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UNIVERSITAS NAPOCENSIS BABEŞ-BOLYAI 1581 ROMÂNIA

TENTH ROMANIAN SYMPOSIUM ON PALEONTOLOGY

Cluj-Napoca, 16-17 October 2015

ABSTRACTS AND FIELD TRIP GUIDE

Edited by:
Ioan I. Bucur, Iuliana Lazăr and **Emanoil Săsăran**

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Abstracts and Field trip guide

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Presa Universitară Clujeană, 2015

The 10th Romanian Symposium on Paleontology

Cluj-Napoca, 16-17 October 2015

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The 10th Romanian Symposium on Paleontology

Programme

Thursday, 15 October
17.00-20.00 – Registration (at the symposium venue)

Friday, 16 October
From 8.00 onwards – Registration (will be available all day at the symposium venue)

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12.00-12.15 – Bucur, I.I., Gawlick, H.-J., Missoni, S., Săsăran, E. & Lein, R. - Biostratigraphic correlation of Middle Anisian (Pelsonian) calcareous algae, foraminifera and conodonts from the northwestern Neotethyan realm (Northern Calcareous Alps, Austria)
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3. Cristea, A., Popa, M.V., Chira, C. M., Silye, L. & Săsăran, E. - Palaeontological and palaeoecological investigation of the Eocene from Morlaca (Huedin, Transylvanian Basin)
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6. Ghita, D., Limberea, E. L. & Sindilar, V. D. - Middle–Upper Jurassic and Lower Cretaceous Nannoplankton Assemblages from Central Valachian Platform (Mamu area)
7. Grigore, D. , Lazăr, I. & Gheuca, I. - New Middle and Upper Jurassic fossiliferous deposits mapped in the Rucăr area – Purcărețului Valley (South Carpathians – Romania)
8. Hiru, A., Rățoi, B.G. & Brânzilă, M. - Paleoecology of endemic molluscan assemblages of the Volhynian deposits from Basarabi area (Moldavian Platform)
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11. Ioniță, C. & Stoica, M. - The Sarmatian Microfauna Identified in Preajba Area (Moesian Platform)
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13. Kallanxhi, M.E., Falahatgar, M., Javidan, M. & Parvizi, T. - Calcareous nannofossils from the Baghamshah Formation (Iran)
14. Kallanxhi, M.-E., Palzer, M., Wagreich, M. & Knierzinger W. - Early Miocene calcareous nannofossils from the Eastern Austrian Foreland Basin
15. Kovalchuk, O.M. - Distribution and evolutionary stages of percid fishes (Teleostei, Percidae) in the Late Neogene of Southeastern Europe
16. Kövecsi, Sz. A., Less, Gy., Silye, L. & Filipescu, S. - New data on the middle-Eocene (Bartonian) *Nummulites perforatus* “banks” from the Transylvanian Basin (Romania)
17. Melinte-Dobrinescu, M.C., Roban, R.D., Macaleţ, R., Brustur, T., Jipa, D. & Briceag, A. - Palaeontological assemblages and sedimentological features of the Buzău Land Geopark geological and palaeontological
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20. Neri, M., Papazzoni C.A., Vescogni A. & Roghi G. - Cyclical variation in paleoenvironments of the Rotzo Formation (Lower Jurassic, Lessini Mts., N Italy)
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22. Rățoi, B.,G., Codrea, V., Ursachi, L. & Brânzilă, M. - A Late Miocene large-sized dinothere at Gherghești (Scythian Platform) - Preliminary data
23. Rekovets, L., Nowakowski, D. & Dema, L. - The molar enamel ultrastructure of the Miocene-Pliocene Spalacidae and Anomalomyidae (Rodentia, Mammalia) of Ukraine
24. Scager, D. J., De Leeuw, A., Wessels, W., Matoshko, A. & Matoshko, A. - Concerning the East Carpathian Foreland Mammal Biostratigraphy (Eastern Romania, Moldova and Western Ukraine)
25. Schlagintweit, F., Studeny, M. & Sanders, D. - Shallow-water benthic foraminifera across the Cretaceous-Paleogene boundary (Kambühel Limestone, Lower Austria): preliminary results
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Abstracts

Field-trip guide

Ichnology and sedimentology of Straja Formation, Tarcău Nappe

Anistoroae, A.[1] & Miclăuş, C.[1]

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Keywords: Outer Carpathians, Straja Fm. stratotype, wave-influenced turbidite system, *Cruziana* Ichnofacies.

An ichnological and sedimentological study has been performed on Straja Formation (Paleocene-early Eocene), belonging to Tarcău Nappe, in its stratotype, at the confluence of Bistriţa River with Stejaru tributary. This lithostratigraphic unit is a heterolithic one, petrographically consisting of: quartz-arenites, spongolites, siltstones, and claystones (Grasu et al., 1988).

Several sedimentary facies were defined based on their lithology, sedimentary structures, and geometry: normal graded sandstones (S_{ng}), parallel laminated sandstones (S_{pp}), ripple cross laminated sandstones (S_{rcl}), wave ripple cross laminated sandstones (S_{wrcl}), hummocky cross laminated sandstones (S_{hcs}), parallel laminated coarse mudstone (M_{pp}), ripple cross laminated coarse mudstones (M_{rcl}), laminated fine mudstones (Ml). They represent the result of different sedimentary processes such as rapid fallouts, tractive currents, good weather and storm induced waves, and pelagic-hemipelagic sedimentation.

In the analyzed log of Straja Fm. we recognized some ichnogenera, such as: *Chondrites*, *Planolites*, *Palaeophycus*, *Avetoichnus*, *Thalassinoides*, *Lockeia*, *Ophiomorpha*, *Rhizocorallium*, and others. In Martinsson's terminology (Ekdale et al., 1984), hypichnial forms are the most frequent, followed by epichnial and endichnial ones. Ethologically, the analyzed ichnofossils are feeding, resting, dwelling, and composite feeding-dwelling, mainly horizontal-subhorizontal traces. Most of their cross cut profiles are only slightly deformed from circular to elliptical section which may indicate some consistency of the deposit when it was populated by tracemakers. The fine ornamentation of the hypichnia trace fossils and the presence of passively filled vertical-subvertical structures suggest the same consistent substrate at bioturbation time. According to Seilacher's model (1964), the analyzed trace fossils would belong to *Cruziana* Ichnofacies.

The sedimentary facies were grouped, based on their sedimentary and ichnological attributes, in one facies association, namely a heterolithic facies association with variegated mudstone. The coarse interlayers of it are characterized by hypichnial ichnoforms, while the fines contain mostly endichnia. This facies association may indicate a wave-influenced distal turbidite system (in Myrow et al., 2002 terminology) as it is proved by occurrence of S_{hcs} and S_{wrcl} together with sedimentary facies peculiar for turbidites. The sedimentation area was favorable for tracemakers of the ichnofossils grouped in *Cruziana* Ichnofacies.

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Biostratigraphy of Aptian deposits from Cernavoda area, South Dobrogea

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Keywords: Lower Cretaceous, ostracods, marine facies, continental-fluvial facies

This paper presents the main biostratigraphical characteristics of Aptian deposits intercepted by new wells drilled in the Cernavoda area. The Aptian deposits are well developed in this area, being intercepted in all boreholes. The Aptian is developed in two types of facies: the shallow marine facies (*Ramadan Formation*) and the continental-fluvial facies (*Gherghina Formation*). There is no clear relation between these facies. In some boreholes the marine facies overlies the continental – fluvial one, but in some others, these two types of facies are intercalated. We also identified a lacustrine facies represented by yellowish to greenish soft marls and clays that contain *Charophyta* algae and freshwater *Cypridea* ostracods species.

The shallow marine facies is represented by yellowish and gray marls or silts, fine-grained pebbles, sands and sandstones as well with bioclastic limestone intercalations (rich with pachyodont bivalves). The marls contain layers rich in bivalve (ostreids) and gastropod shells. The microfauna is very well represented by foraminifers (dominated by Orbitolinids) as well ostracods (*Cytherella ovata, C. paralella, Centrocythere denticulata, C. gottisi, C. bordeti, Neocythere mertensi, Schuleridea jonensiana, Asciocythere albae, Cytherelloidea sp., Hechticythere derooi, Parataxodonta uralensis, Bairdia sp., Eocytheropteron sp., Paracypris sp., Cythereis (R) reticulata, Cythereis (R) geometrica, Cornicythereis cornueli* and *Parexophthalmocythere* sp.*)* that prove the Aptian age.

The continental-fluvial facies consists of kaolinitic clays (reddish, greenish, yellowish or whitish) with calcareous concretions that in the basal part pass to sands and fine to medium - grained pebbles with reddish silt or clay matrix. No fossils have been recorded in this formation.

Evidence of evolution in the fungi discovered in the Miocene deposits of the Teleajen and Buzău river basins

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Keywords: fungi, morphological phylogeny, natural selection, oncogenesis, ornamentation, paleoclimate

Considering that Paleomycology is still young in Romania, the paper begins with the presentation of the geological record of fossil fungi (according to Kalgutkar & Jansonius, 2000) and generalities on the evolution of fungi [the morphological phylogeny of fossil fungi (according to Elsik, 1977), the chronophenetic relationships between fossil and living fungi (according to Locquin, 1982)].

Issues regarding the “evidence of evolution in the fungi discovered in the Miocene deposits of the Teleajen and Buzău river basins” are approached, expounding “The Mycotic Transience Law of the Earth” (the reconstruction of the paleoclimate, the evolution of flora in the Cenozoic Era - in general and the evolution of climate and flora in the Paleogene of Western Europe (all three according to Sittler, 1965); the influence of physical factors (temperature and humidity) on the growth of fungi is also dealt with, along with the process of mycotic transience itself.

Confirmations of the morphological phylogeny of fossil fungal spores are concretely presented, mainly with reference to the ornamentation and synergistical morphologies of the spores found in the Podu Morii Formation (Late Oligocene - Early Miocene) and in the Șipoțelu Formation (Volhynian).

There follow the confirmations of evolution in the fungi discovered in the Miocene deposits of the river basins of Teleajen and Buzău, in accordance with Locquin’s criteria (1982).

50 spores, sporiferous bodies and hyphae are used to illustrate the research.

In conclusion, the objective existence of the evolutionary process is underlined as being compatible with the belief in God

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Microfossils of Urgonian limestones from Popii Rarăului in Rarău Mountains (east Carpathians)

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Keywords: Rarău Mountains, microfoils, Urgonian Limestone, Bucovinian Nappe

Rarau Massif consists of crystalline basement and Mesozoic cover made by autohtonous sediments (Bucovinic Nappe) and allochtonous ones (Transylvanian Nappe) (Popescu & Patrulius, 1964; Turculeţ, 1971; Săndulescu, 1973; Grasu et al., 1995; Rusu, 2002). Popii Rarăului is considered to be a massive klippe incorporated into the autohtonous sedimentary succession of the Bucovinian Nappe of the Rarău Syncline (Săndulescu, 1973).

Situated on Nort-East of the Rarău pick and East of Limpedea creek, Popii Raraului consist mainly of massive gray limestone, with lateral changes in some parts into conglomerates and breccias with limestone elements. The main microfacies are represented by bioclastic wackestone-floatstone-rudstone, characteristic for an external platform environment (Flügel, 1982).

The identified micropaleotological association consists of dasycladales and foraminifera, associated with corals, echinoderms, bivalvs, gastropods, and other skeletal fragments. The presence of orbitolinid forminifera indicates an Upper Barremian – Lower Aptian age.

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Photo plate: A) *Salpingoporella pygmaea* (Gümbel) B) *Neomeris cretacea* Steinmann C, D) *Lithocodium aggregatum* (Elliott) E,F,G,) *Palorbitolina lenticularis* (Blumenbach) H) *Suppiluliumaella* sp.

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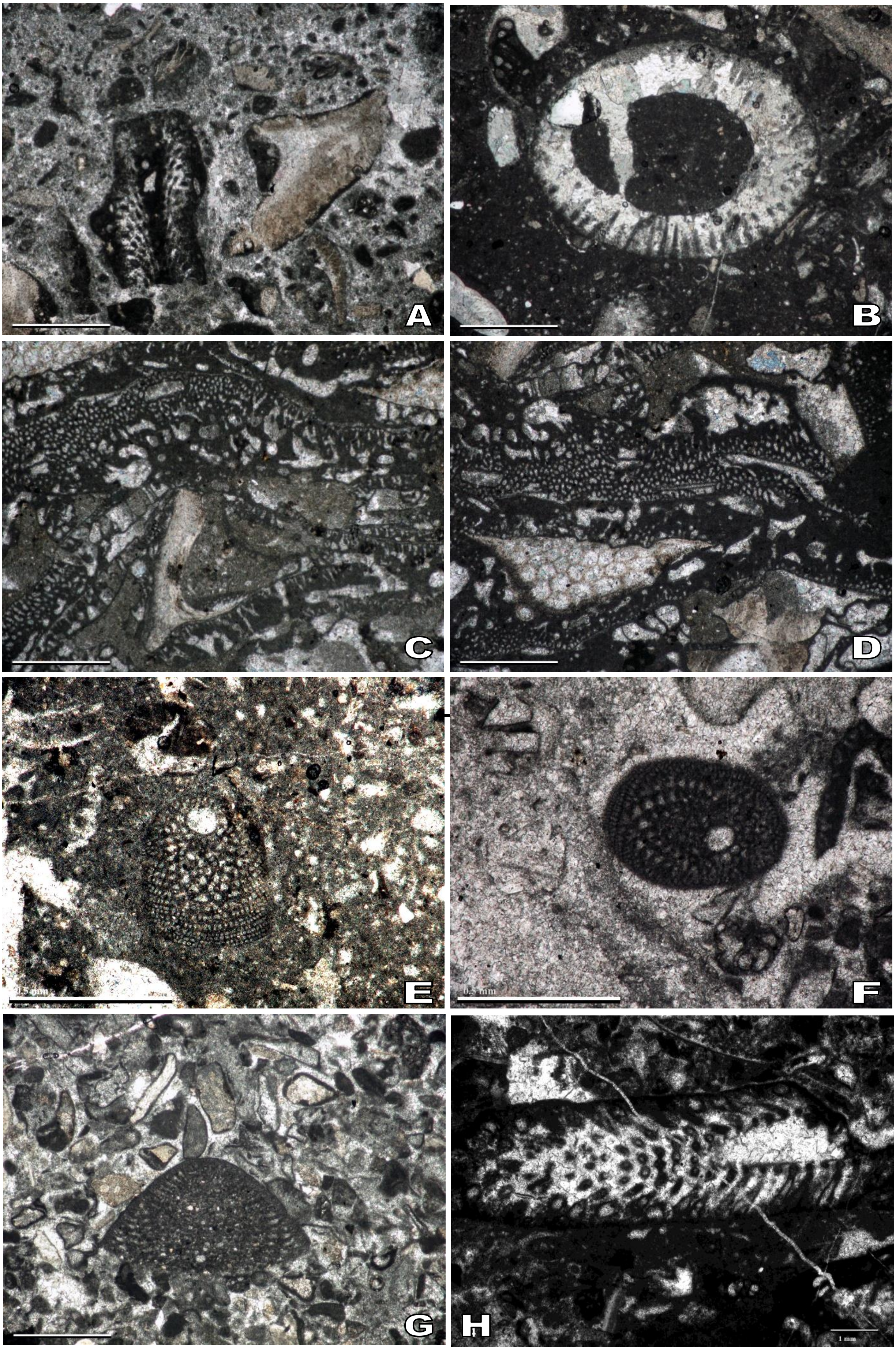
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Foraminiferal biostratigraphy and palaeoenvironments in the Izvor Formation (Tarcău Nappe, Eastern Carpathians)

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Keywords: agglutinated foraminifera, Paleocene, biostratigraphy, paleoecology, Eastern Carpathians.

Introduction

The Paleocene Izvor Formation (Ionesi, 1967) is part of the northern Tarcău Nappe (Eastern Carpathians) and is represented by a turbiditic succession. The studied sections are located on the Izvor Valley (N 47°31’52.1”; E 25°55’34.4”) and Suha Valley (N 47°31’05.2”; E 25°48’09.6”) and consist of green and grey clays alternating with quartz/carbonate sandstones and grainstones. The foraminiferal assemblages were examined on order to gather data on the biostratigraphy and paleoenvironmental settings.

Material and methods

18 samples from the Izvor Valley and 15 samples from the Suha Valley were collected from the fine grained intercalations of the turbiditic sequence. Sediment samples were processed by standard micropaleontological methods and more than 300 foraminifera were picked from the >63 µm fraction. Primary identification was done under the stereomicroscope, while several specimens were examined in detail with a scanning electron microscope. Palaeoecological methods included the analysis of agglutinated foraminifera morphogroups (Kaminski & Gradstein, 2005; Cetean et al., 2011; Murray et al., 2011; Setoyama et al., 2011, 2013) and diversity analysis (Murray, 2006).

Results

The foraminiferal assemblages in both sections are dominated by agglutinated forms; rarely these are associated with calcareous benthic and planktonic forms. About 98% of the taxa in the assemblages from the Suha Valley are charasteristic for the deep water environments. The agglutinated foraminifera morphogroups consists of tubular forms (M1 morphogroup) such as *Nothia* spp., *Rhizammina* sp., *Rhabdammina* sp. suggesting paleoenvironments with low organic matter flux. Significant percentages of flattened streptospiral forms (M3c morphotype – *Ammosphaeroidinia pseudopaucilata*, *Paratrochamminoides* spp., *Trochamminoides* spp) was noticed in some samples suggesting more favorable palaeonvironmental conditions, with high organic matter flux and moderate oxygenation.

Foraminiferal assemblages from the Izvor Valley display variations throughout the section – high abundances (where the foraminiferal preservation is very good) alternating with quasi sterile intervals (the foraminiferal taxa display a moderate to poor preservation); these conditions could had been caused by the palaeoenvironmental instability in the turbiditic sistems. The distribution of the agglutinated foraminifera morphogroups reveals periods with low organic matter flux (suggested by the dominance of tubular forms – M1 morphogroup) alternating with eutrophic intervals, with high organic matter flux and moderate oxygenation (suggested by the dominance of infaunal *Karrerulina* forms – M4b morphogroup).

The foraminiferal assemblages from the both sections contain taxa with a large stratigraphical range. Even so, the presence of *Rzehakina fissistomata* allow the assignment of the sections to the Paleocene *Rzehakina fissistomata* Zone of the Eastern Carpathians (Săndulescu, 1973; Neagu et al., 1992) and Polish Carpathians (Morgiel & Olszewska, 1981).

Conclusions

The agglutinated foraminifera morphogroups (consisting mainly of coarsely agglutinated taxa like *Nothia*, *Rhabdammina*, *Rizammina*, *Hyperammina*) and the presence of *Ammolagena clavata* demonstrate that foraminifera populations belong to the „flysch type” biofacies, typical for bathyal deep-water environments (Kaminski, Gradstein & colab., 2005). The identified complete Bouma sequences suggest a deposition in the middle part of the turbiditic fans.

The irregular morphotype distribution, combined with fluctuating diversity values along the sections suggest changes in the amount of oxygen, organic matter and energy at the sea floor, probably caused by the palaeoenvironmental instability typical for the turbiditic sistems.
Agglutinated foraminifera demonstrated the Paleocene age for the studied deposits from the Izvor and Suha valleys.

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Late Pleistocene - Holocene sea-level fluctuations inferred by microfaunal and isotope fluctuations in the Romanian Black Sea shelf

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Keywords: ostracods and foraminifers; NW Black Sea; Late Glacial red clays

During the Quaternary, the Black Sea experienced a series of sea level fluctuations driven by the global glaciations and deglaciations, which led to successive episodes of isolation followed by the re-connection with the Mediterranean. During low-stand periods, the entire Black Sea basin evolved as a giant lake, being isolated from the Mediterranean. During the late Pleistocene deglaciation, the connection between the Black Sea and Mediterranean via the Marmara Sea was re-established through the narrow Bosporus and Dardanelles Straits. In the sedimentary record this deglaciation accumulated allochthonous continentally derived red sediments, simultaneous with the global Heinrich Event 1, 18 to 15 kyr BP (Lericolais et al., 2013). These sediments are characterized by depleted δ18O and Mn, increased Ti/Ca ratio as well as higher values of kaolinite and illite, probably indicating that their origin is from a more northern location (i.e., the Alps and the Fenoscandinavian Ice Sheet) (Yanchilina et al., in prep.).

This study is focused on the fluctuations in composition and abundance of the ostracods encountered in a core collected from the Romanian Black Sea shelf area, integrated with AMS 14C dating, oxygen isotopes and CaCO3 measurements. In the core, situated at 200 m water depth, two lithological units, respectively the youngest Unit 1 (Coccolith Mud) and the oldest Unit 3 (Lacustrine lutite), were identified, with the base dated 24.5 kyr BP. Since Unit 2 is missing, either the water depth was not enough to develop the sapropel facies or it was naturally eroded. In the two lithological units identified, i.e. Unit 1 and Unit 3, five biozones are distinguished based on changes in microfossil assemblages, which reveals climate shifts and oscillations of the salinity.

The Last Glacial Maximum period is characterized by more stable conditions recorded by homogenous ostracod assemblages, but the onset of the Fennoscandian Meltwater Pulses changed drastically the hydrology of the basin, by lowering the salinity, raising the sea level and allowing the fresh water ostracods to thrive. These fresh water pulses are mirrored in the sedimentary record by the reddish-brown clay deposition, during the Heinrich Stadial 1 and prior to the Bølling–Allerød warm period.

Based on AMS 14C dating, oxygen isotopes, CaCO3 measurements and qualitative and quantitative ostracod analysis of the core, the fluctuation pattern is interpreted in term of environmental changes.

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Biostratigraphic correlation of Middle Anisian (Pelsonian) calcareous algae, foraminifera and conodonts from the northwestern Neotethyan realm (Northern Calcareous Alps, Austria)

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Keywords: Calcareous algae, dasycladales, Middle Triassic, Norther Calcareous Alps

An exact biostratigraphic correlation of shallow-water organisms and deep-water (open marine) organisms provides a very powerful tool of a high-resolution biostratigraphy especially of shallow-water carbonates, where often long living forms hamper a determination of an exact biostratigraphic age. Also important is the correlation of the evolution of shallow-water carbonate ramps and platforms with the sediment deposition in open marine settings, were highstand shedding from shallow-water areas can be a helpful tools for the correlation of parasequences and therefore to recognize sea-level changes. Sea-level drops result in shallow-water depositional environments in sometimes long lasting gaps and strong recrystallization of carbonates which often complicate a correlation of shallow- and deep-water environments.

Transgressive systems tracts with an open marine fauna are often hard to detect in thick shallow-water carbonate sequences, but provide an unique opportunity to correlate shallow- with deep-water organisms. We present new data from Middle Anisian carbonate successions from the central Northern Calcareous Alps, where A) a transgressive systems tract in the lower Middle Anisian (Pelsonian) related to the first opening phase of the Neotethys Ocean and B) a late Middle Anisian (Pelsonian) drowning related to the break-up of the Neotethys Ocean clearly define the age of the in the Mediterranean widespread preserved Steinalm Carbonate Ramp as Pelsonian. The Steinalm carbonate successions are sometimes rich in calcareous algae, which were attributed since Pia (1930) as Middle-Late Anisian. Whereas the drowning sequence of the Steinalm Carbonate Ramp is widespread well dated with ammonites as latest Pelsonian, exact datable successions at the beginning of the Steinalm ramp evolution are rare and practically nothing is known about the age and the floral and faunal content.

In the Northern Calcareous Alps the unique opportunity exist, to correlate the lower Pelsonian calcareous algae at the beginning of the Steinalm Carbonate Ramp evolution with conodont faunas and to compare them with the calcareous algae from the top of the Steinalm Carbonate Ramp ~~platform~~ just below the late Pelsonian drowning event. We investigated the Sulzkogel section in the central Salzkammergut region east of the township Hallstatt and the section Clessinsperre near Saalfelden in the Salzburg Calcareous Alps.

The section Sulzkogel represent an isolated block in the Middle Jurassic Hallstatt Mélange and consist in the lower part of the succession of lower Anisian (Gutenstein) dolomites, deposited under restricted conditions. On top of these dolomites an approximately 20 m thick open marine influenced limestone succession with an shallowing upward trend was deposited, which contain conodonts in the open marine influenced limestones and calcareous algae in the intercalated tempestites. This level was defined as Sulzkogel Member of the Annaberg Formation by Lein et al. (2010). The Pelsonian age is proven by the occurrence of following conodonts: *Nicoraella germanica*, *Nicoraella kockeli*, *Paragondolella bulgarica*. This level contains following calcareous algae (dasycladales): *Euteutloporella peniculiformis*, *Macroporella alpina*, *Oligoporella* cf. *pilosa*, *Oligoporella* cf. *praealpina*, *Oligoporella* cf. *varicans*, *Physoporella pauciforata*, *Pocetella hexaster*, *Scinderella scopuliformis*, *Teutloporella* sp. *Physoporella paucicalcarea* dominates the assemblage. Dasycladaleans are associated with some rare foraminifera: small specimens of

Ammodiscus sp., *Endotriadella wirzi*, *Glomospira* sp., *Meandrospira dinarica*, *Meandrospira* cf. *pusilla*, *Trochammina almtalensis*, *Trochammina alpina*.

On top of these succession the Steinalm Carbonate Ramp evolution started, which is topped near the Schreyeralm by a drowning unconformity of late Pelsonian age (*binodosus*-Zone), known since nearly 150 years, and well dated by ammonoidea. Characteristic conodonts from the base of the drowning sequence (red nodular Schreyeralm Limestone) are *Paragondolella bifurcata* and *Paragondolella bulgarica*.

The section Clessinsperre (Pia 1924) is located on the southern rim of the Steinernes Meer Mts. northeast of the township Saalfelden in the Salzburg Calcareous Alps and represents the type-locality of the Steinalm Formation. The algae-bearing horizon is restricted to the upper part of the succession, few metres below the late Pelsonian drowning, dated by conodonts and ammonoidea as Late Pelsonian. Following conodonts are characteristic for the lower part of the drowning level (grey cherty limestones of the Reifling Formation): *Paragondolella bifurcata* and *Paragondolella bulgarica*. Below the drowning level the following dasycladalean algae have been identified: *Aciculella bacillum, Oligoporella pilosa, Oligoporella dissita, Oligoporella praealpina*. The assemblage is dominated by *Oligoporella pilosa*. From the same limestone, Wagner (1970) and Ott (in Tollmann 1976) mentioned also *Physoporella pauciforata* and *Teutloporella* (= *Euteutloporella*) *peniculiformis*. Some rare foraminifera are also associated: *Ammodiscus* sp., *Glomospira* sp., *Glomospirella* sp., *Frondicularia woodwardi*, *Meandrospira* cf. *dinarica*, *Trochammina almtalensis*.

The algae and foraminifera assemblages from both localities are known in literature as indicating Pelsonian-Lower Illyrian age (e.g. Ott 1972; Bystricky 1986; Granier & Deloffre 1994 for algae; Salaj et al. 1983; Rettori et al. 1994 for foraminifera). Even if the algae from the two assemblages differ a little in composition and dominant species, all of them are generally attributed to the above mentioned time interval. However, it is important to mention that the Steinalm Carbonate Ramp has in the whole Mediterranean a more or less contemporaneous drowning in the late Pelsonian in respect to the break-up of the Neotethys Ocean. In fact shallow-water carbonates are not known from the Illyrian interval elsewhere. Only around the Anisian/Ladinian boundary a short living shallow-water evolution is well known from the whole realm, which provides slightly different algae associations.

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Taxonomy of Middle Miocene coralline algae (Rhodophyta) from Lopadea Veche (Gârbova de Sus Formation, Transylvanian Basin)

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Keywords: Badenian, systematics, rhodolith, Corallinales, Sporolithales, palaeoecology

In the Lopadea Veche area, Gârbova de Sus Formation (Middle Miocene) is represented by a mixed carbonate-siliciclastic succession about 30 m thick. Coralline algae are major components and in order to identify and describe them, a total of 113 thin sections of various dimensions were analysed. They occur as crusts, branches or forming rhodoliths. Non-geniculate and geniculate forms belonging to Corallinales (subfam. Melobesioideae, subfam. Mastophoroideae, subfam. Lithophylloideae, subfam. Corallinoideae) and Sporolithales (subfam. Sporolithoideae) were identified to the lowest possible taxonomic level. The coralline assemblages consists of *Hydrolithon corculumis*, *Phymatolithon calcareum*, *Lithoporella melobesioides* and various species of *Lithothamnion*, *Mesophyllum*, *Spongites*, *Sporolithon* and geniculate forms. Published taxonomic accounts with detailed floristic descriptions and illustrations were used. The measured distances of coralline algae are according to Rasser & Piller (1999) and Basso *et al*. (1996) (Fig. 1) and algal growth forms follows Woelkerling *et al*. (1993).

The present study provides a detailed description of some Middle Miocene (Badenian) coralline algae from the Lopadea Veche section. Their palaeoecological implications are discussed.

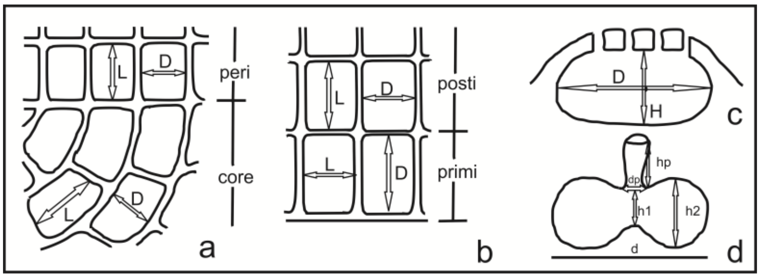

Fig. 1. Distances measured in coralline algae: a) monomerous; b) dimerous; c) multiporate conceptacle; d) uniporate conceptacle; (D = diameter, L = length, H = height (h1/h2) (after Rasser & Piller, 1999 and Basso *et al*., 1996)

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An example of progradation of turbidite system based on nannoplankton data: a case study of Transcarpathian Flysch from Bargau Mountains

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Keywords: calcareous nannoplankton, sedimentology, Oligocene, Lower Miocene, Borsa Formation, Transcarpathian Flysch, Romania

The analysed successions, especially concerning the calcareous nannoplankton assemblages, belong to the Transcarpathian Basin, and are formed by turbidite deposits intersected by subvolcanic bodies of the Bârgău Southern Group. The deep-water turbidite deposits mainly show depositional facies of mid fan and outer fan, being lithostratigraphically framed into the Borşa Formation of Oligocene – Lower Miocene age (Mészáros & Hosu, 1989).

The calcareous nannoplankton assemblages from outcrops of three areas have been analysed and compared: Muresenii Bargaului, Colibita, and Tihuta Pass.

Colibiţa Quarry. The lithology includes alternations of fine-grained sandstones and hemipelagic marls, affected by thermal metamorphism caused by subvolcanic intrusions, andesitic in composition, clearly visible as sills at the top of the quarry. These deposits, emplaced by processes generated by low-density turbidity currents, can be considered as transitional from mid fan to outer fan turbidites. Paleocurrent directions, detected by the analysis of basal scours and cross-laminations, are directed from WSW to ESE, generally according with the previous studies (Contescu et al., 1966) for the Transcarpathian Basin.

The calcareous nannoplankton assemblages contain: *Zygrablitus bijugatus* (NP11 - NP25), *Lanternithus minutus* (NP14 - NP23), *Istmolithus recurvus* (NP19 - NP22), *Reticulofenestra umbilica* (NP16 - NP22), *R. dictyoda* (NP13 - NP16), *R. bisecta*, *Coccolithus pelagicus, C. eopelagicus, Discoaster* cf. *lodoensis* (NP14 - NP17), *Sphenolithus dissimilis* (Oligocene - NN3), prouving the **Oligocene** age of the deposits from Colibiţa. The assemblage contain also: *Sphenolithus spiniger, S. annarhopus, S. moriformis, S.* cf. *stellatus,Chiasmolithus* sp*., Discoaster barbadiensis, D. saipanensis, Helicosphaera* cf. *perch-nilseniae.*

Mureşenii Bârgăului. The turbidite succession analysed in the Blaju Creek consists in an alternation of massive fine- and medium- grained sandstones beds (up to 1m) and thin (up to 20cm) hemipelagic marly levels shows depositional facies of mid fan turbidites. In the studied outcrop three thinning- and fining-upward facies sequences have been identified. The massive sandstone intervals, lacking any evident inner sedimentary structures, can be linked to processes produced by high-density turbidity currents with generation of prograding sandstone lobes. Transport direction of the clastic material, detected from the measurement of sole marks, slightly deflects (10-15 degrees towards S) compared to those identified at Colibiţa.

The calcareous nannoplankton assemblages contain: *Sphenolithus conicus* (Pg - NN3), *S. predistentus* (NP17 - NP24)*, Helicosphaera scissura* (NN2 - NN4), *H. mediterranea* (NN2 - NN4), *H. euphratis* (NP18 - NN5), *Discoaster deflandrei* (Eocene - NN7), *Cyclicargolithus floridanus* (Paleogene - NN7), *Reticulofenestra bisecta* (NP17 - NP25)*, R.* cf. *haqii* (NN2 - NN15), prouving the **Upper Oligocene – Lower Miocene** age of the deposits from Mureşenii Bârgăului. The calcareous nannofossil assemblages contain also: *Sphenolithus moriformis*, *S. obtusus, Reticulofenestra minuta, R. dictyoda, R. umbilica*, *Discoaster* cf. *adamanteus, Coccolihus pelagicus*, *C. eopelagicus*, *Dictyococcites bisectus, D. stavensis, Pontosphaera multipora, P. discopora,* ascidian spicules and calcispheres.

Tihuta Pass. Turbidite successions have been analysed in three different outcrops along the main road not far from Tihuta Pass. The alternation of massive fine- and medium- grained sandstones beds (up to 80cm) and hemipelagic marly levels (up to 40cm) shows depositional facies of mid fan and outer fan turbidites. Transport direction of the clastic material, detected from the measurement of sole marks, regain the same average direction measured at Colibita.

The samples analysed from the outcrops of Bistrita - Vatra Dornei area, in the Tihuta Pass, prouve the presence of the NN1 and NN2 biozones: NN1 – with *Triquetrorhabdulus carinatus* and NN2, because of the presence of: *H. ampliaperta* (NN2-NN4) and *H. mediterranea* (NN2 – NN5). The assemblage contain also: *Sphenolithus* cf. *ciperoensis* (NP23-NP25), very frequent *Coccolithus eopelagicus* and *C. pelagicus* and frequent reticulofenestrids with a large distribution in Oligocene, which continue their evolution in the Lower Miocene. Discoasters are very rare. The age of the deposits is **Lower Miocene** (NN1-NN2).

Conclusions. Facies analysis of progressively superimposed clastic deposits demonstrate the progradation of the turbidite depositional systems, in this part of the Transcarpathian Basin, from Colibiţa area (SE) to Mureşenii Bârgăului area (NW) during Oligocene (Aroldi et al., 2013).

The calcareous nannofossil assemblages strongly confirm the progradation of the analysed depositional systems. The age of the investigated deposits of Borsa Formation, are: Oligocene at Colibita, Upper Oligocene – Lower Miocene at Mureşenii Bârgăului and Lower Miocene at Tihuta Pass. A general uplift of the source area linked with a regional tectonic activity is envisaged, in order to explain the architectural variation of both source area and basin geometry and so justifying the vertical variations of sandstone composition.

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Cylindracanthus (Leidy, 1856) In Natural History Museum Sibiu Collection

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Keywords: Turnu Rosu, Eocen, presumed rostrum.

Introduction

The present paper continues the work of revising the pieces of the "Richard Breckner" collection. This collection it is hosted by the Natural History Museum in Sibiu and it is likely the most valuable of its kind from our country (Ciobanu, 1998). A few thousand teeth of sharks and bony fish give proof of a very complex marine vertebrate association from the Eocene period. All the teeth were collected from the Turnu Rosu locality, in the Sibiu county. Since no stratigraphic information it is available for any of the pieces, only a generic assignment can be made, to the Eocene limestone deposits that can be found near the Turnu Rosu village. The Eocene limestone from Turnu Rosu (Porceşti), it is, in the present days, part of a paleontological protected area. Situated in the south-est of the Turnu Rosu village, the limestone deposit, is a small erosion witness, a patch of the sedimentary cover of the Transylvanian Basin. The Richard Breckner collection is composed manly of shark teeth but aside of them there are an important number of other vertebrate remains like bony fish teeth or crocodile teeth. One of this vertebrate remains draw our attention.

Description

The study subject of the paperwork it is a isolated fossils remain, a fragment of a presumed rostrum from Cylindracanthus Leidy 1856. In cross section it is circular and presents a central internal canal. The exterior surface seems to be a thick enamel-like layer, deeply fluted, that presents 32 ridges. Also, it is important to note the presence of two deeper grooves, a little bit more wider than the rest, grooves that can possible be the insertion place of some blunted teeth. No actual teeth have being observed.

Discussions

Usually any paper work dealing with the *Cylindracanthus* genus starts with remarks like "a perplexing fossil" or "taxonomic problem" (Parris, Grandstaff, Bell, 2001, p.161). Friedman (2012, p.116) states that *Cylindracanthus* has a tumultuous history, being variously associated with chimaeroids (cartilaginous fishes related to sharks and rays), tetraodontiformes, billfishes (Schultz, 1987) and most recently sturgeons (Parris et al., 2001). The problems that constituted the subject of the vast majority of the studies that refer to *Cylindracathus* type of fossils are connected to the anatomical functionality of the fossils, to the morphological diversity, systematic and also stratigraphic framing.

Regarding the systematic position of the "The *Cylindracanthus group*" Firestone states (1974, p. 36) that it is a taxonomic chaos". Taking on to account the teeth position and the way the rostrum is inserted, Parris (2001, p.169, 170) suggest that *Cylindracanthus* has a possible relationship with Acipenseriformes, sturgeons (with a bigger resemblance to juveniles). The fossil records of this group are considered by him to be substantial in the sediments of about the same age as *Cylindracanthus*. From the known actinopterygians the Acipenseriformes seem to be the only group that have a rostrum with no evidence of a occluding lower jaw. Parris argued that the insertion of *Cylindracanthus* within xiphioids would make *Cylindracanthus* the oldest record of this group but the supposition that *Cylindracanthus* was cartilaginous (resulted from the lack of additional skeletal remains) does not fit with the structure of present day xiphioids that are bony. In supporting his opinion about the relationship with Acipenseriformes, Parris, states that like *Cylindracanthus*, the Acipenseriformes also had a good development during Cretaceous, crossing with success the K/T boundary but fading in the next period along with the development of

Perciforms. Although the Acipenseriformes are extant the *Cylindracanthus* did not survived and at the end of Eocene it got extinct (Parris 2001, p.169, 170).

In 2002 Fierstine and Monsch while making a redescription of Blochiidae family from the middle Eocene pf Monte Bolca, in Italy bring forward again *Cylindracanthus*. A cladistic analysis was attempted in order to reveal the phylogenetic position of *Blochius* genus among related genera. They reveled that during computing of the cladistic analysis *Cylindracanthus* had to be excluded because of their ambiguity (Fierstine and Monsch, 2002, p. 146). The conclusion was that the phylognetic position of *Cylindracanthus* but also other members of the "Cylindracanthus group" remains unresolved.

In a later paper Parris et al. (2007, p.100, 101) compared and synthesized the major characters of the Acipenseiformes, Billfishes and *Cylindracanthus* genus. In what the lately is concerned the authors consider as the first apparition the Cretaceous and it is characterized by a cylindrical, bony rostrum with bilateral symmetry and most likely cartilaginous body. The proposed lineage is *C. ornatus* (Cretaceous) as an ancestor to *C. rectus* (Eocene) and a separate lineage to *C. acus* (also Eocene) with an emphasis that the observed changes in the degree of dental preservation is of a substantial value as biostratigraphic evidence.

Conclusions

We can place without doubt the described piece to the genus *Cylindracanthus* (LEIDY, 1856). Taxon, anatomical identity is not solved for Cylindracanthus type fossils. The pros and cons of these issues are valid. The difficulty is related to the fact that in outcrops do not appear other parts attached to the skeleton. These residues may be ichthyodurulites, rostrum, spins or occupy other anatomical positions. What is clear is that fossil outcrops occur in Cretaceous deposits until the Eocene.

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Palaeontological and palaeoecological investigation of the Eocene from Morlaca (Huedin, Transylvanian Basin)

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Keywords: molluscs, foraminifera, calcareous nannofossils, microfacies, Priabonian.

We studied in high detail the Eocene exposed along the Fagetelului Valley, near Morlaca in the northwestern part of the Transylvanian Basin, 10 km northwest of Huedin city.

The investigated outcrop is made up at its base by an alternation of white limestones and green clays, without fossil content. The limestones are mudstones with drying cracks, nodular processes, extraclasts of quartz. These features suggest a lacustrine - palustrine facies with subaerial exposure for the base of the studied strata. In the middle part of the outcrop the alternation of limestones and fossiliferous yellow-grey marls can be observed. From the marls remains of bivalves (*Crassostrea transsilvanica*, *Vulsella dubia transilvanica*, *Chlamys biarritzensis*, *Lucina rectangulata*) and gastropods (*Terebellum sopitum*, *Cepatia cepacea*, *Campanile parisiense*, *Rimella fissurella*) were recovered. They areare innercasts of shells in different ontogenetic stages, and with connected valves. Only a few bivalves were fossilized as shells (e.g. *Crassostrea*, *Vulsella* and *Chlamys*).

In the upper part of the exposure the limestones varies from packstone to bioclastic packstone. The bioclastic of these limestones are formed by remains of molluscs, foraminifera, red algae, echinoids, ostracods, and bryozoans.The microfacies analysis of the limestones present in the middle and upper part of the studied outcrop, and the macro- and microfossil assemblages recovered from these part of the outcrop indicate a shallow marine depositional environment with normal salinity.

