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AUI GEOLOGIE

The relationship between the Sarmatian and Quaternary formations from the Păcurari area (Iaşi, Romania)

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Abstract

During the execution of a foundation for a six-floor building in the Păcurari area (Iaşi), we gathered micropaleontological and lithological samples and collected fauna from the artificial outcrops or from the soils taken from the drilling operations carried out with this occasion. From a lithological point of view, the material found in the northern and western part of the artificial outcrops and in the drillings consists mostly of clay deposits with a sand-gravel layer, and other millimetre-sized interlayers of sand. Generally, the colour of these deposits ranges from yellow to grey. The main criterion used in separating the Sarmatian formations from the Quaternary deposits was the presence of the *Cryptomactra pesanseris* taxon (Mayer-Eymar). In the Sarmatian deposits, apart from *Cryptomactra pesanseris* (Mayer-Eymar), we identified foraminifera (*Porosononion subgranosus subgranosus* (Egger), *P. s. umboelata* (Gerke), *Elphidium macellum* (Fichtel et Moll), *Quinqueloculina akneriana* (d'Orbigny)), mysid statoliths (*Paramysis mihaii* (Voicu)), ostracods etc. The fossils were found both in the yellow and in the grey clays. Generally, the Quaternary deposits are barren or very poor in terms of fauna content. In the eastern part of the site, yellowish clay deposits within which Sarmatian microfossils can be recognized are visible. A slipping plan was noticed along this level of yellowish clay. The corroborated presence of the elements listed above indicates that, during the slope processes, Sarmatian deposits were included as well.

Keywords: Foraminifera, Mollusca, Sarmatian, Quaternary, Formation with *Cryptomactra*, Iaşi, Păcurari.

Introduction

During the execution of a foundation for a six-floor building in the Păcurari area – Iaşi (in the eastern part of the Moldavian Platform, Fig. 1), we collected lithological and paleontological samples from the artificial outcrop and from the drilling performed with this occasion.

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Regional geology

The deposits that occur in the Iaşi area belong to the Formation with *Cryptomactra*, on top of which Quaternary deposits are placed. Văscăuţanu (1929) is the first researcher who reported and correctly interpreted, in biostratigraphical terms, the presence of clays with *Cryptomactra* on the left bank of the Prut River, in the village of Ungheni (Ionesi et al., 2005). Subsequently, this formation from the Moldavian Platform was studied by researchers such as Tufescu (1937), Roșca and Saianov (1962), Trelea (1969), Jeanrenaud (1971), Ionesi (1998, 1999), Brânzilă (1999), Ionesi and Pascariu (2011).

Regarding the Quaternary deposits from the city of Iaşi, Martiniuc and Băcăuanu (1959) consider that fluvial accumulations and deluvial deposits exist here. Deluvial slopes characterized by a high degradation rate where slipping is dominating are graphically shown on the geomorphological map of the Păcurari area. These slipping slopes are formed by lutites, sandy clays, along with sand and gravel lenses. In their papers, Bucur and Barbu (1959) indicate that, along the entire Moldavian Plain, instead of primary or remodelled loess deposits, only alluvial materials and clays which became loess, depending on their granulometric properties, are present. On one map devised for the city of Iaşi and its surroundings, in the interest zone, namely the Păcurari area, Sarmatian clay deposits and alluvial deposits with loess particularities are illustrated. Băcăuanu (1980) analysed the Bahlui river terrace along the territory of the city of Iaşi and identified eight types of terraces, which developed from the Pliocene (the 8th terrace) up to the Holocene (1st terrace). In the area studied in the present paper, Băcăuanu (1980) mentions deposits belonging to the 2nd (20 m) and 3rd (30–35 m) terraces.

Method

Lithological and paleontological samples were collected from the site in three stages (Fig. 2):

1. After several digs meant to level the field (May 2009) where the consolidation works were to be performed (drilled pillars) – samples M.I.2–M.I.5.
2. During the process of drilling for the supporting pillars (October 2009), from the following depths: –1.8 m; –2.5 m; –3 m; –4 m; –4.8 m; –5 m; –6.8 m; –7.2 m.
3. At the end of the digging process, until the level of the foundation of the future building was reached (February 2010) – samples 275/1–275/6.

Macro- and microfossil processing and establishment have been performed according to standard methods within the Geology Department. Microfossils were photographed by means of a SEM from the Biology Department.

