ANALELE ŞTIINŢIFICE ALE UNIVERSITĂŢII "AL. I. CUZA" IAŞI
Geologie. Tomul LI, 2005

PRELIMINARY DATA ON THE SARMATIAN DEPOSITS FROM LOMBI HILL (POPEŞTI LOCALITY) NORTHWEST FROM CLUJ-NAPOCA

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Abstract: The hills in the southern and northern parts of Cluj-Napoca municipality and its neighbourhoods (Iris, Feleacul Hill and the top of Lombi Hill) consist of Sarmatian deposits conformably overlaying the Badenian ones. In Lombi Hill the micropaleontological content was investigated, which provided the first evidence for an Upper Volhynian – Lower Basarabian age of these deposits.

KEY WORDS: Sarmatian, foraminifers, lithostratigraphy, biostratigraphy, paleoenvironment

Introduction

The Middle Miocene deposits cover the largest areas with Cluj-Napoca municipality and its neighbourhoods. Many authors have contributed with significant results in building a complex geological framework of the area: Koch (1900), Nițulescu (1936), Răileanu (1955), Gábos et al. (1985), Nicorici et al. (1979), Mészáros & Clichici (1988), Filipescu (1999) etc.

Lithostratigraphy

The most extended lithostratigraphical units cropping our in the study area are Badenian in age: Dej Formation (Popescu, 1970), and Cheia Formation (Filipescu, 1996). These are conformably overlaid by Sarmatian deposits (Table 1): Iris Formation (Filipescu, 1999), and Feleac Formation (Koch, 1884).

Popescu (1995) defined five biostratigraphical units within the Sarmatian deposits of Romania (Table 1), and noticed the occurrence of the species *Affinetrina voloshinovae* (Bogdanowicz) within the Biozone with *Dogielina sarmatica*.

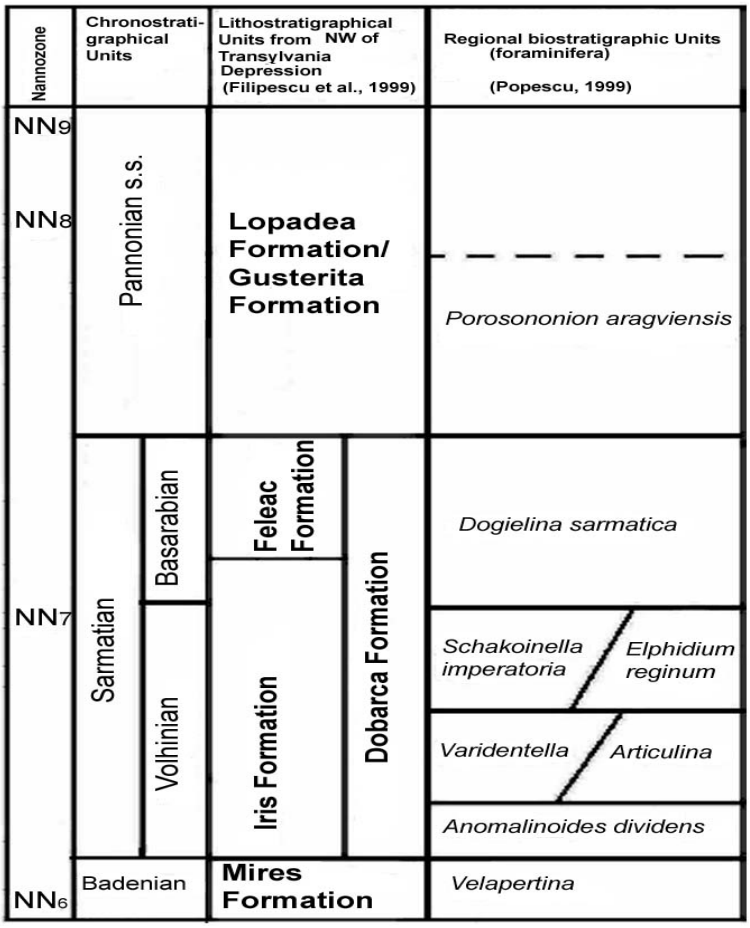


Table 1 Lithostratigraphical and biostratigraphical units of Transylvania Depression