The calcareous nannofossil assemblages are relatively scarce, represented especially by small reticulofenestrids (*Reticulofenestra dictyoda, R. minuta*) and rarely larger forms of *R. bisecta*, *R.* cf. *daviesii, R. lockeri, R.* cf. *umbilicus*. Very rare *Coccolithus* cf. *eopelagicus* also occur. The most frequent are the ascidian spicules and subordinately calcispheres.

The foraminifera assemblages are dominated by Miliolida (*Quinqueloculina, Triloculina*) and Rotaliida, but a few planktonic foraminifera tests have been also found.

The deposits cropping out in the lower part of the exposure at the Fagetelului Valley belong most probably to the Valea Nadăşului Formation (Popescu, 1978) (Lower Priabonian). Whilst the upper part of the studied outcrop, the features of the carbonates and the presence of the accumulations (lumachells) of *Crassostrea transsilvanica* and *Vulsella dubia transsilvanica* are characteristic (Rusu, 1987) for the base of the Cluj Limestone (Hofmann, 1879) (Upper Priabonian)

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Reconstruction of water level and pH variations from a high altitude peatland during the Holocene

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Keywords: paleoclimate, palaeohydrology, Rhizopoda, testate amoebae, peat, Holocene, Romania.

In the last years testate amoebae (Protozoa: Rhizopoda) gained more attention from the Quaternary research groups around the globe. Being a group of organism that have a quick response to environmental changes they are a good proxy for quantitative reconstruction using transfer function methods. Our purpose in this study is to presents the qualitative and quantitative analysis of testate amoebae and the changes in water table and pH from the peat bog Tăul Muced, located in the Rodna Mountains (Northern Romanian Carpathians).

From this site, a peat core of 560 cm long which is composed mainly from *Sphagnum* remains was extracted with a hand-operated Russian sampler. The extraction of testate amoebae was realized using a boiling and sieving technique, without any chemical reagents. Subsamples were prepared at each 4 cm or in some cases at 2 cm intervals. For each sample a minimum of 150 fossils were counted and identified at species level, according to latest taxonomical classification. The results were processed into C2 statistical program and expressed as percentage of total count. For the quantitative analyses a transfer function developed from a Polish modern data base to reconstruct the depth to water table (DWT) and pH was used (Lamentowicz and Mitchell, 2005). The chronology was obtained with ^{14}C method. For the bottom part of the sequence an age of ca. 8800 cal. years BP was established.

A number of 122 samples were analysed and 29 species, showing different gradients of humidity, were identified. Wet environmental conditions are indicated by the presence of taxa such as *Archerella flavum* and *Hyalosphenia papilio*, while dry conditions are indicated by *Difflugia pulex* and *Nebela militaris*. Six testate amoebae zones (TAZ) were identified based on the DWT and pH changes. In TAZ-1 and TAZ-3 we observed dryer environmental conditions with DWT values over 18 cm and very acidic waters while in TAZ-2 DWT values are under 18 cm and the pH rises over 4. TAZ-4 indicate a period with high amount of precipitations in which DWT values reach 8 cm and pH is between 4 and 5. TAZ-5 starts as a dry period but ends with high water levels and pH reach values around 4. The last zone, TAZ-6 express dryer conditions with deep water table and less acidic water probably linked to recent water drainage from the peatland and drying of the *Sphagnum* vegetation.

The results of this study show the importance of the transfer functions in palaeoenvironmental studies. This demonstrates the need of creating new regional modern data bases that will wider the range on the taxa distributions and will establish more strongly ecological parameters for the use of testate amoebae in future palaeoecological studies.

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New data on the Middle Miocene flora from Pârlagele (Mehedinţi County)

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Keywords: macroflora, Scoarţa Valley, leaf assemblage, Badenian.

Introduction

In this paper are presented research on the Badenian deposits in Scoarţa Valley, on left tributary Neagonea River, near to Pârlagele. Pârlagele locality (Bâlvăneşti common) is located 12 km north-east from Drobeta Turnu Severin, Mehedinţi County (Fig. 1), being part of the Mehedinţi Geopark Plateau.

The Mehedinţi Geopark Plateau is situated in southwestern Romania and in the northern part of the Mehedinti County, between Mehedinti Mountains and Getic Piemont (Meilescu et. al., 2004). This park is neighboring with tow protected areas: The Iron Gates Natural Park in the south - west and Domogled-Cerna Valley National Park at north-west.

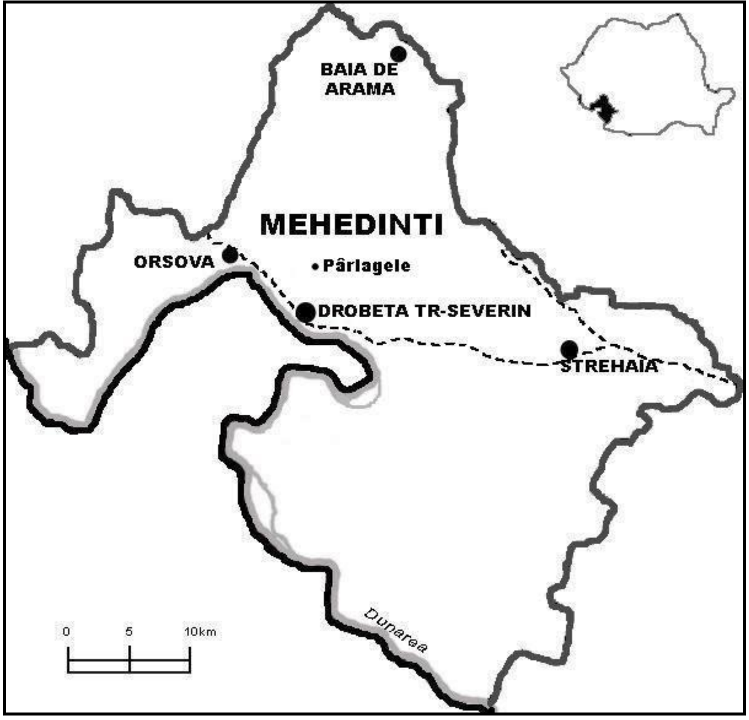

Fig. 1 Location of Pârlagele site on the map of Mehedinţi County

Previous research

The occurrence of fossil plants in the Badenian deposits near Pârlagele, at Neagonea Valley has been mentioned for the first time by Stancu & Ţicleanu (1974). In this site was pointed out 16 taxa, including 2 new species and 7 species reported for the first time in Badenian flora of Romania.

In his monograph paper (Marinescu, 1978) describes the representative profiles of the western Dacic Basin, including profiles to limit Sarmatian/Badenian which can be seen on left tributaries Neagonea Valley.

From outcrops on the left slope of the Neagonea Valley were identified (Diaconu & Meilescu, 2011), not figured or described mollusks and plants fossil species.

Diaconu & Meilescu (2012) proposes a geotourist route on Neagonea Valley (Mehedinti) opened for scientific tourism to promote and support the research aimed to preserving the natural heritage of the Mehedinţi Plateau Geopark area.

Methodology

The macrofloristic material consists in leaf impressions, the compression being destroyed by oxidation. The applied method was represented by obtaining some drawings under the stereomicroscope, a proceeding which allows the observation of all the morphological details. Sometimes, because of the obvious contrast between the color of the foliar impressions and the color of the host rock, there were used pictures as well for the comparisons and presentation.

Almost all the specimens collected represent imprints (rare compressions), which are preserved without anatomical details. The material is kept in the collections of the Iron Gates Region Museum.

Results

The fossil vegetal remains identified in the Middle Miocene (Badenian) deposits from Pârlagele are: *Pinus* sp., *Carpinus grandis* UNGER, *Quercus* sp., *Laurophyllum* sp., *Juglans acuminata* AL. BRAUN, *Myrica lignitum* (UNGER) SAPORTA, *Populus* sp., *Tilia josephinae* ŢICLEANU.

Conlusions

Based on the paleoecology analysis of flora identified in the Badenian deposits from Pârlagele can be reconstituted the environmental conditions of that period;

This interesting fossil place is probably the most important among Badenian sites of Mehedinti, including Mehedinţi Geopark Plateau.

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The biostratigraphy and sedimentology of Pontian deposits from Slanicul de Buzau section, Dacian Basin

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Keywords: Eastern Paratethys, ostracod species, Odessian, Portaferrian, Bosphorian.

The Dacian Basin represents an important component of Eastern Paratethys. It evolved from Sarmatian up to the Romanian regional stages in conditions of progressive decreasing of salinity due to the variable communications with the Euxinian and Pannonian basins. The sedimentation and subsidence rate were very high which led to the accumulation of more than six thousand meters of clastic sediments (*Jipa et al., 2009*).

The Slanicul de Buzau River comprises a complete stratigraphic succession from the Late Miocene up to Late Pliocene. The present study describes palaeontological (ostracods) and sedimentological aspects of the Pontian deposits from this section.

The Lower Pontian (Odessian) deposit from Buzau Area develops into a pelitic facies represented by fine-bedded of massive marls with rare thin intercalations of silts and sandstones. The Lower Pontian sediments are very rich in mollusk and ostracod species. The base of the unit is marked by layers with *Pseudoprosodacna littoralis.* The muds are very rich in shallow-water bivalves including *Congeria rhomboidea* and *Paradacna* sp.

The fresh water ostracods fauna from Upper Maeotian is replaced by a more brackish one in Lower Pontian after the transgressive event at Maeotian/Pontian boundary (*Krijgsman et al., 2010; Stoica et al., 2012*). The Odessian ostracod fauna is represented by: *Candona (Caspiocypris) alta, C. (C.) pontica, C. (Camptocypria) ossoinaensis, C. (Zalanyiella) venusta, C. (Hastacandona) hysterica, C. (Fabeaformiscandona)* sp., *Pontoniella (Zalanyiella) acuminta, P. (Z) quadrata, P. (Z) striata, Cypria tocorjescui, Bakunella dorsoarcuata, Cytherissa* sp., *Cyprideis pannonica, Tyrrhenocythere pannonicum, Leptocythere cymbula, L. costata, L. bosqueti, L. lata, Amnicythere andrusovi, A. palimpsesta, Loxoconcha babazananica* and *L. petasa.* The presence of ostracods with eye tubercles indicates the need of the photic zone for there development.

The Middle Pontian (Portaferrian) represented a regressive phase in Dacian Basin. We interpret the transition from HST (high stand system tract) in Odessian to LST (low stand system tract) in Portaferrian as a moment when the bathymetry of the Dacian Basin and all Eastern Paratethyan basins decreased, possible as a consequence of the disconnection with Mediterranean Sea during its desiccation moment (Messinian Salinity Crisis Event).

The basinal sequences of the Lower Pontian are replaced in the Middle Pontian by a more proximal ones developed in littoral and fluvial-deltaic environments. The sedimentary record becomes scarce in fossils. The mollusk fauna is represented by fresh water, lacustrine and fluvial species: *Unio (Rumanunio) rumanus* and *Dreissena polymorpha.* The ostracods fauna is also rare and is represented by species of: *Amplocypris dorsobrevis, Cyprideis pannonica, C.* sp*., Tyrrhenocythere* ex. gr. *motasi, Candoniella* sp*., Zonocypris membranae.* The faunal assemblages from Portaferrian deposits indicate fresh water environments and a small drop of the water level.

The Upper Pontian (Bosphorian) sequence started with a new transgressive moment. The Bosphorian deposits are represented by massive or stratified gray marls and clays, rich in fossils, alternating with thinner sandstones and shell accumulations. The Upper Pontian is marked by a gradual upward increase in littoral and fluvial deposits.

The mollusk fauna is represented by numerous species of bivalves that are mostly typical for brackish waters; the gastropods fauna is also rich developed in Portaferrian deposits. A new ostracods bloom occurs and some of the species common in the Odessian sediments become dominant again in the Portaferrian deposits. The main ostracod species from the Upper Pontian are: *Candona (Caspiocypris) alta, C. (Camptocypria) ossoinaensis, C. (C.) balcanica, Pontoniella (Zalanyiella) acuminata, Cypria tocorjescui, C.* sp.1, *Bakunella dorsoarcuata, Cytherissa* *boghatschovi, Cyprideis pannonica, C. torosa, Tyrrhenocythere motasi, T. filipescui, T.* sp., *Leptocythere cymbula, L.* ex. gr. *bosqueti, L. (?) costata, L. lata, Maetocythere bacuana, Amnicythere andrusovi, A. palimpsesta, Loxoconcha petasa, L. schweyeri, L. babazananica*.

The base of the Bosphorian corresponds to a second transgressive moment in the Dacian Basin, showing a major faunal change of the ostracod assemblages and a lithological change to more basinal sequences.

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Oldies but goldies. A revision of the Upper Cretaceous echinoids in the collections of the Romanian National Museum of Geology

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Keywords: Echinoidea, Cenomanian-Campanian, museum, Romania

In September 2014, a visit to the collections kept at the Romanian National Museum of Geology (RNMG) in Bucharest allowed the recovery of several specimens of Upper Cretaceous echinoids from different localities of the Carpathians, southern Dobrogea and the Babadag area currently under study. The resulting information is completing the one obtained in a former visit to this institution in 2008 to look after the southern Dobrogea cretaceous echinoids of the Chiriac collection just after having checked its type and figured specimens kept at the Palaeontology Laboratory of the University of Bucharest.

Specimens in the RNMG were originally collected by or given to L. Szász, G. Macovei, R. Pascu, I. Simionescu, R. Lăcătușu, O. and E. Mirăută, N. Anastasiu, I. Popescu-Voitești, D. Patrulius, M. Chiriac and D. Lupu. They are representative of the Cenomanian, Turonian, Coniacian, Santonian (?) and Campanian stages.

A provisional list of the species includes: *Typocidaris subvesiculosa* (d'Orbigny, 1850); *Camerogalerus minimus* (Desor, 1842); *Conulus subrotundus* Mantell, 1822; *Protocardiaster cotteauanus* (d'Orbigny, 1855); *Holasteropsis credneriana*? Elbert, 1902; *Rispolia subtrigonata* (Catullo, 1827); *Stenonaster tuberculatus* (Defrance, 1816); *Echinocorys beaumonti*? Bayan, 1870; *Echinocorys scutata* Leske, 1778 forma *vulgaris*; *Echinocorys scutata* Leske, 1778 forma *planodoma*; *Offaster pillula* (Lamarck, 1816); *Hemipneustes striatoradiatus* Leske, 1778; *Epiaster michelini* (Agassiz, 1847); *Micraster normanniae* Bucaille, 1883; *Micraster cortestudinarium* (Goldfuss, 1826); *Micraster rogalae*? Nowak, 1909; *Micraster aturicus* Hébert *in* Seunes, 1891; and *Micraster (Gibbaster) gibbus* Desor, 1858.

Many of the outcrops where these species were originally found in the past have nowadays disappeared because they lay under public works or are not quarried anymore, and this fact gives them an added value. But their own greatest potential has to do with biostratigraphy, palaeoecology and palaeobiogeography. *Offaster pilula* is a marker of the *Hoplitoplacenticeras marroti-O. pilula* Zone in the basal Upper Campanian (Küchler, 2000). The presence of *Rispolia subtrigonata* and *Stenonaster tuberculatus* was already indicating both an important depth of the sediments in which they are found and a link between the deposits of the Italian *Scaglia Rossa* Formation, and their occurrences in Ormeniș (E Carpathians) and Caugagia (Babadag). The identification of *Echinocorys beaumonti* in the latter area strengthens such link and extends the distribution area of this species, up to now restricted to the Venetian southern Alps.

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Middle–Upper Jurassic and Lower Cretaceous Nannoplankton Assemblages from Central Valachian Platform (Mamu area)

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Keywords: Middle-Late Jurassic, Lower Cretaceous, calcareous nannoplankton, central Valachian Platform (Mamu area)

Introduction

In the central Valachian Platform area were drilled many exploration wells, which investigated the sedimentary deposits trying to discover new oil and gas reservoirs. A perspective area it is proved to be Mamu, where oil traps were identified. For this paper it was choosen three wells from which a total of 19 cutting samples have been analyzed using the calcareous nannoplankton criteria. These rock samples were selected from the Middle–Upper Jurassic and Lower Cretaceous age intervals.

Methodology

On these rock samples, nannoplankton analyses according to the I.C.P.T. Campina Geological Laboratory procedures were performed.

Results

The Middle–Upper Jurassic and Lower Cretaceous deposits are represented by blackish and rarely brown clays, gray calcareous clays, gray and rarely reddish-brown marls, fine grained light-gray sandstones, whitish limestones and light-gray argilaceous limestones.

The oldest Jurassic deposits belong to Bajocian and were intercepted by all three wells. This age was given by a relatively rich calcareous nannoplankton assemblage, containing the following taxa: *Discorhabdus striatus* Moshkovitz & Ehrlich, *Lotharingius crucicentralis* (Medd) Grun & Zweili, *Ellipsagelosphaera britannica* (Stradner) Perch-Nielsen, *Ellipsagelosphaera communis* (Reinhardt) Perch-Nielsen, *Schizosphaerella punctulata* Deflandre & Dangeard. The Oxfordian-Callovian deposits were crossed by the well M-3 and were dated by the presence of *Zeugrhabdotus erectus* (Deflandre) Reinhardt taxon. The top of the Upper Jurassic (Upper Kimmeridgian-Tithonian) was identified in the M-2 well, using the occurrence of *Zeugrhabdotus embergeri* (Noël) Perch-Nielsen and *Nannoconus colomii* (de Lapparent) Kamptner markers (Barnard & Hay, 1974).

The Lower Cretaceous is represented by Lower „Neocomian” (Berriasian-Valanginian) and Upper Albian formations. The Berrisian-Valanginian deposits were crossed by M-3 well and were identified using the *Nannoconus steinmannii* Kamptner and *Stradneria crenulata* (Bramlette & Martini) Noël zone markers (CC 1 and CC 2 zones - Sissingh, 1977; Perch-Nielsen, 1985a). The sequence of Lower Cretaceous deposits ends with the Upper Albian layers, crossed by M-2 well and dated using *Eiffellithus turriseiffelii* (Deflandre) Reinhardt zone marker (CC 9 zone - Sissingh, 1977; Perch-Nielsen, 1985a).

Conclusions

The nannoplankton analyses show that the oldest Middle Jurassic sedimentary deposits belong to Bajocian and Callovian. A rich assemblage was identified at the Bajocian level. The Bathonian could be considered a gap in sedimentation.

All the terms of the Upper Jurassic were identified, except the Early Kimmeridgian.

The first Lower Cretaceous deposits are the Berriasian-Valanginian ones and they were identified using the zone markers of CC 1 and CC 2 zones - Sissingh, 1977; Perch-Nielsen, 1985a. The nannoplankton analyses performed on rock samples from the three mentioned wells did not put in evidence the Hauterivian - Early/Middle Albian formations. The Late Albian was dated using the zone marker of CC 9 - Sissing 1977; Perch-Nielsen, 1985a.

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Badenian rocky near-shore facies in Dobrogea - a new finding in the Capidava area

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Keywords: Badenian, Chokrakian, Rocky near-shore facies, Central Dobrogea

The geological maps show the state of knowledge at time on the distribution and age of the mapped rocks. The subsequent work may provide new stratigraphic data that could improve the maps. This is the case of the Sheet 46 Constanța, published in 1968, in the Geological Map of Romania, scale 1:200,000. The sedimentary deposits that have been mapped and dated as Aptian in the area of the Capidava village are now proved on firm biostratigraphic data to belong to the Badenian. In the previous publications (Chiriac, 1970; Avram et al., 1996; Munteanu & Munteanu, 1999), the northernmost-known deposits of the Badenian had been mentioned and described only from the area of the Dunărea village and had been interpreted as a near-shore facies.

Our data show that the Badenian deposits extends in the area of the Capidava village (Fig. 1), more northwards of the Dunărea village. The most representative outcrop is located 1km south of the Capidava village on the right bank of the Danube, vis-à-vis of the Sts. Epictet and Astion Monastery. The exposed section, around 26 m thick and dipping southwards, made up a steep, rocky slope on the left side of the 65 Road running towards the Capidava village (Fig. 1). The base and the top of the section are concealed under the Quaternary loessoid deposits. The possible thickness of the entire Badenian section may be estimated to around 200 m.

The most conspicuous pattern of the exposed section is the presence of several packages of mostly clast-supported, disorganized conglomerates made up of well-rounded pebbles and cobbles of Upper Jurassic limestone (Figs 2 and 3). Soft, poorly cemented, bioclastic limy strata are interbedded within section. Pebbles or cobbles of Upper Jurassic limestone, extensively bored by *Botula subcordata* (d'Orbigny, 1847) are found in the limy deposits. At some levels, the limy deposits contain abundant, displaced individuals of the rock-boring bivalve genus *Botula* Mörch, 1853. Small-sized ostreids belonging to *Cubitostrea digitalina* (Eichwald, 1830) are occasionally present, alongside rare *Aequipecten varnensis* (Toula, 1892). Among the gastropods, *Thericium cattleyae* (Bailly, 1856) is present. Commonly, the most part of macrofauna is preserved as internal molds, which render difficult the taxonomic assignment.

The upper part of the section that is not exposed is fining upward. It is made up of soft, limy or clayey deposits, in which Green Schists clasts of the Neoproterozoic basement are commonly present alongside rare pebbles of Upper Jurassic limestone.

The Upper Jurassic limestones, on which the Capidava Citadel sits, are topped on the south edge of the citadel by cemented, clast-supported conglomerates, with pebbles and cobbles of Upper Jurassic limestone, which grade upwards to limy deposits bearing almost Green Schists clasts.

By their rocky shore lithofacies and faunas, the Badenian deposits in the area of the Capidava village are typical of a high energy, near-shore, rocky environment while the Badenian deposits from the area of the Dunărea village are typical for a lower energy near-shore environment.

The above mentioned macrofauna that is indicative for the Chokrakian shows close paleobiogeographic connections with the Euxine-Caspian Basin.

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Fig.1 – Google Earth image showing the location of the Badenian outcrop south of the Capidava village

Fig.2 – The Badenian outcrop exposing thick packages of conglomerates with Upper Jurassic pebbles/cobbles

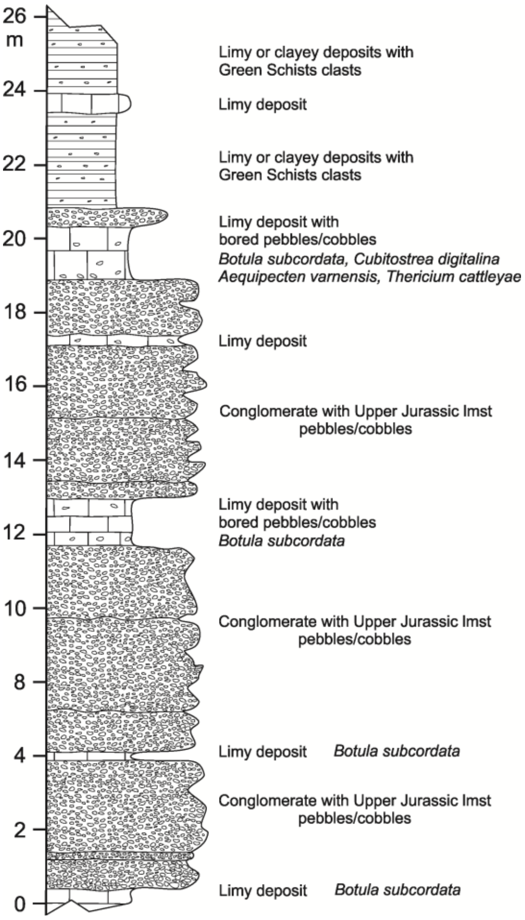

Fig.3 – Stratigraphic column of the Badenian deposits in the outcrop nearby Sts.Epictet and Astion Monastery

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Rediscovery of the famous Callovian section from Lupului Valley (Rucăr zone, South Carpathians, Romania) first described by Simionescu in 1899

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Keywords: microfacies, taphonomy, Callovian, South Carpathians, Romania

Introduction: The studied sequence is located in the Eastern part of South Carpathians (Rucăr-Bran zone) and belongs to the sedimentary cover of the Getic Nappe, which is one of the major geotectonic units of the Median Dacides, interpreted as parts (Getic Domain) of the strongly deformed European continental margin (Săndulescu, 1984). Intense extensional tectonic activity generated during the Callovian-Oxfordian interval was documented in the Rucăr-Bran zone by different thickness and stratigraphic extension of the units of the Middle Jurassic successions, as well by the presence of neptunian dykes, clastic dykes and of the submarine syntectonic sedimentary breccias (Patrulius, 1969; Lazăr and Grădinaru, 2014). The studied succession from Lupului Valley is represented by mixed siliciclastic-carbonate condensed sequence developed within the Callovian - Oxfordian time interval, covering the metamorphic basement represented by Călușu-Tămășel Complex (Leaota Series). The studied sequence crops out on the upper part of Lupului Valley (named Obârşia Văii Lupului or Gruiul Lupului), a left-side tributary of Râuşor Valley and has been described previously by Simionescu (1899). In his paper "*Fauna Calloviană din Valea Lupului (Rucăr)*" Simionescu (1899) described for the first time, unique Middle-Late Callovian ammonites and brachiopods faunas. Afterwards Simionescu' researches, this sequence has only been accessed and briefly described by Patrulius (1969) and Patrulius et al. (1980), who presented the lithostratigraphy of the section (the Gruiul Lupului Formation). Since then, the Callovian sequence from the Lupului Valley has never been visited or studied until recent, although the fossil fauna described by Simionescu (1899) was mentioned in numerous subsequent papers as very interesting considering the taxonomical and paleobiogeographical aspects. In 2012, the authors of the present paper rediscover the section from Lupului Valley after detailed field work in the area that currently is covered by dense forests.

The purpose of our contribution is to describe in detail, the lithostratigraphy of the Gruiul Lupului Formation, highlighting the microfacies types and diagenetic features, the associated fossils faunas as well as description, geochemistry and mineralogy of the unique stromatolitic structures associated with different types of breccias forming the base of the succession.

The methodology for this study included complementary paleontological, sedimentological, geochemical and mineralogical approaches. Microfacies type and diagenesis were investigated in 150 thin-sections under petrographic and binocular microscope. The microfacies types have been identified and described based on the textural descriptions, with percentage of grain and grain-to-matrix ratio, according to Dunham's (1962) classification. Cathodoluminescence microscopy was conducted focusing of the overall range of diagenetic futures observed in 30 polished slabs. In addition, samples were analysed for carbon and oxygen-isotope analysis.

Results: The base of the succession is represented by in situ fracture trough extensional breccias; the angular clasts of breccias are represented exclusively by metamorphic rocks and are coated by few generations of stromatolites and early diagenetic cements. The matrix between the clasts consists of red micrite. The micropeloidal laminae of stromatolites locally contain well preserved calcified bush-like fossil microbial filamentous structures. Successive generations of stromatolites are affected by micro-fractures disrupting the continuity of laminae and are separated by numerous angular clasts of stromatolites and debris of cements, probably as effects of synsedimentary extensional tectonics producing faulting-induced seismic activity that determined stromatolites disruption and resedimentation. Carbon-oxygen isotope ratios obtained from radiaxial fibrous calcite cements (RFC) passing to scalenohedral calcite cements (SC) that were developed synchronous with the stromatolites, show negative values ($\delta^{13}C$ = -0.73 to -0.11‰ and $\delta^{18}O$ = -5.21 to -8.68‰), commonly assigned to meteoric zone.

The next unit is represented by bioclastic peloidal grainstone-packstone to rudstone containing numerous metamorphic clasts and abundant benthic fauna revealing signs of intensive reworking. The fauna is represented by terebratulid brachiopods and bivalves (*Entolium demisum, Chlamys textoria, Inoperna sowerbyana)*, serpulid tube-worms, echinoid spines. The topmost part of this unit is cut by a sharp erosional discontinuity.

The overlying unit is represented by medium bedded grey to red limestone consisting of crinoidal grainstone-packstone with numerous centimeter-sized quartzite and other metamorphic clasts; toward the top of this unit a bed of red peloidal bioclastic grainstone (1,5 meter thick) is developed; within this bed the fauna is represented by abundant brachiopods (mainly *Septocrurella defluxa, „Rhynchonella" arthaberi and* (?)*Karadagithyris gerda*), along with indeterminable ammonites.

The following part of the succession (almost 1 meter thick) is represented by red to pink bioclastic packstone/grainstone to rudstone, respectively oncoidal floatstone and rudstone containing reworked ammonites steinkerns (*Sowerbyceras subtortisulcatum, Hecticoceras richei, Grossouvria* sp.) and coarse to medium-sized, angular rock fragments derived from the underlying lithostratigraphic units; the rock clasts as well the re-elaborated ammonites, bivalves and gastropods are coated with thin ferruginous stromatolitic crusts. These are followed by thin-bedded grey limestones (2,25-m-thick bioclastic wackestone-packstone) containing numerous ammonites (*Kosmoceras mrazeci*, *Reineckeia anceps*, Hecticoceratinae) attesting to Upper Callovian age of the rocks (according to Simionescu 1899; Patrulius et al., 1980). The last part of the succession is represented by almost 2 meters of thin to medium bedded red limestone with cherts (nodular packstone-wackestone and bioclastic wackestone with radiolarians) belonging to the Oxfordian stage (cf. Patrulius et al., 1980).

Conclusions: The multidisciplinary approach of the present study reveals the taphonomy and paleoecology of these particular fossil assemblages and allows the paleoenvironmental assessment of their genesis. The carbonate stromatolites coating the metamorphic clasts of the in situ fracture breccias were formed most probably in very shallow-water marine environments affected by fresh-water incursions. Subsequently, the progressive deepening of the basin transferred this setting within an open-marine environment, below fair-weather wave base or near to storm wave-base. This environment was characterized by low rates of sedimentation and calm waters alternating with periodic episodes of moderate to high water agitation allowing the genesis of a condensed sequence. The deepest character of sedimentation within the distal offshore is documented by limestones with cherts and radiolarites of the Oxfordian age. Such studies are of importance as they could be correlated with synsedimentary tectonics, but they also reflects the effects of the regional and global changes documented for the Middle-Upper Jurassic time interval in different peri-Tethyan areas

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Taramelliceratinae (*Taramelliceras, Metahaploceras, Hemihaploceras*) species from Kimmeridgian strata of Ghilcoş (East Carpathians – Romania)

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Keywords: Oppelidae, Taramelliceratinae, Kimmeridgian, Hăghimaş, East Carpathians.

Introduction

Taramelliceratinae species described here come from the Kimmeridgian and Early Tithonian by Hăghimaş Massif (Eastern Carpathians) - especially from outcrops of Ghilcoş Mountain (Grigore, 2011).

Methodology

In the systematic description was taken into account the classification of Callomon (1981), the morphology and phyletic characteristics observed by Holder (1955) and the amendments made by Sarti (1993) and Oloriz (1978). Determination of species was also based on the comparison of ontogenetic evolution of ribbing and tuberculation. Were analysed here more than 140 specimens.

Results

In paper are described 28 taxa of Taramelliceratinae Subfamily; already known through previous authors are only 12 species from this outcrop and must be reminded here the Type species of: *Oppelia kochi* and *O. mikoi* of Herbich (1878) and *Oppelia pugile*, *O. schwageri*, *O. nobile* of Neumayr (1871), the last one being generotype of *Hemihaploceras* Spath (1925). With that occasion were analized and reviewed specimens from the Collection Preda (1973) present in Bucharest University or Piatra Neamt Museum of Natural Science. Also were analysed the specimens from the collections Neumayr and Herbich, present in the Museum of "Babes Bolyai" University in Cluj Napoca.

The systematic view resulting at this moment (marked with "*" the twelve species previously known) is:

- From *Taramelliceras* Genus

Subgenus *Taramelliceras* Del Campana, 1904 in Holder, 1955: **T.* (*T.*) *trachinotum* (OPPEL, 1863), *T.* (*T.*) *greenackeri* (Moesch, 1865) in Loriol, 1878, *T.* (*T.*) *pseudoflexuosum* (Favre, 1877), **T.* (*T.*) *compsum compsum* (Oppel, 1863), **T.* (*T.*) *compsum holbeini* (Oppel, 1863), *T.* (*T.*) *compsum franciscanum* (Fontannes, 1879), *T.* (*T.*) *compsum hemipleurum* (Fontannes, 1879), **T.* (*T.*) *compsum kochi* (Herbich, 1878), *T.* (*T.*) *compsum bicostatum* nov.subsp., *T.* (*T.*) *compsum tuberculatum* nov.subsp., *T.* (*T.*) cf. *platyconcha* (Gemmellaro, 1872), **T.* (*T.*) *erycinum* (Gemmellaro, 1870), *T.* (*T.*) *subcallicerum* (Gemmellaro, 1872), *T.* (*T.*) nov. sp. aff. *Taramelliceras* (*T.*) *subcallicerum* (Gemmellaro, 1872), **T.* (*T.*) *mikoi* (Herbich, 1878), **T.* (*T.*) *pugile pugile* (Neumayr, 1871), *T.* (*T.*) *pugile pugiloides* (Canavari, 1896), *T.* (*T.*) *pugile pseudopugile* Sarti, 1993;

Subgenus *Metahaploceras* Spath, 1925: **T.* (*M.*) *strombecki* (Oppel, 1857) in Quenstedt, 1887, **T.* (*M.*) *nodosiusculum* (Fontannes, 1879), *T.* (*M.*) *subnereus* (Wegele, 1929);

Subgenus *Fontannesiella* Spath, 1925 in Oloriz, 1978: *Taramelliceras* (*Fontannesiella*) nov.sp. aff. *T.* (*F.*) *valentinum* (Fontannes, 1879).

Other oppelidae atributed to *Taramelliceras* Genus: **Tarmelliceras karreri* (Neumayr, 1873), *Taramelliceras acallopistum* (Fontannes, 1879) and *Taramelliceras intersistens* Holder, 1955.

- From *Hemihaploceras* Genus

Subgenus *Hemihaploceras* (Spath, 1925) in Sarti, 1993: **H.* (*H.*) *nobile* (Neumayr, 1873) and *H.* (*H.*) *loczyi* (Jekelius, 1916) in Patrulius, 1969.

Subgenus *Zitteliceras* Santantonio, 1983: **Hemihaploceras* (*Zitteliceras*) *schwageri* (Neumayr, 1873).

Conclusions

This taramelliceratinae fauna from East Carpathians is dominated by the representatives of *T. compsum* group and *T. pugile*. The new taxa described here are *T.* (*T.*) *compsum bicostatum* nov.subsp. and *T.* (*T.*) *compsum tuberculatum* nov.subsp. Special remarks for the new specimens from species of *Tarmelliceras karreri* (Neumayr) and *Hemihaploceras* (*H.*) *loczyi* (Jekelius), retrieved here with this occasion.

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New Middle and Upper Jurassic fossiliferous deposits mapped in the Rucăr area – Purcărețului Valley (South Carpathians – Romania)

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Keywords: Jurassic deposits, fossils outcrop, Rucăr, map

In the year 2010 a mixt team of research, discover new sedimentary body of rocks in the Rucar area – Purcaretului Valley, absent in the Rucar map 1:50.000. In the following years where realised many studies in the area and in laboratory (Lazar & al., 2013; Lazar et al., 2015). In the field were made geological evaluations fore a new map of the region. That is presented here in the first geological new view extended from approximately 10 ha. The new sedimentary body rock, attested as Middle and Upper Jurassic in age, are similarly with the Callovian beds from a proxy valley (Lupului) described by Simionescu I. in 1899.

Reineckeia anceps

Hecticoceras punctatum

Hecticoceras zieteni

Kosmoceras cf. *mrazeci*

Ammonites association includes species confirming the presence of Middle Callovian and base of Upper Callovian. The notable absence Macrocephalitidae species group (at the bottom), and Cardioceratidae/ Peltoceratinae (like Quenstedtoceras - at the top). The range is dominated by species of Reineckeiidae group with a higher relative abundance in the middle interval, which is ubiquitous Reineckeia anceps (Reinecke, 1818) - attesting Anceps Zone. It noted in particular in the lower part of callovian series the presence more than sporadic of representatives from Kosmoceratidae, in the most abbundant level from Romania discovered until now. Among the species found in the association are: *Reineckeia anceps* (Reinecke), *Reineckeia* cf. *douvillei* Steinmann, *Rehmannia* cf. *segestana* (Gemmellaro), *Erymnoceras baylei* (Jeannet), *Subgrossouvria famula* (Bean), *Binatisphinctes hamulatus* (Buckman), *Homoeoplanulites* cf. *difficilis* (Buckman), *Kosmoceras proniae* (Teisseyre), *Kosmoceras* cf. *mrazeci* Simionescu, *Kosmoceras* sp., *Lissoceras voultense* (Oppel), *Hecticoceras zieteni* De Tsytovitch, *Hecticoceras punctatum* (Stahl), *Hecticoceras* cf. *bannense* Elmi, *Paralcidia* sp., *Calliphylloceras demidoffi* (Rousseau), *Holcophylloceras indicum* (Lemoine), *Sowerbyceras subtorisulcatum* (Pompeckj).

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Paleoecology of endemic molluscan assemblages of the Volhynian deposits from Basarabi area (Moldavian Platform)

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The mollusk fauna of the Moldavian Platform has been intensively studied, but quantitative data allowing further correlation with the other regions of the Central and Eastern Paratethys are sparse. Moreover mollusks have mostly been used for stratigraphic zonation (Ionesi,2006), but palaeocommunity comparisons and paleoecological data are lacking. The present study was designed to provide the first quantitative comparison of Volhynian and mollusk assemblages from the Moldavian Platform, to test the role of spatial and temporal factors and to decipher their palaeoenvironments. For this purpose, 9820 shells from 4 samples with 29 species were quantitatively compared.

The Sarmatian deposits analyzed corresponds to the distal Foredeep – Forebulge depozones of the Eastern Carpathian Foreland Basin Systems, as shown by Grasu et al. (2002). After Ionesi (2006), the upper volhynian deposits that outcrop in the Basarabi area belong to Arghira and Hârtop Member, Şomuz Formation. In terms of sedimentology, the facies associations described in this area shows a coastal depositional system.

The statistical analyses were performed with the program PAST version 3 (Hammer et al.2001). All analyses are based on log transformation of the species within each sample (Luckeneder et al., 2011). To detect hierarchical groupings within the data set, we applied paired group cluster analysis using the Bray–Curtis similarity index (Zuschin et al., 2005). All species represented by less than 20 individuals were removed from the data set.

The two biofacies, as determined through the Bray-Curtis cluster analysis, can be used to interpret two distinct palaeoenvironments. Lower forebeach are characterised by the *Donax – Venerupis* biofacies, and a muddy foreshore with freshwater input by the *Potamides – Hydrobia – Acteocina* biofacies (Kokay, 2006, Zuschin et al., 2004).

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Fossil woods from Bozovici

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Keywords: Bozovici depression, Badenian coals, volcanictufs, petrified wood.

From a collection of petrified woods from Bozovici depression made by one of the authors, some samples were donated to the National Geological Museum. The same person realized in his locality and in Gărâna point, small exhibitions of petrified wood as stumps or logs, collected from different locations. It could be a good occasion to recuperate some information, if the origin of wood can be reconstituted. Anyway, those some samples, coming from Bozovici, donated to our museum, were palaeoxylotomically studied and taxonomically identified. Bozovici area was a small Badenian dpression related, at least, at the beginning with Caransebeș-Mehadia depression. Its filling it's formed by coarse continental deposits of conglomerates, calcareous sandstones, sands, pebbles, marls, banded clay, and interbeded coals and volcanic tuffs. Frequent lateral facies variations and the few fossils of fresh water fauna make difficult a good stratigaphy of those deposits. By the paaeoxylotomical study of few samples of fossil wood preserved by petrifaction some types of conifers of taxodiaceous and a poplar were identified. Advanced studies on more numerous samples coming from Bozovici area could contribute to a good palaeoenvironmental and palaeoclimatic reconstruction of that area during Badenian time.

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A new collection of fossil woods from South Apuseni Mts.

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Keywords: South Apuseni mts., Petrified forest, new collection, Cretaceous and Miocene taxa.

We had in study a new colection of fossil wood from Apuseni mts., initially gathered by one of the authors, simply, by curiosity, from some areas with occurrences of silicification, often as colored opals, related to volcanic rocks, otherwise common and known in some points of South Apuseni mts. The idea of a study captivated us and in the hope that those beautiful samples could become a pride of Gold Museum of Brad, by donation, since they were found in South Apuseni mts., in areas from where numerous petrified woods were already described, some Late Cretaceous and Tertiary petrified forests were outlined, tens lignotaxa were described, and evry new lot of fossil wood studied could complete the composition of those fabulous fossil forests, from other times, from Apuseni mts. Previously, more than 50 Cretaceous and Tertiary (Miocene) taxa were described from those petrified forests, and these new identifications by the study of petrified wood found in Almasul mic area, or Ociu area, will added to the previously described ones, completing the list of known arboreal flora of those forests. Both floras suggest an insular evironment with an equal climate, warm and wet, devoid of freezing intervals.

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New Oligocene fossil woods from Rhodopes, Bulgaria

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Keywords: palaeoxylotomy, Rhodopes, Nanovitsa depression, Oligocene eruptions, Petrified Forest, dispersed fragments.