Results

The studied area (the outcrop) had a final height of 8m and the drilling carried out reached a depth of 13m. From a lithological point of view, one can observe that the northern and western deposits are different from the eastern ones (Fig. 2). In the western and northern areas of the site, in the upper part of the outcrop, we noticed the presence of 0.5m of soil overlaying a 4m thick layer of clays with loess characteristics. At the base of this 4m level, we described a fine-sand lense. Below this clay deposit, approximately 1m below the fine-sand area, we found a 20–30 cm thick layer, containing gravel and sand with fragments of reworked Sarmatian fossils. Below this arenitic and ruditic level, an 8m thick layer of clay with some fine intercalations of sand could be observed. In this sand, *Cryptomactra pesanseris* (Mayer-Eimar) and other Sarmatian microfossils were recognized and described. These deposits differ in colour, from the yellowish ones at the top (5.5 m) to the grey-ashy ones below.

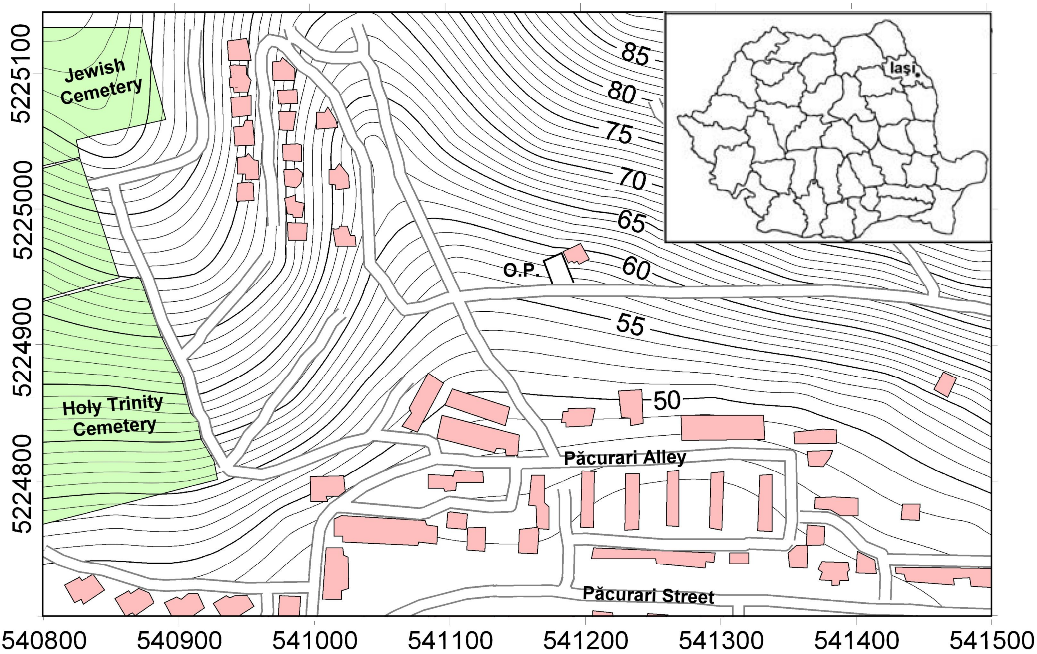

Fig. 1 Location of the Păcurari – Iaşi area (O.P. – observation point).

The fossils identified in the site analysed are presented in Table 1 and figured in Plate 1 and 2.

By analysing the fauna content of the deposits from the Păcurari area, we can reach certain conclusions regarding their age. The *Cryptomactra pesanseris* (Mayer-Eimar) taxon was found only in the yellow and violet-blue clay deposits below the arenitic and ruditic level from the western part of the outcrop. Based on this marker taxon, we believe that we can assign the age of Low Basarabian to these deposits (Ionesi et al., 2005). Microfossils common within this stratigraphic interval (*Porosononion subgranosus subgranosus* Egger, *Elphidium macellum* (Fichtel et Moll), *E. subumbilicatum* (Czjzek), mysid statoliths etc.), along with some which are characteristic for the Basarabian, such as *Porosononion subgranosus umboelata* (Gerke), appear in association with *Cryptomactra pesanseris* (Mayer-Eimar). In the arenitic and ruditic level we also found bivalve clasts of Sarmatian fauna (*Obsoletiforma* sp., *Mactra* sp. and *Tapes* sp.), gastropods, foraminifera (*Elphidium macellum* (Fichtel et Moll), *Porosononion subgranosus subgranosus* (Egger), *P.s. umboelata* (Gerke)), and ostracods. The aspect, generally inferred from these fossil fragments (including foraminifera), indicates a hydrological transportation. Their presence can be explained if we accept that the clay level is a terrace part of the Bahlui river. Considering the altitude where it appears and taking into account the existing literature (Băcăuanu, 1968), it is, therefore, a fragment of the 20 m thick terrace. Above this level, in the clay (with loess characteristics) layer we could barely find microfossil fragments. We managed to collect only a small number of specimens of *Porosononion subgranosus subgranosus* (Egger), *P. subgranosus umboelata (*Gerke), *P. martkobi* (Bogdanowicz), which we see as reworked from the Sarmatian deposits. The statigraphical position, along with the general aspect and the lack of fossil fragments, points to a Quaternary age.

