

Linzer biol. Beitr.	38/1	93-99	21.7.2006
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## Lower Sarmatian Bryozoa from brackish sediment in the northern part of the Danube Basin (Dubová, Slovakia)

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**Abstract:** Rich Early Sarmatian fauna from a new section near the village Dubová consists of gastropods, bivalves, foraminifers, ostracods, bryozoans and cysts of algae. The bryozoans represent the first occurrence in Sarmatian sediments of the Slovak part of the Danube Basin. The bryozoan species *Tubulipora cumulus* (Sinzow), *Schizoporella tetragona* (REUSS), *Hippopleurifera* cf. *semicristata* (REUSS), *Hippadenella regularis* (REUSS) and *Celleporina* sp. were identified. The association from Dubová is interpreted as lived in warm climate, in shallow, brackish water.

**Key words:** Danube Basin, Slovakia, Early Sarmatian, Bryozoa, taxonomy.

### Introduction

A new section with Early Sarmatian sediments were excavated near the village Dubová during the constructing works of a dump place (Fig. 1). The village Dubová is situated about 10 km north of the city Pezinok (Slovakia), on the eastern slope of the Malé Karpaty Mts.

Abundant gastropods, bivalves, foraminifers, ostracods and bryozoans have been found in these deposits. The age of the sediments has been dated as Early Sarmatian – *Elphidium reginum* biozone based on foraminifera (GRIL 1941), *Rissoa* Beds based on molluscs (PAPP 1954) and *Cytheridea hungarica* – *Aurila mehesi* assemblage zone by ostracodes (ZELENKA 1990). The bryozoans here studied are the first Sarmatian bryozoans from the sediments of the Slovak part of the Danube basin.

### Material and methods

Bryozoans were, before detailed taxonomic study, cleaned and treated as described by ZÁGORŠEK & VÁVRA (2000). Each determined species were studied and documented through a Jeol type JSM-6400 SEM in the Paleontological department of Vienna University. The described specimens are deposited in the National Museum in Prague.

### Bryozoa

This is the first report of Sarmatian Bryozoa from Slovakia. Large colonies of *Celleporina* sp. and cyclostomatous colonies of *Tubulipora cumulus* (SINZOW 1892) as described by GHIURCA & STANCU (1974) dominated in the association studied.

Except of Bryozoa, sediments of Dubova yield eleven species of gastropods, five species of bivalves, twenty-three species of foraminifers, six species of ostracods and calcareous cysts of the alga *Chalmasia moreletii* POKORNÝ.

Phylum Bryozoa EHRENBERG 1831  
 Class Stenolaemata BORG 1926  
 Order Cyclostomata BUSK 1852  
 Suborder Tubuliporina MILNE EDWARDS 1838  
 Family Tubuliporidae JOHNSTON 1838  
 Genus *Tubulipora* LAMARCK 1816

#### ***Tubulipora cumulus* (SINZOW 1892) Fig. 2/1-2**

1974 *Tubulipora cumulus* (SINZOW) – GHIURCA & STANCU p. 305, Pl. 1, Fig. 7

**M a t e r i a l:** Six almost complete, delicate, erect colonies with zooecial tubes arranged in irregular fascicles composed of 2 to 3 circular zooecial apertures. Zooecial walls are sparsely pseudoporous and smooth. No gonozooecia observed.

**R e m a r k s:** The studied specimens are almost identical with the description and illustration published by GHIURCA & STANCU (1974). Although there was no opportunity to study the original material of *Tubulipora cumulus* (SINZOW, 1892), because this is the typical brackish water species in Eastern Europe and Asia, we believe that its occurrence in Danube basin is possible.

**D i s t r i b u t i o n:** Sarmatian (Miocene): Petricani, Visterniceni (Moldavia), Buciumi, Copacel, Valea Morilor (Romania) and Lapusna – d'Orheiu (Bessarabian), GHIURCA & STANCU (1974).

