

Ottangian Bryozoa and Foraminifera from the Vienna Basin (Slovakia)

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Abstract. The Ottangian sediments are very poor in remnants of Bryozoa in the Alpine-Carpathian region. A bryozoan association has been reported from the Ottangian sediments of the borehole Cunín 4 and Cunín 21 (in the vicinity of Kopčany village). The age was proved mainly by Foraminifera *Amphicoryna ottangensis* (TOULA) and *Pappina breviformis* (PAPP et TURN) known only from the Ottangian sediments (NN3 zone sensu Martini 1971). Altogether 25 Bryozoa species and 45 Foraminifera species were determined, described and documented. "*Ceriodora*", *Hornera* and *Cellaria* are the dominant Bryozoa genera here. The other macrofauna was represented by fragments of *Balanus*, Hydrozoa and rare undeterminably preserved molluscs. The studied association of Bryozoa is very similar to those described from Austria (Gauderndorf, lower Austria), which is the Eggenburgian in age and to the association from Hungary (Fót, near Budapest), which age is the Karpatian. The similarity is based mainly on the presence of *Cellaria*, "*Ceriodora*" and fragments of *Balanus*. On the other hand the Foraminifera associations of the mentioned localities are completely different.

Key words: Vienna Basin, Miocene, Ottangian, Bryozoa, Foraminifera.

Introduction

During the investigation of the Miocene sediments from the boreholes made by Nafta Gbely Inc. in the northern part of the Vienna Basin a sediment rich in Bryozoa has been found. Altogether 25 bryozoan species have been determined. The age of this sediment was determined on the basis of Foraminifera accompanying bryozoans as the Ottangian (NN3 nannoplankton zone sensu Martini 1971).

The Ottangian Bryozoa are very rare in the Alpine-Carpathian region. Only poorly preserved Bryozoa fauna in the Molasse Zone have been discovered until now. Kühn (1965) reported 6 species from Bavaria and Vávra (1981) found several bryozoan species in the Höch (near Passau). The sediments from the Vienna Basin yielded few Ottangian bryozoans (Vávra, pers. com, 2000). Therefore the studied association is the richest bryozoan fauna of the Ottangian age in the Alpine Carpathians region.

Material and methods

Studied area, called Cunín, is situated in the northern part of the of the Vienna Basin near Kopčany village (Fig.1). The Neogene sediments overlay the flysch nappes of the Western Carpathians here. The Neogene sedimentation of this area starts by the Eggenburgian basal conglomerates, which probably do not reach the basin elevation. The Ottangian sediments overly the flysch basement (Jiríček 1988) here and upward pass into the Karpatian deposits (reg. stages Eggenburgian,, Ottangian and Karpatian = Burdigalian).

For the purpose of this paper 30 samples from the sandy horizon of the following boreholes have been studied: Cunín 35, Cunín 5, Cunín 6, Cunín 8, Cunín 11, Cunín 22, Cunín 41 and Cunín 49. The core material is represented especially by the coarse to fine coarse sands with the clay intercalations. Samples from the Cunín 21, Cunín 4 contain bryozoan remnants. Foraminifera have been found in samples from Cunín 8, Cunín 11, Cunín 22, Cunín 41 and Cunín 49. Washed bryozoans from the studied samples have been soaked in 10% water solution of Quaternary „O“™ for approximately one day. The chemical formula of Quaternary „O“™ is as follows: 1-dihydroxyethyl – 2-heptadekenyl imidazoline chloride = $C_2H(OH)_2 C(C_{10}H_{18})_5 C_2HN_2Cl$. For the method details see Zágoršek & Vávra (in press). Foraminifera were separated by obvious laboratory methods.

Results

The rich foraminiferal associations have been recorded in the studied material. Despite the fact that this sediments were determined as the Eggenburgian in age in the revision by HUDEC 1991, their age was estimated as the Ottangian (this paper). The age of sediments was determined on the base of the occurrence of the Foraminifera species *Amphicoryna ottangensis* (Toula) and *Pappina breviformis* (Papp et Turn) which are known only from the Ottangian regional stage (Cicha et.al. 1998).