Several specimens of fossil wood coming from Nanovitsa depression, eastern Rhodopes Mts. were palaeoxylotomically studied. A Petrified Forest was identified there (locally named: Vkamenenata Gora), extended over an area of about 7.5 hectares, in a deep gorge (local name: Gabaz gulch), close to Raven, Tatul, and Bivoljane localities, Kardjali region. The petrified tree trunks appear on both sides of the gorge, distributed on a distance of more than 120 m. The entire site was declared a protected area ("landmark" category) since 1970, and it is located in the Borovets Natural Reserve established for Turkish pine and oak (Harkovska, 1992; Georgiev & Marchev, 2005). The volcano-sedimentary formation from Nanovitsa depression preserves a series of pyroclastic rocks derived from some acidic Oligocene eruptions overlying the Zvezdel, Dambalak and Sveti Ilia intermediate lava flows, as well as the pyroclastic rocks of the Borovitsa volcanic area, aged of around 31.8 Ma. The pyroclastic sequence consists of two ignimbrite units (the ignimbrites of Raven and of Sapdere type) and one mixed unit comprising air-fall tuffs and epiclastic rocks (the Tatul rhyolitic tuffs) (Georgiev & Marchev, 2005). The air-fall deposits buried a forest with in situ giant trees, and numerous wood fragments preserved chiefly as petrifaction, or charcoal. The central and northwestern parts of Nanovitsa depression are occupied by several bodies of organogenic (reef) limestone full of a large number of mollusks which gave them the relative age (Boyanov & Goranov, 2001). The presence of reef limestones overlying the rhyolitic tuffs suggests a shallow marine Palaeogene basin developed under a warm climate and normal salinity. The first palaeoxylotomic study recently done by us on five samples taken from petrified stumps or big trunk fragments allowed the identification of a morphospecies of an evergreen oak, *Quercoxylon intermedium* Petrescu & Velitzelos, 1981 (Iamandei et al., 2014). In the present paper is presented the study of nine samples of petrified (silicified) wood, collected from the same area of the „Vkamenenata Gora", as dispersed fragments. The palaeoxylotomical study of this new collection led to the identification of some new morphospecies as *Sequioxylon gypsaceum*, *Cinnamomoxylon* sp., *Eucaryoxylon* sp., and again of *Quercoxylon intermedium*, evergreen oak, suggesting a warm, maybe paratropical climate, in a quasimediterranean environment.

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Petrified Forests in Evros, Greece

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Keywords: Petrified Forest, Evros, Eocene-Oligocene, volcanics.

As a part of a Greek project, a study of the Petrified forests was made, and even if the preliminary taxonomic identifications were communicated, the last results of the study of a number of 272 samples are presented now. Still unstudied, new collections of fossil wood coming from the same areas, or others more wait to be studied at the Athens's University (NKUA); some years ago we participated to a field campaign there, collecting numerous specimens and doing field observations. The regional geological setting shows that closely related to the development of post alpine back-basin, in Evros a significant Cenozoic calc-alkaline, high-K calc-alkaline to shoshonitic magmatic activity has manifested as plutonic-subvolcanic (monzonites, monzodiorites, granodiorites, microgranite porphyries) and volcanic rocks (banakites, trachytes, andesites, dacites, rhyolites, accompanied by volcano-sedimentary formations composed of marls, sandstones, clays and intercalations of volcanic rocks as lavas, tuffs, pyroclastics, discordantly covering the basement rocks of the Rhodope massif and Circum Rhodope Belt. New K/Ar ages of volcanic rocks in this area range from 33.5 to 19.6 Ma, establishing an Oligocene and a Lower Miocene period of magmatic activity. The lower series starts with a basal-clastic formation, composed of conglomerates and sandstones which continues a Priabonian clay-marl formation including marls alternated with sandstones and conglomerates and intercalations of lignitic horizons at the upper levels, associated with some andesitic lavas and overlaid by pyroclastics and lavas of dacitic to rhyolitic composition with intercalated sediments of Lower-Upper Oligocene age. The volcanics include pyroclastic flows, air fall deposits, as well as lava flows and domes. The stack continues with Upper Oligocene shallow marine sediments dominated by sandstones, marls and conglomerates (Provatonas series) discordantly covering the volcanics. The area is also dominated by ignimbrites of several meters thickness. A lot of vegetal remains especially as petrified woods have been preserved by the volcano-sedimentary rocks and in Evros there are several occurrences known, east of Alexandropoulos, around Trifili, Lefkimi, Dadia, Provatonas, Fylakto,Lagyna, Likofi, Sapes-Kassiteres and Aetochori. Hundreds of samples were collected and studied and tens of arboreal taxa, defining the Oligocene Forests of Evros, have been identified. Previously published papers showed the presence of mediterranenan evergreen oaks, identified as *Lithocarpoxylon helladae* Petrescu, Velitzelos & Stavropodis and *Quercoxylon intermedius* Petrescu & Velitzelos – with similar type of leaf described as *Eotrigonobalanus furcinervis* (Rossm.) Walther & Kvacek, and most probably representing the same type of evergreen oak (since the genus *Lithocarpoxylon* was invalidated). Revising all the prepared material furnished by NKUA, our palaeoxylotomical study revealed a lot of Pinaceae, Cupressaceae, Lauraceae, Fagaceae Juglandaceae, Betulaceae and Palmae. The list of new identified vegetal fossil taxa in Evros define a Mixed Mesophytic Forest of warm temperate climate of Mediterranean type, proved especially by the presence of Palms, even if only locally, for Late Paleogene-Earliest Miocene.

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New Fossil Remains of Mammuthus primigenius from Dâmboviţa Valley (Southern Bucharest, Romania)

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Keywords: Upper Pleistocene, Dâmboviţa Valley, Dacian Basin, Mammuthus primigenius, Probosciea.

Introducion

Recently findings of dentognathic remains were found during a field trip near Dâmboviţa Valley in the proximity of Glădiţei Street (sector 4).

Results

Four molar fragments were found in the Upper Pleistocene deposits of Colentina Pebbles from the Central-Eastern part of the Dacian Basin (Andreescu et al., 2013). The remains show a poor degree of preservation, all of them being extremely brittle. The new findings add Văcăreşti area to other several occurences from Bucharest such as Colentina, Fundeni, Băneasa, Bucureştii Noi and Vitan (Apostol, 1968) were mammoth osteological and dentognathic fragments were found. The recent discovery was revealed after the execution of a borehole at the depth of 10 meters.

Conclusions

The best preserved of the recovered specimens remain presents morphological characteristics that belong to the species Mammuthus primigenius (Maglio, 1973; van Essen, 2010). This taxon is an usual finding in the outcrops from the northern part of Bucharest. In the southern area the fossil remains are less encountered due to the fact that the fossil beds are covered by loess deposits.

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The Sarmatian Microfauna Identified in Preajba Area (Moesian Platform)

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Keywords: Bessarabian, Volhynian, foraminifera, ostracods, biozones.

In this paper, we present the main biostratigraphic results obtained from 48 core and cuttings samples from the few hydrocarbon wells of the Preajba area (Moesian Platform). In the investigated wells the Sarmatian is represented by silty marls, argillaceous limestones, siltstones, wakestones, sandstones, marls and sandy limestones in Volhynian as well as by dolomites, calcareous shales and silty limestones in Bessarabian.

The microfauna from the micropaleontological samples is represented especially by benthic foraminifers (*Pseudotriloculina consobrina*, *Quinqueloculina reussi*, *Fissurina mironovi*, *Meandroloculina sp*., *Dogiellina sarmatica* , *D. kaptarenko*, *Articulina problema*, *Elpihdium aculeatum*, *E. crispum*, *E. macellum*, *E. fichtelianum*, *Nonion commune, Porosononion subgranosus subgranosus*, *P. hyalinum*, *P. aragviensis)* and ostracods (*Aurila mehesi*, *A. merita*, *Amnicythere tenuis*, *Callistocythere incostata*, *Loxoconcha schmidi*, *L. punctatella*). Beside foraminifers and ostracods, we identified juvenile taxa of bivalves (*Mactra* sp.) and gastropods (*Hydrobia* sp.), Misydae statoliths, fish debris (teeth, otoliths and bones), algae (*Coscinodiscus sp*.) and spicules of sponges.

Based on foraminifera content we identified the following biozones: **Elphidium reginum Zone** and **Varidentella reussi Zone** corresponding to Volhynian substage, **Porosononion aragviensis Zone** and **Dogiellina sarmatica Zone** – corresponding to Bessarabian substage.

On the presence of mangrove elements in the Cenozoic vegetation of Bulgaria

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Keywords: vegetation, mangrove, palynology, paleobotany, Miocene, paleoclimate.

Introduction

The Balkan Peninsula apparently played a significant role in the origin, evolution, and migration of the European vegetation during the Cenozoic, for its position between the Tethys and the Paratethys. The distribution pattern of vegetation strongly depends both on climatic conditions and landscape environments. Thus vegetation diversity reflects habitat and climatic variability and helps us to understand past climates and hencea crucial forcing factor triggering vegetation change.
Mangrove vegetation represents a specific ecological group of trees and shrubs that live in the coastal intertidal zone. In the present study we summarize published records of mangrove elements from the Eocene and Oligocene and report on first evidence for Miocene mangroves in Bulgaria.

Results

In the modern vegetation, there are about 80 different species of mangrove trees. All these trees grow in areas with oxygen-depleated soil, where slow-moving waters allow fine sediments to accumulate. Mangrove forests only grow at tropical and near-equatorial latitudes because they cannot withstand freezing temperatures.

Fossil finds of mangroves from Bulgaria are scarce. Up to now, only the fern *Acrostichum lanzaeanum* (Vis.) E. M. Reid & Chandler has been identified in the Cenozoic of Bulgaria. It is a semi-mangrove element (Palamarev and Petkova 1975), growing in a hot and humid climate. It probably thrived in tidally influenced river valleys of the earlier Cenozoic, under brackish or even lacustrine conditions. These fossil findings are of a late Eocene to early Oligocene age.

Recently, we made available a new palynological record for the lower part of the late Miocene strata of the Euxinian Basin (northeastern Bulgaria). Fossil pollen identified as *Avicennia*, was recorded in the sediments of the Bulgarevo section, situated in the Balchik part of the Varna–Balchik depression (Ivanov et al. 2007). Pollen grains of *Avicennia* (Verbenaceae/Avicenniaceae/Acanthaceae) (The Angiosperm Phylogeny Group 2009) are tricolporate, subprolate to spheroidal in equatorial view, subcircular in polar view, ca 34×25 μm in dimension, with the exine being ca. 3.0 μm thick, sexine thicker than nexine, having a reticulate sculpture and colpi extending to the polar area, and large pores.

Avicennia is present in low quantities and is accompanied by herbs (15-20%) and Ericaceae (22-25%). The spore and pollen assemblages cover a wide range of vegetation types, ranging from the vegetation strata of the lowlands including mangrove, littoral fringe and coastal swamps as well as open landscapes (herbaceous communities), to mixed evergreen–deciduous forest with evergreen elements and mid-altitude conifer forest, the latter having very low proportions of microthermic elements such as *Abies* and *Picea*.

Conclusions

The low quantity of *Avicennia* pollen indicates a very limited distribution of mangroves, and they were probably the last residue of this vegetation type in study area. Nevertheless, this is the first evidence for typical mangrove vegetation in Bulgaria. The presence of *Avicennia* mangroves indicates that very warm climate conditions existed in the study area during the lower part of the late Miocene.This extension of the *Avicennia* mangrove of nearly 20° to the north of its modern distribution area can be related to a considerably warmer global climate at the beginning of the Late Miocene, where the absence of an Arctic ice cap favoured shallower latitudinal temperature gradients, favouring the development of mangrove at more northerly latitudes.

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Micropaleontological evidence for the Middle Jurassic age of the Vršatec Limestone (Pieniny Klippen Belt, Western Carpathians, Slovakia)

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Keywords: Benthic Foraminifera, coral bioherms. Bajocian, Vršatec Formation, Pieniny Klippen Belt, Western Carpathians

The research integrating field data, micro- and macropaleontological taxonomic analyses and paleoecological analyses of coral bioherms and peri-biohermal deposits of the Vršatec Limestone (Pieniny Klippen Belt, Western Carpathians) shows significant evidence for the Middle Jurassic age of these limestones, in contrast to previous studies suggesting that they are of the Late Jurassic age. Here, we focus on micropaleontological research (foraminifers) and on evidence that allows us to determine the age of the Vršatec Limestone.

Vršatec Limestone represents a unique, several decameters-thick coral reefs that developed on the Czorsztyn pelagic carbonate platform. This platform represents the eastern part of the Pieniny Klippen Belt (PKB, Western Carpathians) that was located in the Penninic Ocean. The Vršatec Limestone is formed by coral biohermal framestones, bindstones, and rudstones. In addition to reef constructors, benthic communities are dominated by species-rich bivalve assemblages. Limestones with coral reefs are horizontally replaced by (i) breccias that accumulated at footwall margins of faulted blocks (with clasts formed by biohermal limestones) and by (ii) crinoidal limestones. These biohermal limestones are overlain by crinoidal-spiculitic limestones.

Mišík (1979) presented detailed lithological and microfacies characteristics of these sediments. He introduced the Vršatec Limestone as a new lithostratigraphic member (biohermal limestones with corals and calcareous sponges) and assumed that it belongs to the Oxfordian stage on the basis of bivalves and corals. Mišík & Soták (1998) described organic-walled relicts of foraminifers (calling them „microforaminifers") from the Callovian-Oxfordian limestones of the Pieniny Klippen Belt (Western Carpathians). They suggested that these microforaminifers represent linings of juvenile parts of foraminiferal test (chitinous membranes). The morphologies of foraminiferal linings allowed Mišík & Soták (1998) discriminated these linings into morphogroups.

Based on the investigations of the thin sections from the coral-bearing biohermal and peribiohermal limestones from the Vršatec area, Morycowa & Olszewska (2013) found abundant foraminifera species of the genera *Rumanolina*, *Paalzowella* and *Troglotella*. According to Morycowa & Olszewska (2013), their stratigraphic distribution (like that of most coral species) is characteristic of the Late Jurassic. Another important argument according to the authors for the Late Jurassic age of the studied sediments is the presence of microfossils *incertae sedis* encrusting coral skeletons, such as genus *Iberopora* (*Iberopora bodeuri* Granier & Berthou), known to date from the Oxfordian – Berriasian interval only.

Schlögl et al. (2006, 2009a, b) suggested the Vršatec Limestone belongs to the Bajocian (probably Early Bajocian) on the basis of the stratigraphic superimposition criteria and ammonite species *Nannolytoceras tripartitum* occurring in the neptunic dyke cutting the peribiohermal limestones (i.a. Schlögl et al., 2006, 2009a), and Bathonian-Callovian ammonites occurring in dykes in the uppermost part of the Vršatec limestone in the Vršatec-Castle Klippe (Schlögl et al., 2009b).

Here, we argue that foraminifers also imply that these coral limestones were deposited during the Bajocian, in accord with stratigraphic data on ammonites and brachiopods that occur within and above the Vršatec Formation. Assemblages of benthic foraminifera found in the Vršatec Formation are diverse and contain taxa with hyaline wall (*Spirillina, Tethysiella, Paalzowella, Hungarillina,* *Radiospirillina, Lenticulina* and Nodosariidae), dark microgranular wall (*Troglogtella, Earlandia, Glomospira, Planiiinvoluta*), porcelanous wall (*Nubecularia, Labalina, Ophthalmidium, Cornuspira*), agglutinated wall (*Trochammina, Verneuilinoides, Textularia, Valvulina, Ammobaculites*), and aragonitic wall (*Epistomina* and *Trocholina*). *Ophthalmidium obscurum*, *O. terquemi*, *Labalina rawiensis* and *Hungarillina media* appear for the first time during the Bajocian, and the first three species are restricted to the Bajocian-Bathonian. Such composition and diversity is comparable to assemblages from the Bajocian of Jura Mountains and Burgundy only.

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Bio- and chemostratigraphical study of the Lutetian deposits from the Tarcau Nappe (Suceava Basin, Eastern Carpathians): Paleoenvironmental significance

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Keywords: Lutetian, biostratigraphy, chemostratigraphy, petrofacies, Moldavides, Carpathian foreland basin, Bucovina, Romania

Introduction

The studied deposits belong litho-stratigraphically to the Suceviţa and Scorbura Formations, and tectono-stratigraphically to the external Moldavides (Tarcău Nappe). These formations follow in continuity on top of the deposits of Straja Formation and are overlaid by the Doamna Formation. In the Suceava Basin, the thickness of the Suceviţa and Scorbura Formations varies from 100 to 330 meters. Sedimentologically, the formations are characterized by debritic (Lowe) sequences that alternate with turbidite (Bouma) sequences, consisting of sandstone, silto-lutitic and heterolithic petrofacieses. Lithofacially, the two formations can be distinguished by the different ratios of sandstone sequences vs. the silto-lutitic ones. In the lithological column of the Suceviţa Formation, the sand debrites represent about 40%, while in the westward Scorbura Formation about 80%. Petrografically, the sand debrites consists of different varieties of lithic arenites with transitions to subarenites, with a low degree of maturation. Cronostratigrafically, the deposits belong to the Late Ypresian – Early Bartonian interval. Juravle et al. (2015a, b), have drawn the Ypresian/Lutetian boundary in the first turbidite rhythm from the base of the Suceviţa Formation, in the Pietroasa Section.

Results

Biostratigraphically, the formations were analysed concerning their calcareous nannoplankton assemblages (8 samples from Suceviţa Formation and 5 samples from Scorbura Formation), and the agglutinated foraminifera (4 samples). The distribution of **nannoflora** in the analysed samples is very heterogeneous, from high abundance to scarce or even absence in some samples.

In the first 3 samples (1t, 2t, 4t) from the ***Suceviţa Formation,*** the nannoplankton content is very rich (the richest in sample 2t): frequent sphenoliths (*Sphenolithus radians, S. spiniger*), discoasters (*D. gemmifer* (NP11-16)), reticulofenestrids (*Reticulofenestra dyctioda*), and *Coccolitus eopelagicus, C. pelagicus, Cyclicargolithus floridanus, Helicosphaera bramlettei* (NP14-NP23), *H.* cf. *lophota* (NP12-NP18), *Zygrablithus bijugatus, Nannotetrina* sp*., Braarudosphaera bigelowii, Pontosphaera pulchra* were identified. Samples 5t and 7p are very scarce in nannoflora, with poorly preserved species of *Reticulofenestra dyctioda*, *Nannotetrina* sp*.*, and *Coccolithus latus*. Sample 9p lacks nannoplankton. Samples 10p and 11p contain very few nannoplankton: *Reticulofenestra dyctioda, Coccolithus eopelagicus, C. pelagicus, Discoaster* cf. *saipanensis* (NP14-NP20)*, Pontosphaera pulchra, Sphenolithus moriformis* and, respectively: *Coccolitus eopelagicus, C. latus, Nannotetrina* sp*., Discoaster tani* (NP14-NP23).

The analyse of the identified assemblages from Pietroasa section allows to establish the locations of the Ypresian/Bartonian boundary in the upper part of the Suceviţa Formation.

The deposits from ***Scorbura Formation*** (Jităria section) contain the following calcareous nannoplankton assemblages: a) in the lower and middle part of the formation *Pontosphaera* cf. *desueta*, *Zygrablithus bijugatus, Coccolithus pelagicus, Reticulofenestra dyctioda,* small reticulofenestrids and rare reworked Cretaceous species;, b) in the upper part *Helicosphaera* cf. *bramlettei*, *Cyclicargolithus floridanus*, *Sphenolithus* sp., *Nannotetrina* sp., *Coccolithus pelagicus,* *C. eopelagicus, Reticulofenestra dyctioda, R. bisecta,* sometimes coccospheres of *R. minuta,* relatively frequent small discoasters, and sometimes fragments of discoasters.

The agglutinated foraminifera in the two formations were preliminary analysed. In both Pietroasa and Jităria sections, we have identified only agglutinated forms. They belong to the ***flysch type*** 45 group assemblage -characteristic to the deep marine turbidite system (Kaminski & Gradstein, 2005). The identified forms do not carry biostratigraphical significance, but they support the paleoenvironmental interpretation.

In the ***Pietroasa Section***, samples (5t and 9p) were prevailed from the upper part of the Suceviţa Formation. The dominant forms belong to the morphogroups M2a and M2b (*Psammosphaera* and *Recurvoides*) and seldom to the morphogroup M1. The morphogroups indicate a strong variation of the bathimetry of the depositional marine environment from bathial-abisal to shelf-type. This bathimetric variation is also supported by the observation that the debrites/turbidites of the Suceviţa Formation are overlaid by deposits which probably belong to a carbonatic platform (Doamna Limestone).

The analysed samples from ***Jităria section*** were prevailed from the lower-middle part of the Scorbura Formation (8j). In this section, the forms characteristic to the morphogroup M1 dominate. The assemblages of foraminifera are dominated by tubular forms (M1): *Nothia*, *Hyperammina*, *Psammosiphonella*, which indicate a lower bathial-abisal marine environment. This assignment is supporting the sedimentological data.

Geochemically, samples from the lower part of the Suceviţa Formation were investigated for a series of stable isotopes ($^{88}Sr/^{85}Rb$), $CaCO_3$, TC (total carbon), TOC (organic carbon) and IC (mineral carbon) (Juravle et al., 2015a, b). The obtained results allow the correlation of the paleoclimatical and tectonical events from the East-Carpathian foreland basin from Bucovina with those described from the Eocene foreland of Bistrita Basin and from the Pirinei basins (Guerrera et al., 2012 and Payros et al., 2006).

Conclusions

The preliminary results of this study of the Lutetian deposits from the External Moldavides allow us to define the Ypresian/Lutetian boundary interval in the upper part of the deposits of the Suceviţa and Scorbura Formations. The paleobathimetrical variations of the depositional environments were described, and also the chemostratigraphical imprints for the Ypresian/Lutetian and Lutetian/Bartonian boundary intervals were identified.

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Calcareous nannofossils from the Baghamshah Formation (Iran)

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Keywords: microfossils, biostratigraphy, Ammonites, Middle Jurassic, Iran Basin, Callovian.

Introduction

The Baghamshah Formation was first introduced by Stocklin et al. (1965) in the East of Tabas city, central Iran. At the type section, this formation overlain the Parvadeh Formation conformably and in the upper boundary the upper Jurassic Esfandiar Formation, rests on the Baghamshah Formation conformably. In most regions of central Iran the upper boundary of the Baghamshah Formation is conformable but in the northern and central Kalmard area (central Iran) there are some marks of a disconformity, such as bioturbation and oxidation characteristics (Aghanabati, 1975).

The studied section is located in the Virab area, about 55 km west of Damghan city, northern Iran. The Baghamshah Formation in this region is about 48 m thick and consists of four sedimentary units. This formation overlies the Parvadeh Formation conformably and is overlain by the Lower Cretaceous disconformably.

From the bottom to the top we have the following lithological succession:

Unit 1 consists of about 13 m greenish thin bedded shales alternating with thin bedded limestones.

Unit 2 is composed of about 2 m dark medium bedded limestones with ammonites.

Unit 3 is recognized by about 25 m greenish thin bedded shales alternating with thin bedded limestones with brachiopods, belemnites and ammonites fragments.

Unit 4 is including 8 m greenish thin bedded shales alternating with sandy limestones.

Methods

Several samples for calcareous nannofossils were collected and analyzed under the light microscope Leica (x1000 magnification). A semi-quantitative analyze was performed by counting between 50 to 100 specimen/sample. The species relative abundance was considered as follows: F – few (1 to 10 specimens/FOV), R – 1 to 10 specimens/10 FOV), VR – 1 specimen/ more than 10 FOV. The nannofossil preservation was assessed as follows: M – moderate and P – poor.

Additionally, several ammonite samples were collected from different levels and identified.

Results

We present here the first record of calcareous nannofossils from the Middle Jurassic of the central Iranian Basin, respectively from the Baghamshah Formation.

The samples contain moderate to poorly preserved calcareous nannofossil assemblages, with low diversity and abundance. The assemblages are dominated by species belonging to the family Watznaueriaceae: *Watznaueria barnesiae* (Black *in* Black & Barnes, 1959) Perch-Nielsen, 1968, *Watznaueria britannica* (Stradner, 1963) Reinhardt, 1964, *Watznaueria communis* Reinhardt, 1964, *Watznaueria fossacincta* (Black, 1971) Bown *in* Bown & Cooper, 1989, *Watznaueria* cf. *manivitiae* Bukry, 1973, *Watznaueria* sp., *Cyclagelosphaera* spp. etc.

The ammonite assemblages are poor to very poor preserved and their identification was only possible at the genus level. The most common genera are: *Reineckeia* sp. A, *Rehmannia*? sp. A, *Choffatia*? sp. A, *Pseudoperisphinctinae* indet, *Rehmannia* sp. B, *Reineckeinae*? indet, *Perisphinctinae* sp..

Conclusions

Biostratigraphycally, the ammonite and calcareous nannofossil assemblages composition, suggest the Callovian age.

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Early Miocene calcareous nannofossils from the Eastern Austrian Foreland Basin

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Keywords: Central Paratethys, Eggenburgian - Ottnangian, molasse, biostratigraphy, Austria.

Introduction

The Lower Austrian Molasse Basin predominantly comprises sediments of Oligocene and Miocene ages.

In the late Ottnangian a global drop of the sea level and the continuous uplift of the Alps caused the deposition of the regressive Traisen Formation (formerly Oncophora beds) in the Lower Austrian Molasse Basin between St.Pölten and Tulln. These yellowish-brownish to greyish mica-rich sands and silts with clayish interlayers were originally named after a brackish water bivalve (*Oncophora*). West to the Waschberg Zone, a deeper-water environment (so called Oncophora beds in former literature, herein [informally] renamed to Wildendürnbach Member) with sediment gravity flows (turbidites, muddy/sandy slumps) is inferred from OMV well data. Biostratigraphical analyses of these fine sandstones, silts and laminated pelites have been carried out on the basis of five OMV drilling cores.

Methods

Several samples from boreholes located in different areas in the Lower Austrian Molasse Basin were sampled and investigated for calcareous nannofossils. Smear slides were prepared and each sample was analysed using the light microscope (1000 x magnification) in parallel and crossed Nichols. Quantitative analyses were performed by counting at least 300 specimens/sample while for semi-quantitative analyses we counted 100 specimens/sample.

Results

The investigated boreholes contain moderate to poor preserved calcareous nannofossils, where the most abundant species and taxonomical groups are as follows: *Coccolithus pelagicus,* followed by the reworked nannofossils from Cretaceous and Paleogene, in lower amounts *Reticulofenestra minuta*, *Helicosphaera ampliaperta* (in sizes <10 µm and >10 µm), *Coronosphaera mediterranea, Syracosphaera* cf. *pulchra, Reticulofenestra haqii, R. pseudoumbilicus, R. lockeri, Helicosphaera mediterranea, H. scissura, H. carteri, H. vedderi, Sphenolithus moriformis* etc.

The most common reworked Cretaceous nannofossils are dominated by: *Watznaueria barnesiae, Watznaueria fossacincta, Watznaueria* sp.*, Micula staurophora, Quadrum* spp.*, Uniplanarius* spp.*, Micula murus, Calculites* spp., *Cretarhabdus* sp., *Eiffellithus* spp., *Prediscosphaera* spp., *Arkhangelskiella spp.* The most common reworked Paleogene species and groups are: *Coccolithus bownii, Coccolithus foraminis, Coccolithus pauxillus, Reticulofenestra bisecta, R. dictyoda, R. umbilicus, Ericsonia* spp., *Chiasmolithus* spp., *Cruciplacolithus* spp., *Sphenolithus* spp., *Toweius* spp. etc.

Conclusions

Biostratigraphycally, we suggest that the studied material belongs to the interval from NN2 (*Discoaster druggii* Zone) - NN3 (*Sphenolithus belemnos* Zone) – lower NN4? (*Helicosphaera ampliaperta* Zone) zones of Martini, 1971.

The attribution to nannozones upper NN2 - NN3 – ?lower NN4 would indicate upper Eggenburgian to middle - upper Ottnangian.

The presence of *Coccolithus pelagicus* in high amount, sustained also by high percentages of reworked material, point up to eutrophic, unstable environment conditions with colder surface waters, high nutrient input, upwelling regime, but normal salinity. It might also be possible that the sporadic presence and in very low amount of *Sphenolithus* genus, species which prefer warmer, near continental margin waters, may be due to this unstable conditions.

Acknowledgements

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Pleistocene Agglutinated Foraminifera from the Lomonosov Ridge, Arctic Ocean

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Keywords: micropaleontology, biostratigraphy, paleoceanography.

Introduction. During the 2014 ALEX expedition on board the R/V Polarstern, four long Kastenlot cores were collected along the Lomonosov Ridge. The cores penetrated into sediments of mid-Pleistocene age, and all four cores contain assemblages of deep-water agglutinated foraminifera (DWAF). We present a new record of DWAF from a >6m long kastenlot core collected at 1276 m water depth on the Lomonosov Ridge (88° 39.72' N; 61° 32.52' W).

Results. In the uppermost 350 cm of the core, calcareous foraminifers including benthic and planktic taxa show a very high diversity of species and a generally good preservation.

In the lower part of the core below 215 cm, the calcareous foraminifera progressively disappear, and agglutinated benthic foraminifers are found in relatively high numbers. The DWAF dominate the biogenic content of the sediment below 350 cm. Given their abundance and their potential use for biostratigraphy, special attention has been paid in agglutinated foraminifer assemblages from 215 cm to 621 cm. In this interval, 25 samples were picked quantitatively to describe the DWAF assemblages. The DWAF consist of a mixture of cosmopolitan species such as *Reticulophragmium pusillum* and Arctic endemics such as *Alveolophragmium polarensis*. The dominant species throughout the core are *Reticulophragmium pusillum, Trochammina lomonosovensis*, *Haplophragmoides* sp. 1, and *Psammosphaera fusca*. The small, fragile tests of *Haplophragmoides* sp. 1 are common in the core, but this taxon has not been previously reported to occur in the Arctic. It most closely resembles the species *Haplophragmoides trullisatus*, but a detailed comparison and a differential description needs to be carried out. There appears to be two forms of this species always occurring together: a microspheric form that often has darker agglutinated grains along its sutures, and a larger, more lobate megalospheric variety with a visibly larger proloculus.

At 215 cm, the agglutinated assemblages are sparse and dominated by *R. pusillum*. Below this level, the diversity of agglutinated foraminifers progressively increases downcore. The relative proportions of *Haplophragmoides* sp. 1 and *Trochammina lomonosovensis* also increase downcore, and species diversity reaches a maximum between 395 and 457 cm. Two intervals containing *Alveolophragmium polarensis* are observed: an upper one between 404 and 457 cm, and a second one between 606 cm and the bottom of the core. The occurrence of *Trochammina quadriloba* and *Cribrostomoides subglobosus* in the core is restricted to the upper *A. polarensis* interval. The species *Psammosphaera bowmani* is fairly common between 395 and 583 cm. This species first described from the North Sea has not been previously reported from the Pleistocene of the Arctic. Because of its small dimensions it was most likely overlooked in previous studies. At 510 cm, the assemblage is dominated by *Haplophragmoides* sp. 1 and *Trochammina lomonosovensis,* with subordinate *R. pusillum* and *Psammosphaera*.

Conclusions. A total of 27 DWAF species were recorded in the core, among which many are reported for the first time from Pleistocene sediments in the Arctic Ocean (for comparison Evans & Kaminski, 1998 reported only 10 species). The agglutinated foraminifers at the four stations thus show the potential to produce a stratigraphically meaningful record. Moreover, overlaps with calcareous benthic foraminiferal assemblages should enable cross-correlation between the DWAF and the calcareous benthic assemblages.

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Contribution of microencruster-cement microframework to development of the Late Jurassic–earliest Cretaceous reefs: examples from Bulgaria and Poland

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Keywords: microframework, synsedimentary cements, Moesian platform, Štramberk-type limestones

Much of the research on the Late Jurassic reefs, in particular of Oxfordian–Kimmeridgian age, were focused on the northern, passive margin of the Tethys in Europe, where reefs built by sponges, corals and microbialites (as a main component or associated with sponges and/or corals) are common and diversified. Development of coral reefs on the intra-Tethyan carbonate platforms, commonly still in the "Late Jurassic style", persisted to Berriasian, and even until the Valanginian (Chatalov et al., 2015). Based mostly on studies of the Late Jurassic–earliest Cretaceous reefs from the Northern Calcareous Alps (Austria), Schlagintweit and Gawlick (2008) distinguished a new type of Jurassic reef with a significant role (although not such important as in the Permian and Triassic reefs) of microencruster-cement framework (microframework), but with subordinate role of corals. These reefs were attributed to deeper, fore-reef slope environment.

Studies of carbonate sequence of the Dragoman Block (western part of the Moesian Carbonate Platform), in SW Bulgaria, revealed that the Tithonian–Valanginian coral-rich reefs, were preceded by the development of the Late Kimmeridgian reefs with rare corals, but important role of microencrusters, synsedimentary cements and microbialites (Ivanova et al., 2008; Fig. 1A). Paradoxically, while coral-rich lithosomes seems to represent mostly low relief biostromal reefs, the older reef show massive, biohermal appearance. Among microencrusters, *Crescentiella morronensis, Radiomura cautica, Perturbatacrusta leini* and thin crusts of sclerosponges are the most common, while *Lithocodium–Bacinella* association, *Koskinobullina socialis* and *Thaumatoporella parvovesiculifera* characteristic for younger (in the studied sequence), more shallow-water reefs, are rare or absent there. Some of microencrusters clearly grew on cement crusts, evidencing their synsedimentary origin. Laminated microbialite crusts, mostly with micropeloidal texture, provided additional structural support for reef growth. Macroscopically limestones look commonly like recrystallized. These features, along with the position in the sedimentary sequence (Ivanova et al., 2008) allow, similarly to reefs studied by Schlagintweit and Gawlick (2008), to place the Bulgarian example in the upper slope depositional setting.

Štramberk-type limestones (possibly mostly Tithonian–lower Berriasian age) occur in the Polish Outer Carpathians as exotics in the flysch deposits. Analysis of the exotics representing boundstone facies revealed, besides of typical coral-microbial boundstones (with photophilic microencrusters), also the presence of boundstones with microencruster-cement microframework (Fig. 1B) associated or not associated with corals (Hoffmann et al., 2008; Kołodziej, 2015). The size of exotics (mostly pebbles and small boulders) does not allow to unequivocally determining whether boundstones having such microframework as a main component, represent this specific reef type. Alternatively, such clasts may be part of more complex reef structure, reflecting compositional reef heterogeneity. In growth cavities, corals (mostly encrusting microsolenids adapted to low-light environment) and photophilic microencrusters may be absent or rare. More detailed studies of huge blocks of the Štramberk Limestone from Moravia should provide insight into reef heterogeneity and will allow comparison with other intra-Tethyan reefs (for example: the Štramberk-type limestones, Poland, Romania; Plassen Carbonate Platform, Austria).

More studies on facies and microfacies of the Štramberk-type limestones were performed in Romania. For example, Pleş et al. (2013) showed the presence of similar microframework in boundstone facies from limestones of the Southern Carpathians. In terms of microencruster assemblages, participation of cement crusts these coral-microbial-microencruster boundstones (term proposed by Pleş et al., 2013), show similarities with the coral-rich Štramberk-type limestones from Poland, but also with reefs with rare corals from Austria and Bulgaria.

Following Schlagintweit and Gawlick (2008), reefs with microencruster-cement crust microframework may be attributed mostly to the margins of intra-Tethyan isolated platforms. However, coral-microbial-microencruster boundstones, with important role of cement crusts and specialized microencrusters were developed also in shallow-water settings. Some microencrusters (e.g., *Radiomura cautica, Perturbatacrusta leini* and some sclerosponges) are absent or less important in the Late Jurassic reefs of the northern margin of Tethys.

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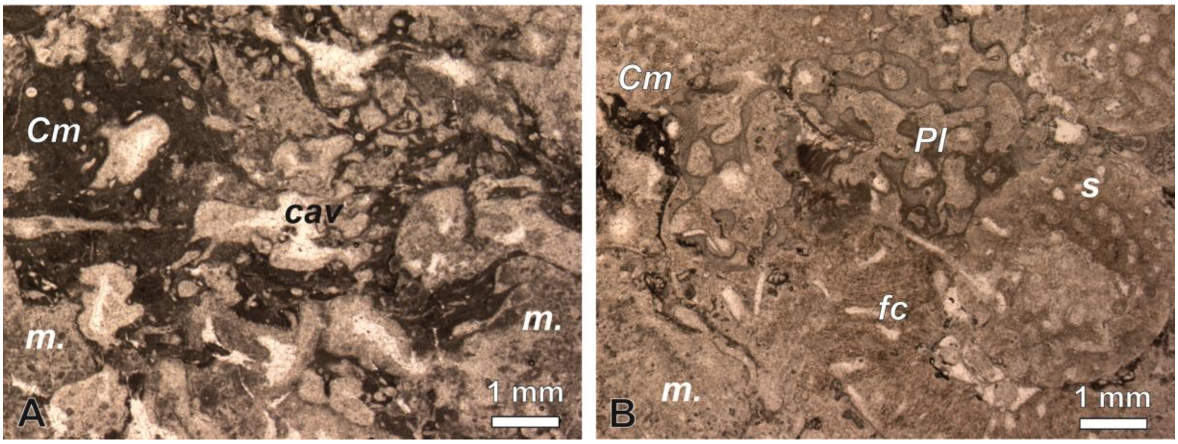

Fig. 1. A – Intergrowth of *Crescentiella morronensis (Cm)* and micropeloidal crusts *(m).* Note some growth cavities *(cav)* filled with early fibrous cement and late (light) blocky cement. Upper Kimmeridgian, Lyalintsi, Bulgaria. B – Microproblematicum (sponge?) *Perturbatacrusta leini (Pl)* associated with *Crescentiella morronensis (Cm),* sponges *(s)* and micropeloidal microbial crusts *(m).* Štramberk-type limestones, Tithonian–lower Berriasian, Koniusza, Poland.

Distribution and evolutionary stages of percid fishes (Teleostei, Percidae) in the Late Neogene of Southeastern Europe

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Keywords: ***Leobergia, Sander, Perca,*** **late Miocene, Pliocene, Southeastern Europe.**

The perch family (Percidae) comprises about 235 extant species, belonging to ten genera (Froese and Pauly, 2014), which are confined to fresh waters, in temperate and subarctic regions of Eurasia and North America. Representatives of six of the ten genera (*Gymnocephalus*, *Perca*, *Percarina*, *Romanichthys*, *Sander*, and *Zingel*) are found in Europe. Percids, along with cyprinids, catfishes and pikes form the core of the late Miocene freshwater fish fauna of Southeastern Europe (Kovalchuk, 2015). There are three percid genera (including extinct *Leobergia*) and near seven species (with two extinct taxa – *Leobergia zaissanica* and *Sander svetovidovi*) found in the fossil record of Southeastern Europe (see Table). First extant pikeperch and perch species have appeared most likely in the Pliocene. This time was an important period of climatic transition in Europe. The percid fishes reported here document the changing ichthyofauna in Southeastern Europe.

Table. Stratigraphic distribution of percids in the Late Neogene of Southeastern Europe

Epoch	Localities	Age, Ma	†*Leobergia zaissanica*	*Sander lucioperca*	**Sander* cf. *S. lucioperca*	†*Sander svetovidovi*	**Sander* sp.	*Perca fluviatilis*	**Perca* sp.	Percidae gen. et sp. indet.
Pliocene	Kotlovina 3	1.7		■				■		■
	Kotlovina 2							■		
	Shirokino			■						■
	Odesa Catacombs				■		■			
	Priozernoe				■					
	Kamenskoe		■	■						
	Kerch			■						
Late Miocene	Pontian Lectostratotype	5.4	■							
	Egorovka 2					■				
	Verkhnya Krynitsa 2		■				■		■	
	Vasylivka 1		■							
	Kubanka 2						■			
	Lobkovo		■	■						■
	Mikhailovka on Bug 2		■							
	Popovo 3	11.0	■		■	■	■		■	

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New data on the middle-Eocene (Bartonian) *Nummulites perforatus* "banks" from the Transylvanian Basin (Romania)

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Keywords: *nummulites,* biometry, sedimentology, palaeoenvironment, Paleogene.

Introduction

Nummulites flourished in the Eocene oligotrophic shallow marine environments of the Thetyan area and formed large accumulations called "banks" (Arni, 1965). These accumulations can be still recognized at the top of the Eocene Căpuşu Formation in the Transylvanian Basin (Popescu, 1978). In order to understand their genesis, we studied these banks located between Mănăstireni and Văleni, Cluj County.

Arni (1965) was the first who proposed a standard model for the nummulitic accumulations. These model was subsequently modified because it was pointed out that the nummulitic accumulations could be strongly influenced by the physical parameters of the depositional environment e.g. the winnowing can cause the sorting out of small A-Form *Nummulites* (Aigner, 1982, 1985; Racey, 1995).

Material and methods

The four studied sections, of an approximately 300 m long exposure, consist of medium to coarse grained sands with large accumulations of *Nummulites perforatus* (A and B forms). Sporadically specimens of *Nummulites beaumonti* are also present. Specimens were recovered from 10 samples, about 2 kg each, prepared by standard micropaleontological methods. The A/B ratio of the *Nummulites perforatus* and other nummulitic species were measured. The biometrical measurements were performed on randomly selected 50 A-form specimens, while biometrical data were measured on all B-form of *Nummulites* present in the washing residues.

Results

Blondeau (1972) postulated that the A/B ratio in the nummulite banks is 10/1, but this ratio seems to represent particular cases (Aigner, 1985). In our samples the A/B ratio of the species vary between 15/1 and 142/1.

No sedimentary structures were identified along the MV4 section. The A/B ratio is 61/1 at the bottom of the exposure, whilst at the top it is 142/1. The high A/B ratio suggest that the original assemblages was winnowed in situ (Aigner, 1985). The lack of the sedimentary structures could be the result of the low hydrodynamics (Aigner, 1982; Racey, 2001). Very similar data were collected along the section MV3, where the A/B ratio of the *Nummulites* is between 50/1 and 106/1, and no sedimentary structures are present.