In the eastern part of the explored area, the situation is quite different. The arenitic and ruditic level is no longer noticeable, *Cryptomacra pesanseris* (Mayer-Eimar) could not be identified, and therefore a Sarmatian age of this area cannot be established based on the criteria of microfauna. What we could observe was a 6–7 meter wide slipping surface. Below and above this surface, we identified a microfauna association similar to the Sarmatian one from the western and northern parts of the analysed area. The conditions in the eastern area can be seen as a result of slope processes acting against the Sarmatian deposits. The slipping area is easily noticeable; more precisely, its western edge is crossing our interest zone. The lack of the *Cryptomactra pesanseris* (Mayer-Eimar) taxon is justified by its highly fragile constitution, which makes it unable to withstand a slipping process. We do not possess all the necessary elements to be able to accurately establish the age of these slipping areas, but we believe that they are relatively recent, since the slipping surface is still visible.

Considering the fact that the dig from the Păcurari area that we have analysed was carried out for construction purposes, the geological observations which we have made allow us to formulate some appreciations regarding the nature of the environment where the foundation will be laid. Here, as in the Palas area, we observed that the colour criterion is not sufficient when attempting to separate Sarmatian deposits from Quaternary ones (Ionesi and Pascariu, 2011).

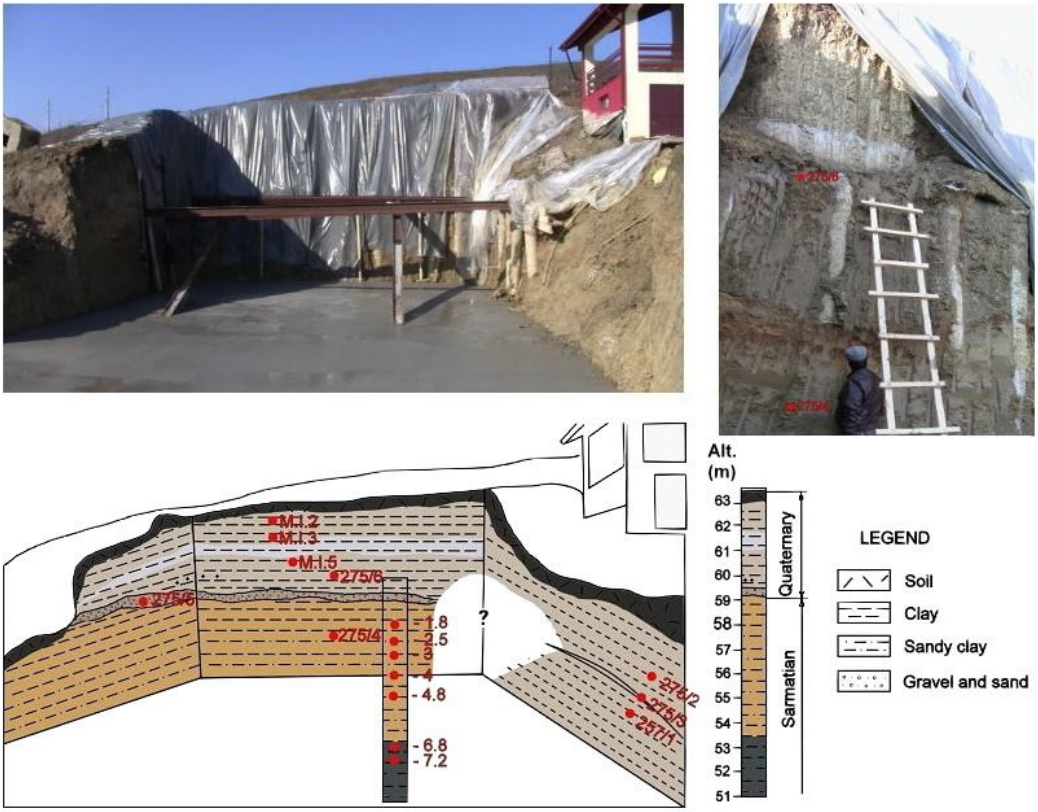

Fig. 2 Lithology and the observation point.