Location

North from Cluj-Napoca (Fig.1- Geological map of Cluj-Napoca and its neighbourhoods) in Popeşti village, on the western slope of Lombi Hill, sand was mined for local usage in a north-south- oriented quarry of about 10 m heights and 25 m length (Plate I, Fig. 1).

Lithology

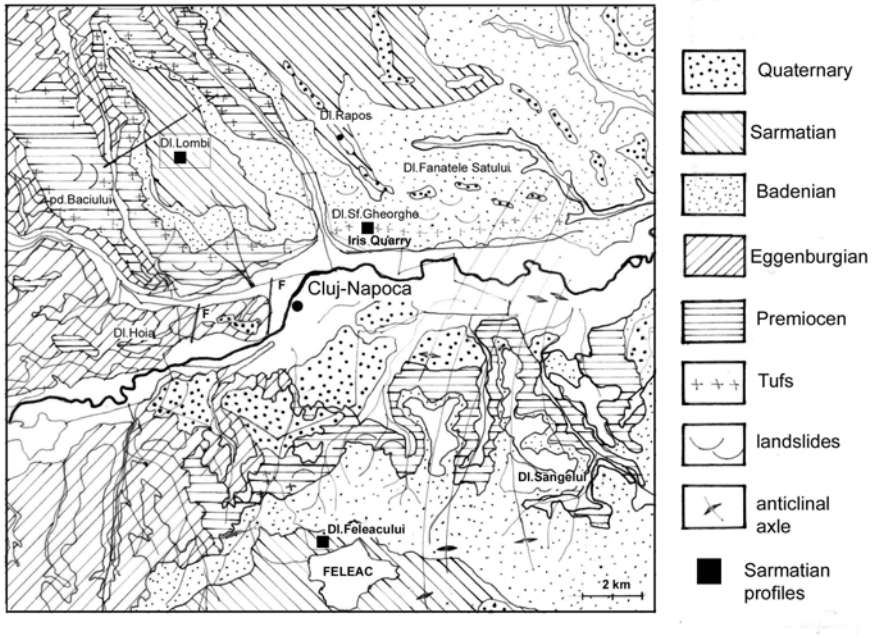
From the base to the top, the profile consists of a succession of well-sorted sands, siltic clays and sandstones, some poorly consolidated (Plate I, Fig. 2). Carbonate muds with extraclasts are interlayered within the marine

Fig.1 Geological map of Cluj-Napoca and its neighbourhoods

facies. Mud cracks were identified in these deposits (Plate I, Fig. 8) pointing out to coastal areas environments (Tucker & Wright, 1999).

In thin sections obtained from the sandstones in the base of the profile (samples 83, 88, 112) a large number of benthonic foraminifera have been identified: miliolids, nodosariids, rotaliids and fragments of red algae (Plate I, Figs. 3-7). The association of the rotaliids with the red algae thalli pleads for deposition within an environment of high hydrodynamics.

The sandstones contain large clasts of mono- and polycrystalline quartz, micaschists, fragments of metamorphic rocks, small amounts of feldspars, volcanic clasts, and rounded, reworked carbonate. In general the clasts have angular morphologies, as a result of a proximal source area, thus a short-distance transport and a rapid sedimentation.



Microfaunal association

A diverse microfauna has been identified in the studied samples, consisting of foraminifers, ostracod fragments, juvenile fragments of cardiaceae, bryozoans and pteropods (Table 2).