The A/B ratio is 97/12 and the sedimentary structures are missing in the sample from the bottom part of the outcrop MV2. At the top of the outcrop the A/B ratio decreases to 15/1, with B-forms of *Nummilites* linearly oriented, and a nummulitic hash horizon: these suggest a shallow water depositional environment, with high hydrodynamic activity, probably on a wave dominated shelf (Aigner, 1982; Racey, 2001). The data collected along the MV1 section suggest similar depositional environment: 90/1 high A/B ratio at the bottom of the outcrop, without sedimentary structures, while the A/B ratio is decreasing at the top to 19/1. The B-forms of *Nummulites* have a linear orientation and the nummulitic hash horizon is present.

Conclusions

Based on our paleontological and sedimentological observations we concluded that the studied nummulitic accumulation (banks) in the Transylvanian Basin were mostly formed by accumulations of monospecific assemblages : they consist almost exclusively of *Nummulites perforatus* (A and B-forms), and only rare specimens of *N. beaumonti*. The type of biofabrics, and the identified sedimentary structures suggest the parautochtonous (sensu Aigner, 1985) origin of the banks. The strata forming the base of the studied outcrops were deposited in deeper water with reduced hydrodynamic activity, whilst the upper part of the outcrop was deposited in shallow water, with high hydrodynamics, in a wave dominated environment. Therefore the accumulation of nummulitic banks seems to represent shallow marine parasequences.

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Palaeoecology of the Late Eocene–Early Oligocene coral-algal bioconstructions from the Transylvanian Basin (Sălaj County, Romania)

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Keywords: reefs, scleractinians, coralline algae, carbonate sedimentology, Paleogene, Paratethys

Introduction. Eocene and Oligocene reefs have been reported mostly from the central Tethyan (circum-Mediterranean) area, but much less is known about coral reefs from the Paratethys (Perrin, 2002). Upper Eocene–Lower Oligocene coral-algal bioconstructions (reefs in broad meaning of this term) from the Transylvanian Basin (NW Romania), not studied till now, belong to the most northerly located coral reef belt in the Central Paratethys. The studied sedimentary sequences, up to 55 m in thickness in Băbeni and Letca (Sălaj County) are part of the Cozla Formation. Coral-algal reefs occur within sequences of shallow-water limestones, mainly bioclastic wackestones and packstones (dominated by coralline algae), nummulitic limestones, subordinately interbedded with thin layers of marls (Popescu, 1976; Prica, 2001; Săsăran & Bucur, 2011).

Fig.1. Reef showing clear relief; Letca quarry.

Results and conclusions. Low-relief reefs attain 4 to 10 m in thickness (Fig. 1). Scleractinian corals are common, however poorly diversified (9 species, 8 genera). Sheet-like, thin leavy (*Bacarella, Leptoseris*) (Fig. 2A), platy colonies (*Actinacis*), branching ramose colonies (*Actinacis,* Fig. 2C; *Acropora, Goniopora*) and branching, quasi-colonial phaceloid corals (*Caulastrea*) (Fig. 2B) dominate. Neither lateral nor vertical zonation in reefs was recognized, and contrasting coral growth forms (branching and sheet-like) may co-occur. Corals are associated first of all by encrusting and geniculate corallinacean and peysonneliacean red algae. Other fossils are much less common: foraminifera (miliolids, textulariids and nummulitids), bivalves (mostly ostreids), bryozoans, serpulids, gastropods, echinoids, crustaceans and ostracods. Bivalve borings are locally abundant. The studied reefs are matrix-supported and can be termed as spaced cluster reefs, or, when relief is not or is poorly marked, as biostromal coral carpets. Low-energy environment is inferred based on (i) the dominance of branching and thin, sheet-like corals, (ii) their occurrence mostly in growth position, (iii) a good state of coral preservation (low fragmentation rates) and (iv) fine-grained matrix. Though low energy is assumed, re-suspension of carbonate mud might result in moderate turbidity. These characteristics, along with low coral and other biota diversity, indicate on a relatively stressful environment. Such interpretation is supported by the abundance of *Actinacis rollei*, a coral species known to dominate paucispecific coral assemblages, formed under environmental stress during the Eocene–Oligocene transition (Bosellini & Russo, 1988). Branching corals are commonly interpreted as tolerant of higher sediment input. On the other hand thin platy corals prefer to grow in an environment low background sedimentation rate, although some are adapted to shedding sediment. High sedimentation rate may be assumed in the case of studied corals lacking encrustations and borings. Additionally, palaeogeographic location at higher latitudes or climate cooling around the Eocene–Oligocene boundary might result in development of low diversity coral assemblages.

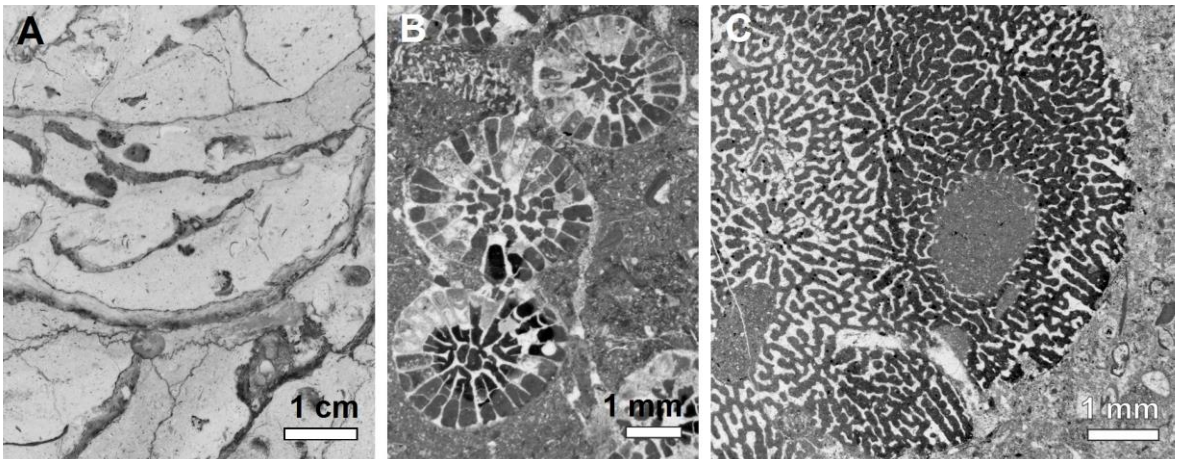

Fig. 2. A –Sheet-like colony of *Bacarella* aff. *vipavica*; B – Branching, phaceloid coral *Caulastrea* sp.; C – part of one branch of *Actinacis rollei.*

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The palaeoenvironmental significance of the *Trypanites-Entobia* inchofacies and of the microendolithic ichnocenoses associated to the intra-Valanginian drowning unconformity from Dâmbovicioara area (Southeastern Carpathians, Romania)

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Keywords: *Entobia*, borings, microendolithic ichnocenoses, Valanginian, Carpathians, Romania

Introduction: During Late Jurassic – Early Cretaceous interval, a complex carbonate platform system developed along the northern passive margin of the Tethys, throughout the Getic Domain (Patrulius and Avram, 1976). The studied region is located in the eastern part of Southern Carpathians (Dâmbovicioara area). Carbonates sequences cropping out in this region reflect the evolution of different settings of the platform. They document successive stages in evolution of the Getic platform during Berriaisian – Late Hauterivian time interval: from shallow water carbonate platform to subaerial exposure, then intra-Valanginian development of an inherited rock ground (IRG) discontinuity and flooding (incipient drowning) of the platform generating a drowning unconformity, followed by gradual drowning during the Hauterivian. However, during the emersion followed by the incipient drowning, the highest parts of the platform became rocky palaeo-shores, the favorite place of intensive shallow-marine bioerosion (e.g. Bromley et al., 2009 and references therein). The aims of this contribution are: to describe the diversity of bioerosive structures three-dimensionally preserved by phosphatization on the intra-Valanginian discontinuity recorded within the carbonates successions of Getic Platform and to emphasize the importance of macro- and microborings as reliable records of the paleoenvironmental changes from rocky palaeoshores to the gradual deepening and drowning of the platform.

Methodology: The macro- and micro-borings assemblages associated with the inherited rock ground (IRG) intra-Valanginian discontinuity and the underlying and overlying deposits were studied concerning the ichnology and taphonomic features and concerning the microfacies, diagenetic, geochemical and mineralogical characteristics. The microfacies types were investigated on thin sections, polished slabs and acetate peels. Scanning electron microscopy and cathodoluminescence were applied to identify the microstructures and diagenetic features. Mineralogy was determined through a combination of standard petrographic techniques and X-Ray fluorescence analysis (XRF) using a Horiba XGT 7000 device for major elements, and X-ray diffraction using a Philips (microXRD).

Results: The shallow water carbonate platform (Stramberk-type limestones) from Dâmbovicioara area is cut by an IRG discontinuity showing an erosive surface with cavities, neptunian dykes and bioerosive structures filled with two types of sediments: the first one is represented by phosphatized bioclastic packstone and the second one is glauconitic wackestone which belongs to the overlying unit. The irregular surface of the unconformity offered numerous cryptic habitats preferred by the entobians and the associated euendolithic microorganisms. The macro-borings cut cleanly the bioclasts, intraclasts and the fenestral cavities marginally coated with meteoric cements and filled with vadose silts, indicating that the substrate was lithified and the subaerial exposure took place prior to drowning. The macroborings are represented mainly by the ichnogenera *Entobia*, *Trypanites* and *Gastrochaenolites*. During the incipient drowning, the IRG was firstly colonized by *Trypanites* and *Gastrochaenolites* borings, which are generally shallow-water trace fossils (few meters depths). The moderate frequency and patchy distribution of these borings suggest a short time interval of this stage. The *Gastrochaenolithes* borings are represented by general shapes with circular outline and rounded base (*G. lapidicus*) the lower part is clavate-shaped boring; the diameter of the borings varies from 0,5 to 1,3 cm; generally oriented perpendicular to the bedding surface. The distribution and frequency of *Gastrochaenolithes* borings on the discontinuity surface is difficult to be estimated due to the intensive bioerosion produced later by endolithic sponges. *Trypanites* are represented by elongate, cilyndrical borings, circular in cross section, rouded termination; 0,2-1,5 mm diameter, length more then 10 mm; generally straight or slightly curved; the borings are disposed almost perpendicularly on the surface or could run paralel or sub-paralel with the surface.With the progressive deepening at depth up to 20 m, the IRG was progressively colonized by endolithic sponges producing different *Entobia* inchospecies. The *Entobia* morphology is highly divers corresponding to Clionaidae and Phloeodictyidae families. The specimens have small single almost spherical to ovoid chambers, or large chambers with irregular morphology, or multiple connected chambers. The exploratory canals are simple, almost straight, with greater length then diameter, only rare branching of the radial canals was observed. The boring surface of most of the chambers and exploratory canals bear a cuspate microsculpture. Detail of scars left by carbonate carving sponge cells are so well preserved as can be observed the concentric surface feature marking the progression of cell margins carving carbonate chips. In the infilling of the majority of the entobinas chambers well preserved spicules occurs, the skeletal opal being replace with sparry calcite.

The micro-bioerosion patterns are in good agreement with the rapid sea-level rise during the incipient drowning when considering the ichnobiocenosis which reflects dysphotic conditions *Scolecia filosa/Eurygonum nodosum*. Numerous others micro-borings (*Saccomorpha clava/ Orthogonum lineare*) suggest aphotic ichnocenosis and are associated with entobians chambers. *Saccomorpha sphaerula* micro-borings are abundant on the external walls of *Entobia*. The spherical aggregates of *Saccomorpha sphaerula* are produced *Scolecia serrata* (unknown bacterium) twining around assumed shaerical fungal traces. The fungal traces might be indicated by thin hyphae emerging from the “bags” (cf. Heidel et al., 2009). Such assemblages might be also indicative for cryptic habitats very abundant on the irregular surfaces of the drowning unconformity.

Conclusions: The studied intra-Valanginian drowning unconformity reveal the diversity of bioerosive structures exceptionally preserved three-dimensionally by phosphatization and emphasize the importance of bioeroders as reliable paleoenvironmental indicators. The studied ichno-assamblage may be related to the *Entobia* subichnofacies (MacEachern et al., 2007) of Bromley and Asgaard (1993) which in turn is assignable to the *Trypanites* ichnofacies of Frey and Seilacher (1980) formed on rocky shores that usually occur above the normal wave base. The intra-Valanginian bioerosion of Berriasian- Lower Valanginian limestones argues that a rocky-shore line existed in the area of the Dambovicioara zone during intra-Valangnian times, and thus that sector of the Dambovicioara zone (a horst structures) was already uplifted and emerged at this stage for short time-interval. The boring activity was terminated by the drowning of the IRG surface under sediment in an open marine, hemipelagic environment.

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New data on the stratigraphy of the Middle and Upper Jurassic rocks of northeastern Iran

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Keywords: stratigraphy, ammonites, Middle-Upper Jurassic, Alborz, Kopeh Dagh, northern Iran

The Middle and Upper Jurassic strata of the Alborz Mts. (northern Iran) and Koppeh Dagh (northeastern Iran) are chiefly represented by the Shal, Dalichai, Bash Kalateh, Kashafrud, Chaman Bid and Mozduran formations. They are distributed over a large area and reach a maximum thickness of nearly 1600 m at the type locality of the Chaman Bid Formation (Majidifard, 2004). In North Iran, the Jurassic system consists of two distinct Sedimentary-Tectonic megacycle (Seyed-Emami & Alavi-Naini, 1990; Aghanabati, 1998). The first started after the closure of the Palaeo-Tethys (in the Late Triassic). From the early Norian onward, widespread transgression of the Shemshak sea led to deposition of siliciclastic rocks of the Shemshak Group (Norian-Middle Bajocian). This cycle ended in the early Bajocian with the Mid-Cimmerian tectonic event (Seyed-Emami & Alavi-Naini, 1990). The second megacycle began in the late Bajocian. The transgression gave rise to an epicontinental sea subdivided into basinal and platform area in north-central and north-eastern Iran. This situation continued into the Cretaceous when, in the Neocomian, the Late Cimmerian tectonic event terminated the second sedimentary cycle. The similarity of the sediments and faunas with those of the same age in Afghanistan and Armenia indicates that north and central Iran were situated at the southern margin of Laurasia (Seyed-Emami & Alavi-Naini, 1990). The second sedimentary megacycle consists mostly of marl and limestone Dalichai Formation and limestone (Lar Formation, Mozduran Formation) indicative of basinal and carbonate platform environments (Nabaviyeh, 1994; Lasemi, 1995). These sediments began to form from the end of the Mid Cimmerian tectonic phase until the Late Jurassic and in some place continued into the “Neocomian” (Seyed-Emami 1975; Keshani, 1988). For example, in some areas of the Alborz and Koppeh-Dagh, sedimentation continued from the late Jurassic (Tithonian) to the early Cretaceous (Berriasian). At some localities such as Minodasht, Firouzkouh and Jam the sedimentary basin was not only deep but also pelagic in nature (Seyed-Emami, 1975). Therefore, the Middle and Upper Jurassic rocks of northeastern Iran consists seven formations; Dalichai, Lar and Shal (Alborz) and Chaman Bid, Mozduran, Kashafrud, and Bash Kalateh (Koppeh Dagh). However there is no difference with respect to lithology and depositional environment between the Dalichai and Chaman Bid formations, no between the Lar and Mozduran formations or between the Bashkalateh and Kashafrud formations. For this reason it is proposed to discontinue the usage of the lithostratigraphic terms Chaman Bid Formation, Mozduran Formation, and Bashkalateh Formation.

Based on ammonites, the Dalichai Formation is strongly diachronous: If many strata in the Upper Bajocian until the Late Jurassic. The Lar Formation ranges from the Oxfordian to the Neocomian, the Shal Formation from the Late Bajocian to the Neocomian and the Kashafrud Formation from the Late Bajocian to the Late Bathonian

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Foraminiferal assemblages as indicators of depositional conditions and basin evolution - a case study from the Hieroglyphic Beds of the Magura and Skole nappes of the Polish Outer Carpathians

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Keywords: Middle-Late Eocene, flysch deposits, agglutinated and calcareous foraminifera, CCD, sedimentary conditions.

The name "Hieroglyphic Beds" was introduced in the stratigraphy of the Polish Outer Carpathians (POC) in the 19th c. (see Rajchel, 1990) and since then applied for Eocene flysch-type deposits, rich in trace fossils, consisting mainly of thin-bedded, muscovite and glauconite sandstones intercalated by greenish, fine-grained sediments. They have been distinguished in all the main nappes of the POC dominated by turbidite sedimentation, namely the Magura, Dukla, Grybów, Silesian, and Skole ones.

The Magura Nappe is the biggest and structurally highest unit, forming the southern part of the POC while the Skole one is structurally the lowest unit, occurring in their north-eastern segment. Thus, in the Carpathian sedimentary domain they occupied more or less opposing, marginal positions.

The Hieroglyphic Beds have been distinguished in the northern part (Rača and partly Siary subunits) of the Magura Nappe (Cieszkowski *et al.*, 2006). The foraminiferal assemblages represent mainly deep water-agglutinated foraminifera (DWAF) of the flysh-type biofacies sometimes grading into slope biofacies (Malata, 2002). These are: *Reticulophragmium amplectens* (Middle Eocene) - either purely agglutinated assemblages with numerous index taxa or with very rare calcareous component; *Reticulophragmium amplectens* and *Reophax pilulifer* (upper part of Middle Eocene) - agglutinated assemblage, sometimes dominated by the second species; *Ammodiscus latus* (upper Middle – lower Late Eocene) - either purely agglutinated assemblage or mixed with dominating agglutinated foraminifers; assemblage with abundant *Praesphaerammina subgaleata* (*?*Middle – Late Eocene) - purely agglutinated, in some cases forming monospecies-association, sometimes pyrityzed *Chilostomella* are present; *Haplophragmoides walteri* (Late Eocene) - index taxa relatively numerous; agglutinated assemblage with rare calcareous, poorly preserved foraminifers.

In the Skole Nappe deposits developed between red shales and the Menilite Beds were distinguished as the Hieroglyphic Formation, subdivided into a few formal members of the upper Early Eocene-lower Early Oligocene age (Rajchel, 1990). This division was argued by Malata T. (1996). In this work only the part of deposits developed below the Globigerina Marls are considered. Agglutinated foraminifera, representing flysch biofacies of DWAF occur in the sediments of the deepest settings. These are assemblages with *Saccamminoides carpathicus, Reticulophragmium amplectens,* sometimes replaced by assemblage with *Reophax pilulifer* and in the upper part of the Middle Eocene accompanied by *Ammodiscus latus. Reticulophragmium rotundidorsatum* occurs in the highest part of the disscussed deposits (Morgiel & Szymakowska, 1978). Radiolarians are common in these assemblages. The marly deposits consists of calcareous benthic and planktonic foraminifera along with the agglutinated ones. The benthic foraminifera are represented by deep water taxa known from the Eocene such as *Anomalina aragonensis*, *Nuttallides trumpyi, Cibicidoides grimsdalei, Abyssamina quadrata* (Rajchel, 1990). Among planktonic foraminifera the most common are *Turborotalia frontosa*, *Acarinina bulbrooki*, *Subbotina eocena* indicating the Middle Eocene. The Late Eocene taxa were also reported (Rajchel, 1990). In the Skole Nappe, redeposited, olistostrome-type deposits within the Hieroglyphic Fm. are relatively common. They consist of foraminifera characteristic of both shallow settings and deeper ones (Morgiel & Szymakowska, 1978; Rajchel, 1990).

During the Eocene time, the POC sedimentation area achieved a wide connection with the world ocean and despite distinct internal diversification displayed considerably unification of facies, particularly in its deepest parts. The occurrence of the flysch, Hieroglyphic Beds in the majority of the nappes can be the expression of this unification.

The Magura Basin was bordered in the south by the Pieniny sedimentary area and in the north by the Silesian Ridge, considered as the main, northern source area, supplying well sorted, quartz-glauconitic sandy material. In the Early and Middle Eocene the deepest part of the Magura Basin was situated in its northern parts (Rača and Siary subunits), where the Hieroglyphic Beds were deposited at the lower bathyal depths, mainly below or close to the local CCD, which is indicated by the dominating deep-water agglutinated foraminifera. A very characteristic assemblage with abundant *Praesphaerammina subgaleata,* pointing to the sedimentation in slightly oxygen-deficient conditions, can be probably connected, with the deepening of the Magura Basin at the end of the Middle Eocene (Oszczypko *et al*., 2006).

The southern margin of the North European Platform (NEP) was the northern border of the Skole Basin while its southern edge was formed by the Subsilesian intrabasinal height, diagonally contacting with the platform (Ślączka & Kaminski, 1998). During the Middle Eocene the Skole Basin displayed considerable diversification which is well reflected in the character of deposits and foraminiferal assemblages. Material forming the Hieroglyphic Fm. was derived mainly from the slope of the NEP. In the Middle Eocene the assemblages of agglutinated foraminifera and radiolaria outline the greatest depths in central part of the Skole Basin while the mixed assemblages or calcareous ones point to the shallower environments above CCD, on the slope of the NEP margin. In the Middle Eocene the gradual shallowing of the marginal parts started, which is indicated by the wider distribution of the assemblages with calcareous foraminifera. This trend continued in the Late Eocene with increasing intensity, reflected by olistostrome-type deposits such as the Popiele Marls (Morgiel & Szymakowska, 1978). Unusually well preserved calcareous foraminifera in some samples from the Hieroglyphic Fm. of the Skole Nappe may indicate weaker diagenetic alteration of these deposits in comparison with the Magura Nappe probably due to the different tectonic burial and thermal history of both nappes (Środoń, 2007).

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New data on the mammalian assemblages of the Early Oligocene of Switzerland: paleoenvironmental and paleobiogeographic implications

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Keywords: Rhinocerotidae, Sciuridae, Adapidae, Swiss Molasse Basin, Jura canton.

The post-"Grande Coupure" time interval encompasses the European mammalian levels MP21 to MP25 (c. 33.5-27.4 Ma) and roughly coevals the Rupelian stage. During this period, the mammalian assemblages from Switzerland comprise a mixture of a few taxa inherited from the Eocene and Oligocene newcomers.

Recent investigations in the Early Oligocene of Swiss Molasse Basin have led to new discoveries of fossil mammals, especially in Jura Canton (North-West Switzerland). These discoveries include new remains and new investigations of Rhinocerotoidea from Bressaucourt (MP21, Becker 2009), Beuchille and Poillat (MP24, Becker et al. 2013), and Bumbach (MP25, unpublished); of Ruminantia from Lovagny (MP23, Mennecart et al. 2011), Soulce (MP23/24, Mennecart et al. 2011), Beuchille and Poillat (MP24, Mennecart et al. 2011, Mennecart 2012), and Bumbach (MP25, Mennecart 2012); of Anthracotheriidae from Vaulruz (MP22, Scherler 2011), Poillat (MP24, Scherler 2011), and Bumbach (MP25, Scherler 2011); but also of small mammals from Del 1 (MP21, Wiedmann pers. com.) and Beuchille, Poillat and Pré Chevalier (MP24, Becker et al. 2013).

Among these discoveries, some taxa provide new indications on the environmental context during the Early Oligocene in Switzerland:

- *Molassitherium delemontense* Becker and Antoine, 2013 from Poillat (Becker et al. 2013) and Bumbach (unpublished) is a newly described species of small-sized unhorned rhinocerotid characterized by a low head-holding, brachyodont teeth and slender and tridactyl limbs. This morphology indicates that *Molassitherium* was probably a regular browser and a forest dweller.
- An undetermined m1/2 of sciurinae from Pré Chevalier displays a characteristic association of a deeptrigonid basin, a larger and well-differentiated mesotylid, a large entoconid and mesoconid in comparison of other cuspids and a large size (3.43 × 3.16 mm). This tooth suggests a significant forest environment to sustain a population of large-sized tree squirrel.
- One small tooth from Beuchille is unicuspid and misses any stylid or crenulation. It is antero-posteriorly elongated with sharp anterior and posterior borders and a strongly bulging lingual side. The distal border bears a vertical and sharp postcristid joining the apex of the tooth to its base. This type of morphology can not be attributed to any know rodent, carnivore, marsupial or insectivore. On another hand, this tooth displays similarities with *Leptadapis* and can be interpreted as a lower premolars (p2) of Adapidae. Since Köhler and Moyà-Solà (1999) identified an Omomyidae in the Early Oligocene of Spain (Fonollosa-13, MP 22), it has been demonstrating that some primates did survive through the Eocene/Oligocene boundary in Europe. However, if confirmed, this tooth from Switzerland would be first occurrence of an Adapidae in the European Oligocene. As for *Molassitherium* and the indetermined sciurinae above, this taxon would indicate a large forest environment at least in North-West Switzerland during the Early Oligocene. It is noteworthy that the same locality yielded fossilised woods and tree trunks (Becker et al. 2004).

The succession of localities in the Early Oligocene (table 1) allows now a better understanding of paleoenvironmental evolution in Switzerland for this period, and emphasizes the importance of the Swiss fossil record for biogeographic reconstructions (see Maridet et al. 2013). Indeed, during the Early Oligocene, the continental climate is known to be cold in contract to the Eocene inducing more open environments at European scale (*e.g.* Wolfe 1978, Legendre 1986). Our new results suggest that in Switzerland, especially in North-Ouest Switzerland, more importance forest environments might have been maintained.

Levels	**Localities**	**Newly discovered/revised taxa**
MP25	Bumbach	*Molassitherium,* Anthracotheriidae.
MP24	Beuchille, Poillat, Pré Chevalier, Grechen 1	*Molassitherium, Ronzotherium, ,* Anthracotheriidae, *Blainvillimys, Protechimys, Paracricetodon, Butseloglis, Eomys, Tetracus,* Adapidae?
MP23/24	Soulce	*Iberomeryx*
MP23	Lovagny	*Iberomeryx*
MP22	Balm, Kleinblauen, Vaulruz	*Ronzotherium, Molassitherium, Plagiolophus, Epiceratherium,* Anthracotheriidae.
MP21/22	Bressaucourt	*Caducotherium, Ronzotherium*
MP21	Del 1	*Theridomys*

Table 1. List and age of the main Early Oligocene localities of the Swiss Molasse Basin and new data on mammalian assemblages.

The earliest Oligocene is so far poorly recorded in Switzerland; however the recent discoveries from Bressaucourt and Del 1 (MP21; Becker 2009, Weidmann pers. com.) suggest that further prospection in Jura canton can complete our knowledge of the fossil record.

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Palaeoecological significance of the Messinian-Zanclean calcareous nannofloras from the Aegean region

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Keywords: Miocene-Pliocene boundary; nannoplankton fluctuation; NW Turkey.

Introduction

The latest Miocene is characterized by an exceptional event, which is the desiccation of the Mediterranean Sea, leading to the Messinian salinity crisis (Hsü et al., 1973; Clauzon, 1973; Suc et al., 1995, among many others). This outstanding geological event produced significant changes in the marine planktonic assemblages, i.e. planktonic foraminifers and calcareous nannoplankton, very sensitive to environmental fluctuations.

This paper aims to describe the nannofloral distribution across the Messinian-Zanclean boundary interval, in a section located in the Aegean region at the opening of the Dardanelles Strait (NW Turkey). Another goal is to give a palaeoenvironmental interpretation of the identified modifications in the composition and abundance of the calcareous nannoplankton assemblages.

Methodology

In the north-eastern Aegean region, the Messinian stage is characterized by the deposition of the Alçıtepe Formation, composed of brackish- to fresh-water carbonates, interbedded with marine sandstones and siltstones. The Alçıtepe Formation conformably overlies the Tortonian Kirazlı Formation and is overlain by the shallow marine siliciclasts of the Göztepe Formation, Zanclean in age (Çağatay et al., 2006). The studied Intepe section contains a continuous deposition across the Miocene/Pliocene boundary interval, from the Alçıtepe Formation up to the Göztepe Formation (Melinte-Dobrinescu et al., 2009). In all, 23 m of sediments of the Intepe section, placed in the NW Turkey, have been detailed sampled for calcareous nannoplankton investigations. Both qualitative and quantitative analyses of calcareous nannoplankton assemblages have been performed.

Results

The base of the studied section contains calcareous nannoplankton assemblages belonging to the NN11b zone. Typical Messinian species, such as *Nicklithus amplificus*, *Reticulofenestra rotaria*, *Amaurolithus primus* and *Amaurolithus delicatus* are present. The nannofloras are dominated by long-ranging and diagenetical resistant taxa, i.e. *Reticulofenestra* spp., but in some intervals, late Miocene *Discoaster* species and *Sphenolithus abies* become abundant.

In the upper part of the NN11b nannoplankton zone, an interval with almost monospecific assemblages, containing *Braarudosphaera bigelowii*, has been identified. Around the base and the top of this interval, blooms of the calcareous dinoflagellate genus *Thoracosphaera* are present.

The end of the Messinian Crisis is mirrored by the FO (first occurrence) of *Ceratolithus acutus*, which co-occur with the nannofossils *Triquetrorhabdulus rugosus*, *Amaurolithus delicatus* and *Amaurolithus primus*. The Early Zanclean nannofloras, above the appearance of *C. acutus* (NN12 nannoplankton zone), are again dominated by discoasterids in assemblages with abundant *Sphenolithus abies*.

Conclusions

Based on the identified calcareous nannofloras, we suppose that a brackish palaeoenvironment dominated during the Late Messinian, but several marine influxes are to be assumed, as species of the *Discoaster* genus, together with *Sphenolithus abies*, indicative of open marine conditions, are commonly present. Probably, during this stage, the studied area was a semi-isolated basin, evolving as gulf of the Paratethys.

Towards the end of the Messinian, the fluctuation strongly varies, a change indicated by the presence of monospecific assemblages with *Braarudosphaera bigelowii*, a living calcareous nannoplankton species that survives at high salinity modifications. The blooms of the opportunistic taxa belonging to the calcareous dinoflagellate genus *Thoracosphaera* indicate, in the same interval, unstable marine conditions and possibly high nutrient input. The shift to a marine environment within the base of the Pliocene (Early Zanclean), pointed out by the presence of open marine nannofloral taxa, such as *Discoaster* spp. and *Sphenolithus abies*, which become significantly abundant, mirrored the earliest Pliocene transgression and therefore the reconnection with Mediterranean.

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Palaeontological assemblages and sedimentological features of the Buzău Land Geopark geological and palaeontological

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Keywords: lithology, macrofaunas, microfaunas, protected areas, Romanian Carpathian bend area.

The geology of the territory of the Buzău Land Geopark (BLG), placed in the Carpathian bend area, is a complex one, showing a structure of nappes involved into two main tectonic phases, i.e., Late Cretaceous (Laramian) and Early Miocene (Burdigalian). The nappes that occur in the BLG area belong exclusively to the Outer Moldavian nappe system, being represented by the Tarcău Nappe (towards West) and the Subcarpathian Nappe (towards East). The whole territory of the BLG exposed complete succession of the Late Cretaceous, Paleogene, Miocene, Pliocene and Pleistocene intervals. Several protected geological and palaeontological sites are to be found on the territory of BLG.

The Amber Colţi Site, geologically and palaeontologically protected, is situated in the Oligocene-Miocene deposits characterized by the shaly facies of the Kliwa sandstones (Lower Kliwa Formation). The Oligocene sediments may reach 400 m stratigraphic thickness, forming metric beds, with intercalations of black bituminous clays, i.e. dysodiles, and siliceous bituminous rocks, i.e. menilites; 1-2 mm laminae of carbon accompanying the amber nodules are also present. Macrofaunas observed in the amber yield a large variety, such as butterfly wings, arachnids, ants, termites, mosquitoes, wasps, plants fleas, scorpions and different types of larvae. Based on calcareous nannoplankton assemblages, belonging to the zones NP23, NP24 and NP 25, the main part of the amber deposits are situated within the Late Oligocene (Chattian) interval.

The Bădila Limestone Blocks, included in the list of the Geological and Palaeontological protected sites of the BLG is a very unusual occurrence, being located in an area where there are no massive limestone of which could have originated. This occurrence is also surprising in the lithological context, because these limestones have a different age than the surrounding units, the latter being much younger (Neogene), while the limestones are Jurassic. Coral fragments, echinids, brachiopods and molluscs (*Nerina*, *Perisphinctes*) are included in the macropalaeontological assemblages of the limestones, together with microfaunas, i.e. radiolarians (*Spumellaria*), ostracods and calpionellids, i.e. *Calpionella alpina*, which is a marker of the latest Jurassic (Tithonian); this age is also substantiated by the presence of the ammonite genus *Perisphinctes*.

Another important site of the BLG, not yet protected, is represented by the stratotype of the Dacian, a Pliocene Eastern Paratethyan stage corresponding to the late Zanclean-Early Piacenzian interval of Mediterranean. This site is located in the Slănicul de Buzău Valley, where it reaches a stratigraphic thickness of around 500 m. The base of the Dacian is marked by the occurrence of bivalve assemblages with *Pachydacna*, *Parapachydacna*, *Stylodacna* and *Zamphiridacna*. The lower part of the Dacian stage, i.e. the Getian substage, mainly contains species of *Prosodacna*, *Stylodacna*, *Limnocardium*, *Phyllocardium*, *Viviparus*, *Pachydacna*, *Zamphiridacna*, *Dacicardium*, *Pseudocatillus* and *Dreissena* genera. The upper part of the Dacian stage, namely the Parscovian substage, is characterized by the presence of *Prosodacna haueri*, *Stylodacna heberti*, *Viviparus rumanus*, *Prosodacna (Psilodon) conversus*, *Limnodacna rumana*, *Dacicardium rumanum* and *Viviparus heberti*.

The stratotype of the Romanian, an Eastern Paratethyan stage covering the latest Pliocene-Pleistocene *pro parte* interval, is also situated in the BLG, being so far not a protected site from geological and/or palaeontological points of view. The boundary between the Dacian/Romanian stages is pointed out by the dominance of the unionid bivalves. Typical mollusk assemblages of the Romanian stage contain endemic macrofaunas, such as *Jazkoa sturdzae*, *Psilunio slanicensis, Prosodacnomya sturi* and *Viviparus bifarcinatus*.

The depositional palaeosetting of the Dacian and Romanian stages is a brackish up to a fresh water one. Lithologically, the Dacian and Romanian successions are mainly made by clays and silts, containing thin cm up to dm lignite levels and sands, more consistent towards the top of the Pliocene.

One spectacular geological site situated in the BLG is represented by the 'Trovants'(Concretions) of Ulmet, known also as Babele (= The Old Ladies) from Ulmet. Unfortunately, this is a not a protected geologically and palaeontologically area, even it is well known by Romanian and foreign researchers and also by tourists. The concretions formed during an early diagenesis of the rocks, process facilitated by the presence of sandy sediments yielding a big porosity, accompanied by the irregular concentration of the minerals. The spectacular concretions, up to 2-3 m high, displaying various shapes, are Middle Miocene (Sarmatian) in age, and occur on the western flank of a syncline. The macrofaunas is mainly represented by the bivalve genera *Criptomactra*, *Cardium* and *Tapes*.

The BLG contains, besides the above-mentioned sites, many other significant ones, such as The Mud Volcanoes from Berca, one of the most famous in Europe, the Neogene salt springs and massives, the spectacular occurrence of Miocene tuffs from Mânzăleşti, etc., which represent a significant geological and palaeontological heritage.

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Biostratigraphy and sedimentology of the Sarmatian deposits from Șomuzul Mare and Șomuzul Mic drainage basins

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Keywords: biozones, Upper Volhynian, non-deltaic coast paleoenvironment, progradational parasequence set, HST.

Lithostratigraphy and biostratigraphy

The studied deposits which outcrop in Șomuz drainage basin (Fig. 1) belong to the Șomuz Formation (Ionesi, 2006) characterized by two members, namely Arghira Mb and Hârtop Mb (Ionesi, 2006). The age of these deposits was obtained based on macro-and microfossil content. Ionesi (1968, 1991) and Ionesi (2006) defined two assemblage zones (AZ), one taxon-range zone (TZ), and one abundance zone (AbZ): *Ervilia dissita* (Eichw.) and *Mactra* (*Podolimactra*) *eichwaldi* Lask. AZ, *Potamides mitralis* (Eichw.) and *Potamides nimpha* (Eichw.) AZ, *Plicatiforma plicata plicata* (Eichw.) TZ and *Elphidium rugosum* (d'Orb.) and *Pseudotriloculina consobrina* (d'Orb.) AbZ. They indicate Upper Volhynian age of these deposits. Recently, Loghin (2014) analyzed the ostracods in some outcrops (Pârâul lui Gheorghe and Logofătu) and found *Leptocythere mironovi* (Schneider) which Ionesi and Chintăoan (1978) considered a marker fossil for Volhynian substage and based on which established an abundance biozone.

Depositional palaeoenvironment

A whole lot of sedimentary facies were defined in the sands and mudstones characterizing the studied exposures (Muscalu, Livijoara, Logofătu, Pârâul lui Gheorghe, Pleșești1 and 2), based on their lithology, sedimentary structures, and bed geometry. They were grouped in four facies associations representing depositional paleosubenvironments, as follows: transition-offshore with heterolithics dominated by bluish-grey mud (FA2), lower shoreface with sands with wave ripple cross lamination and hummocky cross stratification (FA3), upper shoreface with sands and plane-parallel and trough cross stratification (FA4), backshore with coaly mudstone (FA6). Two other depositional paleoenvironments were supposed based on Walther's Law of the Correlation (or Succession) of Facies, meaning the offshore (FA1) and foreshore (FA5).

The FA2 and FA3 contain numerous shell beds or sandy shell beds dominated either by bivalves or by gastropods or both, representing the main source of analyzed macrofauna based on which the deposits were dated. However these beds are part of tempestites. The dated microfauna was collected during the time from the mud and sandy mud deposits belonging to FA2, FA3, and, recently, from FA5. The interpreted paleosubenvironments represent elements of a non-deltaic coast paleoenvironment.

Sequence stratigraphy

In the studied outcrop the above defined facies associations are recurrent in the sedimentary record, suggesting a cyclic nature of sedimentation which was deciphered using the concept of parasequence from sequence stratigraphy and also the Walther's Law of the Correlation (or Succession) of Facies. Offshore-transition deposits on top of backshore deposits suggest an episode of water deepening, a proxy for accommodation space generation associated with flooding surface development. This particular flooding surface in the area might be considered a local maximum flooding surface, the others being established based on occurrence of offshore-transition deposits on top of upper shoreface. Based on the established flooding surfaces in the studied deposits, we defined the local parasequences. In the Livijoara outcrop, where 80 m of column are exposed, we defined 4 such units to which, based on their characteristic average thickness (15 m), we can add two others which are not exposed or are partially exposed (Fig. 1).

The exposed parasequences end with the well known Arghira I, Arghira II, Hârtop I, and Hârtop II "levels" (Ionesi, 1968). 5 km toward south-south-east, on Muscalu River, where only around 40 m of sedimentary succession is exposed, we defined three parasequences corresponding to Arghira I, Arghira II, and Hârtop I “levels”. In the other smaller outcrops either parts of parasequences (Pleșești 1, Pleșești 2) or deposits belonging to different parasequences (Logofătu) occur.

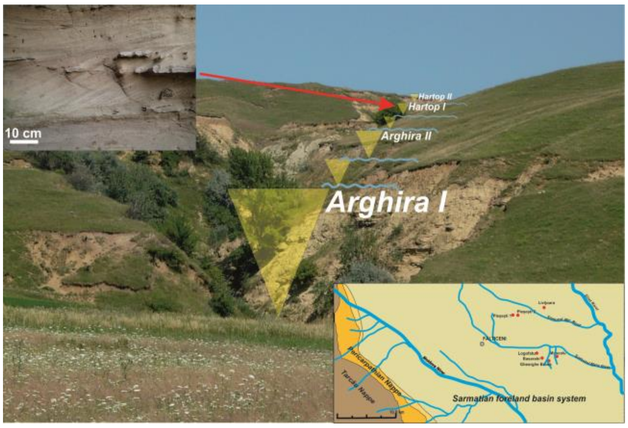

Fig. 1. Șomuz Formation exposed in Livijoara Creek. Notice the six parasequences defined, four of them ending with ArghiraI, Arghira II, Hartop I, and Hartop II “levels” described by Ionesi (1968). These “levels” are upper shoreface deposits consisting of sands with trough cross stratification. Because of the cementation levels which cross-cut the primary sedimentary structure, the deposits seem horizontally bedded (detail in upper left corner).

A geological sketch map with the outcrop locations is in the lower right corner.

In Livijoara outcrop, from the base to the top, the thickness of parasequences decrease and in the same time the offshore-transition are less and less represented, while the lower and upper shoreface deposit thicknesses increase. A situation of this type indicates a progradational parasequence set of highstand type. Popov et al (2010) indicate a HST during Volhynian on sea level curve built for Paratethys. However, Miclăuș et al (2011) described for Lower Volhynian deposits accumulated in the wedge-top depozone of the same foreland basin system (Voitinel-Remezeu area) another progradational parasequence set of HST which indicate that closer to Carpathians the sea level had a different behavior.

Conclusions

The Upper Volhynian deposits in Șomuz drainage basin were accumulated in a non-deltaic coast paleoenvironment which during the time prograded and was flooded several times, consequently the sedimentary record being characterized by a progradational parasequence set of high stand type. A correlation of the proposed model with the existent one would improve the understanding of the sea level control during the Sarmatian and Volhynian in particular.

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Microfacies and microfossils of the limestones from Lapoş Valley (Hăghimaş): paleoenvironmental significance

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As it is the case with the southern (Perşani) Compartment, the allochthonous sedimentary formations in the Moldavian (Rarău and Hăghimaş) one, crystalline-Mesozoic zone, Eastern Carpathians, can be assigned to several Transylvanian „series". According to Săndulescu (1984), these series build-up a number of nappes, each of them displaying a specific stratigraphic succession. In the Hăghimaş syncline, the allochthonous formations belonging to the Transylvanian „series" are present as covering fragments or sedimentary klippen (olistoliths) (Grasu et al, 2010).

