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Pannonian fauna of the northern part of the Danube Basin (Slovakia)

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Abstract: Throughout the Pannonian (7,1-11,5 Ma), on territory of the Slovakia marginal part of a lake resembling in size the present-day Caspian Sea was situated. The fauna of the mentioned lake was of endemic character. In the frame of the Pannonian on the basis of molluscs 8 zones, were distinguished, designated as A to H Zones in the Vienna Basin (Papp, 1951). The objective of this contribution is to characterize the individual zones faunistically in the northern part of the Danube Basin, bound to predominantly marginal environment.

Key words: Pannonian, Biostratigraphy, Danube basin (Slovakia)

Introduction

The Danube basin is a extensional basin, which started to be opened to the end of the Early Miocene. The main part of the synrift phase took place throughout the Middle Miocene and the thermal post-rift phase, during which terminated filling up of the basin, in the Late Miocene and Pliocene. Opening of the basin took place as asymmetrical extension (Kováč et al., 1997; Vass & Pereszlényi, 1998).

Sediments of the Pannonian age in the northern part of the Danube basin were deposited in the post-rift stage of basin development without distinct manifestation of fault activity (Kováč & Baráth, 1996). Throughout the Pannonian in the region of the Danube basin (northern part) the marginal part of a lake extended, sediments of which cover an area of about 250 000 km^2 at present and its size is comparable with the recent Caspian Sea (Kázmer, 1990). The fauna is of endemic character. On the basis of mollusc the sediments were divided into 8 zones, A to H (sensu Papp, 1951).

The Pannonian sediments are represented by the Ivánka and Beladice Formations (Priechodská in Harčár et al., 1988; Fordinál et al., in press). The Ivánka Formation includes zones A to E of the Pannonian and the Beladice Formation F-H Zones of the Pannonian and Pontian (sensu of Rögl et al., 1993). The marginal member of the Beladice Formation is the Hlavina Member of Late Pannonian age (Fordinál & Nagy, 1997).

Characterization of the Pannonian zones

Sediments of the Pannonian **A zone** are formed by light-grey conglomerates with calcareous cement and angular fragments of carbonate rocks in the marginal part, then by gravels medium to coarse grained calcareous sands, which alternate with thin layers of pelites (Gaža, 1974; Jiříček, 1972; 1974; Priechodská in Harčár et al., 1988; Tanistrák, 1969). In the deeper part of the lake layers of sandstones and pelites deposited, in which agglutinated foraminifers *Miliammina subvelatina* Venglinskij (Brestenská in Franko et al., 1982) and ostracodes *Cyprideis tuberculata* (Méhes) (Brestenská in Franko et al., 1985) were found.

Sediments of the **B Zone** are represented by dark-grey and greyishgreen clays, in which a fauna of ostracodes with the species *Hungarocypris auriculata* (Reuss), *Amplocypris globosa* Zalányi, A. *abcissa* (Reuss), *Hemicytheria lörenthey* (Mehés), *Loxoconcha lörenthey* (Méhes), *Cyprideis macrostigma* Kollmann and foraminifers with the species *Silicoplacentina hungarica* Köv. (Brestenská, 1963; Jiříček, 1974) were found.

Sediments of the **C** and **D Zones** in marginal shallow-water development are represented by fine gravels, sands and aleurites. The folloving bivalves and gastropods of stratigraphic importance are found in them:

– in the **C Zone** bivalves *Congeria martonfii pseudoauricularis* (Lörenthey), *Parvidacna tinnyana* (Lörenthey), *Lymnocardium spinosum* (Lörenthey)

– in the **zone D** by the occurrence of gastropods *Melanopsis austriaca* Handmann, *M. lebedai* Lueger, *M. pumila* Brusina as well as bivalves *Lymnocardium conjungens* (Hoernes), *Caladacna ornata bisepta* (Papp) and *Parvidacna loerenthey* (Pavlović). Besides molluscs in the mentioned sediments the occurrence of calcareous nannoflora with the species *Noelaerhabdus jerkovici* Bóna et Gál, *N. bozinovicae* Jerković and *Reticulofenestra pseudoumbilica* (Gartner) (Raková in Nagy et al., 1995) and otolites *„Raniceps" pannonicus* Pana was established (Brzobohatý in Nagy et al., 1995).

The basinal facies of the **zone C** represented by light - greenishgrey calcareous clays with carbonized remnants of plants and light-grey fine to medium grained calcareous sands and sandstone deposited (Tanistrák, 1969). Bivalves *Congeria partschi partschi* Czjz. were found in them (Jandová in Tanistrák, 1969).

In the time of the **zone D** in deeper part of the lake greenishgrey and light-greenishgrey poorly sandy clays deposited, which alternated with sands. The bivalve shells

of *Lymnocardium conjungens* (Hoernes) and *Congeria czjzeki* (Hoernes) were present in them (Gaža, 1968).

