuel O., 1984: New lithostratigraphical division of Inner-Carpathian Paleogene. *Geol. Práce, Spr.,* 81, 103–117 (in Slovak).

Gross P. & Köhler E., Eds., 1980: Geology of Liptov Basin. *GÚDŠ,* Bratislava, 1–217 (in Slovak).

Lang 1922: Catalogue of the Fossil Bryozoa (Polyzoa). Vol. IV The Cretaceous Bryozoa (Polyzoa), the Cribrimorphs part II. *British Museum (Natural History),* London, 1–404 .

Reuss A.E., 1848: Die fossilen Polyparien des wiener Tertiärbeck-

ens. *Ein monographischer Versuch. Naturwiss. Abhadlung.,* 2, 1, 1–109.

Reuss A.E., 1866: Die Foraminiferen, Anthozoen und Bryozoen des deutschen Septarienthones. Ein Beitrag zur Fauna der mitteloligocänen Tertiärschichten. *Denkschr. k. Akad. Wiss., Math.-Naturwiss. Cl.,* 25, 117–214.

Reuss A.E., 1869: Paläontologische Studien über die älteren Tertiärschichten der Alpen. 2) Die fossilen Anthozoen und Bryozoen der Schichtengruppe von Crosara. *Denkschr. k. Akad. Wiss., Math.- Naturwiss. Cl.,* 29, 215–294.

Schmid 1989: Cheilostome Bryozoen aus dem Badenien (Miozän) von Nußdorf (Wien). *Beiträge zur Paläontologie von Österreich,* 15, 1–70.

Waters A.W., 1891: North-Italian Bryozoa. *Quart. Jl. Geol. Soc.,* 47, 1–34.

Zágoršek K., 1994: Late Eocene (Priabonian) Cheilostomata Bryozoa from Liptov Basin — Western Carpathians (Slovakia). *N. Jb. Geol. Paläont. Abh.,* 193, 3, 361–382.

Zágoršek K., 1996: Paleoecology of the Eocene bryozoan marl in the Alpine-Carpathian region. In: Gordon D.P., Smith A.M. & Grant-Mackie J.A. (Eds): *Bryozoans in Space and Time. National Institute of Water & Atmospheric Research*, 413–422.

Zágoršek K., 1996a: Eocene Membraniporiform Bryozoa from the Western Carpathians. *Miner. slovaca,* 28, 120–128 (in Slovak).

Zágoršek, K., 1996b: Eocene Coilostega Bryozoa from the Western Carpathians. *Miner. slovaca,* 28, 523–534 (in Slovak).