Lapoş Valley crosses the Bardoş Mountains – a component of the NW-SE aligned Hăghimaş Nappe calcareous complex. Dragastan (2011) described a complete „Neocomian" (basal Cretaceous) succession from Lapoş Valley, with the Tithonian-Berriasian limit located at the junction of Lapoş Valley and Bicaz River.

Our study is based on the analysis of 345 samples collected along the whole Lapoş valley, going upstream (Fig. 1).

The samples collected in the lower part of the valley (samples 439 to 586) cover the Berriasian, and probably lower Valanginian interval (partly overlapping the interval studied by Dragastan, 2011). The succession starts with inner platform (median-upper slope) microfacies types: grainstone, grainstone-packtone, passing to wackestone and wackestone-packtone with dasycladalean fragments – the latter gradually becoming the dominant organisms. Among the identified foraminifers, one can mention *Anchispirocyclina lusitanica, Bramkampella arabica, Mohlerina basiliensis*, and species of genus *Coscinoconus*. Among the algae, *Actinoporella podolica*, *Rajkaella* species, *Clypeina parasolkani* and *Salpingoporella annulata* are the most frequent. Sample 467 contains rare *Calpionella alpina* specimens. The low frequency of calpionellids pleads for the formation of these deposits in the external carbonate platform, or the upper (median-distal) slope.

In the samples 587-690 we have identified typical Štramberk limestone facies types, dominated by reef structures with encrusting organisms, cements and microbialites. The most significant species we have identified are *Crescentiella morronensis, Radiomura cautica, Perturbatacrusta leini, Terebella lapilloides, Coscinophragma,* as well as *Neuropora lusitanica*- and *Ellipsactinia*-type sponges. Occasionally, dasycladalean algae (*Salpingoporella pygmaea, Griphoporella jurassica, Triploprella remesi,* or *Neoteutloporella socialis*) were also noticed. Most probably, these limestones can be assigned to the Upper Kimmeridgian-Tithonian.

The samples collected in the upper segment of Lapoş Valles (samples 691-783) illustrate a wide range of microfacies types: wackestone-packstone-grainstone, commonly rich in bacinelloid- or micritic oncoids. The foraminifer *Mohlerina basiliensis* dominates, associated with species of *Everticyclammina* genus. Among dasycladaleans, *Clypeina sulcata, Ptrascula bursifotmis* and *Griphoporella* are the most frequent forms. Towards the uppermost segment of the valley, specimens of *Actinoporella podolica,Clypeina parasolkani* and *Rajkaella* species, as well as species of genus *Coscinoconus* become once again frequent. The deposits cropping out in the upper segment of the valley can be assigned to the Upper Tithonian-lower Berriasian and represent typical products of the inner platform (*i.e.*, the upper slope).

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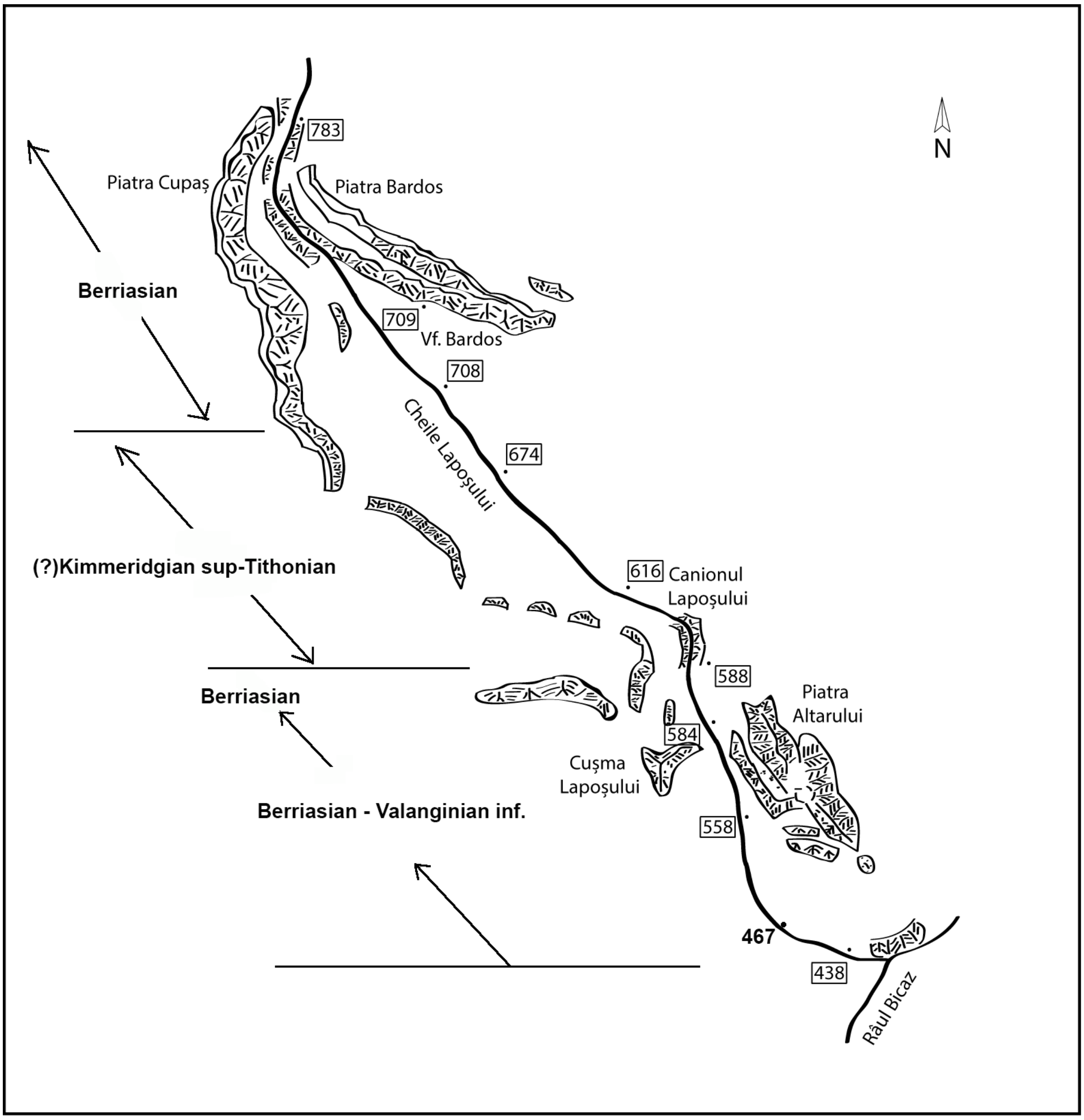

Fig.1 – Location of the samples collected from Lapoş Valley

Cyclical variation in paleoenvironments of the Rotzo Formation (Lower Jurassic, Lessini Mts., N Italy)

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Keywords: *Lithiotis – Orbitopsella,* Pliensbachian, cyclicity, facies.

The Trento Platform is a paleogeographic unit that in the early Jurassic represented a relative high on the southern margin of the Tethys. It was bordered eastward by the Belluno Basin and westward by the Lombardy Basin. We can distinguish two main phases during Jurassic times: the first is represented by a very shallow water paleoenvironment in which the deposition of the Calcari Grigi Group (Hettangian- Pliensbachian) and the Oolite di San Vigilio Group (Toarcian - Aalenian) took place; the second phase corresponds to the drowning of the Trento Platform during the middle and late Jurassic, with the deposition of the deep-water limestones of the Rosso Ammonitico Veronese (Bajocian – Titonian). The Calcari Grigi Group is composed by three formations: the Monte Zugna Formation (Hettangian-Sinemurian), Oolite di Loppio Formation (Sinemurian-Pliensbachian) and the Rotzo Formation (Pliensbachian). The Calcari Grigi Group is overlain either by the Oolite di San Vigilio or directly by the Ammonitico Rosso (Posenato & Masetti, 2012; Masetti et al., 2012; Bosellini & Broglio Loriga, 1971). The Rotzo Formation is the most fossiliferous one, well known for its terrestrial flora, already described by De Zigno in the 19th century and by Wesley in the 20th century (Avanzini et al., 2006).

The Rotzo Formation has been interpreted as deposited in shallow tropical lagoons, only a few metres deep. These lagoons were closed seawards by oolitic shoals and bars, and bordered landwards by marshes and emerged areas (Posenato & Masetti, 2012; Dal Corso et al., 2013). The discovery of amber in the clay layers of the Rotzo Formation in the Bellori section (Lessini Mountains, Verona) attracted again the attention to this Lower Jurassic unit (Neri et al., 2013).

The Bellori outcrop displays about 20 m of limestones with intercalated clays and marls rich in organic matter and sometimes fossil wood (coal) and amber. The limestones are well stratified, with beds 10 cm to more than one metre thick, whereas the clayey levels range between 3 and 40 cm in thickness.

In the Bellori section two biozones were recognized: a lower *Orbitopsella* zone and an upper *Bosniella* zone, allowing to date the strata to the Pliensbachian. Five different facies were recognized (Fig. 1): A: clayey and carbonaceous layers; B: fine-grained limestone*;* C: limestone with bivalves (*Lithiotis*); D: limestone with *Orbitopsella*; E: oolitic limestone.

The facies are repeating cyclically with two distinct patterns: in the lower part of the stratigraphic column we observe typically the succession D-C-A, whereas in the upper part the *Orbitopsella* limestone (Facies D) disappear and the fine-grained limestone (Facies B) become common, giving rise to the characteristic succession C-B-A. Inside the A Facies is sometimes visible a microcyclicity with the succession *Lithiotis* beds-coal-clay repeated.

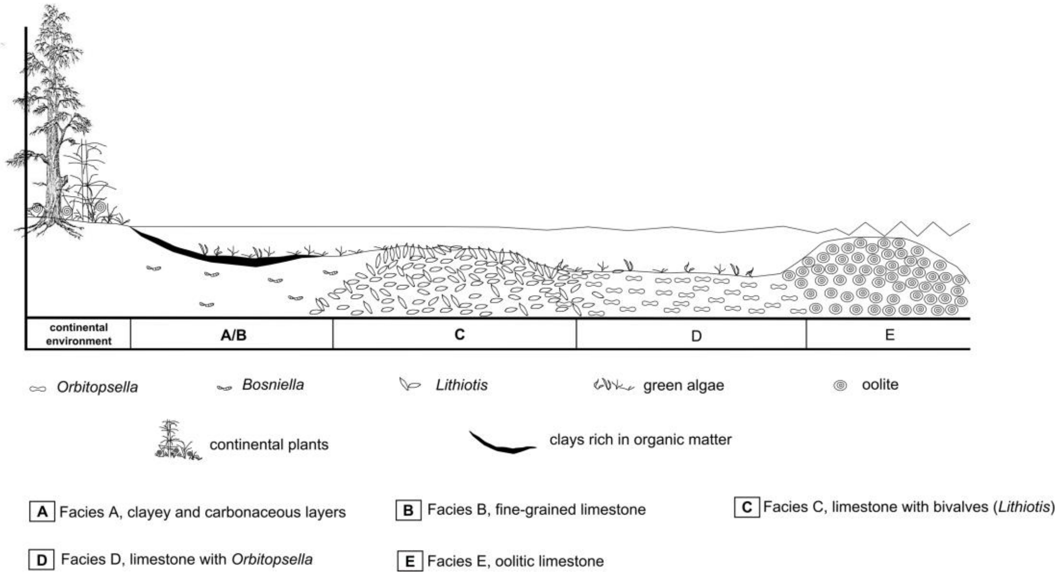

Fig. 1. Paleoenvironmental reconstruction of the Bellori area during Pliensbachian.

The D-C-A cycles record changing environments from the well oxygenated open lagoon, close to the open sea, up to the continental environment. The C-B-A cycles testify the transition from a protected lagoon to low-oxygen conditions maybe in nonmarine environment.

The upper cycles could be linked to the establishment of *Lithiotis* mounds restricting the water circulation and giving rise to protected eutrophic facies.

Close to some of the clay levels we observed plant root traces, testifying the cyclical emersion of at least part of the platform.

To explain the observed cyclicity we can advance different hypothesis:

1) high-frequency eustatic oscillations; because the glacio-eustatic cycles are to be excluded during the Jurassic, we consider this explanation very unlikely.
2) Local subsidence, maybe linked to locally high sedimentation rate; this should imply cyclical variations of the organic productivity.
3) Local tectonics; this is coherent with the generalized subsidence due to the rifting phase related to the opening of the Tethys ocean.

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Biostratigraphy and paleoenvironments of the deep water deposits from the northern part of the Eastern Carpathians (Tarcău Nappe, Romania) based on foraminifera assemblages

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Keywords: agglutinated foraminifera, morphogroups, diversity, "flysch – type" biofacies, Eocene.

Introduction

The Outer Moldavides develop only in the Eastern Carpathians as part of the Outer Flysch Zone (Săndulescu, 1984; Ştefãnescu, 1995). The studied sections belong to the Tarcău Nappe (Joja, 1955) which represents the most important unit of the Carpathian Flysch due to its size, stratigraphic and tectonic complexity. The outcrops are located on the Brusturosu stream, south-west from theVoroneţ village (the northern part of the Tarcău Nappe – N: 47˚ 29' 37.4", E: 25˚ 52' 23.1"; N: 47˚ 29' 24.1", E: 25˚ 52' 08.0") as part of the Tazlău Lithofacies (Agheorhiresei et al., 1967) the deposits consist of medium grained siliciclastic turbidites in the first outcrop and of fine grained siliciclastic turbidites in the second outcrop; complete and incomplete Bouma sequences were identified in the both sections.

Material and methods

7 samples from the first outcrop and 5 samples from the second outcrop were collected fron the fine grained intercalations of the turbiditic sequence. Sediment samples were processed by standard micropaleontological methods and more than 300 foraminifera were picked from the >63 µm fraction. Primary identification was done under the stereomicroscope, while several specimens were examined in detail with a scanning electron microscope. Palaeoecological methods included the analysis of agglutinated foraminifera morphogroups (Kaminski, Gradstein & colab., 2005; Cetean et al., 2011; Murray et al., 2011; Setoyama et al., 2011, 2013) and diversity analysis (Murray, 2006).

Results

Foraminiferal assemblages are relatively abundant, while preservation of the individuals is moderate to good. The foraminifera assemblages are dominated by agglutinated species; calcareous benthic and planktonic forms were identified only in the first section. The tubular forms dominate in the first section: *Bathysiphon microrhaphidus*, *Nothia excelsa*, *N. robusta*, *N. latissima*, *Rhabdammina* sp., *Rhizammina* sp.. The foraminiferal assemblages are more diversified in the third sample; beside the tubular taxa, agglutinated forms with a more complex morphology (such as *Saccammina*, *Ammodiscus*, *Paratrochamminoides,* and *Recurvoides*) and calcareous benthic (*Stilostomella* spp.) were also identified. The assemblages are more diversified in the second section, consisting of *Ammodiscus* spp., *Saccammina* spp., *Haplophragmoides* spp., *Reophax* spp., *Recurvoides* spp., *Reticulophragmium amplectens*. Except for the M3b morphogroup (*Ammolagena*), all morphogroups of agglutinated foraminifera described by Kaminski, Gradstein & colab. (2005), Cetean et al. (2011), Murray et al. (2011), and Setoyama et al. (2011) are present. The distribution of the morphogroups in the first section reveals periods with low organic matter flux for the basal and upper part of the succession (suggested by the dominance of tubular forms – M1 morphogroup) and an interval with mesotrophic conditions with moderate content of organic matter flux and oxygenation for the third sample (suggested by the presence of M2a – globular forms, M2b – rounded trochospiral and streptospiral, M3a – flattened planispiral and streptospiral, M3c – flattened streptospiral moprhogroups). In the second section, the higher values of the diversity and the presence of all the morphogroups suggest eutrophic palaeoenvironmental conditions at the sea floor.

Based on agglutinated foraminifera, the studied deposits can be assigned to the *Reticulophragmium amplectens* Zone of the middle Eocene (Olszewska, 1997).

Conclusions

The foraminiferal assemblages are dominated by agglutinated taxa belonging to "flysch-type" biofacies. These suggest a lower upper bathyal to middle bathyal setting with turbiditic deposition and paleoenvironmental instability with frequent changes in the organic matter input.

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Holocene deposition of aeolian dust and sand over a peatbog from northern part of Romania

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Keywords: geochemistry, storminess, magnetics, radiocarbon, peat, Rodna Mountains.

A multiproxy analysis of an ombrogenous peat profile from Rodnei Mountains provide a valuable record of the mid to late Holocene aeolian activity. Ombrogenous peatbogs retrieve inorganic material solely from atmospheric deposition and therefore are excellent recorders of atmospheric dust and sand content. Radiocarbon dating, loss on ignition, content of Ti and Zr measured with XRF, counting of sand particles from peat and particle size analysis using laser diffraction were used to reconstruct the input of aeolian sediments over the last 7600 years.

The studied peat usually contains less than 10% of inorganic sediment. The clastic particles contained in the peat vary in size from clay to coarse sand. The main part is consisted of silt varying from fine to coarse. In terms of mineralogical content it is composed mainly by quartz, calcite and rarely feldspar, sulphur, mica (biotite and muscovite), magnetite and other melanocrate minerals. In the terms of roundness of the sand particles it varies from well-rounded to sub-angular and angular shape. This shows that the sand particles have different source areas.

We were able to distinguish 10 aeolian input zones (AI 1-10) with different characteristics along the profile. The beginning of the record starts at 7600 cal. years BP and until 7000 cal. years BP the aeolian input was low. From 7000 to 4000 cal. years BP the input of aeolian sand have high and short fluctuations. This period is characterized by short term events with high speed winds intercalated with periods when the winds were slow. The results show a generally higher aeolian input between 4000 and 1600 cal. years BP. The Dark Age Cold Period (1450-1100 cal. years BP) is characterized by low content of sand and dust with some small increasing trends. In the Medieval Warm Period (1050-750 cal. years BP) the aeolian input started to increase until 850 cal. years BP when the maximum of wind speed is reached. The aeolian inputs from Little Ice Age (650-150 cal. years BP) were relatively low. In the last part of the Holocene (150 cal. years BP - present) the studied parameters have an increasing trend maybe due to high deforestations occurred in this period that triggered higher erosion rates.

Late Jurassic – Ealy Cretaceous carbonate clasts within the Upper Member of Bucegi Conglomerates – preliminary study of the microfacies with *Lithocodium-Bacinella* consortium

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Keywords: carbonate olistoliths, microfacies, Bucegi Conglomerates, Southern Carpathians.

Introduction

The Bucegi Conglomerates Formation croping out in the Bucegi Mountains represent an impressive complex litostratigraphic unit of almost 2000 meters thick. This formation belongs to the Mesozoic sedimentary cover of the geotectonic units that developed in the easternmost part of the South Carpathians, respectively on the Southern part of the Eastern Carpathians. The origin and the stratigraphic affiliation of this formation are still controversial. According to Patrulius (1969) the Bucegi Conglomerates Formation is superimposed over the deposits that belong to two tectonic units: the Median Dacides (the Getic Unit) and the External Dacides (the Ceahlău Unit). Săndulescu (1984) assert that the Bucegi Conglomerates was formed during mezocretaceous times as molasse deposits and discuss the position of the Bucegi Conglomerates related to the sedimentary cover of the Ceahlău Nappe. The most representative subsequent papers on the subject (Jipa et al., 2013; Olariu et al, 2014) retain the position of the Bucegi Conglomerates as part of the sedimentary cover of the Ceahlău Nappe.

Murgeanu and Patrulius (1963) and Patrulius (1969) divide this formation in three members: (1) the Lower Bucegi Conglomerates member associated with flysch deposits and characterized by a wide lithological variety; (2) the Middle Bucegi Conglomerates member which exhibit predominately a sandy matrix and contain mainly clasts of carbonate rocks; (3) the Upper Bucegi Conglomerates member that contains large carbonate and metamorphic blocks/clasts/olistoliths along with microbreccia and microconglomerates intercalations and includes also sandstone deposits (the Babele and Scropoasa-Lăptici Sandstones) (Patrulius, 1969; Jipa et al., 2013; Olariu et al., 2014). Olariu et al. (2014) interpreted the Upper Member as fluvial and shallow marine deposits and the Middle Member as deep water slope, subaqueous debris flows which were syntectonic reworked on a narrow shelf. Within the Upper Bucegi Conglomerates there are Upper Jurassic and Lower Cretaceous carbonate olistoliths scattered throughout these deposits. The size of these olistoliths varies from tens of centimeters to tens and hundreds of meters. The depositional age of the Lower Bucegi Conglomerates is Aptian (Murgeanu and Patrulius, 1963; Patrulius, 1969). The depositional age of the Middle and Upper Bucegi Conglomerates is Albian and was documented based on macrofaunal assemblages (Murgeanu and Patrulius, 1957; Murgeanu et al., 1963; Patrulius, 1969) and also based on microfaunal assemblages (calcareous nannofloral associations) (Melinte and Jipa, 2007).

The aim of this paper is to present the preliminary results of the microfacies analysis of few carbonate olistoliths belonging to the Upper Member of Bucegi Conglomerate and represented by oncoidal limestone and to reconstruct some of the sedimentary features of the carbonate platform from where these olistholiths originated.

Methodology

In the studied sections 8 samples were collected and studied for paleontological and sedimentological characterization. These samples were prelevated from relative small sized olistoliths localized on an unnamed valley situated west of the Costila Mountains, on the Bucegi Mountains Plateau. The microfacies types were studied in 5 thin-sections and have been identified and described based on the textural descriptions, with percentage of grain and grain-to-matrix ratio, according to Dunham's (1962) classification, extended by Embry and Klovan (1971).

Results

According to their compositional and textural characteristics as well as microfossil associations observed in the studied sections, following microfacies were recognized: 1) peloidal bioclastic grainstone-rudstone consisting of peloids, benthic foraminifera, calcareous algae, bivalve and brachiopod fragments, rare coral fragments and intraclasts. The grains are surrounded by early isopachous fibrous calcite followed by the radiaxial fibrous cement that exhibits multiple generations followed by a later phase of pore-filling blocky calcite; 2) peloidal bioclastic grainstone-packstone-rudstone consisting of peloids, benthic foraminifera, sponge fragments, calcareous algae, bivalve shell fragments and coated bioclasts, either with micritic envelopes, or completely micritized, intraclasts, and fenestral structures. The grains have a rim of isopachous fibrous calcite followed by the radiaxial fibrous cement that exhibits multiple generations.

In addition all thin sections exhibit microbial crusts represented by *Lithocodium-Bacinella* consortium. Radoičić (1959) firstly described *Bacinella irregularis* as an alga incertae sedis. Schlagintweit (2010, 2012) re-interpreted *Bacinella irregularis* as a euendolithic chlorophycean alga. *Lithocodium aggregatum* was first described by Elliot (1956) as a siphonal codiacean alga. Schlagintweit et al. (2010) described *Lithocodium aggregatum* as a calcareous green alga. Recently *Lithocodium aggregatum* was reinterpretated as a calcimicrobial crust infested by endolithic sponges (Schlagintweit, 2010; Cherchi & Schroeder, 2012).

Conclusions

The studied olistoliths represented by *Lithocodium-Bacinella* oncoidal limestones originated in an intertidal to shallow subtidal environment of a carbonate platform developed during Kimmeridgian – Early Tithonian time interval.

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Diachrony between shallow-water and pelagic crisis: the example of the Bartonian-Priabonian boundary

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Keywords: Middle-Upper Eocene, Biostratigraphy, Larger Foraminifera, Calcareous plankton, Correlation.

One of the major goals of the International Commission on Stratigraphy is to define the GSSP (Global Stratotype Section and Point) for each of the basic subdivisions (stages) of the chronostratigraphic scale. In the Paleogene, most of the stages have defined GSSPs, but still Bartonian, Priabonian, and Chattian have not.

The base of the Priabonian is especially interesting since it occurred lose to the last greenhouse-icehouse transition (e.g., Zachos et al., 2001). The Eocene-Oligocene boundary was for sure a bigger crisis, nevertheless the Middle-Upper Eocene boundary (=Bartonian-Priabonian) recorded a profound change in the shallow water communities, the extinction of all the large species of nummulites being one of the more conspicuous. In the pelagic realm, the extinction of the muricate planktonic foraminifera and some changes in the calcareous nannoplankton assemblages also mark a generalized biotic turnover.

Mass extinctions are defined as differing from the so-called ‘background’ extinctions because of their speed and intensity (Armstrong & Brasier, 2005), but several authors pointed out that they are also poorly or definitely non-selective (Jablonski, 2005) and affecting different paleoenvironments. Therefore, the Bartonian-Priabonian transition, aside for the relatively low intensity, seems to fit the requirements to be ascribed to a (minor) mass extinction event.

A good chance to check wether the extinction events were contemporary or not in the shallow and deep water environments came by the work to find a section suitable for establishing the GSSP for the base of the Priabonian. A good pelagic section close to the type area of the Priabonian in northern Italy was intensively studied in Alano di Piave (northern Italy; Agnini et al., 2011). Here, several extinction and appearances among planktonic foraminifera and calcareous nannoplankton were carefully recorded, and the extinction of the muricate large acarininids and *Morozovelloides* were proposed as one of the possible markers of the base of the Priabonian.

In the Alano di Piave section some turbiditic levels bear larger foraminifera, giving the chance to check the correlation with the plankton events. Only two of these levels contain enough material to be ascribed to the Shallow Benthic Zone (SBZ) 17 (Serra-Kiel et al., 1998). This is currently considered as lower Bartonian, but it has to be underlined that both turbidites are well below (at least 25 m) any of the plankton events.

Another section in Varignano (northern Italy), some 80 km west of Alano di Piave, bear several turbiditic layers with larger foraminifera (Papazzoni et al., 2014) and allowed to recognize that the large nummulites, such as *N.* ex gr. *millecaput*, are still present above the plankton events. Because these large nummulites are indicative of the SBZ 18, considered as upper Bartonian, we have a clear diachrony between the main extinction events in the pelagic realm and in the shallow-water facies. This is further confirmed by the study (in progress) on the Urtszador section in Armenia, where the larger nummulites got extinct much later than the muricate forams.

Therefore, the multidisciplinary study of the Bartonian-Priabonian transition reveal that the crisis in shallow and deep water are diachronous.

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New contributions to the Ciocadia middle Miocene flora (part five)

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Keywords: plant macrofossils, taxonomy, Ciocadia, Upper Badenian-Lower Sarmatian, paleoecology

Some taxa from the middle Miocene Ciocadia flora of the Oltenia province, Romania, including leaves and fruits, have been systematically described in detail, or re-evaluated and updated in order to include modern taxonomic revisions on five characteristic families, Osmundaceae, Lauraceae, Ulmaceae, Juglandaceae and Aceraceae. New leaf macroremains of *Osmunda parschlugiana* (Unger) Andreánszky, *Daphnogene polymorpha* (Al. Braun) Ettingshausen, and *Juglans acuminata* Al. Braun ex Unger, winged fruits of *Cedrelospermum ciocadiae* Paraschiv, *Acer integrilobum* Weber sensu Walther, *Acer jurenaky* Stur, *Acer minor* Knowlton, and woody nuts of *Juglans globosa* Ludwig, are recorded and figured, and careful analytical discussion has been made on the paleoecology, phytostratigraphy and occurrence in Romania. The *Cedrelospermum* remains provides important data for future phylogenetic and phylogeographic studies, indicating evolutionary trends and the extinction crisis within the genus over that time period. The fossil flora of Ciocadia show a high degree of diversity, with many endemic species and hosting a globally unique assemblage, probably related to paleo-refugia.

Fossil plants from the Amber Museum collections, Colți, Buzău County

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Keywords: plant macrofossils, Pătârlagele, Upper Badenian, Poiana Cozanei, Plio-Pleistocene.

The fossil plants from the Amber Museum collections of Colți are described, illustrated and discussed based on silicified wood and leaves impressions. In this paper we describe plant assemblages from Sibiciului Valley (lower Oligocene, the Kliwa Sandstone Formation), Pătârlagele (upper Badenian, Spirialis marls) and Poiana Cozanei (Plio-Pleistocene travertine deposits). We provide a floristic inventory where woods of *Sequoioxylon gypsaceum* and leaves of *Zelkova zelkovifolia*, *Fagus silesiaca*, *Quercus*, *Betula*, *Alnus*, *Acer* and *Dicotylophyllum* are included. The taxonomic composition of both floras of Pătârlagele and Poiana Cozanei conclude to an interpretation of temperate climate. A brief paleobotanical overview of the fossil woods from Sibiciului Valley, in relation with amber deposits, was already made by Petrescu et al. (1989). The Upper Badenian flora from Pătârlagele is compared to synchronous floras of Ciocadia and Pârlagele published by Țicleanu (1984). The Plio-Pleistocene flora from Poiana Cozanei is first described in the current paper. The results of this study will improve the knowledge over the plant megafossils of the Amber Museum of Colți, reorganizing and reinterpreting the current exhibition.

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Foraminifers and algae from the Lower Cretaceous at Prekonozi (Carpatho- Balkanides, eastern Serbia)

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Keywords: Berriasian - Barremian, biostratigraphy, Mt. Leskovik, Getic Unit.

The Lower Cretaceous deposits studied in the Prekonozi village area, on the southern slopes of Mt. Leskovik, eastern Serbia.

According to structural map this region belongs to the Gornjak – Suva Planina Unit of the Carpatho-Balkanides (the geological map, sheet Aleksinac, scale 1: 100 000, Krstić et al., 1980).

Because Lower Cretaceous deposits of wide Mt. Leskovik area, were assigned to the Barremian – Aptian (Krstić, 1977; Krstić et al., 1978, 1980), B. Krstić suggested to me sampling of the Prekonozi syncline.

Micropaleontological studies of sediments in a partly exposed section of the Prekonozi, are documented: upper Berriasian, upper Hauterivian and Barremian (lower to extreme basis of upper). The sediments of the upper Berriasian and upper Hauterivian, presented in this paper, have been presented, for the first time in the author's thesis (Polavder, 2004).

Upper Berriasian

Wackestone, peloidal grainstone and the different bioclastic limestones (packstone-floatstone-rudstone). Microfauna is mainly composed of foraminifera and algae. The following microfosssils were identified: *Charentia cuvillieri*, *Nautiloculina brönnimanni*, *Pseudocyclammina lituus*, *Earlandia*? *conradi,* *Coscinoconus delphinensis*, *C.campanellus*, *Mayncina* sp., *Lenticulina* sp., miliolids and numerous lituolids, then *Clypeina estevezii*, *Pseudocymopolia jurassica*, *Macroporella praturloni*, *Rajkella subtilis*, *Salpingoporella* sp., *Rajkella* sp., *Permocalculus* sp., *Terquemella* sp.

Age of this part of the section is determined based on comparison with the known Berriasian layer in the belt of the Geticum (Ozren, Kurilovo, Jerma). The lower part of Berriasian deposits consists of micritic and feenestral limestones with rare microfossils. Sudden appearance of foraminiferal and algal association, is typical for the Upper Berriasian (Radoičić, 1978, Bucur et al., 1995, Polavder, 2004, 2014).

Upper Hauterivian

It consist mainly of the more or less mud-supported peloidal packstones and/or ooid packstones and bioclastic grainstones. The relatively reach foraminiferal association includes: *Valserina primitiva*, *Paleodictyoconus beckerae*, *Orbitolinopsis debelmasi*, *Paracoskinolina maynci*, *Paleodyctioconus* cf. *cuvillieri*, *Pfenderina globosa*, *Nautiloculina brönnimanni, Charentia cuvillieri*, *Earlandia*? *conradi*, *Pseudocyclammina lituus*, *Coscinoconus campanellus*, *C. alpinus*, *Everticyclammina virguliana*, *Everticyclammina* sp., miliolidis, troholinids etc. Dasycladalean algae include: *Clypeina estevezii*, *Actinoporella* cf. *podolica*, *Rajkella subtilis*, *Salpingoporela* spp.,. *Terquemella* div.sp., and numerous dasycladacean fragments.

Valserina primitiva and *Paleodictyoconus beckerae* indicate upper Hauterivian age.

Barremian (lower to the extreme basis of upper)

Consists predominantly of bioclastic packstones and subordinately grainstones. The significantly poorer microfossils association consist of foraminifers: *Paracoskinolina*? *jourdanensis*, *Paracoskinolina maynci*, *Orbiolinopsis debelmasi*, *Pseudolituonella gavonensis*, *Pfenderina globosa*, *Mayncina bulgarica*, *Charentia cuvillieri*, *Voloshinoides* sp., *Vercorsella* sp., miliolids and some other small forms, then, algae: *Clypeina estevezii*, *Actinoporella* cf. *podolica*, *Neomeris* sp., *Terqumella* spp., *Rajkella* spp. *Salpingoporella* sp., and differents gen. et sp.. Bryozoans, microgastropods and other metazoans and brachiopods (taken in the lowermost bed) are also present.

The lower to extreme basis of the upper Barremian age is indicated by *Paracoskinolina*? *jourdanensis.* The lower boundary was determinated on the basis of by disappearance foraminiferal association characteristic for the upper Hauterivian (beds with *Valserina primitiva* and *Paleodictyoconus beckerae*), and the upper boundary a few meters above the last occurrence of species *Paracoskinolina*? *jordanensis*. Stratigraphic distribution of this species is: the Valanginian to the extreme basis of upper Barremian (Clavel et al., 2010, 2013, 2014; Granier et al., 2013), and this way, the age of this interval was determined.

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The Early Jurassic flora of Mehadia, Danubian Units

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Keywords: fossil plants, systematics, sedimentology, Early Jurassic, Mehadia, Danubian Units.

The Lower Jurassic coal bearing sequences of the Presacina Basin (Danubian Units, South Carpathians) outcrop widely in Mehadia, within the Greațca open cast mine (Gheorghiu, 1958; Iliescu et al., 1968; Pop, 1980). Here, recent fieldwork was undertaken by the authors in order to collect fossil plants and to assess in detail the sedimentology of the terrestrial deposits yielding these plant remains. To the collected material curated at the University of Bucharest (162 hand specimens) was added historical material belonging to the Semaka and Iliescu collections curated at the Geological Museum (Geological Institute of Romania) in Bucharest.

The flora of Mehadia is a compressive, coal flora, represented mainly by impressions and secondary by compressions. The impressions are often filled with pyrophyllitic minerals, with very good optical contrast but generating a poor preservation. This flora was first studied by Iliescu and Semaka (1962), and detailed later by Semaka (1969), while the microflora was studied by Năstăseanu and Cernjavska (1980). The systematic study of the fresh material and the revision of historical collections showed the following plant assemblages: sphenopsids (*Schizoneura carcinoides*, *Equisetites* sp.), filicopsids (Osmundaceae: *Cladophlebis denticulata*; Diperidaceae: *Dictyophyllum* sp., *Dictyophyllum* cf. *nilssonii*, ?*Thaumatopteris brauniana*; Matoniaceae: *Phlebopteris angustiloba*), cycadopsids (Cycadales: *Nilssonia undulata*; Bennettitales: *Anomozamites* sp.), and conifers (*Elatocladus* sp.). This association points to a typical Hettangian – Sinemurian assemblage belonging to the *Thaumatopteris brauniana* range zone and excluding the previously considerations regarding a possible Rhaetian age in the Presacina Basin. A taxon such as *Stachyotaxus elegans*, invoked by previous authors as a key marker for the Rhaetian age, could not be confirmed in the studied material.

Within the 200 m thick Mehadia section in Greațca open cast mine have been distinguished nine facies of clastic rocks in descending fraction order: clast supported conglomerate (CGC), matrix supported conglomerate (CGM), massive sandstone (SB), cross-bedded sandstone (SD), ripple laminated sandstone (SR), root reworked sandstone (SRR), quartz-bearing mudstone (MQ), horizontally laminated mudstone (MP) and massive mudstone (MB). The facies have been grouped into two facies associations, reflecting two main subenvironments.

A) The fine-grained deposits association, composed of greyish black and dark grey massive and horizontally laminated mudstones, containing sometimes dispersed quartz grains (facies MQ), interbedded with fine- to medium grained sandstones with ripple lamination (SR), tabular type low-angle large scale cross-bedding (SD), and in some cases, with massive sandstones (SB). Occasionally root reworked sandstones (SRR) occur at the bottom of the mudstone layers. The thickness of the mudstone members of this facies association changes from a single centimetre up to 60 cm, whereas sandstones reach up to 180cm, although usually they do not exceed 90 cm in thickness. Within the association sediments, very common fining upward sequences have been observed, and only subordinately pensymmetrical have been recorded. The leafy plant remains occur in thin horizons distributed over the whole succession. The thickness of the rock sequences composing this association is changing from a few centimetres up to 6,5 m and the majority falls into 2-4 m thick interval.

B) The coarse-grained facies association consists of various grained sandstones and conglomerates, both clast- and matrix supported, from granule to pebble clast size. Usually, the sequences of this association start with conglomerates, but only in a few a cases the fining upward tendency has been observed. Such sequences contain continuous decreasing grain size through massive conglomeratic or very coarse-grained sandstones, cross-bedded coarse - to medium-grained up to ripple laminated fine-grained sandstones followed by mudstones. Almost all basal members of the association are underlain by erosional surfaces. In some cases, internal erosional surfaces have been described. The clast inventory is dominated by angular to subrounded quartz grains with small admixture cherts and quartzites, as well as elongated mudstone and isometric sandstone intraclasts. The drifted large plant remains have been found only in two beds, as well as coal-coated holes evidencing plants in growth position.

The sediments of the fine-grained association is interpreted as deposited on an alluvial plain during flood water table and almost all sedimentary structures are diagnostic for traction. The changes in the grain size of the deposits are related to flow velocity changes across overbank areas. The sandstone interlayers are regarded as crevasse channels fill and thinner sandstone bodies as proximal crevasse splays. The relatively low fine-grained/coarse-grained association ratio (<20%) can be explained by two factors: (1) the accommodation space creation rate was not enough to accumulate a large amount of the overbank deposits; (2) the lack of larger quantity of the fine-grained material transported with the river. Both factors can operate independently as well as can interact i.e. however there was only a small amount of overbank fines and simultaneously no space to accommodate all this sediment.

The coarse-grained facies association is interpreted as being deposited within active river channels. The features of this association allow us to recognize a sandy braided river system. The 3,5 m paleodepth of the channel based on fully developed inchannel sequences can be estimated. The presence of the numerous erosional surfaces, recurrence of the facies within association (channel bodies), as well as abundant mudstone and sandstone intraclasts pointing out frequent bout sedimentation and erosion (including cannibalism) of previously deposited material.

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Spathian (Early Triassic) foraminifera from Tulcea Unit (North Dobrogean Orogen, Romania)

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Keywords: Spathian, latest Early Triassic, foraminifera.

During the Spathian (Olenekian, latest Early Triassic), following the terrigenous deposition laying transgressively on the Variscan basement, the carbonate sedimentation started in the Tulcea Unit of the North Dobrogean Orogen. Carbonate platform facies are present in the mid and eastern areas of the Tulcea Unit while carbonate basinal facies are found in the western part. The edge of the carbonate platform is fringed by a thick succession of calciturbidites showing Bouma sequences of different composition, which characterize a slope/toe-of-slope environment (Grădinaru, 1995). The most representative occurrences of Spathian calciturbidites are cropping out in the Trei Fântâni Quarry (in the eastern part of Tulcea city), south of the Malcoci village, and in the area of the Zebil village (Grădinaru, 2000). In the last area, Spathian calcirudites occur on the western slope of the Dealul Roșu Hill. Complete sequences start by thick-bedded, clast-supported calcirudites with flat lithoclasts, and grade upwards to calcarenites, calcsiltites, calcilutites and marly shales. Base-cut or top-cut Bouma sequences of calciturbidites and hemipelagic limestones are interbedded. Studied in thin sections, the fine-grained calcarenites and calcsiltites show varied bioclasts, such as foraminifera, ostracods, bivalve and brachiopod shells, echinoid spines (diadematoid type) etc. The present study is focused on the taxonomic study of the foraminiferal assemblage identified in the Dealul Roșu Hill section, its biostratigraphic and paleoecological significance.

Microscopic analysis of the studied limestones revealed a rich foraminiferal assemblage belonging to the following families: Ammodiscidae, Nodosariidae, Meandrospiridae. The foraminifera fossils of Trochamminidae, Textulariidae, Endotebidae, Ptychocladiidae, Earlandiidae are rarely represented.

The foraminiferal assemblage consists of typical species for the Tethyan Lower Triassic: *Meandrospira pusilla* Ho, *Meandrospira cheni* Ho, *Hoyenella* gr. *sinensis* HO, *Pilammina praedensa* Urosevic, *Glomospira* aff. *kutani* Salaj, *Ammodiscus parapriscus* Ho, *Trochammina almtalensis* Koehn-Zaninetti, *Nodosaria* aff. *shablensis* Trifonova, *Frondicularia woodwardi* Howchin, *Endoteba* ex. gr. *controversa* Vachard & Razgallah, *Tetrataxis nana* Kristan–Tollman.

This assemblage proves the Spathian age of the limestones cropping aut in the Dealul Roșu section. The numerous species belonging to a great variety of families make us to consider that the Dealul Roșu section is a important locality for the Spathian in Romania.

Foraminiferal assemblage contains species described for the Olenekian – Lower Anisian interval of the Bucovinian Nappe of the Eastern Carpathians (Popescu & Popescu 2005, Popescu, 2008) and of the Sasca zone of the South Carpathians (Bucur et al., 1994, Bucur, 1997). Similar assemblages was mentioned from “Campilian” in Inner Dinarides (Sudar, 1986), Hungary (Berczi-Makk, 1976), Alps (Zaninetti, 1968), West Carpathians (Salaj et al., 1983), etc.