Species/ Sample nr.	80	83	112	90	91	84	85	86	88	94	95	96	97
Martinotiella communis (d'Orbigny)				+									
Sinzowella novorossica (Karrer & Sinzow)						+				+			
Spiroloculina excavata d'Orbigny			+										
Cycloforina badenensis (d'Orbigny)						+							
Cycloforina contorta (d'Orbigny)			+										
Quinqueloculina akneriana d'Orbigny		+	+					+					
Quinqueloculina boueana d' Orbigny		+											
Quinqueloculina buchiana d'Orbigny		+											
Pseudotriloculina consobrina d'Orbigny		+	+										
Triloculina gibba d'Orbigny		+											
Varidentella sarmatica (Karrer)			+										
Articularia articulinoides (Gerke & Issaeva)			+										
Laevidentalina elegans (d'Orbigny)						+	+	+					+
Nodosaria guttifera d'Orbigny		+											
Plectofrondicularia concava Liebus				+									

Species/ Sample nr.	**80**	**83**	**112**	**90**	**91**	**84**	**85**	**86**	**88**	**94**	**95**	**96**	**97**
Lenticulina calcar (Linne)										+			
Lagena laevis (Montagu)											+		
Globulina gibba d'Orbigny										+			
Glandulina laevigata (d'Orbigny)											+		
Hoeglundina elegans (d'Orbigny)							+						
Paragloborotalia mayeri (Cushman & Ellisor)											+		
Velapertina indigena (Luczkowska)											+		
Velapertina iorgulescui Popescui											+		
Globigerina bollii Cita & Premoli-Silva											+		
Globigerina bulloides d'Orbigny											+		
Globigerina tarchanensis (Subbotina & Chutzieva)											+		
Globigerinella obesa (Bolli)											+		
Globigerinoides quadrilobatus (d'Orbigny)											+		
Orbulina suturalis Bronnimann											+		
Bolivina alata Seguenza											+		
Bolivina dilatata Reuss							+				+	+	+
Bulimina costata (d'Orbigny)										+			
Bulimina elongata d'Orbigny				+							+		
Bulimina pyrula d'Orbigny							+						
Bulimina subulata Cushman & Parker				+		+	+	+		+	+		+
Praeglobobulimina pupoides d'Orbigny				+									

Species/ Sample nr.	**80**	**83**	**112**	**90**	**91**	**84**	**85**	**86**	**88**	**94**	**95**	**96**	**97**
Uvigerina aculeata d'Orbigny											+		
Uvigerina semiornata d'Orbigny								+		+			
Valvulineria complanata (d'Orbigny)								+			+		
Neoeponides schreibersi (d'Orbigny)			+										
Sphaeroidina bulloides (d'Orbigny)						+	+	+					
Cibicides lobatulus (d'Orbigny)		+	+					+		+	+		
Asterigerinata planorbis (d'Orbigny)	+		+				+	+		+			
Nonion bogdanowiczi Voloshinova	+									+			
Melonis pompilioides (Fichtel & Moll)	+				+		+	+				+	
Anomalinoides dividens Luczkowska							+	+			+		
Heterolepa dutemplei (d'Orbigny)	+		+	+	+		+	+		+	+		
Gyroidinoides soldanii (d'Orbigny)								+					
Ammonia beccarii Linne	+			+	+	+	+	+	+	+	+		
Elphidium aculeatum (d'Orbigny)	+		+	+	+		+	+		+	+		
Elphidium crispum (Linne)	+				+	+	+	+		+			
Elphidium fichtelianum (d'Orbigny)	+			+		+	+	+		+		+	
Elphidium hauerinum (d'Orbigny)	+			+		+	+	+					
Elphidium macellum (Fichtel & Moll)							+						
Elphidium obtusum (d'Orbigny)				+	+			+		+		+	
Elphidium reginum (d'Orbigny)							+	+		+			

Species/ Sample nr.	**80**	**83**	**112**	**90**	**91**	**84**	**85**	**86**	**88**	**94**	**95**	**96**	**97**
Elphidium sp.			+										
Porosononion granosum (d'Orbigny)										+			
Limacina		+	+				+			+			
Fragments of ostracods			+		+			+		+			

Table 2 Microfaunistical assemblage from Popesti

No fresh-water ostracod has been noticed, probably as a result for the fragmentation of their extremely fragile tests during transport.