From the paleoecological point of view and according to the statistical analysis of foraminifera a mixture of two paleoecological associations can be assumed here. One of them is the shallow water association with low-

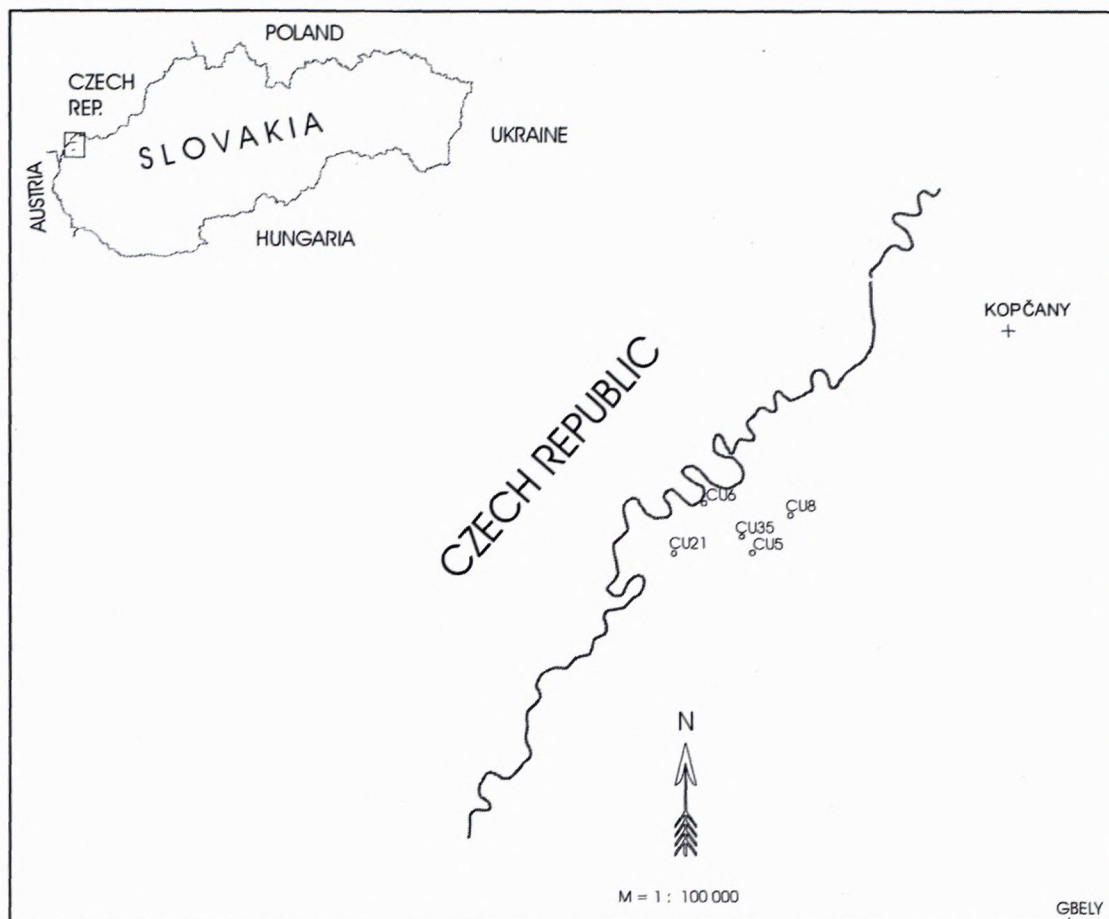


Fig. 1 Localization of the studied boreholes

ered salinity represented by dominance of the *Ammonia* ex gr. *beccarii* (Linne) and the second one, highly diversified neritic association rich in *Pappina breviformis* (Papp et Turn.), *Cibicidoides ungerianus* (Orb.), *Amphicoryna ottnagiensis* and *Bolivina* sp.. This fact is supposed to be caused by short transport from the littoral shallow water marginal facies into the shallow neritic conditions. From the Cunín 4 borehole core only the shallow water foraminifer associations have been recorded in the samples. The possibility of the environment probably with lowered salinity, which are documented by dominance of *Ammonia* ex gr. *beccarii* (L.) (90%), which can refer to more marginal position of the deposition. In the Hungarian area the sediments rich in bryozoans (with similar bryozoan association as in the Cunín area) are poor in Foraminifera – only one area (Fót - Budapest) contained association with *Pararotalia aculeta* (Orb.) documented more marginal position too. Unfortunately, Foraminifera have not been studied in the sample material from Austria containing bryozoans (Gauderndorf, lower Austria).