Tab. 1 Fossil association identified in the Păcurari area

Nr.	Taxa	Outcrop									Drilling (depth, in m)						
		275/1	275/2	275/3	275/4	275/5	275/6	M.I.2	M.I.3	M.I.5	1.8	2.5	3	4	4.8	6.8	7.2
	Bivalvia																
1	*Cryptomactra pesanseris* (Mayer-Eimar)				x						x	x		x	x		
	Foraminifera																
2	*Quinqueloculina akneriana* (d'Orbigny)			1													
3	*Pseudotriloculina consobrina* (d'Orbigny)	1	3	2						1						8	2
4	*Articulina problema* (Bogdanowicz)					1										2	
5	*Bolivina sinzovi* (Didkowski)	1															
6	*Caucasina subulata* (Cushman & Parker)			1													
7	*Rosalina* sp.		1	2									1			20	10
8	*Cibicides boueanus* (d'Orbigny)										1						
9	*Eponides sp.*										2						
10	*Nonion bogdanowiczi* (Voloshinova)	2	2	1						1	1						
11	*Ammonia beccarii* (Linné)	1									3						
12	*Porosononion martkobi* (Bogdanowicz)	>20	4	3						10						4	
13	*Porosononion subgranosus subgransosus* (Egger)	>20	6	7		5	1		2	15			1		1	6	
14	*Porosononion subgranosus umboelata* (Gerke)	2	1	5		6				4	13						
15	*Elphidiella artifex* (Serova)	1															
16	*Elphidium macellum* (Fichtel & Moll)					15					2						
17	*Elphidium submbilicatum* (Czjzek)	5		7						8	4						
18	*Elphidium hauerinum* (d'Orbigny)	3		1													
19	*Globigerina edita* (Subbotina)										1						
20	*Globigerina* cf. *hoterivica* (Subbotina)										1						
21	*Globigerina praebulloides* (Blow)							1									
	Mysid Statoliths																
22	*Paramysis mihaii* (Voicu)	>50	10	>20					2	>50	3		2		2	30	>50
	Ostracods																
23	*Callistocythere egregia* (Méhes)									1							

In this case, both the yellow and violet-blue clay layers below the arenitic and ruditic level have the same age. Moreover, in Păcurari we could clearly identify a slipping area whose edge crosses right through the future emplacement of the construction zone. The drills penetrated the violet-blue Sarmatian clays, considered by the geotechnical engineers as belonging to the base rock, with good characteristics in setting the foundation. Nevertheless, taking into account the presence of the slipping surface in the investigated area, we believe that, in the future, if a development of the constructed area is decided upon, a more detailed analysis of the slope processes should be carried out.

In conclusion, we feel that the research carried out on this artificial outcrop was quite interesting, given the fact that, in the northern and western part, we could follow the differences between the Sarmatian deposits and the Quaternary ones very closely, based on paleontological criteria, while in the eastern part the existence of certain slipping areas whose movement also involved Sarmatian deposits was clearly distinguishable.

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CAPTION OF PLATES

Plate I

1. *Quinqueloculina akneriana* (d'Orbigny) (sample 273/3).
2, 3, 4. *Pseudotriloculina consobrina* (d'Orbigny) (samples: 275/2, 275/3, –7.2).
5, 6. *Articulina problema* (Bogdanowicz) (–6.8).
7. *Caucasina subulata* (Cushman & Parker) (275/3).
8. *Bolivina sinzovi* (Didkowski) (275/1).
9, 10, 11. *Rosalina* sp. (275/3, –7.2, 275/3).
12. *Cibicides boueanus* (d'Orbigny) (–1.8).
13, 14. *Eponides* sp. (–1.8).
15, 16. *Nonion bogdanowiczi* (Voloshinova) (275/1, M.I.5).
17, 18. *Ammonia beccarii* (Linné) (–1.5, 275/1).
19, 20. *Porosononion martkobi* (Bogdanowicz) (275/1).
21, 22. *Porosononion subgranosus subgransosus* (Egger) (275/1).
23, 24. *Porosononion subgranosus umboelata* (Gerke) (275/1, –1.8).
25. *Elphidiella artifex* (Serova) (275/1).
26, 27. *Elphidium macellum* (Fichtel & Moll) (–1.8).
28. *Elphidium submbilicatum* (Czjzek) (M.I.5).
29. *Elphidium hauerinum* (d'Orbigny) (275/3).

