

GEOLOGICAL AND PALEONTOLOGICAL PATRIMONY OF THE SOUTHERN DOBROGEA (SE ROMANIA)

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ABSTRACT

The Southern Dobrogea is situated in SE Romania, being included, tectonic point of view, in the Moesian Platform. The Southern Romania is bordered by the Danube to the West and the Black Sea to the East. In the N, the Southern Dobrogea is bordered by the Capidava-Ovidiu subcrustal fault; towards south, it continues to the northern Bulgaria. In the Southern Dobrogea, a carbonate platform developed from Mesozoic (Upper Jurassic and Cretaceous), and continued through the Paleogene up to the Miocene. The Pliocene is mainly developed along the right side of the Danube, in low topographic areas, and is represented by the sedimentation of continental red clay successions. The Pleistocene is characterized by the sedimentation of continental red clays and the development of the loess deposits. This paper describes several protected geological and paleontological sites of the Southern Dobrogea. Some of them, i.e., ‘The Cernavodă Fossil Site’, contain a rich Early Cretaceous macro- and microfaunas, along with ‘The Limestone walls from Petroșani’, exposing Upper Cretaceous and Middle Miocene rocks, and ‘Credința Quarry’, enclosing rich faunas of Miocene mammals and mollusks, are protected areas of national interest. Other sites, significant for their geological exposures and paleontological context, are not yet protected, although their geoheritage is of an outstanding importance.

Keywords: South Dobrogea, Romania, geological and paleontological sites.

INTRODUCTION

In Southern Dobrogea, the Cretaceous yielded a complete development of all its stages [1], [2], [3] and [4]. The Berriasian and Valangian are represented by marine shallow water carbonates in the eastern part of the Southern Dobrogea and mainly by fluvial and continental deposits in the western part. The Hauterivian-early Aptian interval is characterized by the presence of marine shallow water carbonates. A fluvial-lacustrine sedimentation took place within the middle to late Aptian, followed by Upper Cretaceous glauconitic sandstones and chalk deposits.

The Paleogene deposits are mainly constituted of Lower to Middle Eocene siliciclastic successions, which contain significant assemblages of large foraminiferal (especially nummulites) [5]. The Neogene deposits cropping out in Southern Dobrogea, towards S of the Ovidiu-Capidava Fault [6], belong to the Middle-Late Miocene and Pleistocene intervals.

The Miocene is represented by the Paratethys stages Sarmatian, and Pontian (*pro parte*); these depositional intervals mainly expose oolitic limestones, clays, sands, marls and diatomites. The Middle Miocene is characterized by a marine environment (inner shore) and grades up, towards the Upper Miocene, into deltaic and fluvial ones [3]. The Pliocene (including the regional Paratethyan stages Pontian *pro parte*, Dacian and Romanian) mainly occurs along the right side of the Danube, in low topographic areas, where continental red clays occur [1]. Therefore, the Lower Pleistocene is characterized by the presence of red continental deposits and the large development of the loess deposits, in the upper part.

CRETACEOUS GEOLOGICAL AND PALEONTOLOGICAL SITES

The Cernavodă Fossil Site exposes Lower Cretaceous limestones (Fig. 1), on the right bank of the Danube, at the Cernavodă bridge. This is a protected area of national interest which corresponds to IUCN III category (natural reserve of paleontological type); the protected area extends on 3 ha. This site is characterized by rich macrofaunal associations, composed of ammonites, brachiopods, bivalves and gastropods [1]. Besides, rich microfaunal associations (especially foraminifers and ostracods) are present [7], [8]. Besides, calcareous nannofossil investigations revealed the presence of biozones characterizing the Berriasian-Valanginian interval [9]. The calcareous nannofossil assemblages are dominated by long-range taxa *Watznaueria* spp., along with the Tethyan species of the genus *Nannoconus*. Intervals of cosmopolitan eurytopic *Watznaueria* dominance are thought to reflect cooler and humid conditions and well mixed surface waters, while those with a dominance of *Nannoconus* indicate warmer conditions and more stable surface water stratification. In the Southern Dobrogea, as well as in other sections from Romania, calcareous nannofossils more-related to the paleolatitudes were identified in the late Valanginian [9].