Class Gymnolaemata ALLMAN 1896  
 Order Cheilostomata BUSK 1852  
 Infraorder Lepraliomorpha GORDON 1989  
 Superfamily Schizoporelloidea JULLIEN 1883  
 Family Schizoporellidae JULLIEN 1883  
 Genus *Schizoporella* HINCKES 1877 (= *Multiporina* D'ORBIGNY 1852)

#### ***Schizoporella tetragona* (REUSS 1848) Fig. 2/6**

v\* 1848 *Cellepora tetragona* m. – REUSS p. 78, Pl. 9, Fig. 19

1957 *Schizoporella tetragona spongitiiformis* SAULEA-BOCEC 1943 – BOBIES p. 87, Pl. 7, Fig. 6, Pl. 8, Fig. 7-11, Pl. 10, Fig. 28

1974 *Schizoporella tetragona* (REUSS) – DAVID & POUYET p. 156, Pl. 15, Fig. 1

v. 1977 *Schizoporella tetragona* (REUSS) – VÁVRA p. 119 (cum. syn.)

1989 *Schizoporella tetragona* (REUSS) – SCHMID p. 43, Pl. 12, Fig. 8

**M a t e r i a l:** One fragment of an encrusting colony, with zooecia arranged in ir-

regular series. Zooecia have a characteristic quadrate shape with a prominent suboral avicularium and orifice with a wide sinus. Ovicells are hyperstomial, globular with granular frontal wall.

**R e m a r k s :** The single specimen exhibits all of the characteristic features of this species, except that the avicularia are a little larger than in the type material deposited in the Natural History Museum in Vienna. This species has also reported from brackish water deposits, although very rarely.

BOBIES (1957) listed multilamellar colonies of this species under a different subspecies name (*Schizoporella tetragona spongiformis*). There are no differences, however in morphology of the autozooecia between these subspecies and therefore the unusual growth form is perhaps only an adaptation to particular environmental conditions.

**D i s t r i b u t i o n :** widely distributed taxon around Alpine-Carpathians region:

Badenian (Miocene): many localities in Vienna Basin, mainly in Nussdorf, Eisenstadt (Austria – SCHMID 1989) and Hlohovec, Mikulov (Czech – personal observation of ZÁGORŠEK), many localities in Carpathian Foredeep mainly in Židlochovice, Podbřežice and Kralice nad Oslavou (personal observation of ZÁGORŠEK).

Sarmatian (Miocene): Schleinbach, Kalch (Austria – BOBIES 1957), Lapusna – d'Orheiu (Bessarabian – BOBIES 1957).

Superfamily Lepralielloidea VIGNEAUX, 1949

Family Umbonulidae CANU, 1904

Genus *Hippopleurifera* CANU, 1927

***Hippopleurifera* cf. *semicristata* (REUSS 1848) Fig. 2/4**

\*1848 *Cellepora semicristata* m. – REUSS p. 82, Pl. 10, Fig. 3

1974 *Hippopleurifera semicristata* (REUSS) – DAVID & POUYET p. 153, Pl. 11, Fig. 7

1977 *Hippopleurifera semicristata* (REUSS) – VÁVRA p. 113 (cum. syn.)

**M a t e r i a l :** One fragment of an encrusting colony, with zooecia arranged in irregular series. Zooecia have a characteristic convex frontal wall perforated by numerous, large pores. The orifice is very wide with well-developed cardelles. No ovicells and avicularia observed.

**R e m a r k s :** The specimen studied exhibits the characteristic development of the frontal wall and orifice as seen in *Hippopleurifera semicristata* (REUSS 1848), which has a nonporous area proximal of the orifice. Because ovicells and avicularia were not developed on the studied specimen, and this species has never been reported from brackish water, species attribution remains uncertain.