Bryozoa fauna from the Cunín 21 and Cunín 4 boreholes is unusually rich. The fauna consists of 12 Cyclostomata and 13 Cheilostomata species. Dominant species belong to *Hornera* (Cyclostomata) and *Cellaria* (Cheilostomata). Many Bryozoa specimens belong to undeterminable group of "*Cellepora*". *Myriopora truncata* (Pallas, 1766) and *Tretocyloclecia dichotoma*

(Reuss, 1848) are abundant species as well. Other species occur only in one or two specimens. The complete list of determined Bryozoa species are given in Tab. 1.

The fragments of *Balanus* represent the most common fossil except for Bryozoa within the studied sediment. Other organic remains (fragments of molluscs, foraminiferal tests, Hydrozoa, and Echinoidea) are associated with them.

Until now the only described Ottnangian bryozoan fauna from the Alpine Molasse Zone yielded 6 species, from which *Steginoporella* and "*Cellepora*" genera dominated (Kühn, 1965). Within the studied material no *Steginoporella* have been found, and species of "*Cellepora*" are not as common as in the described association from the Vienna Basin. On the other hand, four from six species described by Kühn (1965) have been found also in the studied boreholes.

Vávra (1981) mentioned *Steginoporella* also from other Ottnangian localities. He argued that the presence of *Steginoporella* is an indicator of migration from the western Europe into the Molasse Zone during the Ottnangian (Vávra 1981). Although *Steginoporella* does not occur in studied area near Kopčany many other bryozoan species accompanying *Steginoporella* have been found. Taking in consideration, that we have only limited amount of sediment to study, we believe, that nevertheless, *Steginoporella* does not occur in Cunín, the studied

Tab. 1

taxa	C 21/875	C 21/930	C 21/936,5	C 21/940	C 4/897
<i>Balanus</i> sp.	1	1	1	1	1
"Celleporidae"	1		1	1	1
<i>Adeonella polystomella</i> (REUSS, 1848)			1		1
<i>Cellaria fistulosa</i> Auct (REUSS)	1				1
<i>Cellaria mandibulata</i> HINCKS, 1882	1	1			
<i>Cellaria</i> sp.		1			
<i>Celleporaria globularis</i>		1	1		1
<i>Crisidmonea foraminosa</i> (REUSS, 1866)			1		
<i>Disporella</i> cf. <i>goldfussi</i> (REUSS, 1864)	1				
<i>Exidmonea atlantica</i> D., M. & P., 1972		1			
<i>Fedora auingeri</i> (REUSS, 1874)		1			1
<i>Heteropora anomalopora</i> REUSS, 1848		1			1
<i>Hornera</i> cf. <i>frondiculata</i>	1				
<i>Hornera frondiculata</i>		1			
<i>Hornera reteporacea</i> MILNE EDWARDS, 1838		1			1
<i>Hornera</i> sp.n.					1
<i>Hornera striata</i> MILNE EDWARDS, 1838		1			
<i>Mecynoecia</i> cf. <i>geinitzi</i>		1			1
<i>Mecynoecia pulchella</i> (REUSS, 1848)		1	1		1
<i>Membraniporella ungeri</i> (REUSS, 1848)			1		
<i>Myriopora truncata</i> (PALLAS, 1766)		1	1		1
<i>Reteporella gigantea</i> KUHN					1
<i>Rosseliana incompta</i> (REUSS, 1848)	1		1		
<i>Schizoporella geminipora</i> (REUSS, 1848)					1
<i>Tretocyloecia dichotoma</i> (REUSS, 1848)		1			1
<i>Turbicellepora coronopus</i> (WOOD, 1844)	1				
Total 25	7	14	9	2	15

sediments belong perhaps to the same sea way migration track from the Mediterranean towards Central Europe.

The studied association of Bryozoa is very similar to the association described from Austria (Gauderndorf, lower Austria), which is the Eggenburgian in age (Kühn, 1925 and Vávra, 1979). Sediment is also the fine grained conglomerate to sand stone with dominance of the Bryozoa and *Balanus* fragments. Molluscs (bivalves), brachiopods, and echinoids occur as well. Up to now 29 species have been determined from this locality (Vávra, pers. com, 2000). *Schizoporella*, *Umbonula* and *Callopora* are dominant genera in bryozoan fauna. The representatives of "*Cellepora*" are rare.

Kókay (1967, 1993) described Bryozoa-Balanus sandstone near Bárapusta village (Várpalota, Hungary), which is the Karpatian in age. The lithofacies is very similar to those found in Cunín. It is the conglomerate to sandstone with dominance of fragments of the Bryozoa and with common *Balanus*. The other fauna is very limited and rare. The main difference is in absolute predominance of "*Cellepora*" with the bryozoans fauna. The

other bryozoan species are very rare. Only 10 bryozoan species could be distinguished on the basis of preliminary study made by the first author.