The Limestone Walls from Petroșani nature reserve exposes Upper Cretaceous and Middle Miocene deposits. This is a protected area of national interest, which corresponds to the IUCN III category (geological) and extends on 4.8 ha. The protected rocks are cropping out on both sides of the Urluia brook (Figs. 2 and 3). The Upper Cretaceous sediments are mainly composed of poorly sorted conglomerates and microconglomerates. Interbedded glauconitic limestones with parallel and crossed-stratification are also present along with cm-thick bedded claystones and marlstones.

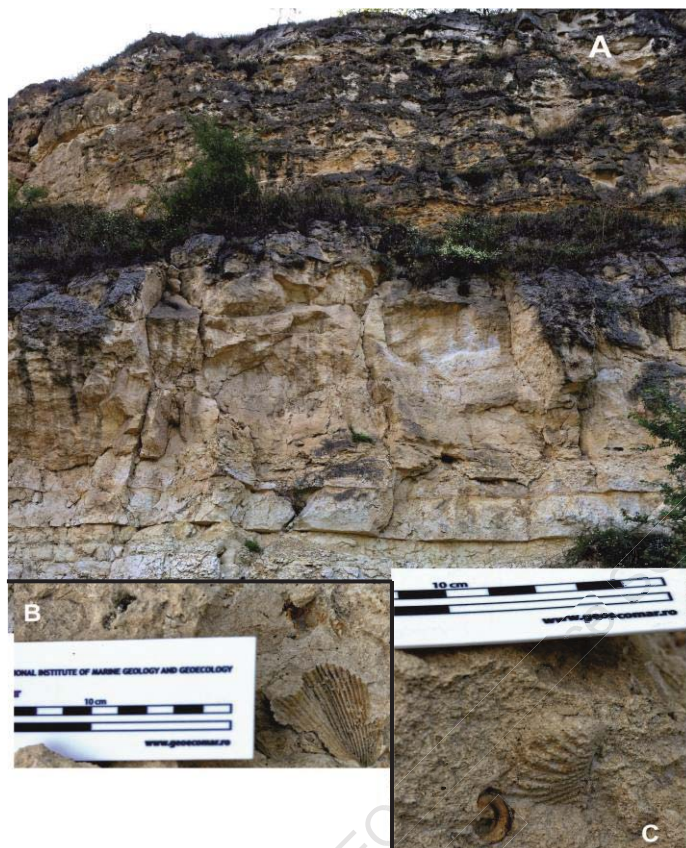


Fig. 1 - The Cernavodă Fossil Site. A – general view; B and C – macrofossils (Photos: Gabriel Ion).

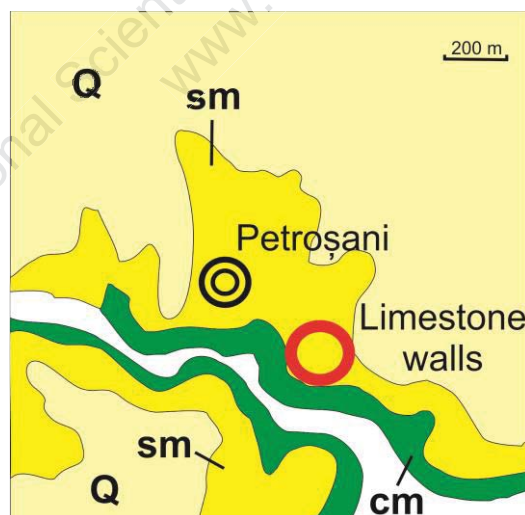


Fig. 2 – Location of the protected site ‘The Limestone Walls at Petroșani’; cm – Cenomanian; sm – Sarmatian; Q – Quaternary. Redrawn after Constanța Sheet 1:200,000 - Geological maps of Romania - (Geological Institute of Romania).