**D i s t r i b u t i o n :** Badenian (Miocene): Vienna basin: Eisenstadt (Austria – VÁVRA 1977), Nussdorf (Austria – SCHMID 1989), Hlohovec (Czech – VÁVRA 1977), Carpathian Foredeep: Židlochovice, Kralice and Holubice (Czech – personal observation of ZÁGORŠEK), Miechowicz (Poland – VÁVRA 1977).

Family Hippoporinidae BASSLER, 1935

Genus *Hippadenella* CANU & BASSLER, 1917

***Hippadenella regularis* (REUSS 1874) Fig. 2/5**

\* 1848 *Lepralia regularis* m. – REUSS p. 168, Pl. 2, Fig. 1

1974 *Hippadenella regularis* (REUSS) – DAVID & POUYET p. 177, Pl. 10, Fig. 5

1977 *Hippadenella regularis* (REUSS) – VÁVRA p. 129

**M a t e r i a l :** Three fragments of erect colonies, with zooecia arranged in regular longitudinal rows. Zooecia have a characteristic convex, granular, nonporous frontal wall perforated marginally by small areolar pores. The orifice is wide with well developed cardelles. A small, circular to key-shaped suboral avicularium is sometimes developed near the proximal margin of the orifice. No ovicells observed.

**R e m a r k s :** The investigated specimens exhibit all of the characteristic features, mainly the regular growth pattern of the zooecia and small key-shaped suboral avicularium, that are seen in the holotype deposited in the Natural History Museum in Vienna and studied by ZÁGORŠEK (personal investigation). Although this species has never been previously reported from brackish water, its morphology allows a precise determination.

**D i s t r i b u t i o n :** Badenian (Miocene): Vienna basin: Podivín (Czech – REUSS 1874), Carpathian Foredeep: Kralice nad Oslavou, Židlochovice and Holubice (Czech – personal observation of ZÁGORŠEK).

Superfamily Celleporoidea JOHNSTON, 1838

Family Celleporidae JOHNSTON, 1838

Genus *Celleporina* GRAY, 1848

***Celleporina* sp. Fig. 2/6**

**M a t e r i a l :** Three fragments of multilamellar colonies. Zooecia are recumbent at colony margins, suberect, arranged chaotically on the surface of the colony. Zooecia are oval to circular with convex, nonporous frontal walls and rare marginal areolar pores. The terminal orifice has a well-developed, wide sinus and are situated on a short peristome. Condyles are slightly prominent. Avicularia sub-oral, adventitious, usually one near to the proximal margin of each orifice, rarely paired. Ovicells are hyperstomial, prominent and globular, with a perforated frontal area and smooth, nonporous margins. The perforated area is subcircular to semilunar with 5 to 7 thick radial ridges. Ovicellate zooecia may develop usually two suboral avicularia.

**R e m a r k s :** Due to the presence of a sinuate orifice, smooth frontal wall with scattered marginal pores, hyperstomial ovicell with perforated frontal area and the absence of oral spines, this species is assigned to *Celleporina* as understand by HAYWARD & RYLAND (1999).

No known species of *Celleporina* has the combination of thick radial ribs in the perforated area of the ovicells and only one suboral avicularium. We have however not enough specimens to erect a new species.

**Discussion**

Bryozoans from brackish environment were described very rarely. BOBIES (1957) was the first (and last up to now), who mentioned Bryozoa from non-marine sediments form

surrounding countries. He described 10 species from Austrian Sarmatian, only *Schizoporella tetragona* (REUSS 1848) occurs also in studied locality. GHIURCA & STANCU (1974) described *Tubulipora cumulus* (SINZOW 1892) from brackish sediments of Romania. POUYET (1973) pointed out, that *Celleporina* could also survived in water with lower salinity. The presence of *Hippopleurifera* cf. *semicristata* (REUSS 1848) and *Hippadenella regularis* (REUSS 1874) is the first occurrence of these species in brackish water.