Sediments of the Fót Formation (Noszky 1935) exposed in the abandoned quarry near Fót village (Budapest, Hungary) are very similar as well. Sediment represent the sandstone to fine grained conglomerate with the dominance of Bryozoa and *Balanus* fragments. Other fauna is represented by molluscs (mainly bivalves) and echinoids. The age of the deposits is the Karpatian. Although the sedimentary facies is very similar to those from Cunín, but the bryozoans fauna is completely different. The Fót formation yielded more than 80 species of Bryozoa. The "*Cellepora*" bryozoans are very rare, dominant species belong to *Reteporella*, *Schizoporella*, and *Porina* genera.

We suppose that the Bryozoa - *Balanus* facies represents particularly special, unusual environmental conditions. These conditions, which are very suitable for bryozoans occurred for first time during the Eggenburgian in the Molasse Zone in Austria (Gauderndorf). Later (in Ottnangian), the same conditions occurred in the

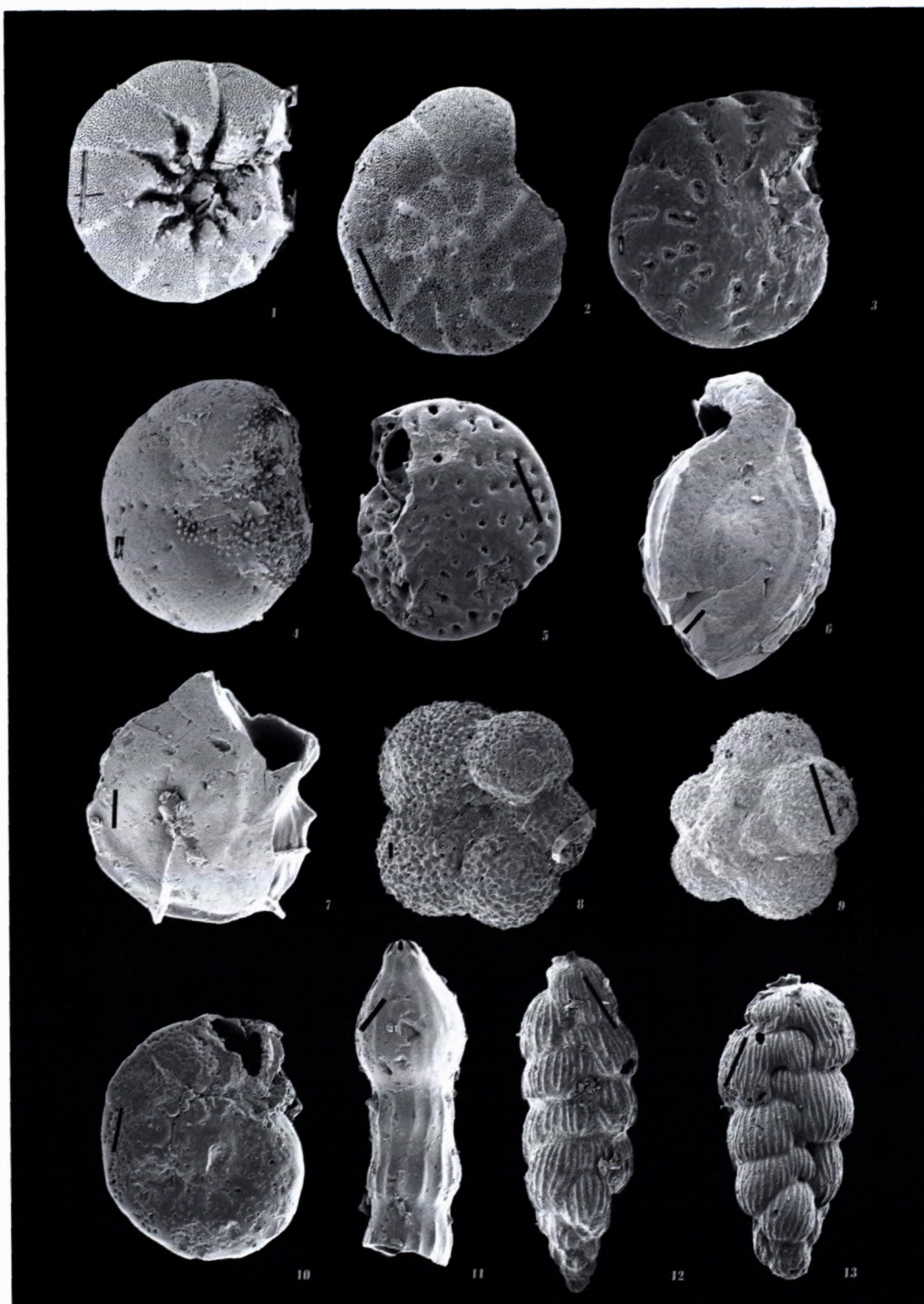


Plate I.

1. *Ammonia* ex. gr. *beccarii* (Linne) Cunín 21, 930m; 2. *Ammonia* ex. gr. *beccarii* (Linne) Cunín 21, 930m; 3. *Elphidium* cf. *excavatum* (TERQUEM) Cunín 21, 930m; 4. *Ephidiella heteropora* (EGGER) Cunín 21, 930m; 5. *Elphidium* cf. *subtypicum* PAPP Cunín 21, 930m; 6. *Spiroloculina* aff. *excavata* Cunín 4, 897; 7. *Lenticulina* sp. cf. *calcar* (LINNE) Cunín 4, 897; 8,9. *Globigerina ottnangiensis* ROEGL, Cunín 21, 930m; 10. *Cibicidoides ungerianus* (ORB.) Cunín 4, 897; 11. *Amphicoryna ottnagensis* (TOULA) Cunín 11, 905,5m; 12,13. *Pappina breviformis* PAPP Cunín 21, 930m 897