The investigation of claystones and marlstones of the Peștera Formation, overlaying the basal rudites of the Cochirleni Formation (supposed to be Albian), has led to the identification of calcareous nannofossil assemblages. These contain, besides long-ranging taxa, significant biostratigraphic species, such as: *Corollithion kennedyi*,

Eiffelithus turriseiffelii, *Axopodorhabdus albianus* and *Eprolithus floralis*, suggesting an early Cenomanian stage, i.e., biozone UC1 [10]. In ‘The Limestone Walls from Petroșani’ site, the Upper Cretaceous (Cenomanian) sediments are unconformably covered by the Middle Miocene (Sarmatian) limestones, containing very rich macrofaunas of bivalves and gastropods.



Fig. 3 – Upper Cretaceous deposits of the Limestone Walls cropping out in the Petroșani Site. (Photo: Gabriel Ion).

The Seimenii Mari Fossil Site is another protected area of national interest situated in the Southern Dobrogea, assigned to the IUCN III category (natural reserve of paleontological type). The protected area extends 0.5 ha, being situated on the right bank of the Danube, i.e., in the Danube cliff below the Seimenii Mari village. There, the Albian deposits of the Cochirleni Formation made by phosphatic gravels, including coquina beds are cropping out.

A very rich ammonite fauna was identified in this site, containing *Douvilleiceras mammillatum*, *D. pringlei* and *Otohoplites destombesi* (lower Albian), *Hoplites paronai*, *Anahoplites praecox* and *A. daviesi* (middle Albian) and the upper Albian species *Hysterocheras varricosum*, *Mortoniceras cf. inflatum*, *Mariella gresslyi* and *Anisoceras pseudoelegans* [11]. The phosphatised fossils reworked in the lower Cenomanian conglomerates of the Peștera Formation are also upper Albian (Vraconian) in age and include *A. cf. perarmatum* and *Mortoniceras perinflatum*, among many other taxa. The Cretaceous deposits are unconformably covered by the Miocene (Sarmatian) limestones of the Seimeni Formation and Quaternary loess (Fig. 4).

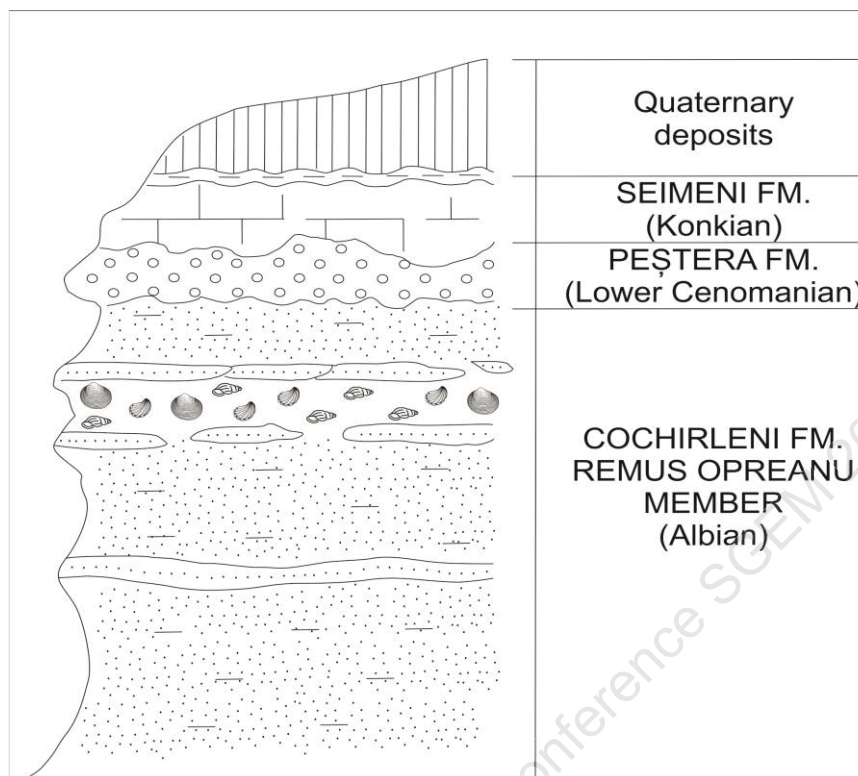


Fig. 4 – Succession of the lithostratigraphic units exposed in ‘The Seimenii Mari Fossil Site’ (modified after Avram et al., 1996). The Konkian is a Sarmatian regional substage.