The richest foraminiferal assemblage was found in the “Campilian” of the Balkan where the upper part of the Spathian corresponds to the biozone (interval-range zone) *Meandrospira pusilla* (Trifonova, 1977; Budurov et Trifonova, 1994).

According to Salaj et al. (1983, 1988) the *Meandrospira pusilla* subzone and the upper part of the *Meandrospira cheni* subzone (interval-range zone) characterize the Spathian in the West Carpathians.

In the Dealul Roșu section both species *Meandrospira pusilla* Ho and *Meandrospira cheni* Ho appear together, reason for that we consider them index forms of the *Meandrospira pusilla* zone typical for the Spathian in Dobrogea. The same situation was mentioned in Central and Meridional Tunisian Atlas (Kamoun et al., 1998).

These species are good indicators for detrital coastal facies, of meso to infralitoral environments of carbonate platform in the upper part of the Lower Triassic – basal Anisian (Salaj et al. (1983).

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Eocene planktonic foraminifera from some boreholes from the southern part of Oltenia (Moesian Platform)

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Keywords: hydrogeological wells, continous coring, Paleogene deposits.

During the 1990s, in the southern part of Oltenia were drilled four hydrogeological wells with continous coring. Three of these wells, after drilling through Miocene deposits, intercepted Paleogene deposits. These three wells are situated near the villages of Dăbuleni, Grojdibodu, and Ocolna. A fifth well, cored only intermitently, approximately every 50 metres, was also drilled at Bistreţu (Fig. 1). Some stratigraphic observations on the deposits crossed by the Dăbuleni and Grojdibodu wells, and those crossed by the Amărăştii de Jos well, which stopped in Miocene deposits, were published by Popescu & Enciu (1996). The present paper is a palaeontological study of the Eocene planktonic foraminifera obtained after sampling the cores from the four wells that intercepted and crossed through Paleogene deposits. Many of them were also described and figured in the PhD thesis of one of the authors (Popescu, D.P., 2002).

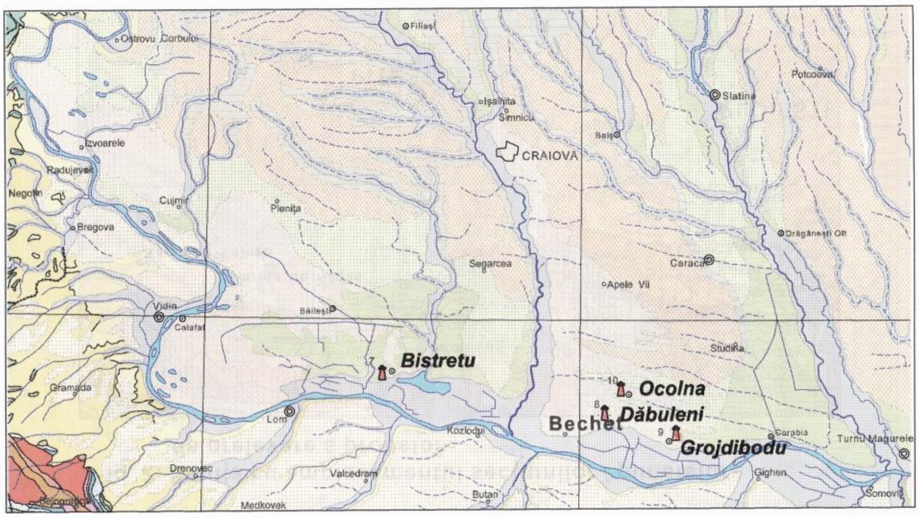

Fig. 1 Map sketch with locations of the studied wells

The Bistreţu well intercepted Paleogene deposits in the depth interval between 534-703 m, and stopped in Thanetian deposits. The lithology of this interval is rather uniform, with marls and silty marls, and few sandstone intercalations.

The Dăbuleni well drilled through Eocene deposits in the interval 162-356 m, and stopped in Lower Eocene deposits. Lithologically, the Eocene deposits in this well are more diverse, with a marly - silty marly upper half, and a mostly arenitic lower part.

The Grojdibodu well crossed through Eocene deposits in the interval 56-246 m, and stopped in Middle Eocene deposits. From a lithological point of view, the Eocene deposits in this well are very similar to those in the Dăbuleni well.

The Ocolna well drilled through Eocene deposits in the interval 155-348 m, and stopped in Upper Eocene deposits. The lower half of the Eocene interval is, as in the Dăbuleni and Grojdibodu wells mostly arenitic, with few marly-clayey intercalations.

The marly-clayey and silty intercalations from all the four wells were sampled, and were the source of rich, and most of the times very well preserved microfaunas of both planktonic and benthonic foraminifera.

The planktonic assemblages are represented by species of the genera *Chiloguembelina, Turborotalia, Acarinina, Morozovella, Truncorotaloides, Globanomalina, Hastigerinella, Hantkenina, Hastigerina, Subbotina, Globigerinatheka* etc.

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First record of the genus *Lissodus* Brough 1935 for the Triassic of Romania

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Keywords: Chondrichthyes, hybodont shark teeth, Middle Triassic.

Introduction

The Middle Triassic fossil sites Lugaşu de Sus and Peştiş, Bihor County, North-Western Romania are well known for their fauna consisting of marine invertebrates and vertebrates. Up to now, 3 selachian and 5 osteichthyes genera have been identified in the Middle Triassic deposits of Pestis, based on isolated teeth and scales. The first report was made by Jurcsak (1976), based on a tooth identified as *Hybodus reticulatus* and a scale of *Colobodus* sp. Latter, Jurcsak (1977) listed the selachians *Hybodus* sp. and *Acrodus* sp., as well as an actinopterigyan identified as cf. *Birgeria* sp. The ichthyofauna has been completed by Jurcsak (1978) with *Hybodus* cf. *multiconus, Palaeobates angustissimus, Birgeria* sp., *Serrolepis* cf.. *suevicus*, *Gyrolepis quenstedti, Saurichtys* sp, *Colobodus* sp. From Lugasu de Sus only a scale of *Colobodus* sp. was reported (Jurcsak, 1978).

Methodology

The specimens discussed here have been collected from a single locality: Lugasu de Sus, Locus Huza, during the 1995 joint French-Romanian fieldwork. The samples from the first four layers were subjected to weak (<10%) acetic acid preparation for 3-5 hours and then rinsed. The disintegrated material was sieved through 2 mm and 1 mm. Fish remains consisting mainly of teeth and scales were separated and studied in detail.

All the specimens are hosted in the collection of Natural History Department – Ţării Crişurilor Museum Oradea. Abbreviation: MTCO – Ţării Crişurilor Museum Oradea

Results

The preliminary microvertebrate analyses reveal that Layers no. 3 and no. 4 are the most abundant in ichthyoliths, consisting of chondrichthyan and osteichthyan teeth, scales and dermal denticles. The identified hybodontid shark fauna comprises *Acrodus* sp. and *Palaeobates* sp., genera already known from Peştiş and *Lissodus* sp., which is reported for the first time for the Triassic of Bihor.

The use of morphological criteria in the description of *Lissodus* in this paper has been preferred. Cutting of thin sections in order to analyze histology in this case is not recommended because the studied material is so limited. The terminology for teeth description is that used by Duffin (1985). With the exception of *Lissodus africanus* from the Early Triassic of South Af*rica,* based on two almost complete and several partial skeletons (Rees and Underwood, 2002) and *Lissodus cassangensis*, based on two incomplete skeletons from the Early Triassic of Angola (Antunes et al. 1990), all the other *Lissodus* species are based on isolated teeth and cephalic spines (Duffin, 1985; Fisher 2008). The scarcity of articulated specimens might be an explanation for its controversial systematic position. Some authors placed *Lissodus* and *Polyacrodus* in the Polyacrodontidae (Delsate and Duffin, 1999), others included it in Lonchidiidae (Rees and Underwood, 2002; Blazejowski, 2004). Rees (2008) considered that *Lissodus* has some unique characters and shares characters with both the Lonchidiidae and Acrodontidae, leaving it without family assignment.

Class Chondrichthyes Huxley, 1880
Subclass Elasmobranchii Bonaparte, 1838
Order Euselachii Hay, 1902
Superfamily Hybodontoidea Owen, 1846
Family ?Lonchidiidae Herman, 1977
Genus Lissodus Brough, 1935
Lissodus sp.

Material: 4 isolated crowns and one fragmentary crown. Non of the specimens preserved the root.

Description: one of the most complete crowns is MTCO 25025/1 (Fig.1), it measures 2,2 mm mesiodistally, 0,7 mm high at the central cusp and 0.9 mm labio/lingually. The low central cusp is slightly inclined labially and is flanked by two rather weak lateral cusplets, which decrease in height. Mesially there are 2 better preserved cusplets, distally the lack of the cusplets is due to preservation. The labial peg is moderately developed. A strong vertical ridge is descending the central cusp labially from its apex toward the labial peg. The occlusal crest is passing mesio-distally the length of the crown, clearly separating the labial side from the lingual side of the crown. Labially and lingually a longitudinal ridge surrounds the tooth at the crown shoulder.

Fig. 1. *Lissodus* sp. – lateral tooth (MTCO - 25025/1), occlusal and labial view. Line indicates 1 mm.

Conclusions

The *Lissodus* tooth described here shows similarities with *Lissodus cristatus* from the Anisian-Ladinian of Luxembourg described by Delsate and Duffin (1999).

Triassic deposits of Europe contain *Lissodus* teeth or cephalic spines in Spitzbergen, Poland, Germany, Luxembourg, Spain and Hungary. The *Lissodus* teeth recovered from the Middle Triassic deposits from Lugasu de Sus, Bihor County is the first record of the genus for the marine Triassic sediments of Romania.

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A Late Miocene large-sized dinothere at Ghergheşti (Scythian Platform) - Preliminary data

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Keywords: Proboscidea, *Deinotherium*, Turolian, Moldova, Romania.

The last sedimentary megasequence in the Scythian Platform (Săndulescu 1984) refers to the Middle Miocene-Pleistocene time span (Ionesi 1994). This area became worldwide notorious in vertebrate paleontology due to the first finding of a nearly complete skeleton of *Deinotherium proavum* EICHWALD, 1835 (= *D. gigantissimum* ŞTEFANESCU, 1891), the largest and last representative of the European dinotheres lineage. This dinothere skeleton was unearthed at the end of 19th century (1890- 1894) from sands with rather poorly known stratigraphy (? Maeotian) exposed near Mânzaţi village (Zâmboanga, Ibăneşti commune in Vaslui District) by Gregoriu Ştefănescu, former professor at the University of Bucharest (Ştefănescu 1891, 1895, 1899; Codrea 1994).

The Maeotian mammal fauna from the Scythian Platform consists of taxa such as *e.g.*: "*Hipparion" moldavicum* Gromova, *Aceratherium incisivum* Kaup, *Tragoceras leskewitschi* Borissiak (Sevastos, 1922), *Gazella brevicornis* Roth et Wagner (Simionescu, 1904), *Chilotherium* sp. (Codrea et al., 2011), and *Dihoplus* sp. (Sava et Codrea, 2011) etc. This year, at Ghergheşti (Vaslui District, Scythian Platform) a dinothere partial skeleton was unearthed. In terms of sedimentology, the facies associations described in this area shows a fluvial depositional system. Taphonomic analysis of the recovered specimen indicates that all the teeth and bones originated from a single individual. Before their definitive burial, the bones were moved by the water stream, losing their anatomical connections. A part of bones show poor preservation, but this is due to a small landslide occurred in the last decades, more precisely after the works carried out for the road where the partial dinothere skeleton was found. This small landslide allowed the free circulation of the rain water on the bones, and fissured and even broke some of them. On the opposite, where such process missed, the preservation is a fair one (cranium and teeth).

The study of the collected material showed that they belong to a large sized *Deinotherium.* The metrical similarities with the data in the recently published works on the taxonomy and chronology of deinotheriidae (Pickford and Pourabrishami, 2013; Markov, 2008; Aiglstorfer et al., 2014), allow to refer the studied material to *D. proavum* (EICHWALD 1831), a species which stands for the group that includes the synonymised taxa *D. gigantissimum*, *D. thraceiensis* and *D. indicum* (Pickford and Pourabrishami, 2013). Therefore, the age of the assemblage can be considered as Late Miocene, more specifically as early MN11 (Early Turolian).

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The molar enamel ultrastructure of the Miocene-Pliocene Spalacidae and Anomalomyidae (Rodentia, Mammalia) of Ukraine

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Keywords: enamel, teeth, structure, Miocene, Pliocene, Spalacidae, Anomalomyidae.

The tooth enamel ultrastructure of mammals has been studied extensively from the beginning of the second half of the twentieth century. To date, thanks to the works of W. von Koenigswald, his co-authors and other researchers, the basic elements of layered structure of the tooth enamel depending on taxa, geological time and the teeth function are known. The basic layers enamel (radial, tangential and lamellar) were characterized with a lot of modifications, the basic evolutionary trends in the enamel formation in ontogenesis and phylogeny were detected, as well as its importance as a taxonomic characteristic for the systematics and phylogeny of different taxa was justified (Kalthoff, 2000, Koenigswald, 2004, Martin, 1997; Rekovets et al., 2013, 2014).

The aim of our research was to study the molar enamel ultrastructure of the genera *Anomalomys*, *Pliospalax* and *Spalax* (all five species) from the Miocene and Pliocene of Ukraine, along with comparative morphological characteristics of enamel and making some phylogenetic inferences. So far, these issues have not been studied for these extinct taxa from the Ukraine; although some works dedicated to the cutter enamel ultrastructure of Spalacidae and morphologically similar groups from other regions are known (Kalthoff, 2000; Flinn et al., 1987). The study material was a molar series of *Anomalomys gaillardi*, *Pliospalax macovei*, *Pliospalax odessanus*, *Pliospalax* sp. and *Spalax minor* from the late Miocene and Pliocene localities within Ukraine. We studied the enamel structure around the perimeter of teeth cross-sections (parallel to the grinding surface) using a scanning microscope in the Wroclaw University of Environmental and Life Sciences.

The molar enamel of *Anomalomys gaillardi* (Gritsev locality, MN 9) contains of two well-defined layers – the outer radial, and the inner – lamellar layer (or HSB uniserial type). The basis of each layer is IPM matrix which usually has reticulated or linear structure whose cells are filled by prisms. The HSB layer (lamellar enamel) is prevalent in thickness (60%); radial layer takes up 40% of the total enamel thickness. Lamellar layer is located near the EDJ border and consists of interlocking prismatic structures; this type is the most evolutionary progressive. This layer is only sporadically situated on conidia of upper and lower teeth and is not represented by the entire perimeter of the tooth enamel. It is presented in both progressive and primitive modifications, which is essential for understanding the evolution of structures in the enamel due to its function according to Koenigswald (1980). The radial type of enamel is always available, especially in flexies and fossetts where lamellar enamel is always absent. Sometimes cells of the IPM radial layer are not filled by vertical prisms and remain as if empty. Radial OES layer near the border in some places of tooth perimeter (in the presence of lamellar enamel sections) by forming a small capacity (up to 8% of the enamel thickness) layer of the nonstructural enamel type PLEX. Characterized structure of the *Anomalomys* enamel as compared to other morphologically related forms is relatively complicated (progressive). It casts doubt on the phylogenetic proximity of Spalacidae and Anomalomyidae during their common but independent evolution.

Pliospalax macovei (Kuchurgan locality, MN 14) is characterized by different structural type of tooth enamel as compared with the *Anomalomys*. Mainly one (radial) enamel layer can be traced around the tooth perimeter. It composed of very thin (delicate) IPM matrix, with linear or finely reticulated structure in the middle layer, and very well-expressed reticulation of the IPM matrix near the EDJ border. Cavities (cells) of matrix are lenticular and filled by isolated small prisms which are not assembled in bunches (contrary to those in *Anomalomys*). The IPM matrix forms a weak, non-prismatic PLEX layer closer to the OES border. The same structure of the radial enamel layer is preserved for inflections, differing by distinct linear (non-reticulated) IPM matrix throughout the whole layer. The weak layer of HSB type is also observed closer to the EDJ border. The lamellar enamel layer (HSB – uniserial) on flexies and fossetts is absent.

The enamel of *Pliospalax* sp. from Gavanosy locality (MN 14-15) is composed of radial and weakly developed (to 10% of the total enamel thickness) HSB layer with nonstructural primitive elements on the tooth perimeter. The IPM matrix of the radial layer has a strictly linear structure, which is completely devoid of the prisms, and near the EDJ border matrix forms a well revealed reticulated plexus and also without prisms. A completely different enamel structure is observed on the ellipsoid fossett. It is longitudinally divided into two very different parts. One part consists of radial enamel with good IPM matrix, lenticular and rounded cells filled by prisms. The other part is also consists of IPM, which is completely devoid of the cell prisms and well presented HSB layer. These distinctive features have allowed the use of the open nomenclature for this species.

Pliospalax odessanus (Odessa catacombs locality, MN 15.). The enamel on the entire tooth perimeter has two-layer structure. Radial layer occupies 70-80% of the total enamel thickness, the rest is HSB layer. The IPM matrix is represented by relatively thin linear structures and includes a very large number of small individual prisms, especially in the middle part of the layer. There is well defined layer near the OES border that structurally resembles the HSB layer with prisms. They are particularly well visible on the border with radial the enamel. Enamel on fossetts and flexies is represented only by the radial type with a well-developed structure of the IPM matrix, and their cells are filled by a variety of very small crystalline prisms.

Spalax minor from the Tarkhankut locality (MQR 8). The radial type is near the 90% of enamel thickness along the tooth perimeter; the rest approximately 10% is primitive HSB enamel structure layer near the OES border. A feature of the radial enamel is that it is composed of very fractional linear IPM matrix structures, however resembles a fractional reticulum, particularly near the EDJ border. Lenticular small cells are filled by isolated small prisms, inclined to the OES border. Flexies and fossetts have very similar enamel characteristics. The radial type with closely stacked prisms and matrix IPM is almost predominating. There are some rudimentary elements of the PLEX enamel near the OES border. It can be noted that the general character of this type of tooth enamel is similar in structure to those in species from the Kuchurgan and remote from those enamel in species from the Odessa Catacombs.

Thus, it may be concluded, that the tooth enamel of the genera *Anomalomys* and *Spalax* is clearly different, so the phylogenetic relationships of these groups are doubtful. The enamel of the Pliocene representatives of the genus *Spalax* is species-specific.

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Concerning the East Carpathian Foreland Mammal Biostratigraphy (Eastern Romania, Moldova and Western Ukraine)

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Keywords: Neogene, Eastern Paratethys, Eastern Europe.

The East Carpathian Foreland (ECF), located between the East Carpathians to the West, the Ukrainian Shield to the North-East and The Black Sea to the South-East, provides one of the key Late Miocene mammal records of SE Europe.The mammal record of the ECF has great potential as a link in between Western Asian mammal faunas and European mammal faunas during Late Serravalian (Middle Miocene) up to Gelasian (Early Pleistocene) stages (Neubauer et al., 2015). Due to improved access to the local literature as a result of interational cooperation (Ali-Zade et al., 1972; Ionesi et al., 2005; Vangengeim & Tesakov, 2008; Lungu & Rzebik-Kowalska, 2011; Nicoara, 2013) and recent advances in Paratethys magnetostratigraphic study and isotopic dating over the past 10 years (Vasiliev et al., 2005; Vasiliev et al., 2011; De Leeuw et al., 2013) there is currently a high potential to create a local mammal biostratigraphy that can be compared with European, Mediterranean and Asian records.

A detailed overview is made of all mammal occurrences over many of the known localities of the ECF basin and these occurrences are ordered into a local biostratigraphic scheme, thus providing a workable framework for the mammal biostratigraphy within Eastern Europe.

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Shallow-water benthic foraminifera across the Cretaceous-Paleogene boundary (Kambühel Limestone, Lower Austria): preliminary results

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Keywords: Maastrichtian, Danian, Selandian, Thanetian, stratigraphy, KT boundary

A variety of papers deal with the turn-over of planktic foraminifera across the Cretaceous-Palaeogene (C-Pg) boundary in pelagic settings, but only little is known about impact on benthic shallow-water fauna and its taxonomic inventory. A succession of upper Maastrichtian mixed siliciclastic limestones with orbitoidids and *Siderolites*, overlain by Danian-Thanetian carbonates is reported from Kambühel hill in Lower Austria, southeastern part of the Northern Calcareous Alps (Plöchinger, 1967; Tollmann, 1976; Tragelehn, 1996) (Fig. 1). In the Kambühel Formation (KF) of its type-locality, besides the disappearance of orbitoid foraminifera (and *Siderolites*), the most important biotic change across the preliminarily fixed C-Pg boundary is expressed by a blooming of bryozoans and withdrawal of corallinaceans. The lower Danian notably contains an impoverished microfauna with an assemblage including *Cibicidoides* gr. *succedens*-*Stomatorbina*? *binkhorsti*-*Planorbulina*? *uva*, associated with nodosariids and polymorphinids. Agglutinating taxa only constitute minor faunal elements. In the lower Danian, encrusting *Solenomeris*, abounds, interpreted as the blooming of an opportunistic taxon. Along with the recovery of corallinaceans, debris of corals, dasycladaleans and representatives of *Nummofallotia*? sp., and Rotaliida (*Rotorbinella hensoni-detrecta*, *Pararotalia*? sp.) occur. Higher up large thick-walled *Gyroidinoides*? sp., *Cocoarota*? *orali* and fragments of encrusting *Haddonia praeheissigi* are common. The latter two species become more significant in the overlying micritic, mostly bioclastic coral limestones together with large-sized dasycladaleans (*Neomeris deloffrei*, *Dactylopora bystricki*). In the same level, tiny euendolithic foraminifera are also frequently observed.

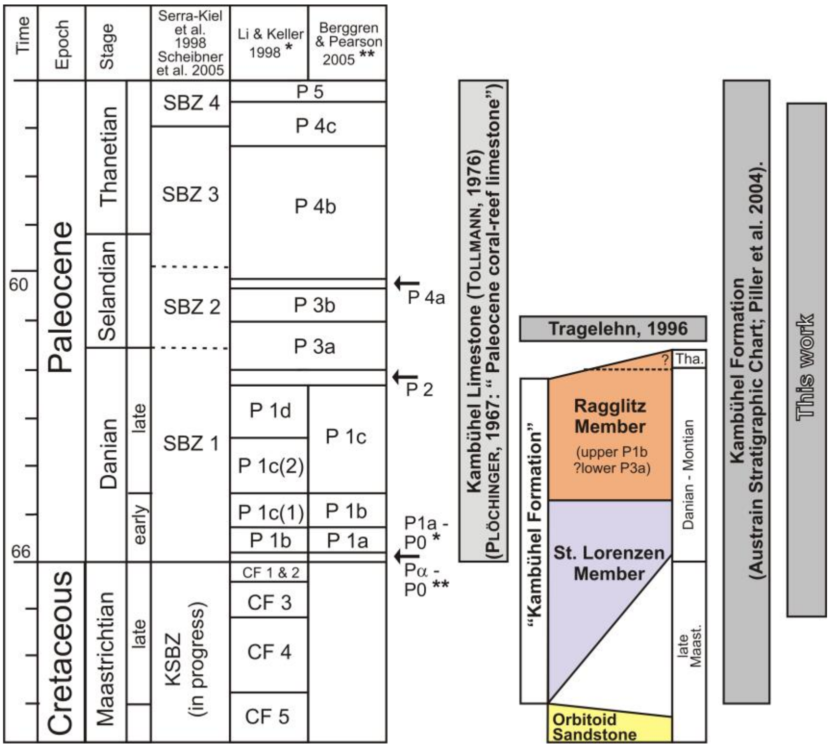

Fig. 1. Late Maastrichtian-Thanetian biozonation (larger benthic and planktonic foraminifera) and application to the shallow-water carbonates of Kambühel hill, Austria

The tentative biostratigraphic scheme (Fig. 2) is largely based on planktic foraminifera, which occur in some parts of the section, since none of the larger benthic foraminifera that provide the base for the Shallow Benthic Zones (SBZ) in Serra-Kiel et al. (1998) were observed. The basal parts of the KF at the type-locality can be assigned to the Late Maastrichtian CF3 Zone (*hariaensis* Z.), the coral limestones, making up the top of the KF can be assigned to the Thanetian P4c Zone (*pseudomenardii* Z.).

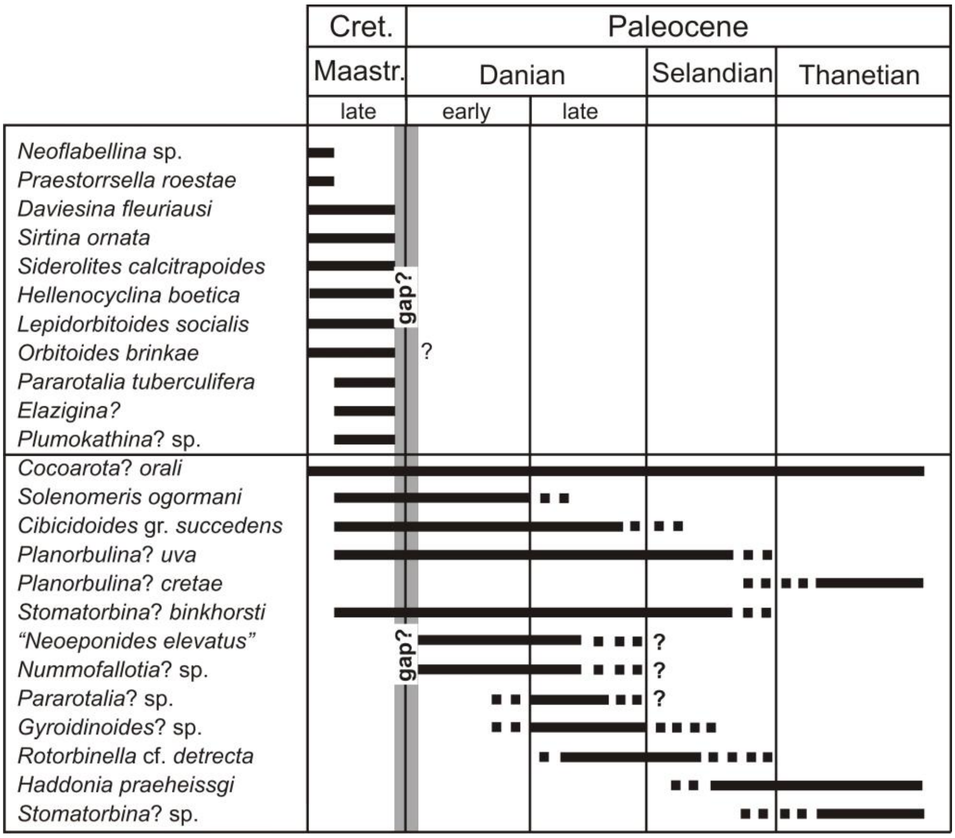

Fig. 2. Taxonomic inventory of Late Maastrichtian – Thanetian benthic foraminifera from Kambühel Hill, Austria. Tentative biostratigraphic distribution of taxa is based on planktonic foraminifera

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Middle Triassic ostracods (crustacea) from Agighiol (North Dobrogea, Romania)

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Key words: Ostracods, Anisian, Ladinian, North Dobrogea, Romania.

Introduction: The Middle Anisian to Lower Ladinian stratigraphic interval exposed in the Pietros Hill section from Agighiol (North Dobrogea, Romania), around 21 m thick, was investigated for the ostracod fauna. The lithology is made up of thick-bedded, variegated limestone, light-creamy to grey in the Middle Anisian and dominant redish into the Upper Anisian to Lower Ladinian section. The biostratigraphy of the ostracod fauna is well calibrated by conodont and ammonoid faunas.

Methodology: The samples were processed by hot acetolysis, by the method described in Crasquin-Soleau *et al.* (2005). The ostracods are well preserved. Both silicified and non-silicified carapaces are recovered. The material was photographed with scanning electronic microscope (Hitachi TM1000), Pierre-and-Marie-Curie University (UPMC).

Results: The 9 processed samples delivered 429 ostracod specimens from 9 families, 15 genres and 42 species (Fig. 1). The Bairdiacea family that represents over 70%, both of species and specimens in each sample, alongside the Healdiidae family (non-ornamented species), characterize a warm-water carbonate platform. The ostracods of Polycopidae, thin shelled Acratiidae species, Bythocytheridae and some representatives of Cypridoidea, less than 30%, are interpreted as cold-water forms and characterics of low-energy basinal environment. The triangular diagram of Lethiers & Raymond model (1991) suggests that the ostracod fauna of the Pietros Hill section populated a carbonate platform (Fig. 1). Two new species from family Bairdiacea have been identified: *Bairdia popescui* n. sp. and *Bairdia doinae* n. sp. (Sebe, 2013 unpublished).

Conclusions: The Pietros Hill section has an homogenous ostracod fauna, along the whole section. No significant faunistic differentiations could be observed, either qualitatively and quantitatively. The palaeoecological analysis of the studied fauna allows the conclusion that the ostracod fauna from the Pietros Hill section lived in an inner shelf environment. From bathymetric point-of-view, no variations are observable. The low percentage of the palaeopsychrospheric ostracod fauna could show the absence of cold water, and by this of the palaeopsychrosphere . By its taxonomic composition and palaeoecological significance, the ostracod fauna from the Pietros Hill section is clearly distinct from the coeval ostracod faunas from other sections in the Tulcea Zone, e.g. the Uzum Bair and Cataloi sections where the presence of abundant paleopsychrosphere ostracods documents a cold-water, deep-water basinal environment (Crasquin-Soleau & Grădinaru, 1996; Sebe et al., 2013; Sebe, 2013).

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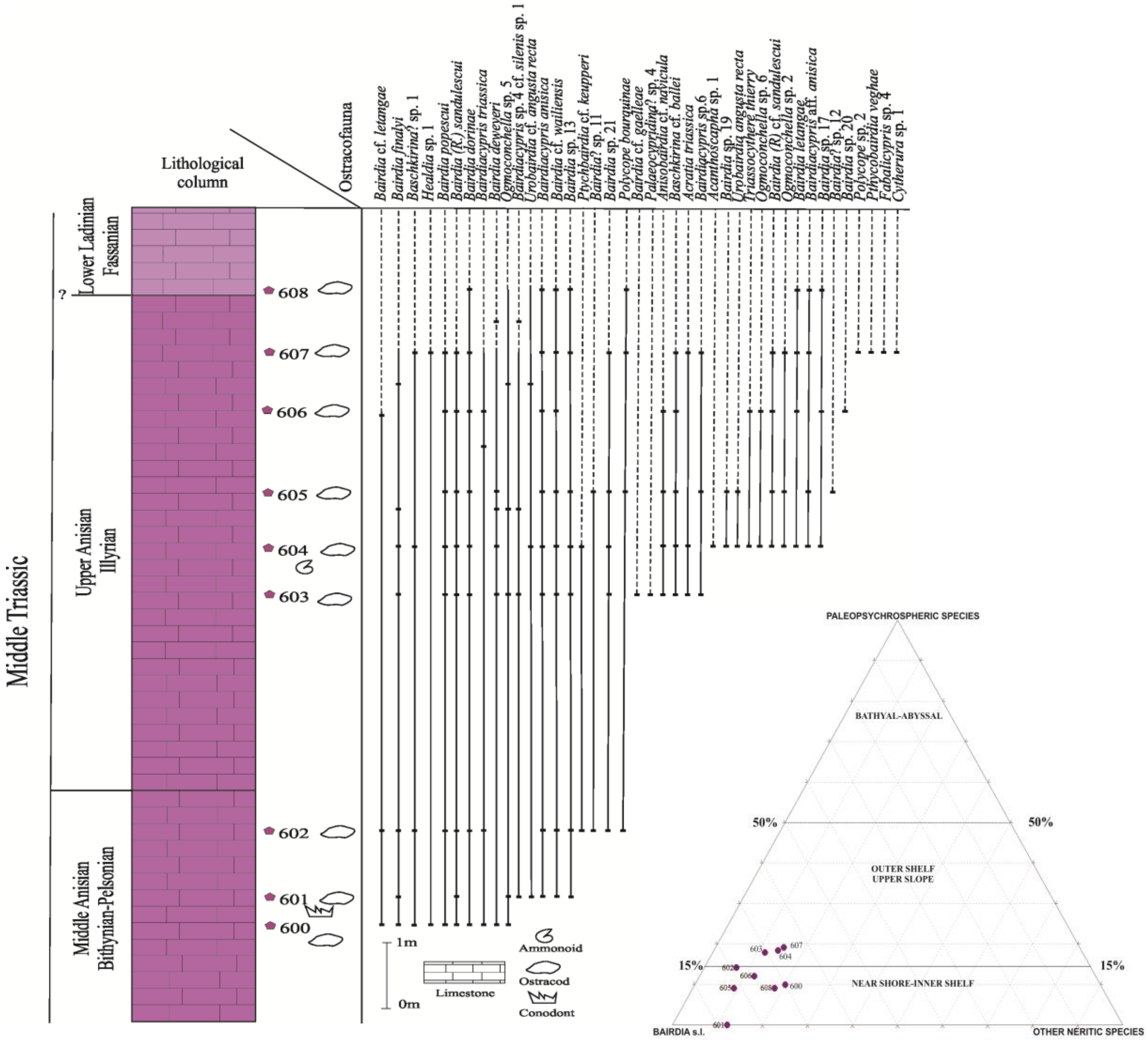

Fig.1 - Stratigraphic distribution of conodonts in the Pietros Hill and the triangular diagram showing the composition of ostracod assemblages and the possible bathymetric location of the different samples.

Some details about the Maastrichtian environments in Rusca Montană sedimentary basin

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Keywords: latest Cretaceous, "Haţeg Island", vertebrates, environments.

The notorious "Haţeg Island" was an insular realm in the Tethys Ocean which emerged in the latest Cretaceous, soon after the "Laramian" tectogenesis. The hard evidence concerning the specific environments documented by terrestrial deposits can be noticed in several sedimentary basins. The best studied one is the Haţeg Basin (abbreviated, HB), which is nominative for the island. Apart this one, Maastrichtian continental rocks can be observed also in the Transylvanian Basin (TB; its SW and NW sides), but also westward, in the Rusca Montană Basin (RMB), which is the westernmost area where such deposits are documented. RMB bears several distinctive features, different from the ones of the HB and TB, the most important being the consistent participation of magmatic rocks and the richness of plant remains. Moreover, this basin was an important coal mining area at the end of 19th and beginning of 20th centuries.

For long time, Maastrichtian vertebrates were not mentioned at all in RMB. Even Baron Fr. Nopcsa, a fine viewer of these faunas couldn't find evidence on terrestrial vertebrates in this basin. However, in the last decade, the presence of Maastrichtian vertebrates was documented in the eastern half of the basin, mainly near Lunca Cernii de Sus area. This region is scarce in outcrops, only small such ones are noticed along some creeks, due to the low erosion processes. In the area comprised between Lunca Cernii de Sus the Maastrichtian continental deposits refer to: i. basal breccias, reworking metamorphic rocks as well as grey marl-limestone; ii. a lower volcano-sedimentary andesitic formation, including breccias, volcanic tuffs, andesitic agglomerate, but the Rusca Andesite is less present; iii. sandstone, violet breccias, blackish silt, but the associated coal seams recorded elsewhere in the sedimentary basin are missing here; iv. an upper volcano-sedimentary andesitic formation, with a very similar lithology as the lower one; the andesite with hornblende and pyroxenes forms a ridge located north to Negoiu village, trended to NE towards Lunca Cernii de Jos, where it has vanished (Maier and Lupu, 1979).

The main outcrops of interest for vertebrates are exposed at Negoiu village, along Fărcădeana Creek. The outcrops from this creek allow observing the levels labeled in the former paragraph as iii and iv. The fossils were collected in two distinct levels that we name Ng1 and Ng2.

Ng1 is cropping out on the left bank of the creek and in the creek bed. It exposes a lithology from bottom to top: i. silt and sandstone rich in mica with conglomerates; ii. a brown silt with limy concretions (4-5 cm); iii. a lens-like black fine silt (8-10 cm to complete balking); iv. black silt very rich in white mica, mixed with quartz arenite (20 cm); v. conglomerate with arenitic matrix, with subangular metamorphic clasts (150 cm). The last level is a channel fill, which is incising the subjacent silts. The upper part of this outcrop is covered by soil and is hidden by tree roots. Visibly, this level is the same that yielded some of the macro- and microvertebrates mentioned by Codrea et al. (2009, 2012) and the one of Vasile and Csiki (2011) and Vasile (2012), named by the latter Fărcădeana.

Ng2 is cropping out on the opposite bank of the creek (the right one) and in 2006 was exposing over 4 m of Maastrichtian fluvial sediments represented by red and yellowish-grey silts, sometimes bearing limy concretions, interleaving with several thin quartz arenite strata. At the top, a distinct bluish-grey arenite bed can be noticed even nowadays, when the basal part of the outcrop is covered by debris. This level yielded mainly crocodilians, ornithopod dinosaurs and multituberculate mammals.

All the teeth and bones belonging to non-mammalian and mammalian representatives were found isolated, a lot of bones exposing roll-marks due to water streams transport. Apart of the already known taxa (Codrea et al., 2009, 2012; Vasile and Csiki, 2011; Vasile, 2012), we add now the presence of the basal hadrosaur *Telmatosaurus transsylvanicus* (NOPCSA, 1900), documented by an isolated tooth fragment. But by far, the most interesting fossils are the ones of multituberculate mammals, exposing peculiar morphology.

RMB is a promising area for future discoveries of Maastrichtian vertebrate localities.

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Paleoenvironmental reconstruction of the Oligocene Vima Formation from the north-western Transylvanian Basin based on geochemical data and foraminifera assemblages

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Keywords: phosphorus, total organic carbon, benthic foraminifera, paleoecology.

The Vima Formation outcrops at the northwestern border of the Transylvanian Basin south of the Preluca Massif. It is considered to be deposited in a slope setting (Krézsek & Bally, 2006). The studied sediments from the Fântânele section consist of silty- and sandy - clays characterized by rare intercalations of sandstones.

One hundred and eleven samples were collected from three outcrops of the Fântânele section during two sampling campaigns. All samples were analysed for their foraminiferal and phosphorus content, while 38 samples collected during the first field trip were analysed for their total organic carbon content. Phosphorus (P) analysis was conducted on bulk sediments using the five-step SEDEX method (Ruttenberg et al., 2009). Five sedimentary phosphorus reservoirs were separated using specific extract agents for each phosphorus sedimentary phase: the loosely-bound P, iron-bound P, authigenic P, detrital P, and organic P. The reason for phosphorus analysis was to gain additional information on the local paleoecological parameters. Characterization of organic matter was performed on approx. 80 mg of ground and sieved sediment with a Rock-Eval 6 equipment using the whole rock pyrolysis method (Espitalié et al., 1986). The aim of this analysis was to determine the quantity, quality and source of organic matter and to observe its effects on the species composition of the benthic foraminiferal assemblages.

The presence of the planktonic species *Chiloguembelina cubensis* and *Paragloborotalia opima* enabled the correlation of the studied deposits with the O4 (late Rupelian; first outcrop) and the O5 (early Chattian; second and third outcrops) Biozones of Wade et al. (2011).

The results of the phosphorus and total organic carbon (TOC) content correlate well with the inferred paleoenvironments based on benthic foraminifera assemblages and contributed to the understanding of the local paleoecological parameters.

The graphic representation of the TOC and pyrolizable hydrocarbons (Langford & Blanc-Valleron, 1990) indicates two potential sources for the organic matter: marine (Type II) and continental (Type III). The marine organic matter is the result of primary productivity, while the one of terrestrial origin was probably transported during sediment supply or it represents degraded marine organic matter (Katz, 1983).

The good representation of the detrital P suggests higher sediment supply from the continent that resulted in the oxygenation of the environments probably due to the progradation of the sediments. Foraminifera assemblages suggest shallower environments on the outher shelf and episodes of well oxygenated bottom waters which enabled the development of diverse calcareous and agglutinated benthic foraminifera assemblages. The oxic species (e.g. *Cibicidoides* and *Heterolepa* - Rögl & Spezzaferri, 2003), phytodetritus flux indicators (*Epistominella molassica* and *Gyroidina constans*), species suggesting high primary productivity (e.g. *Uvigerina* species - Rögl & Spezzaferri, 2003), suboxic indicators (representatives of *Lenticulina* and *Stilostomella* - Rögl & Spezzaferri, 2003) and agglutinated forms (e.g. *Spirorutilus carinatus*) are well represented. Although there is evidence of high primary productivity, the low TOC and organic P content suggest poor preservation of organic matter. The release of dissolved P as a consequence of organic matter breakdown potentially served as source for the formation of authigenic P.

The relatively high organic matter concentration related to high primary productivity (also suggested by peaks of organic-bound P) represents the controlling factor of benthic foraminifera assemblages developed on the outer shelf in oxygen-depleted environments lacking currents. Foraminifera assemblages are dominated by low-oxygen tolerant taxa and stress markers such as *Bolivina* spp., *Bulimina schischkinskayae* and *Fursenkoina* spp.. Some samples also contain high primary productivity indicators, phytodetritus opportunists, suboxic genera, oxic indicators and agglutinated foraminifera (e.g. *Haplophragmoides carinatus*).

In deeper (upper bathyal) environments, the development of benthic foraminifera assemblages was mainly influenced by organic carbon flux to the sea floor and the physico-chemical properties of the water masses. Benthic foraminifera assemblages are dominated by agglutinated forms and together with geochemical data suggest low organic matter flux to the sea floor (as indicated by tubular agglutinated foraminifera - Kaminski, Gradstein & collaborators, 2005) and calcium-carbonate subsaturation (low mineral carbon and authigenic P content).

The variability of the local paleoecological factors is probably in strong connection with the complex interaction of eustatic sea-level fluctuations, regional tectonics and the paleogeographic configuration of the Transylvanian Basin in the context of the Paratethys which influenced the water depth, sediment supply and consequent primary productivity and bottom water oxygenation.