Ecological requirements of the identified species and genera of molluscs, foraminifera and ostracods in the studied association indicate shallow littoral to sublittoral environment at depths of up to 30 m, with sandy to sandy-clay bottoms and well aerated, brackish water on a warm climate.

### Acknowledgement

Many thanks go to Prof. N. Vávra and Dr. R. Zetter (Institute of Palaeontology, Vienna University, Austria) for their help with photography and comments.

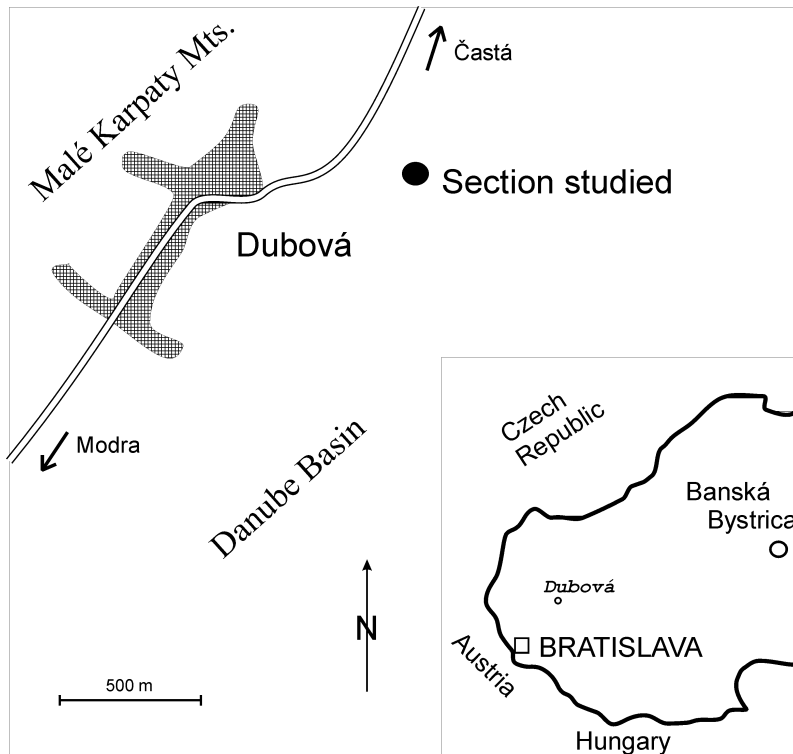
The research was supported by FWF (Fonds zur Förderung der wissenschaftlichen Forschung, Austria) through Project P15600 and by Ministry of Culture of Czech Republic MK00002327201.