The Alimanu Fossil site is a protected area of national interest, assigned to the IUCN III category (natural reserve of paleontological type), extending on 15 ha. The site is located SE of the Alimanu village, towards S of the Vederoasa Lake. In this site, the Lower Cretaceous (Valanginian) limestones [2], [7] enclose rich macrofaunas, especially ammonites and brachiopods.

MIOCENE GEOLOGICAL AND PALEONTOLOGICAL SITES

In Southern Dobrogea, the Middle Miocene (Sarmatian) limestones that characterized a shallow marine setting occur on large areas [12]. Since centuries, even from the Roman Empire times, these rocks were used for anthropic purposes. Many quarries, such as Deleni, Urluia, Adamclisi and Credința, expose good Middle Miocene successions, with a significant fossil content.

The Credința Fossil Site is a protected area of national interest, assigned to the IUCN III category (nature reserve of paleontological type). The protected area extends on 6 ha, being situated W of the Credința village, SE of the Plopeni Lake. The Credința Quarry exposes Sarmatian (lower Bessarabian) limestones, marls, sands and poorly cemented quartzose sandstones; their age was assigned based on microfaunas, such as ostracods and foraminifers [13], [14], [15].

The macrofossils are represented by rich vertebrate assemblages, characterizing a littoral and near-shore environment. The largest number of isolated bones was provided by seals: *Phoca (Pusa) pontica*, along with perciform-sparid, clupeid fishes and small whales (*Cetotheriidae*). The birds include several taxa, such as pelicans (*Sarmatosula*

dobrogensis), storks (*Ciconia sarmatica*), cranes (*Grus miocaenicus*), together with species of ducks (*Anas*, *Aythia*), geese (*Anser*), gulls (*Larus*), albatrosses (*Diomedea*), and limnic seabirds (*charadriiformes*) [15].



Fig. 5 – Credința Quarry – Paleontological protected area (Photo: Nicoleta Aniță).

CONCLUSION

The Southern Dobrogea is a region of a great significance for its natural heritage, including geological and paleontological nature reserves. The rock successions cropping out in this area cover around 145 million years of geological history, comprising significant Lower Cretaceous, Upper Cretaceous and Tertiary sites. Based on the exposed rocks, good correlation may be achieved between S Dobrogea and the Romanian Carpathian foreland regions, as well as N Bulgaria ones. Therefore, similar lithological features and biostratigraphical (macrofaunas, microfaunas and nannofloras) were recognized.

However, there are many other significant geological and paleontological sites not yet protected in Southern Dobrogea, although they show an outstanding scientific importance, being also valuable for education and touristic purposes. Besides its geological and paleontological heritage, the Southern Dobrogea is one of the Romanian regions famous for its speological sites. The presence of the caves from this region, such as Movile, Limanu and Gura Dobrogei, is related to the Middle Miocene (Sarmatian) limestone occurrence [15]; for instance, Movile Cave is worldwide known, due to its unique groundwater ecosystem rich in H₂S and CO₂, while the oxygen content is low. As the biotas of this cave were separated from the outside world during the last 5.5 million years, the survival of these endemic organisms is based

on chemosynthesis rather than photosynthesis. The natural heritage of Southern Dobrogea is completed with numerous wetlands (water holes, eutrophic swamps, peat bogs, sulfur springs, reeds and forests) occurring on the Dobrogean plateau, which is home to a wide range of floras (halophilic, hygrophilic and mesohygrophilic species), providing also nesting places for several species of birds. Therefore, the Southern Dobrogea is one of the most suitable areas in Romania for the promotion of the natural heritage (biotic and abiotic), enhancing the general interest in the holistic protection of the nature.

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