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Dinoflagellate cysts and palynofacies across the Cretaceous-Paleogene boundary from the Vrancea Nappe (Eastern Carpathians, Romania)

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Keywords: dinoflagellate cyst biostratigraphy, palynofacies, Cretaceous-Paleogene boundary, Vrancea Nappe.

Introduction

In the Eastern Carpathians, the Moldavide Nappe System is divided into the Inner Moldavides (i.e. Teleajen, Macla and Audia Nappes), consisting mainly of cretaceous sediments, and the Outer Moldavides (i.e. Tarcău, Vrancea and the Subcarpathian Nappes), comprising Cretaceous to earliest Miocene flysh deposits (Săndulescu, 1984; Grasu et al., 1988; Guerrera et al., 2012).

The Vrancea Nappe is structurally interposed between the Tarcău and Subcarpathian Nappes and cropping out in several tectonic half-windows, including the Bistriţa Half-window. The geological cross section analyzed in this study, is located in this tectonic half-window, more specifically at the confluence Cuejdiu-Runcu rivers (8 km NW of the Piatra Neamţ city).Th e aim of this paper is to present dinoflagellate cyst biostratigraphy and palynofacies distribution across the Cretaceous-Paleogene (K-Pg) boundary from the Vrancea Nappe (Cuejdiu - Runcu geological section).

Methodology

For palynological and palynofacies analysis, six samples were analysed (Fig. 1): two samples (P140, P141) from the Lepșa Formation, one sample (P142) from the olistostrome which consisting of black shale assigned at the Sărata Formation (Middle Member) and three samples from the Putna-Piatra Uscată Formation.

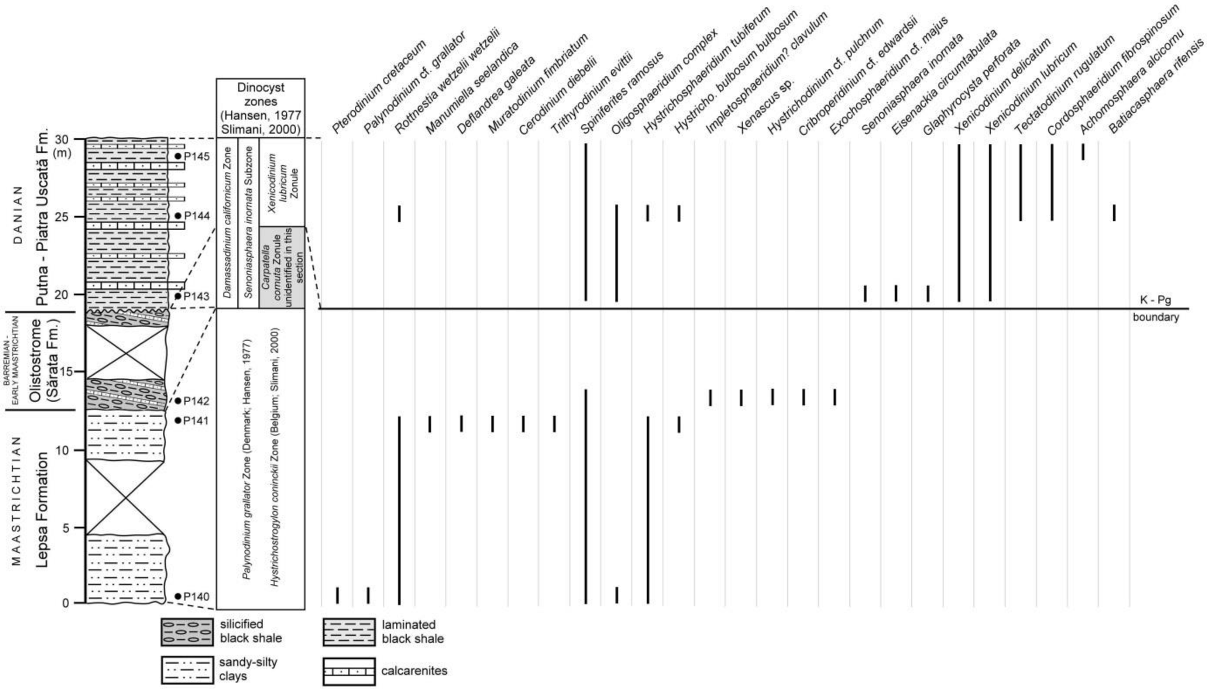

Fig.1. A lithological log of the analyzed geological section on the Runcu river and a range chart illustrating the stratigraphical occurence of selected marine palynomorphs (dinoflagellate cysts)

Results

Latest Maastrichtian. The biostratigraphic interpretation of the dinocyst assemblages, based on the dinocyst bioevents, suggests an upper Maastrichtian age for the top of the Lepşa Formation. The palynological assemblages identified in samples P140 and P141 (Fig. 1) contains dinocyst species such as *Palynodinium* cf. *grallator*, *Pterodinum cretaceum*, *Deflandrea galeata*, *Manumiella seelandica*, *Muratodinium fimbriatum*, *Cerodinium diebelii*, *Rottnestia wetzelii* subsp. *wetzelii*, *Trithyrodinium evittii* etc, usually used to identify upper Maastrichtian strata in many areas. Among these species, an important marker taxa is *Pterodinum cretaceum*, having the Last Appearance Datum (LAD) in the latest Maastrichtian (Slimani et al., 2008; Slimani et al., 2010; M'Hamdi et al., 2013; Guédé et al., 2014). From the olistostrome disposed above the Lepşa Formation, the dinoflagellate species indicate a Barremian - early Maastrichtian age of this deposits, the genus *Xenascus* being an important marker for the stratigraphic range above mentioned (Williams et al., 1993). Another taxa identified in sample P142 is *Hystrichodinium* cf. *pulchrum*, quoted from Campanian - early Maastrichtian deposits of the Outer Western Carpathians (Skupien & Mohamed, 2008), the LAD of this species being known in the early Maastrichtian.

Early Danian. The dinoflagellate cysts such as *Damassadinium californicum*, *Carpatella cornuta*, *Senoniasphaera inornata* are global Danian index fossils, valuable for the identification of the K-Pg boundary. Among these species only *Senoniasphaera inornata* has been identified in the lower part of the Putna-Piatra Uscată Formation (sample P143). This occurrence suggests that the K-Pg boundary can be placed just below the first appearance of this species. *Eisenackia circumtabulata* is another important species for the identification K-Pg boundary. Its First Appearance Datum (FAD) indicates the lowermost Danian from several biostratigraphically calibrated section such as El Kef in Tunisia (Brinkhuis & Zachariasse, 1988) and Ouled Haddou in Morocco (Slimani et al., 2010).

The palynofacies analysis from the all samples studied in this section show an abundance of continental organic matter (mainly opaque phytoclasts belonging to the inertinite group), which could suggest an oxic to suboxic depositional environment disposed in a inner neritic zone of the sedimentary basin.

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Palaeoecological distribution of the Lower-Middle Jurassic brachiopods in the sedimentary allochtonous rocks in East Stara planina Mts. (Bulgaria)

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Keywords: Jurassic brachiopods, provincial or palaeoecological distribution.

In east Stara planina Mts., there are Triassic and Jurassic rocks, which are "exotics" for the Bulgarian geology and which can be correlated (by me) to the rocks with the same age of the "North Dobrogean Orogen" and Southern Crimea. These sediments in eastern Stara Planina Mts. are of two types: basinal (tectonically allochthonous) (deposited in the Tethyan Mator Basin) and shelf (sedimentary allochthonous - now olistoliths) - derived from the destruction of the southern palaeoshelf. The basinal sediments are: 1. Mayadere Fm. - marls, shales, siltstones, sandstones and limestones; upper parts of the Olenekian. 2. Gyurgenliya Fm. - gray, reddish or yellowish limestones and marls; L. Anisian - L. Carnian (p.p.). 3. Glogova Fm. - marls with thin-bedded silty limestones; L. Carnian (p.p.)-Norian-Rhaetian (?). 4. Sinivir Fm. - siliciclastic turbidity alternation; M. Norian-Toarcian (p.p); 5. Balaban Fm.: thick sandstone beds; Toarcian; 6. Kotel Fm.: black shales with abundant olistoliths; Aalenian-Bathonian (?)(Tchoumatchenco, Cernjavska 1989-1990).

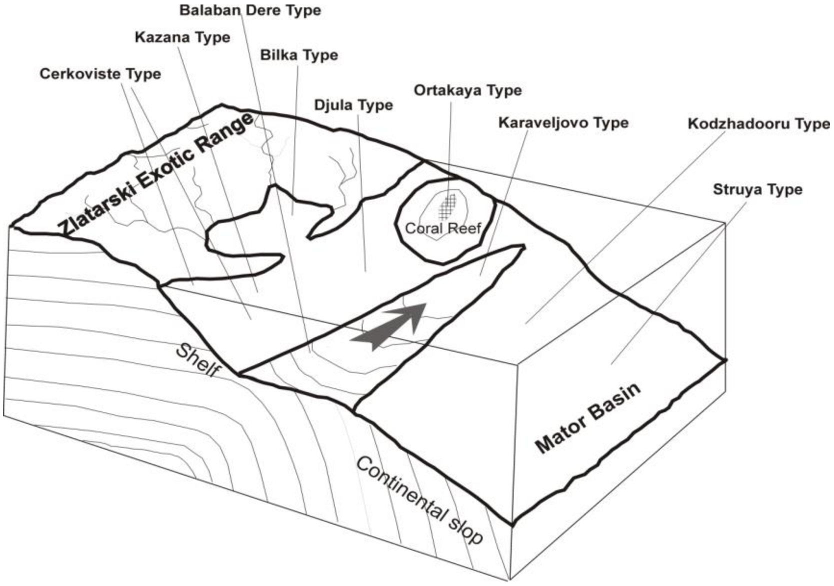

Fig. 1. Sketch of the sedimentary allochtonous rocks in East Stara planina and their primary position of sedimentation in the panorama of the Zlatarski Exotic Range (southern shelf of Mator Basin)

In the tectonicaly allochtonous sediments there are many olistoliths (from few cm - up to 1-2 km^2) of Triassic and Jurassic rocks, coming from the destruction of the southern shelf of the Mator Basin - from the Zlatarski Exotic Range in Bulgaria (and from Theodosia Exotic Range - in S. Crimea - Mileev et al. (1989). The first olistoliths in the area had been finding by Nachev et al. (1967). Now the olistoliths are united into 9 sedimentary types (Fig. 1) – term for free use. The Jurassic blocks of Bilka, Kazana, Cerkoviste, Djula and Karaveljovo Types, included in the Kotel Fm., contained brachiopods (Tchoumatchenco 1988, 1989, 1990): (1) Bilka Type - structured by reddish micritic limestones, They are deposited in quiet bay conditions and contain brachiopods: in the basal parts: *Cirpa* cf. *langi* Ager, *Cirpa borissiaki* (Moisseiev), *Liospiriferina alpina alpina* (Oppel), *Lobothyris subpunctata* (Davidson), *Zeilleria waterhausi* (Davidson) - Domerian; in the upper part, in neptunian dykes: *Homoeorhynchia cynocephala* (Richard) - (Toarcian - base of Aalenian), *Aulacothyris blackei* (Davidson), *Dundrythyris perovalis* (Sowerby), *Ractorhynchia* sp. indet., *Kallirhynchia platiloba* Muir-Wood, *Ornitella* sp. - (Middle Jurassic). Bernd (1934) - in Bulgaria and Moisseiev (1934) - in South Crimea, compared them with the Hierlatz Kalk of Upper Austria (2) Kazana Type - grey, biodetritic limestones. Brachiopods: *Liospiriferina alpina alpina* (Oppel), *L. alpina falloti* (Corroy), *Spiriferina oxyptera* (Buvignier), *Squamirhynchia squamiplex* (Quenstedt), *Scalpellirhynchia scalpellum* (Quenstedt), *Homoeorhynchia almaensis* (Moisseiev), *H. acuta* (Sowerby), *Lobothyris subpunctata* (Davidson), *Zeilleria quadrifida* (Lamarck), *Z. subnumismalis* (Davideson), *Z. waterhousii* (Davidson), *Aulacothyris resupinata* (Sowerby). These sediments are deposited in shallow, very agitated water near the beach. Berndt (1934) - in Bulgaria and Moisseiev (1934) - in South Crimea, compared them with the Liassic Gresten Facies. (3) Cerkoviste Type - alternation between red marls and red biodetritic limestones, often with belemnites, deposited in localities, located far from the beach. Brachiopods: *Spiriferina haueri* Suess, *Gibbirhynchia amalthei* (Quenstedt), *Piarorhynchia juvenis* (Quenstedt), *Prionorhynchia greppini* Oppel), *Nucleata bodrakensis* (Moisseiev), *Lobothyris subovoides* (Münster), *Zeilleria numismalis* (Lamarck), *Z. subdigona* (Oppel). In others blocks - *Liospririferina alpina falloti* (Corroy), *Aulacothyris resupinata* (Sowerby). (4) Djula Type - reddish, ferruginous, biodetritic, partly nodular limestones, often with belemnites, deposited far from the beach. Brachiopods: *Lobothyris subovoides* (Münster), *Cincta numismalis* (Vallenciens). (5) Karaveljovo Type - alternation between thin bedded grey-rose limestones and grey-greenish marls, deposited in conditions with strong currents. Predominance of Spiriferinids with single valve: *Liospiriferina alpina falloti* (Corroy), *L. alpina alpina* (Oppel), *Spiriferina haueri* (Suess), *S.* cf. *oxyptera* (Buvignier), *Homoeorhynchia almaensis* (Moisseiev), *Zeilleria quadrifida* (Lamarck), *Aulacothyris resupinata* (Sowerby).

Conclusions

The 5 types olistoliths with brachiopods, have been compared (Berndt 1934) and Moisseiev (1934) with different type sediments in the Alps, deposited in different basinal or shelf conditions. But these types of sediments contained in East Stara planina Mts. almost the same brachiopod spectrum in the same age sediments. The differences between the study olistoliths is due only to the palaeoecologic conditions of life or the differences in the taphonomic conditions during the sedimentation of the rocks and these sedimentary types had been deposited in different conditions, situated not in different basins, but in the different parts of the same shelf - of the Zlatarski Exotic Range. In the allochthonous shelf Peri-Tethyan sequences in east Stara planina Mts. the boundary Triassic/Jurassic is transgressive, connected with sandstones or with bioturbated surfaces of the substratum and in the basinal sediments it has a transitional character being situated within the turbidities of the Sinivir Formation (closed to the Nalbant Fm. - Gradinaru 1984).

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Hitherto undescribed Norian ammonites of the Timon Klippe (Rarău Syncline, Eastern Carpathians, Romania)

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Keywords: Ceratitina, Trachyceratina, Phylloceratina, biostratigraphical attempt.

Geological framework of the Timon Klippe

The Timon Klippe (Late Triassic in age) belongs to the allochthonous Transylvanides *sensu* Săndulescu 1984 within the Rarău Syncline framework of Median Dacides or Cristalline-Mesozoic Zone of Eastern Carpathians. The klippe represents a large block of facies-varied limestone exploited locally for lime in the past, and only remnants of the initial carbonate succession can be encountered nowadays.

Historical approach

The first information on Timon Klippe were published officially by Mutihac (1966), but Turculeţ (1967-2004) essentially outlined the paleontological significance of klippe in successive papers about several major taxa. Mutihac (1966) also issued primarly several ammonite taxa, then Turculeţ (1976, 1983, 2000, and 2004) and Grădinaru and Sobolev (2010) described the ammonite fauna up to present days. The paper summarizes critically the previous ammonite fauna, pointing out the peculiar records. Firstly, Mutihac (1966) assigned the klippe to (?Ladinian) Carrnian-Norian, because later Turculeţ (1970, 1976) assumed the Norian, respectively and Norian–beginning of Rhaetian age, point of view roughly accepted by the subsequent researchers (e.g. Grădinaru and Sobolev, 2010).

Field observations and new records of Norian ammonites

The recent fieldwork allowed several observations on the klippe lithology and the sampling of new invertebrate specimens. The limestone remnants presume a large development of light and dark grey limestone, with several events of variegated and red nodular limestone. The ammonite fauna has been collected mainly *in situ* from several successive fossil-bearing beds (the main body of he klippe remnants): bedded grey-greenish packstone with irregular surfaces showing the reworked limestone fragments, diaclazes, and rare fossils; b) massive variegated (red-pinkish-brown) mudstone and wackestone, with nodular levels (around 8-10 m thickness); c) light to dark grey mudstone (around 7-8 m thickness); d) a red nodular limestone level with small blocks and a marly matrix, the last one with restricted lateral development in the outcrop. A calcite diaclaze (around 0.60 m) connects the second and fourth beds. The presence of macrofossils in the grey limestone types (*Steinmannites sp., Arcestes intuslabiatus* MOJSISOVICS 1873, *A. ?sicanus* GEMMELLARO 1904, *Stenarcestes sp.,* nautiloids) was documented for the first time. As previous work have already evinced the the most frequent and diversified are the leiostracus Arcestidae, with sphaerocone and sub-platycone morphologies. The arcestids can be encountered in within the all above-mentioned strata, being more frequent in the last one (Sevatian). *Arcestes pseudogaleatus* MOJSISOVICS, 1875, *A. monachus* MOJSISOVICS 1875*, A. clausus* MOJSISOVICS, 1875*, A. geyeri* DIENER 1919*, A. aff. sturi* MOJSISOVICS, 1875,*, Stenarcestes leiostracus* MOJSISOVICS 1875*, S. julicus* MOJSISOVICS 1902, *Pararcestes sp.* among others species have been added to the previous known taxa. Also, very abundant is the *Placites* div. sp., unlike several sub-oxycone *Pinacoceras* specimens*,* which was recorded scarcely. Cladiscitidae which prooves a constant occurence, expecially in the variegated/red-type limestone (*C.(C.) angustus* GAMSJAGER 1982*, C. (C.) neortus* MOJSISOVICS, 1873 among the previous quoted cladiscitids)*,* and rare *Megaphyllites* specimens (Megaphyllitidae) complete the Superfamily Arcestaceae.

Family Haloritidae was also enocuntered relative frequently in the second and fourth bed (Alaunian 2-3, Sevatian), *Catenohalorites malayicus* WELTER, 1914, *C. catenatus* (BUCH 1833), and *C. subcatenatus* MOJSISOVICS, 1875 being new records for the klippe. *Steinmmanites* (Clionititidae) and *Hauerites* ex. gr. *rarestriatus* (HAUER) of the Family Cyrtopleuritidae*, Distichites sp.*(Distichitidae), *Didymites sphaeroides* (Didymitidae) as well the relative rare phylloceratids *(Tragorhacoceras* and *Rhacophyllites* genera) have been also collected. It should be mentioned that several specimens are bad preserved and there are samples which have to be prepared. Several index-taxa argued the presence of Alaunian substage during second and third bed (partially), respectively *Distichites sp., Didymites sphaeroides* (*in situ*, second bed) *Steinmannites* sp.(*ex situ* third bed) claimed roughly the *Himavatites hogarti* and the *Halorites macer* Zones. Sevatian was better documented in previous papers (e.g. *Rhabdoceras suessi* – Grădinaru and Sobolev, 2010), as well by several new samples (*Arcestes intuslabiatus* – third bed*, Arcestes pseudogaleatus, Stenarcestes leiostacus, Catenohalorites catenatus* – last bed). Fragments of cochina levels of few centimeters thickness with exclusive *Monotis*, and frequent *Oxycolpella* specimens could be also noted in the last studied red limestone bed. It is worth mentioning the paleogeographical significance of *C. malaiycus* and *Cladiscites angustus* for the correlation with Asian Realm of Tethys. Frequent calcite diaclazes affect the limestone beds and also the ammonite casts, which proved a post-taphonomical action. One also obsevers that related and unrelated taxa proove various morphologies and sculpture in the same bed, which suggests a relative independence of ammonites from the environment features and/or a post-mortem mixture (currents, infilling of previous voids). But the supposition of a mixed fauna favored by the big diaclaze which crosses the mentioned succession is not sustains by reliable arguments until this stage of research. The ammonite taxa recorded to date presumed only Norian age, but an older and also earlier ages cannot be excluded (the klippe heigth was larger) , and an accurate biostratigraphy of the klippe are still to be solved by ongoing research taking into account the macro and microfauna, and also the carbonate microfacies.

Discussion

Several grey and red levels rich in filaments of juvenile pelagic bivalves argue the predominant pelagic deposition of limestone. Consequently, the initial assignment to the Hallstatt facies of Tethys Realm performed by Mutihac (1966) and subsequent researchers can be reinforced by several similarities with the region-type: the major pelagic deposition, intervals of very slow sedimentation rate argued by few coated Fe-MN-oxid cephalopod casts as well as several possible hardgrounds, several diagenized shells, the reworked of pelagic rocks by the strong action of bottom currents, the evidences of karstification process etc. Consequently, the Timon Klippe represents a block of predominant pelagic limestone of Hallstat facies-type belonging to the large Late Triassic carbonate platform formed on the Tethys shelf of southern Europe (Mandl, 2000).

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Calpionellid-bearing microfacies and their implications on the source area of Aptian conglomerates from Piatra Craiului massif

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Keywords: Aptian, Dambovicioara Couloir, Piatra Craiului, microfacies, source area

The Piatra Craiului syncline, made up of Middel-Upper Jurassic terrigenous-carbonate and carbonate deposits, is filled with Cretaceous conglomerates. The Upper Aptian conglomerates are extending from North-West to South-East parallel with the Piatra Craiului main ridge, while the Uppermost Albian – Cenomanian conglomerates can be found only in North-West of the area.

In order to study the limestone components of these conglomerates, a large area with well developed outcrops and good exposed sedimentary structures have been studied. A large number of pebbles (~1500) were collected, from which hundreds of thin sections have been made and studied in order to reveal petrology and micropaleontological assemblages.

A large part of pebbles (more than 80%) from these conglomerates consists of limestone. Microfacies and micropaleontological analysis revealed assemblages of Middle Jurassic to Early Createceous(Early Aptian) age.

Upper Aptian conglomerates include many limestone pebbles of pelagic and allodapic facies among which the most frequent are: wackestone and packstone with calpionellids, radiolarians and calcispheres, but also allodapic limestones with calpionellids and shallow water microfossil assemblages. The calpionellid assemblage covers the following calpionellid zones: Crassicolaria, Alpina, Elliptica, Calpionelopsis (subzones Oblonga and Simplex) and possible also Calpionellites. Considering the Upper Jurassic-Lower cretaceous deposits in the eastern part of the Getic domain, calpionellids are known only from Bucegi Massif (e.g., Patrulius, 1969).

The study revealed also one type of facies that consists of allodapic limestones with calpionellids and a high content of terrigeous quartz, which has not been reported so far from Dambovicioara Couloir or the surrounding areas belonging to the Getic domain. This specific assemblage, combined with the fact that paleocurents indicate a flow from North-West to South-East and from West to East may suggest the existence of a basinal area situated North to North-East from Piatra Craiului Massif which supplied these pebbles during the Aptian.

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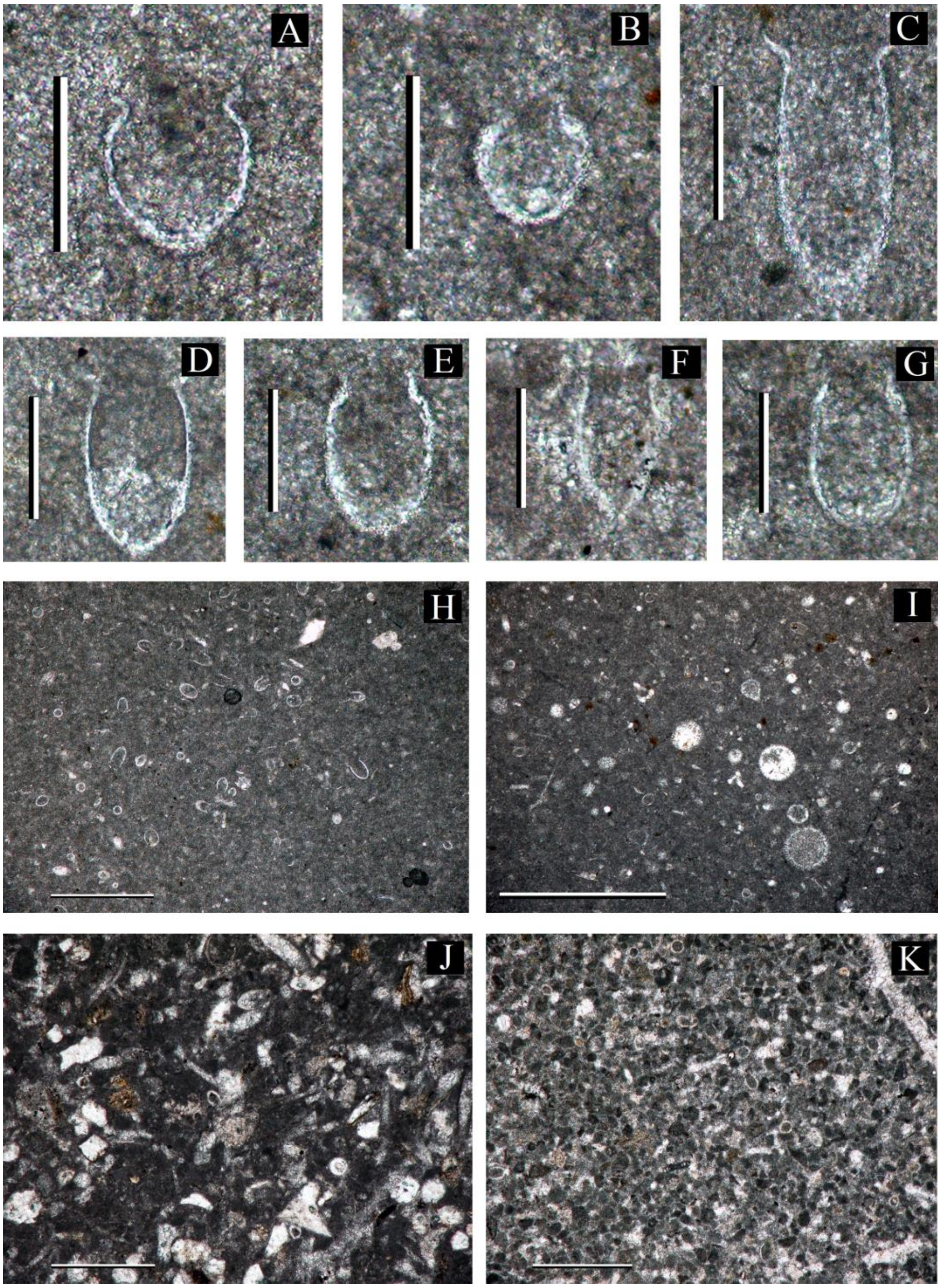

Fig.1 – Microfossils and microfacies from conglomerates pebbles of Piatra Craiului: **A**. *Lorenziella hungarica*, **B**. *Calpionella alpina*, **C**. *Tinntinnopsella longa*, **D.** *Tintinnopsella carpathica***,** **E**. *Calpionella elliptica*, **F**. *Crassicolaria parvula*, **G**. *Cadosina fusca,* **H.** Wackestone with calpionellids, **I**. Wackestone with calpionellids and radiolarians, **J**. Bioclastic packstone with terrigenous quartz and calpionellids, **K**. Bioclastic Packstone with calpionellids

Crețești-Dobrina 1: a new Early Vallesian locality in Moldova

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Keywords: early Late Miocene, terrestrial vertebrates, environments, Eastern Romania.

In Eastern Romania, the Late Miocene formations of the Moldavian Platform are part of the last sedimentary megasequence (3rd sedimentary cycle), which started in the Middle Miocene (Badenian). In the Sarmatian *s.l.* (BARBOT DE MARNY, 1869), the waters of the Eastern Paratethys that once covered this area of the Dacic Basin regressed and the evolution of the terrestrial environments started on these new emerged lands.

Until now, very scarce data were available on the Late Vallesian terrestrial vertebrates. The majority of data are based on scattered, fortuitous finds. But in the last couple of years, due to regular geological surveys in Vaslui District, new Vallesian localities were found. Among them, the most illustrative is by far a locality that we name now Crețești-Dobrina 1. It was discovered due to the works carried for renewing the national road 24B, linking Crasna and Huși.

At Crețești-Dobrina 1, the Late Sarmatian (Khersonian) deposits are cropping out on a rather small area, on the roadside. The thickness of the sedimentary succession exposed is about two meters only. In dominance there is greenish mudstone, interleaving with thin (few centimeters only) silty sand. These rocks are rich in vertebrate remains, but apart from vertebrates it worth to notice the presence of freshwater gastropods (e.g. *Planorbis* sp.). The sedimentary structure of this heterolithic deposit is the horizontal lamination. Based on sedimentology these rocks may be considered as belonging to an ancient floodplain. There, the sedimentation progressed by fallout from suspension, during periodic floods.

Unearthed from these rocks, the following vertebrate taxa can be reported so far from this locality: Anura – *Pelobates* sp.; Reptilia – "*Protestudo"* sp. (extremely frequent), various lizards [*Chalcides* sp., *Lacerta* sp., *Ophisaurus* (s.l.) sp.] and snakes [*Coronella* sp., *Macrovipera* sp.(frequent)]; Aves indet.; Mammalia – Erinaceomorpha: *Schizogaleryx* sp.; Sciuridae: *Spermophilinus bredai*; Lagomorpha: ?*Proochotona* sp.; Carnivora – *Adcrocuta eximia* (ROTH & WAGNER, 1848), *Metailurus* sp.; Proboscidea: *Choerolophodon pentelici* (Gaudry & Lartet, 1856)*;* Perissodactyla - "*Hipparion*" sp. (very frequent), *Acerorhinus* sp.; Artiodactyla – *Hippopotamodon* sp., *Tragoportax leskewitschi* (BORISSIAK, 1914), *Paleotragus* sp.

This fauna is typical for the Vallesian in this region of Europe, showing similarities with the ones already reported from Republic of Moldova. There, two Khersonian levels were coined: Katerlezskii (lower, part of the "Keinar complex") and Mitridatskii (upper, in the "Poleshetskii complex"), the last one dominated by fluvial-lacustrine deposits. Crețești-Dobrina 1 could be related to this upper level. In Republic of Moldova, this level is considered as "Late Vallesian, MN 10" (Lungu & Rzebik-Kowalska, 2011). However, according to Vangengeim & Tesakov (2013), it could belong rather to the Early Vallesian (MN9).

Based on these vertebrates, the Khersonian environment in this locality could be interpreted as a savannah-like one, with open grassy areas, but rare trees could be also present. The forested areas were probably common on the fluvial banks. There is no evidence of swamp areas. The climate was warm temperate, but compared to the Middle Sarmatian (Bessarabian) the rainfall decreased.

The bones were accumulated probably by floods, but they were not carried on too long distances. The anatomical connections are rare and refer only to partial skeletons, excepting turtles, where the limb bones and skulls are often preserved. Large mammal remains occur together with medium and even with small vertebrates, indicating that there was no grading process due to the water streams.

Before the definitive burial, at least part of these bones and teeth were exposed to weathering long enough to suffer damages (numerous teeth enamel fragments were detached and buried at small distance of their initial origin, in skulls and mandibles).

Crețești-Dobrina 1 is a very illustrative, outstanding Khersonian locality in Romania and its richness in terrestrial fossils could be compared only to Reghiu and Bacău (both localities with vertebrate assemblages specific to the Khersonian/Meotian boundary time span).

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Mammuthus meridionalis associated remains from Brebina (Teleorman County, southern Romania)

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Keywords: Proboscidea, Elephantidae, early Pleistocene, Dacian Basin.

The Pleistocene sedimentary infill of the Dacian Basin (roughly overlapping the Romanian Plain) consists of a succession of fresh-water detritical deposits, ranging from alluvial fan and fluvial conglomerates to cross-bedded sands, and sometimes lacustrine marls and clays, all capped by loess (Andreescu et al., 2011; 2012). These deposits have yielded a large number of megafaunal remains, including elephantid bones and teeth (Radulescu et al., 2003; Apostol, 1968; 1976). The remains of *Mammuthus meridionalis* (Nesti, 1825) are most common among the fossil elephantid material reported so far from the Dacian Basin (Apostol, 1968), but they mostly occur as isolated remains (especially teeth), whereas associated remains or partial skeletons are only known from a few localities, such as Tetoiu (Radulesco and Samson, 1990), and Copăceni (Vasile et al., 2013).

Here, we present the recent discovery of associated dentognathic and skeletal remains of an elephantid proboscidean, found at Brebina (Teleorman County), in a fine sand bed from the left bank of the Vedea River. The material consists in a well-preserved mandible, three partial thoracic vertebrae, part of the sacrum, and a pelvis fragment. The mandible is missing the vertical processes, but it is still bearing the second molars, in use at time of death, and the barely-erupting third molars. Using the method of estimating the age of the African elephant based on the wear stage of molars, described by Laws (1966), it results that the mammoth from Brebina was around 31 African Equivalent Years at the time of death. The morphometric parameters of the second molars (e.g., lamellar frequency: 4.6; number of plates: 11; average thickness of enamel: 2.75 mm) confidently assign the mandible to *Mammuthus meridionalis* (e.g., Maglio, 1973; Lister, 1996). The size and type of preservation of the vertebrae and pelvis found associated with the mandible support the possibility that all elements might belong to the same individual.

The presence of *Mammuthus meridionalis* remains in the fluvial deposits from Brebina are consistent with other finds of specimens belonging to the same taxon, in gravel and sand beds cropping out along the Vedea River and its tributaries, in the central area of Teleorman County (Apostol and Cacoveanu, 1980; Vasile et al., 2012), which supports the early Pleistocene age of these deposits.

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Mammoth molars from the collection of the “Ioan Raica” Municipal Museum, Sebeş (Alba County, Romania)

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Keywords: Proboscidea, late Pleistocene, Transylvanian Basin, *Mammuthus primigenius*.

Elephantid proboscidean occurrences in Romania are numerous, as would be expected given the wide extent of the Quaternary deposits in the country (Apostol, 1968). In the Transylvanian Basin, where the Upper Pleistocene beds are best represented among the Quaternary deposits, almost all the elephantid proboscidean fossil remains reported so far belong to the woolly mammoth, *Mammuthus primigenius* (Blumenbach, 1799) (Apostol, 1968; Codrea, 2008).

As in the rest of the Transylvanian Basin, woolly mammoth fossil remains are very abundant in the Alba County as well, with occurrences reported from: Câlnic, Cetea, Colibi, Colţeşti, Decea, Lunca Mureşului, Ocna Mureş, Ormeniş, Pianu de Sus, Răhău, Râmeţ, Sebeş, Sibişeni, Unirea, Vinţu de Jos (Apostol, 1968; Vörös, 1983).

The collection of the “Ioan Raica” Municipal Museum from Sebeş hosts three complete and very well preserved elephantid molars, as follows:

- Third upper left molar found at Valea Lungă, reworked, in the Recent alluvia of the Târnava Mare River;
- Third upper left molar, found at Răhău, reworked, in the Recent alluvia of the Secaş River;
- Third lower right molar, found at Răhău, reworked, in the Recent alluvia of the Secaş River.

The high number of plates alone is a clear argument for assigning the two upper molars to *Mammuthus primigenius*. The morphometrical parameters of the lower molar, however, place it in an intermediate position between *M. primigenius* and *M. trogontherii* (Pohlig, 1888). Since the number of plates, length and height of the molar are closer to the average values indicated for the woolly mammoth, the lower third molar from Răhău is here tentatively assigned to *M. primigenius* as well (Maglio, 1973; Lister, 1996). Although none of the molars was found *in situ*, their good state of preservation suggests they did not undergo significant transport, probably coming from Upper Pleistocene alluvial deposits eroded by the Târnava Mare and the Secaş rivers.

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Taxonomic diversity of early Pleistocene snakes from the Tetoiu Formation (Dacian Basin, Romania) – preliminary results

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Keywords: Serpentes, Quaternary, Herpetofauna, Colubrinae, Natricinae.

The fossil assemblage discovered in the area of Olteţ Valley (Vâlcea District, Romania), shows the highest diversity of large fossil vertebrates known so far from the Romanian Pleistocene (Radulesco and Samson, 1990; Radulescu et al., 2003). The fossil-bearing gravels and sands from this area were formally assigned to the Tetoiu Formation, dated early Pleistocene on the basis of the vertebrate and mollusk assemblages it has yielded so far (Andreescu et al., 2011).

Although very diverse and abundant, the vertebrate assemblage from the Tetoiu Formation only includes mammal and avian taxa, with no mention of material belonging to other vertebrate classes (Radulesco and Samson, 1990; Radulescu et al., 2003). A survey of the material from the Tetoiu Formation, housed in the collection of the „Emil Racoviţă" Institute of Speleology (Bucharest), led to the identification of over 300 vertebrae and several cranial bones belonging to ophidians.

The morphological and morphometrical analysis (Szyndlar, 1984; Venczel, 2000) helped assign this material to several colubrine and natricine snakes, including: *Hierophis gemonensis, H. paralongissimus, H. viridiflavus*, *Dolichophis jugularis*, (?)*Zamenis situla*, *Natrix natrix*, and *N. tessellata*. These taxa are consistent with those reported from other sites of Central and Eastern Europe and western Romania (Szyndlar, 1991a, b; Venczel, 2000), augments the vertebrate taxon list from the Tetoiu Formation, and helps document snake presence in the early Pleistocene herpetofaunal assemblages of the Dacian Basin, previously reported only from Copăceni (Ilfov County) (Vasile et al., 2013).

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Rodent assemblages from the Eocene - Oligocene interval of Serbia

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Keywords: Paleogene, biostratigraphy, small mammals, paleobiogeography, paleogeography.

Late Eocene- Early Oligocene small mammal sites have been discovered in south east Serbia during field campaigns by members of the Natural History Museum of Beograd and the Department of Earth Sciences of Utrecht University in 2010-2013. The Paleogene rodent assemblages from Serbia are dominated by Muridae, which is in sharp contrast to the contemporary theridomyid-dominated ones from western Europe. *Eucricetodon* (*Atavocricetodon*), a common member in many early Oligocene Eurasian fauna's, is absent in Serbia, and so are representatives of the Eomyidae, Sciuridae and Gliridae. The presence of an array of Pseudocricetontinae, Paracricetodontinae and Melissiodontinae suggests that we are dealing with hitherto unknown rodent associations that developed on a Dinaro/Balkanian micro-continent.

The peculiar composition of these Paleogene rodent associations hampers a straightforward correlation with successions from elsewhere.The occurrence of a representative of the Diatomyidae in the Early Oligocene assemblages of Serbia, a family that has so far been considered to be endemic to south east Asia, suggests that this family may have a different area of origin than previously assumed. The new faunas are of great interest for a better understanding of the distribution and evolution of the Muridae during the Oligocene as well as for reconstructing the paleogeography of the Balkans.

LOWER AND MIDDLE JURASSIC DEPOSITS FROM VADU CRISULUI (APUSENI MOUNTAINS)

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STOP 1

Introduction

The Jurassic sequences from the Vadu Crisului area belong to the sedimentary cover of the Bihor Unit (Fig. 1A), one of the major geotectonic units of the Inner Dacides, interpreted as parts of the strongly deformed Foreapulian continental margin (Săndulescu 1984, 1994).

The Inner Dacides crop out in the Apuseni Mountains (Northern Apusenides) consist of several north and northeast vergent nappes composed of metamorphic rocks (and locally granites) and sedimentary formations. The metamorphic series are pre-Cambrian and Paleozoic.

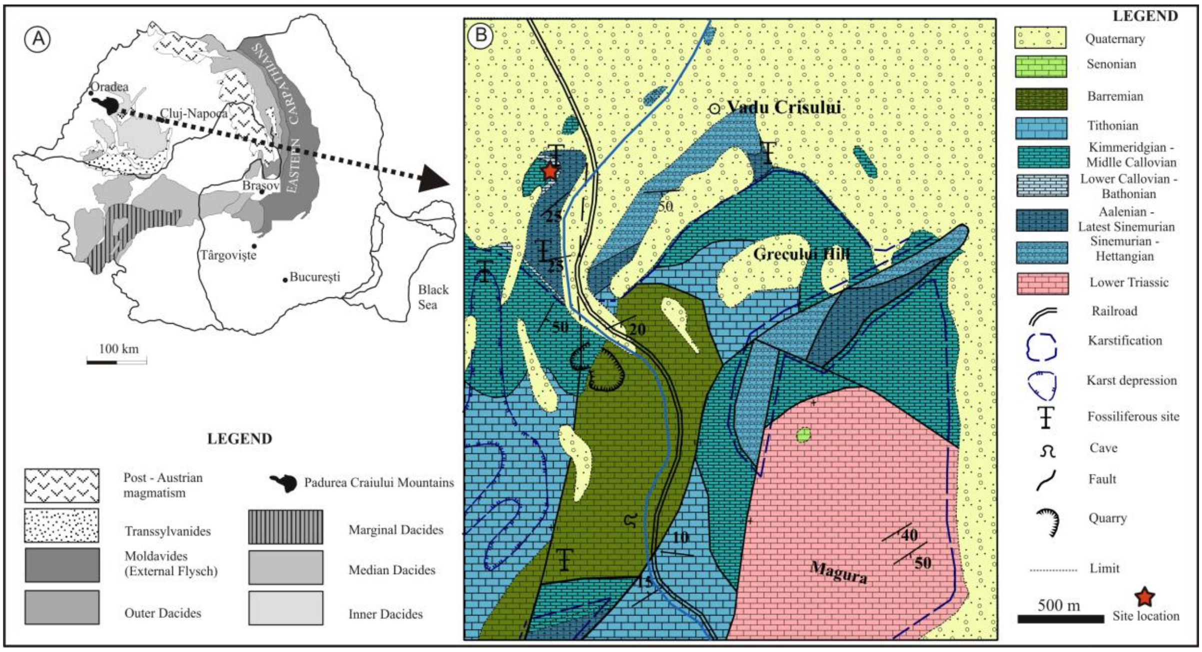

Fig. 1 Location of the studied sections: **A** General location of the studied zones within the Apuseni Mountains (based on the geotectonic map of Romania, Săndulescu 1984); **B** Locations of the studied section from Vadu Crişului on the geological outline maps (modified from Patrulius et al., 1973).