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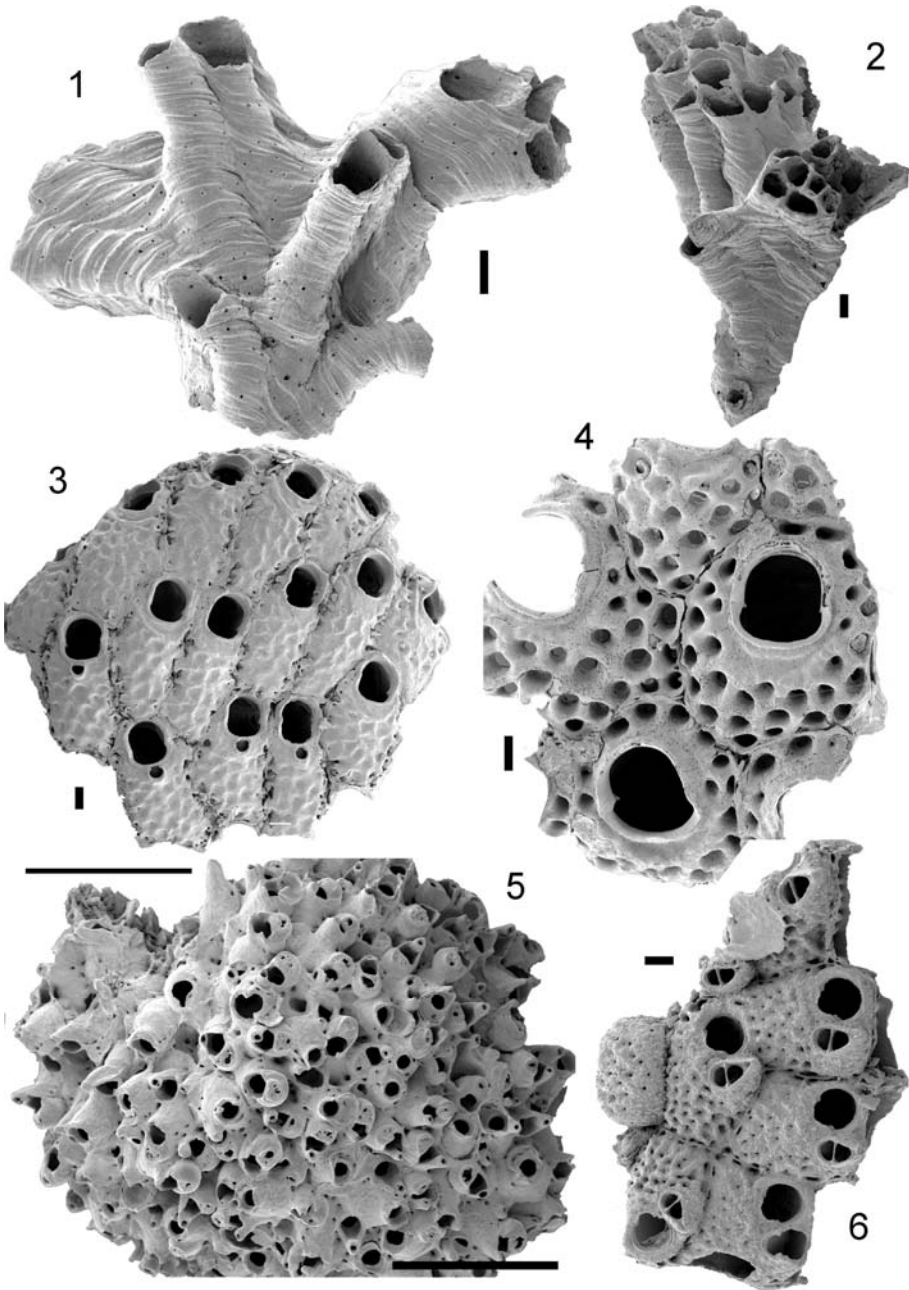
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**Fig. 1:** Geographical sketch of the locality Dubová.

**Fig. 2:** Bryozoa: (1-2) *Tubulipora cumulus* (Sinzow 1892). Note marked concentric grown lines, apertures arranged in fascicles and porous frontal walls. (3) *Hippadenella regularis* (Reuss 1874). General view showing wide apertures with characteristic key-shaped suboral avicularium (visible on lower rows of zooecia). (4) *Hippoleurifera* cf. *semicristata* (REUSS 1848), fragment of colony with characteristically developed apertures and large pores on frontal wall. (5) *Celleporina* sp. general view showing small suboral avicularia, lateral areolar pores and ovicells with semicircular windows. (6) *Schizoporella tetragona* (REUSS 1848). Detail of few zooecia with visible characteristic aperture with wide sinus and large oral avicularia with prominent pivotal bar. All pictures were made in Paleontological Institute of Vienna University in SEM Jeol type JSM-6400 by Dr. K. Zágoršek. Scale bar 100  $\mu$ m.



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Band/Volume: [0038\\_1](#)

Autor(en)/Author(s): Zagorsek Kamil, Fordinal Klement

Artikel/Article: [Lower Sarmatian Bryozoa from brackish sediment in the northern part of the Danube Basin \(Dubová, Slovakia\) 93-99](#)