The gastropods are derulated, and are present only as internal moulds.

Foraminifers are present in large amounts, the carbonate hyaline benthonic ones being dominant. The porcelaneous foraminifers are frequent only in the base of the profile, and become rare or accidental towards the top. Rotaliids represent in average 60% of the foraminifer association. The planktonic foraminifers belong to Globigerina, Globigerinoides, Paragloborotalia, and Velapertina genera; we consider them as being reworked from the Badenian deposits, due to their poor conservation status.

In the poorly cemented sandstones in the lower part of the succession miliolids are dominant, followed by rotaliids: *Pseudotriloculina consobrina* (d'Orbigny), *Varidentella sarmatica* (Karrer) and *Elphidium aculeatum* (d'Orbigny).

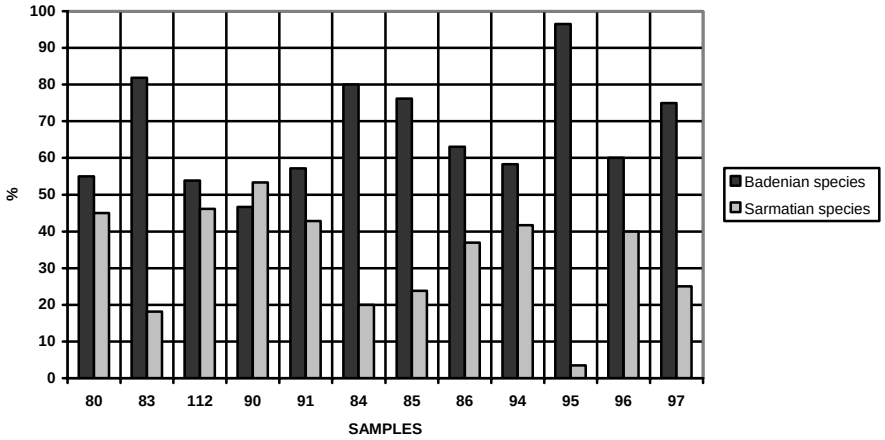
In the top of the profile, the deposits are richer in foraminifers represented by: *Sinzowella novorossica* (Karrer & Sinzow), *Cycloforina badenensis* (D'orbigny), *Cycloforina contorta* (d'Orbigny), *Quinqueloculina akneriana* d'Orbigny, *Quinqueloculina buchiana* d'Orbigny, *Varidentella sarmatica* (Karrer), *Articularia articulinoides* (Gerke & Issaeva), *Cibicides lobatulus* (d'Orbigny), *Asterigerinata planorbis* (d'Orbigny), *Heterolepa dutemplei* (d'Orbigny), *Ammonia beccarii* Linné, *Elphidium aculeatum* (d'Orbigny), *Elphidium crispum* (Linné), *Elphidium fichtelianum* (d'Orbigny), *Elphidium hauerinum* (d'Orbigny), *Elphidium macellum* (Fichtel & Moll), *Elphidium obtusum* (d'Orbigny), *Elphidium reginum* (d'Orbigny), and *Porosononion granosum* (d'Orbigny).

The foraminifer association in the upper part of the Lombi Hill suggests a shallow, probably intertidal environment of formation.

In our opinion, the presence of the Sarmatian species in all the collected and investigated samples (starting with the base of the profile to the top) (Plot 1) is a strong argument in assigning a Sarmatian age to the studied deposits.