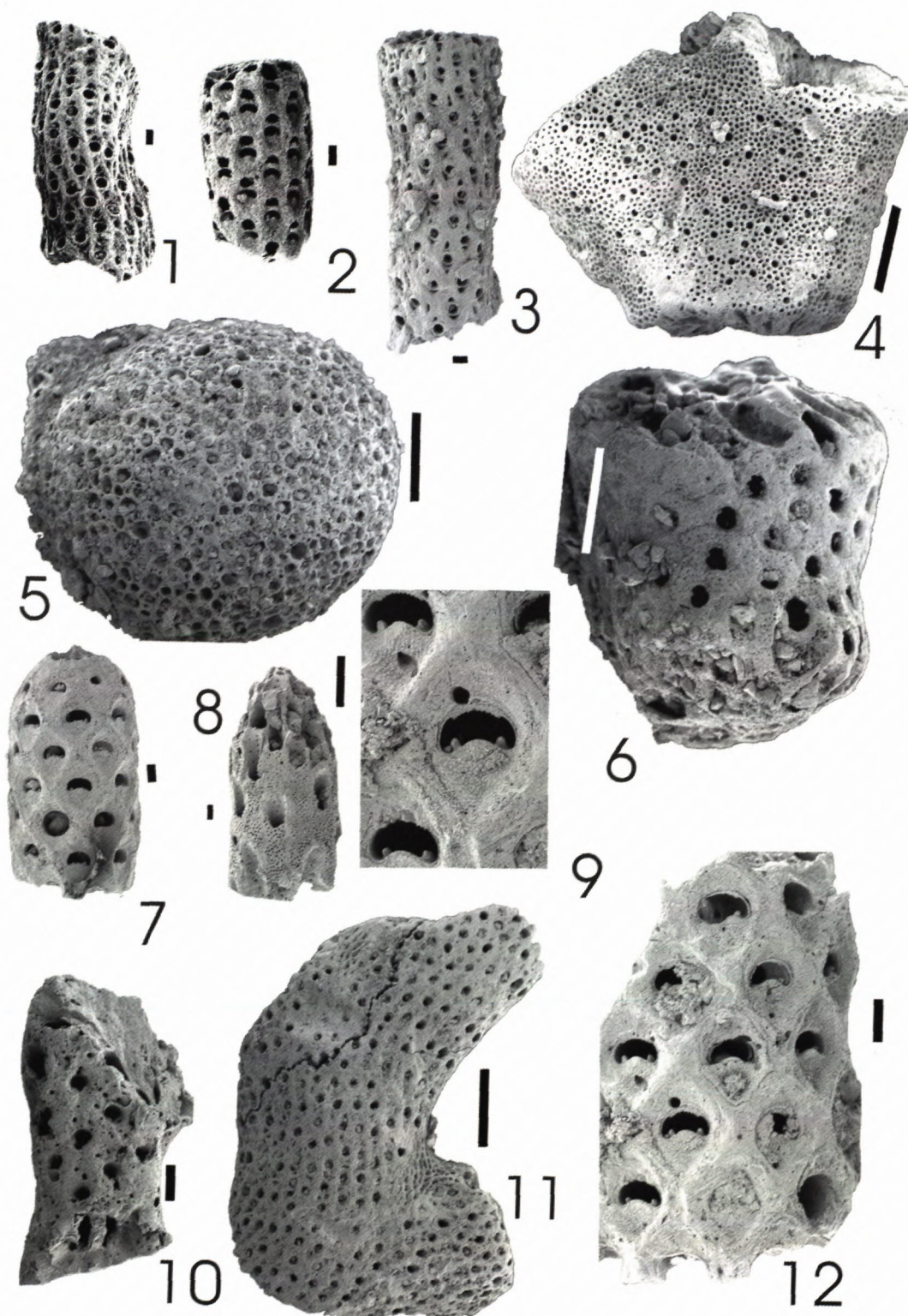


Plate II.

1. *Hornera frondiculata* Auct. Frontal view. Cunín 21/930; 2. *Cellaria fistulosa* Auct. General view with visible ovicells above the each zooecial aperture. Cunín 21/930; 3. *Hornera striata* MILNE EDWARDS, 1838. Frontal view with visible one large vacuole above and below the aperture. Cunín 21/930; 4. *Tretocycloecia dichotoma* (REUSS, 1848). General view of large colony shows large apertures and small pores. Cunín 21/930; 5. "*Cellepora*" (similar to *Celleporaria globularis* (BRONN, 1837). Cunín 21/930; 6. *Myriopora truncata* (PALLAS, 1766). typical early Miocene species with visible aperture divided in two parts. Cunín 4/897; 7. *Cellaria mandibulata* HINCKS, 1882. General view (note the large vicarious avicularium). Cunín 21/930; 8. *Mecynoecia pulchella* (REUSS, 1848). Fragment of rod like colony with visible porous frontal wall an length of zooecial tubes. Cunín 4/897; 9. *Cellaria fistulosa* AUCT. Detail of fig. 12. shows dentition and characteristically developed distal margin of aperture; 10. *Reteporella* cf. *gigantea* KÜHN, 1925. Typical Otnangian species preserved only as a small fragment. The characteristic growth form is not preserved. Cunín 4/897; 11. *Hornera reteporacea* MILNE EDWARDS, 1838. Large fragment with visible typical pores in place of bifurcation. Cunín 21/930; 12. *Cellaria fistulosa* AUCT. General view. Cunín 4/897.

Vienna Basin in Slovakia (Cunín) and the last known Bryozoa - Balanus sands are known from Hungary (Fót, perhaps also in Várpalota), which are the Karpatian in age.

Conclusion