Sediments of the Pannonian **E Zone**, found at the basin margin, are formed by clays and sands with layers of coal. In the time of the mentioned zone repeated oscillations of water level were found out, causing changes of the paleoenvironment from deep lacustrine to continental with paleosoils (Baráth et al., 1999).

In sediments of the mentioned zone were found bivalves of stratigraphic importance *Congeria subglobosa subglobosa* Partsch, *C. subglobosa longitesta* Papp, *Dreissenomya primiformis* Papp, *Monodacna viennensis* Papp (Holec et al., 1987; Fordinál, 1997) and ostracodes *Candona (Candona) mutans* Pokorný, *C. (Caspiolla) praebalcanica* Krstić, *C. (Pontoniella) multipora* (Pokorný), *Cyprideis heterostigma* (Reuss), *Hemicytheria reniformis* (Reuss), *H. brunnensis* (Reuss), *Tyrrhenocythere pezinokensis* (Jiříček) and *Leptocythere lacunosa* (Reuss) (Tuba in Kováč et al., 1991; Pipík, 1998). Besides the mentioned fossils remmants of vertebrates and teeth belonging to the species *Hipparion primigenium* (H. v. Meyer) (Holec, 1981) and *Trogontherium* cf. *minus* Newton (Holec et al., 1987), as well as otolites of the species *Umbrina cirrhosa* (Linné), *Morone kuhni* (Weinfurter), *Gobius dorsorostralis* Weinfurter, „genus aff. *Umbrina" kokeni* (Schubert), and fish teeth belonging to the genera *Tinca*, *Scardinius*, *Squalis*, *Pelecus* a probably *Leuciscus* (Brzobohatý, oral communications) were found there.

Sediments of the Pannonian **F Zone** (in the past the coal serie) are represented by dark-grey and greenishgrey clay with layers af sands and lignites in the marginal part. The occurrence of brakish (*Melanopsis affinis* Handmann, *M. sturii* Fuchs, *Theodoxus soceni* Jekelius, *Congeria zahalkai* Špalek, *C. neumayri* Andrusov), freshwater (*Lymnaea* sp., *Planorbis* sp. and *Anisus* sp.) as well as terrestrial (*Carychium pachychilus* (Sandberger), *Vertigo oecsensis* (Halaváts)) mollusc was established in them. Besides ostracodes *Cyprideis cf. heterostigma* (Reuss), *Leptocythere (Amnicythere)* aff. *larga* Krstić, *Limnocythere sanctipatrici* Brady et Robertson (Fordinál & Tuba, 1992) were found in the mentioned sediments. Trought the Pannonian F Zone, similarly as in the E Zone, it was possible to trace oscilation of the lake level, causing alternation of freshwater and terrestrial gastropods assemblages with brakish ones. The mentioned changes were also identified by the study of palynomorphs, on the bases of which alternation of swampy primeval forests (*Taxodiaceae - Cupressaceae*) and lacustrine environment represented by abundant water plants (*Nymphaceae*, *Potamogetonaceae*, *Sparganiaceae-Typhaceae*) is present (Papšíková, 1989).

The **G Zone** of the Pannonian (in the past blue series) is represented by deep greyishgreen fine sandy clays causing the bluishgreen shade of these beds. The mentioned sediments are very poor in fauna. Only sporadical tests of ostracodes of the genus *Candona*, shells of gastropods of the family *Planorbidae*, oogonia of Characeae and osteocols were found (Cílek, 1960).

Sediments of the Pannonian **H Zone** (in the past variegated serie) are formed by greenishgrey, highly rustybrown and yellowishbraun spotted clays with layers of sands and very rarely also coal clays (Cílek, l.c.). At tectonic lines, in the sediments of the marginal development often freshwater limestones, lacustrine chalk and travertines were deposited. In these carbonate sediments a rich fauna of terrestrial and freshwater gastropods was found. From species of terrestrial gastropods of stratigraphic importance *Fortuna clairi* Schlickum-Strauch, *Clausilia strauchiana* Nordsieck, *Tropidomphalus doderleini* (Brusina), *Klikia goniostoma* (Sandberger) (Fordinál, 1996) and from freshwater gastropods *Planorbis confusus* Soós, *Armiger subptychophorus* (Halaváts), *Segmentina loczyi* (Lörenthey) *Bathyomphalus moedlingensis* Sauerzopf (Fordinál, 1998) were present.

Besides gastropods the occurrence of freshwater ostracods *Candona (Typhlocypris) roaixensis* Carbonell, *Candona (Lineocypris) mollasica invaginata* Carbonell, *C. (Fabaeformiscandona)* cf. *lineata* Krstic, *Cypria tocorjescui* Hanganu, chelae of freshwater crabs *Potamon (Pontipotamon) ibericum* Biberstein (Fordinál, 1994) as well as otolites of fish *Palaeoesox* cf. *praekrameri* (Weinfurter) (Brzobohatý in Fordinál, 1994) was established in these sediments.

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