Based on the presence of the index species: *Elphidium reginum* (d'Orb.), *Elphidium aculeatum* (d'Orb.), and *Sinzowella novorossica* (Karrer &

Plot 1 Frequency analisis of the Badenian and Sarmatian foraminifera from Lombi Hill at Popesti



Sinzow), we attribute the foraminifer association from the top of Lombi Hill to the Biozone with *Elphidium reginum* (Upper Volhynian) and to the Biozone with *Dogielina sarmatica* (Lower Basarabian). Consequently, the deposits are synchronous with the lower part of the Feleac Formation.

On the geological map of Cluj-Napoca (Sheet Cluj, scale 1:200.000) and on the maps produced by Răileanu (1955), Moisescu & Popescu (1967), and Mészáros & Clichici (1988), the deposits on the top of Lombi Hill were assigned to the "Buglovian", the Lower Sarmatian, and to the Sarmatian, *i.e.* Volhynian-Basarabian; no supporting argument was presented.

The novel identified microfauna represents the first biostratigraphical argument for the Sarmatian, *i.e.* Lower Basarabian age of the deposits cropping out in Lombi Hil.

Paleogeography

Both the lithology and the microfauna defined from the deposits in the upper part of Lombi Hill (Popeşti locality) plead for their accumulation in a shallow marine, probably intertidal area, in a brackish environment with a sandy substrate.

In general the elphidiids associations are typical for littoral facies, pointing out to the shallowing of the environment.

Among the foraminifers, the nonionids and elphidiids dominate, being forms that adaptate themselves easily to sandy substrates or hardgrounds.

The carbonate mud interlayers occurring at several levels in the succession also suggest a littoral environment of formation (Plate I, Fig. 3).

Conclusion

Based on the Sarmatian species identified in all the investigated samples, we assign the foraminifer association from Lombi Hill to the Biozones with *Dogielina sarmatica* and, respectively, *Elphidium reginum*. Correspondingly, the age of the deposits is considered Upper Volhynian – Lower Basarabian. Thus, this study provides the first arguments for the presence of the Sarmatian, *i.e.* Lower Basarabian in the Lombi Hill.

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Plate I
Fig. 1 The sand quarry from Popeşti (western slope of Lombi Hill) - general view.
Fig. 2 Lithological profile – Lombi Hill (Popeşti)
Figs. 3-7 Microphotographs (on thin sections) of the sandstones in the base of the profile (sample 83) with: miliolids (Fig. 3); bryozoans (Fig. 4); rotaliids (Fig. 5); nodosariids (Fig. 6); red algae (Fig. 7).
Fig. 8 Mud cracks-type structures

Plate II
Fig. 1 *Sinzowella novorosica* (Karrer & Sinzow)- sample 84, Popeşti.
Fig. 2 *Cycloforina badenensis* (d'Orbigny) - sample 84, Popeşti.
Fig. 3 *Quinqueloculina boueana* d'Orbigny - sample 83, Popeşti.
Fig. 4 *Pseudotriloculina consobrina* (d'Orbigny) - sample 112, Popeşti.
Fig. 5 *Triloculina gibba* d'Orbigny - sample 83, Popeşti.
Fig. 6 *Varidentella sarmatica* (Karrer) - sample 112, Popeşti.
Fig. 7 *Nonion bogdanowiczi* Voloshinova - sample 94, Popeşti.
Fig. 8a, b *Anomalinoides dividens* Luczkowska - - sample 85, Popeşti.
Fig. 9 *Elphidium aculeatum* (d'Orbigny) - sample 80, Popeşti.
Fig. 10 *Elphidium hauerinum* (d'Orbigny) - sample 84, Popeşti.
Fig. 11 *Elphidium macellum* (Fichtel & Moll) - sample 85, Popeşti.
Fig. 12 *Elphidium reginum* (d'Orbigny) - sample 94, Popeşti.
Fig. 13 *Porosononion granosum* (d'Orbigny) - sample 94, Popeşti.

N. B. The scale bar is 0.5 mm