1. In the Vienna Basin NE part 25 bryozoan and 45 Foraminifera species of the Ottnangian age have been determined.

2. Mixture of the Ottnangian foraminiferal paleo-ecological associations is supposed - shallow water association with lowered salinity represented by *Ammonia* ex gr. *beccarii* and high diversified neritic association rich in *Pappina breviformis* (Papp et Turn.), *Amphicoryna ottnangensis* (Toula) and *Bolivina* sp.

3. In the Bryozoa associations "Celleporids" dominated in all studied samples. They are characteristic for the shallow water tropical to subtropical sea. The presence of *Balanus* proves this hypothesis.

4. The Bryozoa - *Balanus* facies represents special environmental conditions. The mentioned conditions occurred for the first time during the Eggenburgian in the Molasse Zone in Austria (Gaudernsdorf), the than during the Ottnangian in the Vienna Basin in Slovakia (Cunín area). The last occurrence is known from Hungary (Fót), which is the Karpatian in age.

Acknowledgement

The authors would like to express their thanks to Prof. Vávra from the Institut für Paläontologie (Universität Wien) for reading the manuscript and improving the quality of this paper. Many thanks go also to Fond FWF (Fonds zur Förderung der wissenschaftlichen Forschung, project M517-GEO) which enabled first author to work in the Department of Paleontology at the Vienna University. The authors are grateful

for the financial support to Slovak VEGA grant agency (VEGA grant No. 1/7087/20), to Geological Survey of Slovak Republic and to Nafta Inc. Gbely for core material.

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