Plate II

1. *Globigerina edita* Subbotina (–1.8).
2. *Globigeina* cf. *hoterivica Subbotina* (–1.8).
3. *Globigerina praebulloides* Blow (M.I.2).
4, 5. *Paramysis mihaii* (Voicu) (275/1).
6, 7. Ostracods (275/1, M.I.3).
8. *Callistocythere egregia* (Méhes) (M.I.5).
9, 10. Otoliths (–7.2).
11, 12. Calcareous algae (–6.8).
13-17. *Cryptomactra pesanseris* (Mayer-Eimar) (–1.8, –1.8, –2.5, –4, –4, –4.8).

Plate I

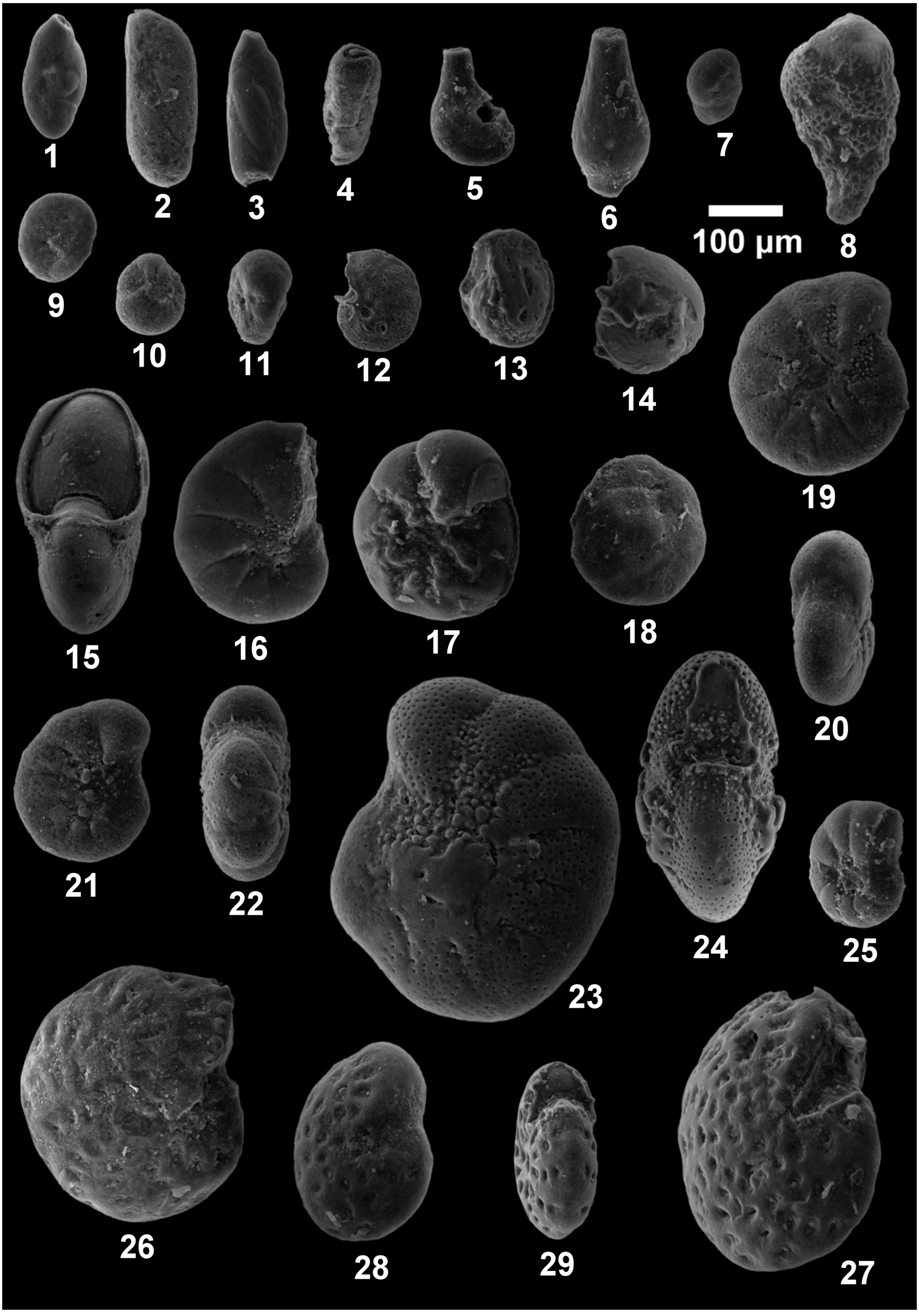
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Plate II