The sedimentary succession starts with Upper Carboniferous and mostly Permian molasses deposits (conglomerates, breccias and piroclastites). The orthoquartzitic Lower Triassic is followed by a carbonate Triassic sequences showing different lithofacies. The Lower Jurassic (with paralic facies toward the north and deeper water facies toward the south). Middle Jurassic (condensed mixed carbonate-siliciclastic deposits), Upper Jurassic- Early Cretaceous (carbonate platform) and Cretaceous (pre-Senonian) (bauxites) followed by neritic Urgonian-type limestones (Săndulescu, 1994).

The overthrusting processes of the Inner Dacides are Late Turonian in age. The structured and partly eroded nappes were overlapped by a Senonian post-tectonic cover, with large developed Gosau lithofacies (Săndulescu, 1984, 1994).

In the Bihor Unit, Jurassic deposits are exposed in the Pădurea Craiului and Bihor Mounatins (Preda, 1962, 1971; Patrulius et al., 1972; Ianovici et al., 1976; Patrulius, 1976; Popa, 1981; Mantea, 1985; Popa et al., 1985; Dragastan et al., 1986, Haas et al., 2011).

Geological setting and description of the Lower and Middle Jurassic deposits

The Jurassic deposits from the Pădurea Craiului and Bihor Mountains lie unconformably on the top of the Ladinian Wetterstein-type limestone. The synthesis of the Jurassic successions will be presented according with the next authors: Ianovici et al., 1976; Patrulius, 1976; Patrulius, 1996; Popa et al., 1996; Grădinaru in Haas et al., 2011. Starting from the valuable data obtained by the previously mentioned studies, the present description of the Vadu Crişului site, represents the preliminary results of the first attempt of integrated analyses concerning the internal facies patterns and the stratigraphic and sedimentological features, facies contrast, geometrical relationships, depositional and diagenetic features, biostratigraphy and taphonomy of the Lower-Middle Jurassic heterochronous condensed deposits from the Apuseni Mountains.

The Lower Jurassic succession (around 250 m thick):

- **Hettangian**: a continental sequence (100–180 m) consisting of red argillaceous-silty shales locally including breccia with boulders of Triassic limestones (at the base) followed by micaceous quartzite sandstones (similar with the Gresten Sandstone) interbedded with fire clays in the lower part followed by quartzite conglomerates with vegetal remains at the top.

The next units are represented by marine sequences:

- **? Upper Hettangian – Lower Sinemurian**: the basal member (40– 60 m thick) consisting of micaceous and fine-grained quartzite sandstones, locally with marly-argillaceous micaceous siltstones;
- **Upper Sinemurian – Lower Pliensbachian** (5–35 m thick): massive or thick-bedded limestones interbedded with crinoidal layers toward the base. The fossil assemblages recorded from this interval (Patrulius,1976) is represented by mass occurrence of *Gryphaea mccullochi* SOWERBY and *Gryphaea gigantea* SOWERBY along with brachiopods, belemintes and rare ammonites (*Uptonia jamesoni* (SOWERBY) and *Beaniceras luridum* (SIMPSON). Brachiopods are concentrated in specific beds with assemblages with numerous individuals: *Tetrarhynchia aequicostata* (JEKELIUS) and *Piarorhynchia* within the crinoidal limestone toward the base; *Tetrarhynchia tetraedra* (SOWERBY), *Tetrarhynchia argotinensis* (RADOVANOVIC), *Lobothyris subpunctata* (DAVIDSON) in the middle part of this interval; *Tetrarhynchia argotinensis* (RADOVANOVIC), *Lobothyris punctata* (SOWERBY), *Cincta numismalis* (VALEN), *Callospiriferina tumida* (BUCH) toward the top part of this interval.
- **Upper Pliensbachian (Domerian)** (3–40 m thick): medium bedded spongiolithic cherty limestones alternating with thin silty or marly layers; this succession contains *Amaltheus stockesi* (SOWERBY), *Aegoceras* sp., *Amaltheus margaritatus* (MONTFORT), *Pleuroceras solare* (PHILLIPS), *Pleuroceras spinatum* (BRUGUIÈRE), *Belemnites paxillosius* LAMARCK, *Pseudopecten aequivalvis* (GOLDFUSS), *Homeothynchia acuta* (SOWERBY), *Tetrarhynchia argotinensis* (RADOVANOVIC), *Cincta numismalis* (VALEN), *Callospiriferina tumida* (BUCH), *Liospiriferina rostrata* (SCHLOTHEIM);
- **Toarcian** (5–15 m thick): grey-blackish condensed marls and marly/silty limestones with phosphate concretions and locally with pyrite concentration; the faunal assemblages are contains mainly belemnites and ammonites (*Harpoceras mulgravium* (YOUNG & BIRD), *Pseudogrammoceras fallaciosum* (BAYLE), *P. quadratum* (d'ORBIGNY)) and rare bivalves and brachiopods.

The Middle Jurassic successions in the Pădurea Craiului Mountains, is strongly condensed (maximum 10 m in thickness) and reveal several discontinuities: the first one between the topmost part of the Toarcian including the Lower Bajocian and the second one in between the Lower-Middle Callovian.

- **Lower Aalenian** (2 m thick) dark-grey-blue limestone and marly-limestone with glaucony grains, phosphate ooids and oncoids and abundant phosphatized ammonite fauna (e.g. *Leioceras comptum* (REINECKE), *Tmetoceras scissum* (BENECKE), *Rhabdobelus exilis* (d'ORBIGNY), *Cylicocears crassicostatum* (RIEBER)).

- **Upper Aalenian** (0,8-3 m thick): blackish marls and marly-limestone with phosphate ooids and oncoids, locally with fossilized wood fragments; the fossil assemblage is dominated by belemnites (e.g. *Homaloteuthis spinatus* (QUENSTEDT), *Brachybellus breviformis* (VOLTZ)).
- **Lower Bajocian** (2 m thick): red-violaceous ferruginous ooidal limestones and marly-limestone with *Darellella*, *Sonninia*, *Otoites*, *Emielia*, *Belemnopsis*, *Megateuthis*.
- The detailed succession for the **Middle Bajocian – Late Callovian** interval will be presented bellow in the for the Vadu Crişului section.

During the **Upper Jurassic** on the territory of the Bihor Unit a carbonate platform was developed in the area of the Pădurea Craiului and Bihor Mts. The Upper Jurassic carbonate deposits from these areas are 100–300 m thick and show distinct facies zones representatives for different depositional environments developed on the carbonate platform.
One of the most representative profiles is located in the vicinity of Vadu Crişului village, on the left side of Crişul Repede Valley, on the northern extremity of the gorges formed by Crişul Repede Valley on the Jurassic deposits (Fig. 1B). The Vadu Crişului is a paleontological protected site (since 1973) and is famous in the scientific literature by the extremely abundant and divers Bathonian – Callovian ammonite fauna, studied and partially published by Patrulius (1976) and Patrulius (1996). The ammonite fauna collected by Patrulius is housed at the Geological Museum of Romania. The original site from where Patrulius collected the fossil material it was an old quarry that nowadays is closed and completely cover with dense vegetation (Fig 2A,B).

Fig. 2A General view of the former quarry near the Vadu Crişului locality (photo courtesy of Geologist Radu Huza).

Fig. 2B Outcrop view of the Bathonian-Callovian condensed deposits on the left side of Crişul Repede Valley, near to the Vadu Crişului locality (photo courtesy of Geologist Radu Huza).

In this location the succession of the Jurassic deposits crop out on almost 60 meters thickness and are represented by Pliensbachian to Toarcian deposits unconformably covered by Middle Bajocian – Upper Callovian condensed sequence (Figs. 2,3, 4).

- **Lower Pliensbachian (Carixian)** (16 m thick): grey to reddish massive, thick-bedded limestones interbedded with crinoidal layers toward the base; the associated fauna is represented by bivalves (mainly *Gryphaea*) along with brachiopods, belemintes and rare ammonites. The microfacies of this unit are represented by bioclastic packstone-wackestone and crinoidal packstone, locally with abundant glauconite and phosphate grains and bioclastic packstone with echinoderms, bivalves and brachiopods fragments, planktonic and benthic foraminifera and sponge spicules (Figs. 5A-D). Toward the top of this unit were observed clastic dykes within a bed of bioclastic packstone containing reworked belemnites, crinoids fragments and rare miliolids foraminifera (Fig. 5E), filled with the overlying burrowed bioclastic wackestone with rare ferruginous oncoids (Fig. 5F), and followed by bioclastic packstone rich in glaucony and phosphate grains with transition toward spiculite packstone with radiolarians, crinoids ossicles, glaucony and phosphate grains; crinoid ossicles are frequently replaced with glaucony (Figs. 5G, H).

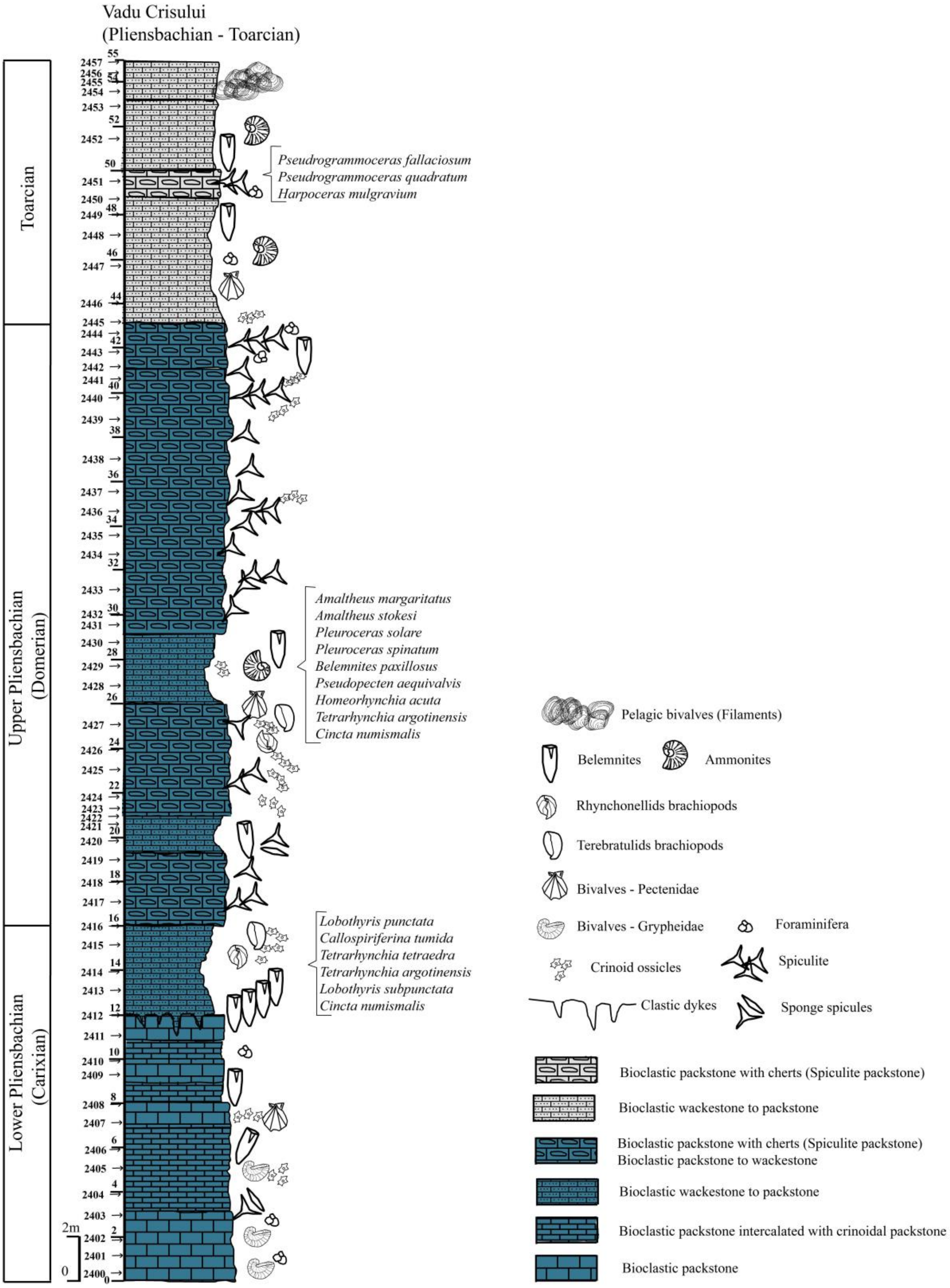

Fig. 3. Lithostratigraphic log of the Vadu Crişului section: Pliensbachian – Toarcian succession.

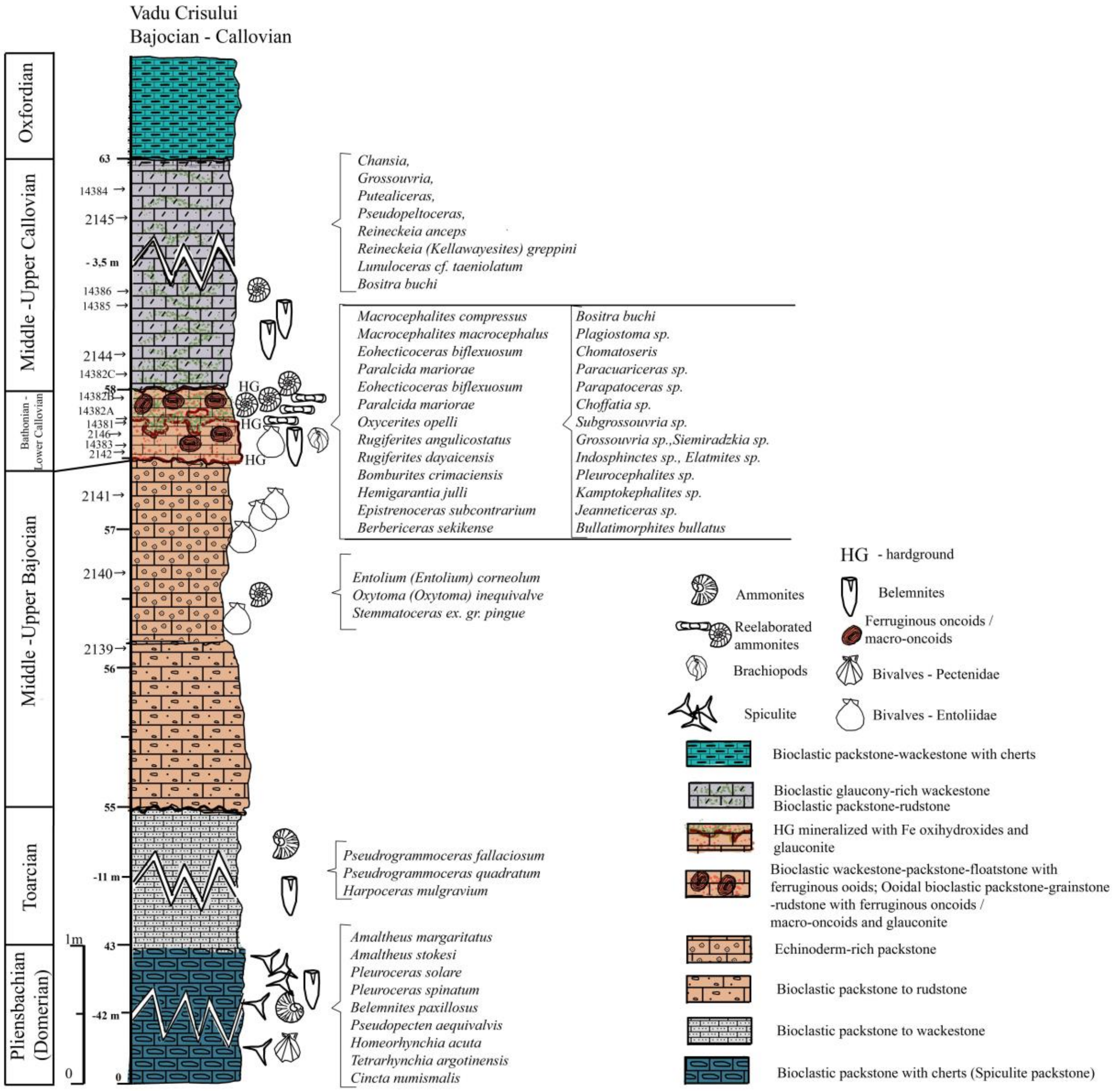

Fig. 4. Lithostratigrafic log of the Vadu Crisului section: Middle Bajocian – Upper Callovian succession.

- Upper Pliensbachian (Domerian) (26 m thick): medium bedded (10-30 cm) spiculite limestones. These deposits were previously named as *spongiolithic cherty limestones* (Patrulius in Ianovici et al., 1976; Grădinaru in Haas et al., 2011), but considering that these rocks are built of sponge spicules the term ***spiculite*** is more appropriate. On the other hand the term "***spongolite***" is used for rocks consisting of "rigid-bodied sponge skeleton" (Gammon and James, 2001; Jach, 2002). The bioclastic spiculite packstone to wackestone (Figs. 6 A-E) consist of massive accumulations of monaxon and other hexactinellid sponge spicules, partly calcified; additionally grains are represented by radiolarians (Fig. 6B), rare crinoid ossicles, glaucony grains (toward the base); the crinoid ossicles are strongly micritized or replaced with galucony; the matrix is generally organic-rich micrite (Fig. 6C), either calcisiltite. The parallel orientation of spicules indicates the activity of slow bottom currents during the deposition. Water energy was sufficient to orientate the spicules, but not to winnow the carbonate mud (Flügel, 2010). The microfossils and associated grains may be densely packed or sparsely distributed due to intensive burrowing (Fig. 6C). The matrix of the bioclastic packstone to wackestone with chert nodules is made up of fine bioclastic micrite with disseminated glaucony and quartz grains, peloids, small benthic foraminifera, sponge spicules and pyrite (Fig. 6D). Bioclastic (?crinoidal) packstone with dispersed pyrite grains (Fig. 6F) are intercalated. Toward the topmost part of the unit there are few beds (2-3 meters total thickness) of condensed bioclastic packstone rich in pelagic bivalves with

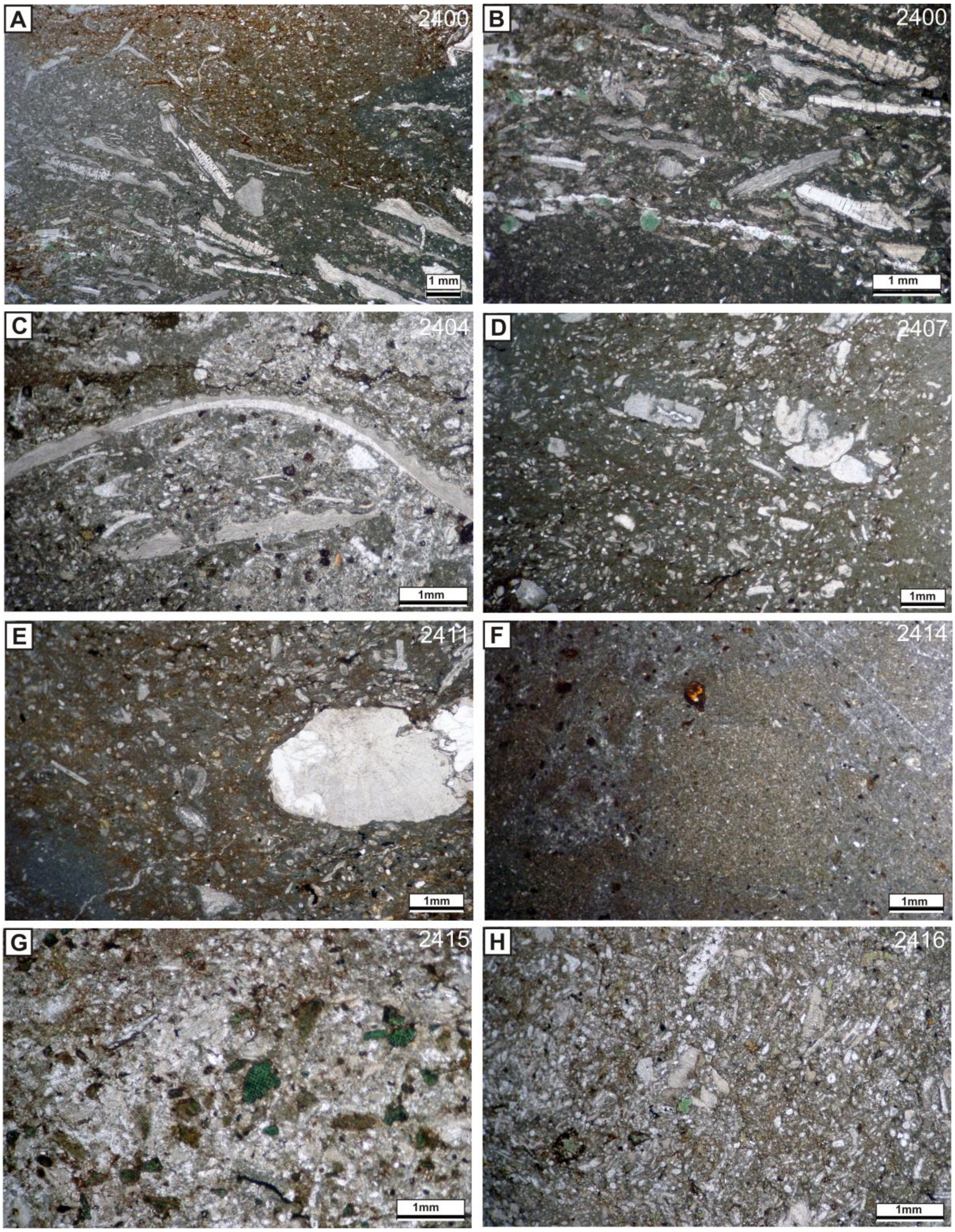

Fig. 5 Representative microfacies of the Lower Pliensbachian (Carixian) unit: A bioclastic packstone with crinoid and echinoid fragments and angular, siltite quartz grains; **B** crinoidal packstone-wackestone with autochthonous glaucony grains, **C** bioclastic packstone with echinoderms, bivalves and brachiopods fragments, planktonic and benthic foraminifera and sponge spicules; **D** bioclastic packstone-wackestone with crinoid fragments and rare glaucony grians; **E** bioclastic packstone containing reworked belemnites, crinoids fragments and rare miliolids foraminifera; **F** bioclastic wackestone with rare ferruginous oncoids; the matrix is micritised and burrowed; **G** bioclastic packstone rich in glaucony and phosphate grains; crinoid ossicles are frequently replaced with glaucony; **H** spiculite packstone with radiolarians, crinoids ossicles, glaucony and phosphate grains.

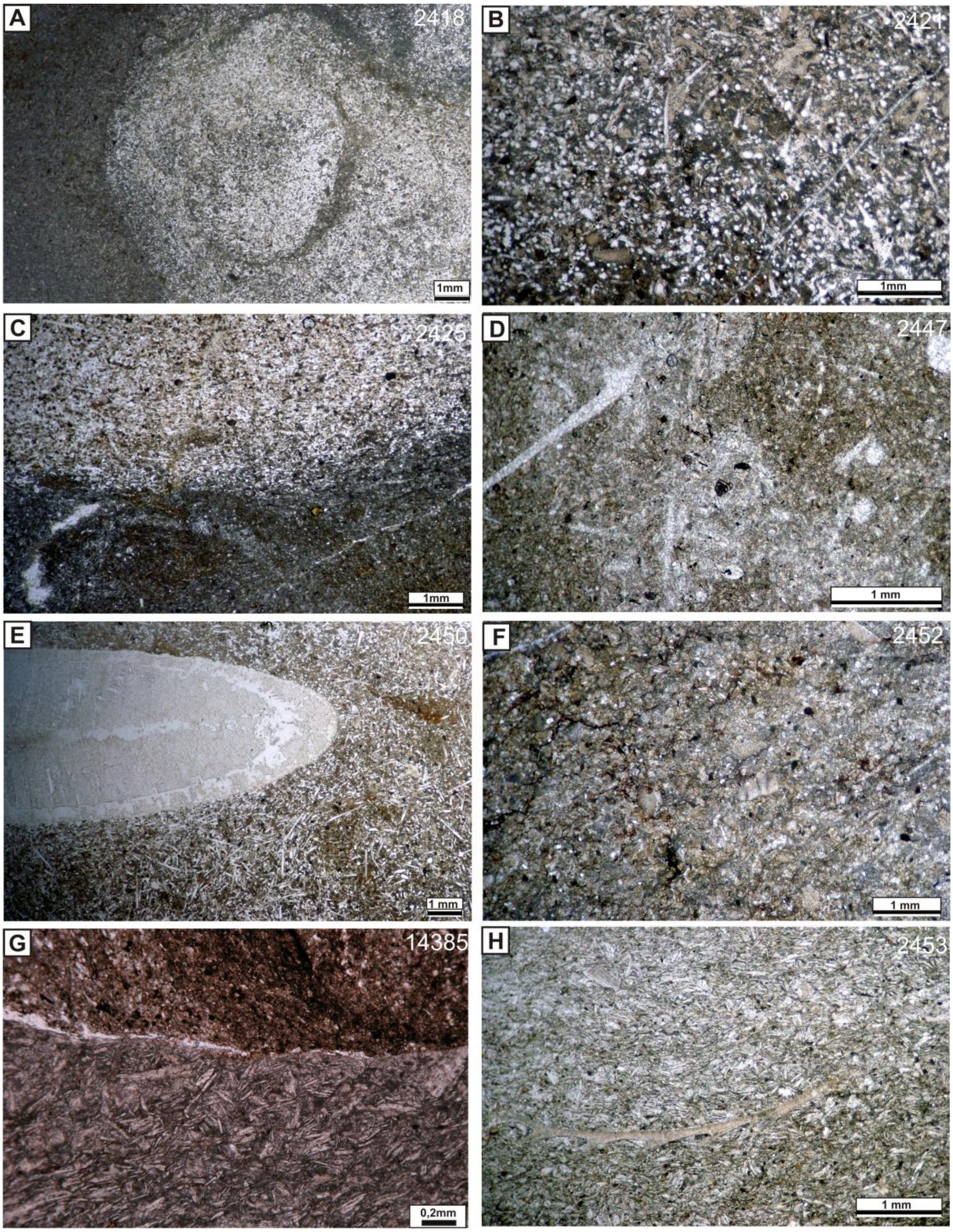

Fig. 6 Representative microfacies of the Upper Pliensbachian (Domerian) - Toarcian unit: A -C: bioclastic spiculite packstone to wackestone; **A** wackestone with spiculite nodules; **B** - bioclastic spiculite packstone with monaxon and other hexactinellid sponge spicules, partly calcified, additionally grains are represented by radiolarians; **C**- bioclastic spiculite packstone: the matrix is organic-rich micrite; the parallel orientation of spicules indicates the activity of bottom currents; the bioclasts and grains may be densely packed or sparsely distributed due to intensive burrowing; **D-H:** bioclastic packstone to wackestone with chert nodules; **D** the matrix made up of fine bioclastic micrite with disseminated glaucony and quartz grains, peloids, small benthic foraminifera, sponge spicules and pyrite; **E** spiculite packstone with belemnites, **F** bioclastic (?crinoidal) packstone with dispersed pyrite grains; **G** the contact between the underlying spiculite unit and the pelagic bivalve packstone; **H** pelagic bivalve packstone with aptychus fragments.

rare aptychus fragments (Figs. 6 G,H). These microfacies are common in basinal deep-water environment with slow sedimentation (e.g. deeper shelf below storm wave-base, as well as in mid-ramp and outer ramp settings, cf. Flügel, 2010).

- **Toarcian** (9 m thick): grey-blackish marls and marly limestones (bioclastic packstone-wackestone) with phosphate concretions and locally with pyrite concentration (Fig. 6F). Toward the topmost part a distinct litologic unit is represented by bioclastic packstone with chert nodules composed of extremely abundant pelagic bivalves, echinoderm fragments, peloids, benthic foraminifera (Nodosariidae, *Glomospira* sp., *Glomospirella* sp.) and sponge spicules (Fig.6E-H). The matrix is made up of fine bioclastic micrite with disseminated glaucony, as well as quartz grains. This microfacies is characterized by an abundant accumulation of pelagic bivalve filaments disposed parallel to the bedding, due to the strong bottom currents, in deep-subtidal environments.
- **Middle – Upper Bajocian** (2,5 m thick): the base of this unit is represented by bioclastic grainstone with thin, discontinuous, quartzitic micro-conglomerate intercalations followed by ooidal bioclastic (crinoidal) grainstone-packstone; the associated fauna consists mainly of the bivalve *Entolium (Entolium) corneolum* (YOUNG and BIRD) (Fig. 9A); the additional fauna is scarce and represented by the bivalve *Oxytoma (Oxytoma) inequivalve* (SOWERBY) and the ammonite *Stemmatoceras* ex. gr. *pingue* (QUENSTEDT); the associated microfacies are represented by: echinoderm-rich packstone composed of echinoderm plates either with syntaxial overgrowth cements or with micritic envelopes caused by microbial microborings, peloids, micritized bioclasts and abundant angular to subangular quartz grains (range from poorly sorted to moderately well sorted) (Fig. 7A). Syntaxial overgrowth cements surround exclusively echinoderm plates devoid of micritic coatings (Fig. 7B). The micritic envelopes were stained by oxyhydroxide impregnations.
- **Bathonian - Lower Callovian** (0.2–0.5 m): grey-green to reddish bioclastic ooidal packstone-grainstone with cavities and fractures filled with bioclastic wackestone- packstone, respectively oncoidal floatstone and rudstone. This bed has a nodular aspect and contains numerous ferruginous macro-oncoids, ferruginous ooids and a fossil assemblage represented mainly by ammonites, belemnites, sponges, crinoids, besides rare bivalves (*Bositra buchi* (ROEMER), *Plagiostoma* sp.), rare gastropods, brachiopods, echinoids and extremely rare solitary corals (*Chomatoseris*). The top of this bed is represented by a complex hardground surface mineralized with ferruginous crusts; the ferruginous crusts are distributed along the top of the bed, but they also occur within fissures, fractures and small neptunian dykes.

Patrulius (1976, 1996) studied the stratigraphic setting of this bed and demonstrated that it represents a heterochronous condensed horizon representative for Bathonian – Early Callovian time interval. The ammonite fauna is represented by: *Berbericeras sekikense* ROMAN (representative for the Early Bathonian), *Epistrenoceras subcontrarium* (BEHRESDEN), *Hemigarantia julli* (d'ORBIGNY), *Bomburites crimaciensis* (ENAY), *Rugiferites dayaicensis* (LISSAJOUS), *R. angulicostatus* (LISSAJOUS), *R. ?supersphaere* (STEPHANOV), *Oxycerites opelli* ELMI, *Paralcida mariorae* (POPOVICI-HATZEG), *Eohecticoceras biflexuosum* (d'ORBIGNY) (representatives for the Late Bathonian), *Macrocephalites macrocephalus* (SCHLOTHEIM), *M. compressus* (QUENSTEDT) and species belonging to the genera *Pleurocephalites*, *Kamptokephalites*, *Jeanneticeras* and *Bullatimorphites bullatus* (d'ORBIGNY) (representative for the Early Callovian). This ammonite assemblage is also characterized by the exceptional abundance of the Perisphinctidae (species of the genera *Choffatia*, *Subgrossouvria*, *Grossouvria*, *Siemiradzkia*, *Indosphinctes*, *Elatmites*) and by the presence of the heteromorf species of the genera *Paracuariceras* and *Parapatoceras* (Patrulius, 1996). Species representative for the Middle Bathonian are missing from this assemblage (Patrulius, 1996).

Patrulius (1996) comparing the ammonite fauna from the Bathonian – Lower Callovian condensed bed from Vadu Crişului with the fauna from the similar condensed bed from the western Bucegi Mountains that corresponds to the Early Bathonian (Zigzagiceras zigzag biozone) in the Grohotişul Mountain, the Early Bathonian–Early Callovian in the Strunga Pass area, and Middle–Late Bathonian (including at least retrocostatum zone cf. Patrulius, 1969) in the Tătarului Gorge, respectively, concluded that the fauna from Vadu Crişului is just a little "younger", considering the presence of *Berbericeras sekikense* ROMAN representative for Early Bathonian and the complete absence of other Morphoceratidae.

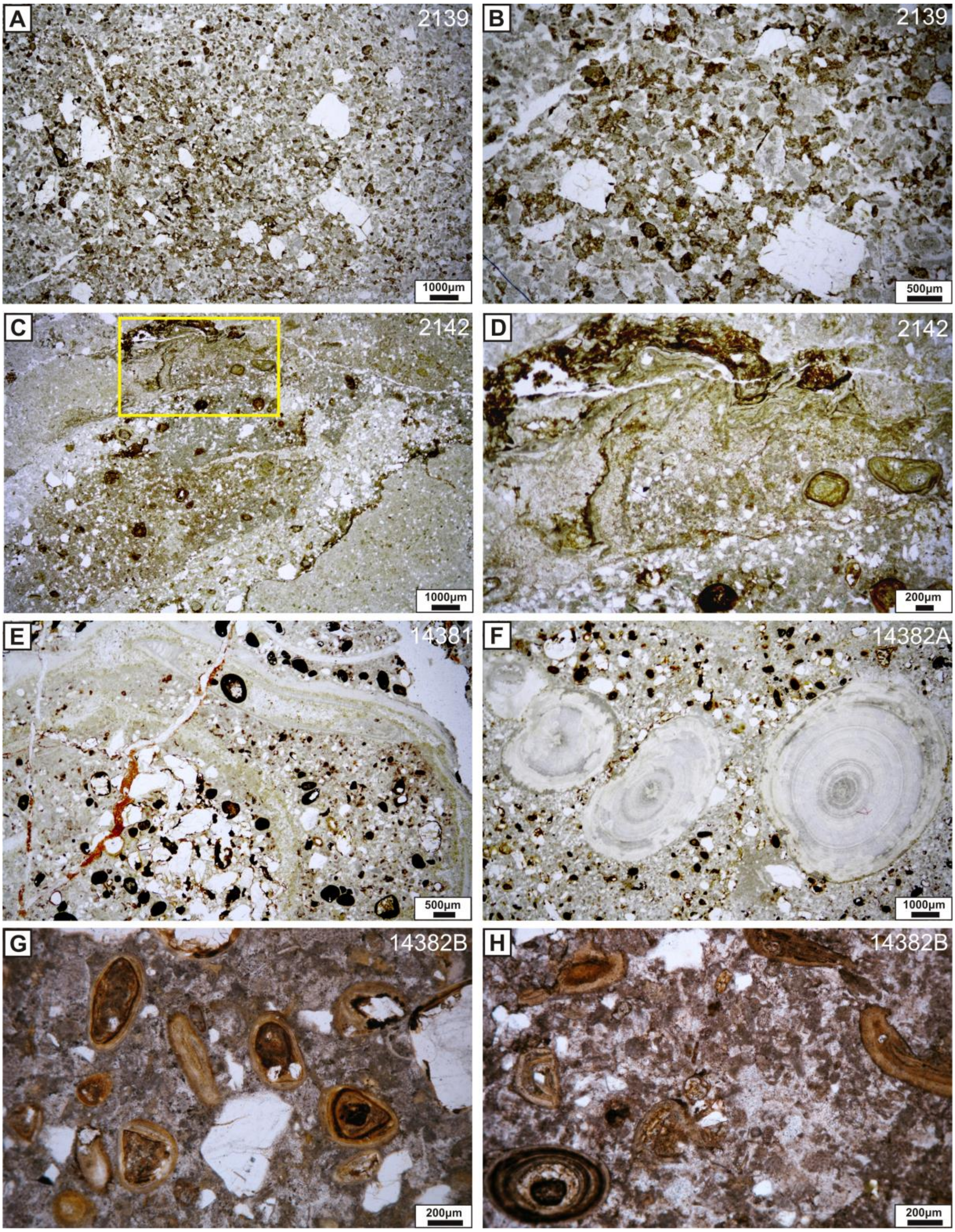

Fig. 7 Representative microfacies of the condensed Middle Bajocian-Bathonian-Lower Callovian unit: **A,B** Echinoderm-rich packstone; B Detail of the echinoderm plates with syntaxial overgrowth cements and micritic envelopes. **C,D** Bioclastic wackestone-packstone-floatstone with echinoderm fragments, ferruginous ooids, aggregate grains, oncoids and peloids. D Detail of C - the intraclast encrusted with ferruginous laminated crusts, forming the oncoids. **E-H** Ooidal bioclastic packstone-grainstone-rudstone. E,H Detail of the ferruginous ooids from the condensed bed.

The characteristic microfacies of this condensed unit are represented by:

- Bioclastic wackestone-packstone-floatstone containing ferruginous concentric ooids, aggregate grains, peloids, echinoderm fragments, hemipelagic foraminifera (*Lenticulina* sp), serpulids, moderately sorted quartz grains and oncoids (Fig. 7C,D). The ferruginous ooids are irregular in shape with a cortex composed of 3 up to 5 laminae. The nuclei consist of micritized bioclasts, peloids, and fragments of ferruginous microbial crust, glaucony and quartz grains. The matrix consist of fine and ferruginous bioclastic micrite and rare glaucony grains.
- Ooidal bioclastic packstone-grainstone-rudstone composed of ferruginous ooids, ferruginous oncoids, aggregate grains, echinoderm fragments with syntaxial overgrowth cements, most of them affected by numerous microborings caused by endolithic organisms, sponges, coated bioclasts or completely micritized, peloids, serpulid tubes, bivalve shells, rich belemnites, reworked intraclasts and abundant quartz grains (Fig. 7E-H). The ferruginous ooids are mostly sub-spheroidal to ellipsoidal grains irregular in shape and range from 250 to 1900 µm in size of diameter. Some of them have a thicker cortex composed of 3 up to 5 laminae but other ooids either have a single cortical layer (superficial ooids, cf. Flügel, 2004) or they do not seem to have any laminae, representing micritized ooids made of concentric micrite layered. Ooid nuclei are composed of quartz grains, micritized bioclasts, echinoderm plates or glaucony grains. Several different types of ooids have been recognised with slightly different texture and composition for the cortex: 1) ooids with the surrounded cortex composed of alternating dense and thicker red to dark brown ferruginous micrite and very thinner white to yellow calcitic laminae (Fig.7H); 2) ooids with cortex composed of alternating thicker white to yellow and very thinner red to dark brown laminae, surrounded together by thicker red to dark brown micritic envelops; 3) superficial ooids composed of a single cortical layer made up of white to yellow calcitic lamina (Fig. 7F); 4) ferruginous micritic ooids made of concentric micrite layered or formed from micritized bioclasts (Fig. 7E,F). The irregular shapes of ooids result from microbial encrustations, indicating a weak reworking of the surrounded matrix and grains. The aggregate grains consist of micritic ooids, along with some coated and micritic skeletal grains bound together by organic films and microcrystalline calcite. The matrix consists of fine and ferruginous bioclastic micrite with disseminated glaucony grains, and sparry calcite. The ferruginous ooids, oncoids, macro-oncoids and the reworked intraclasts were deposited in a deep subtidal environment, distal offshore transition to proximal offshore (bellow fair weather wave-base, or even below storm wave-base, affected by episodic activity of the strong shelf currents.
- **Middle - Upper Callovian** (2-5 m thick): reddish to grey-greenish marly-limestones with variable amount of glaucony and by grey to yellowish peloidal grainstone-packstone with planktonic foraminifera *Globigerinelloides*); the associated fauna is dominated by large belemnites (*Hibolites*) along with ammonites belonging to the genera *Chansia*, *Grossouvria*, *Putealiceras*, *Pseudopeltoceras*, and *Reineckeia anceps* (REINECKE), *Reineckeia (Kellawayesites greppini* (OPPEL), *Lunuloceras* cf. *taeniolatum* (BONARELLI) (Patrulius, 1996), *Bositra buchi* (ROEMER). The representative microfacies of this unit are: Bioclastic packstone-rudstone represented by echinoderm and shell fragments, ferruginous ooids, belemnites, quartz grains (range from moderately to well sorted), glaucony grains and dolomite (Fig. 8A,B). The echinoderm fragments and ferruginous ooids show evidence of compaction before final cementation and lithification (Fig. 8B). Deformation occurs when poorly cemented ooids are buried. The matrix or porosity has been completely lost during compaction, associated with mechanical grains rearrangement and pressure solution process (chemical compaction) concentrated at grain contacts resulting sutured contacts with progressive grain interpenetration (Proximal to mid slope/offshore, bellow storm wave base); Bioclastic glaucony-rich wackestone consisting of echinoderm fragments, planktonic bivalves and quartz grains (Fig.8C,D). The matrix consists of glaucony-rich grains, embedded within calcite micrite. The glaucony grains are irregular shaped and ranges in colour from pale-light to dark green with variable grain size distribution, being interpreted as para-autochthonous to autochthonous origin; Bioclastic packstone-wackestone, characterized by pelagic filaments associated with echinoderm fragments (Fig. 8E,F). Note the absence of allochthonous shallow-marine biota (Mid slope). Bioclastic packstone-wackestone containing peloids, radiolarians, pelagic filaments, ostracods, hemipelagic foraminifera (*Lenticulina* sp), echinoderm plates and spines and sponge spicules (Fig. 8G,H). The radiolarian tests were completely replaced by calcite. The matrix consists of fine micrite with rare disseminated glaucony grains (Distal offshore, below storm wave base).

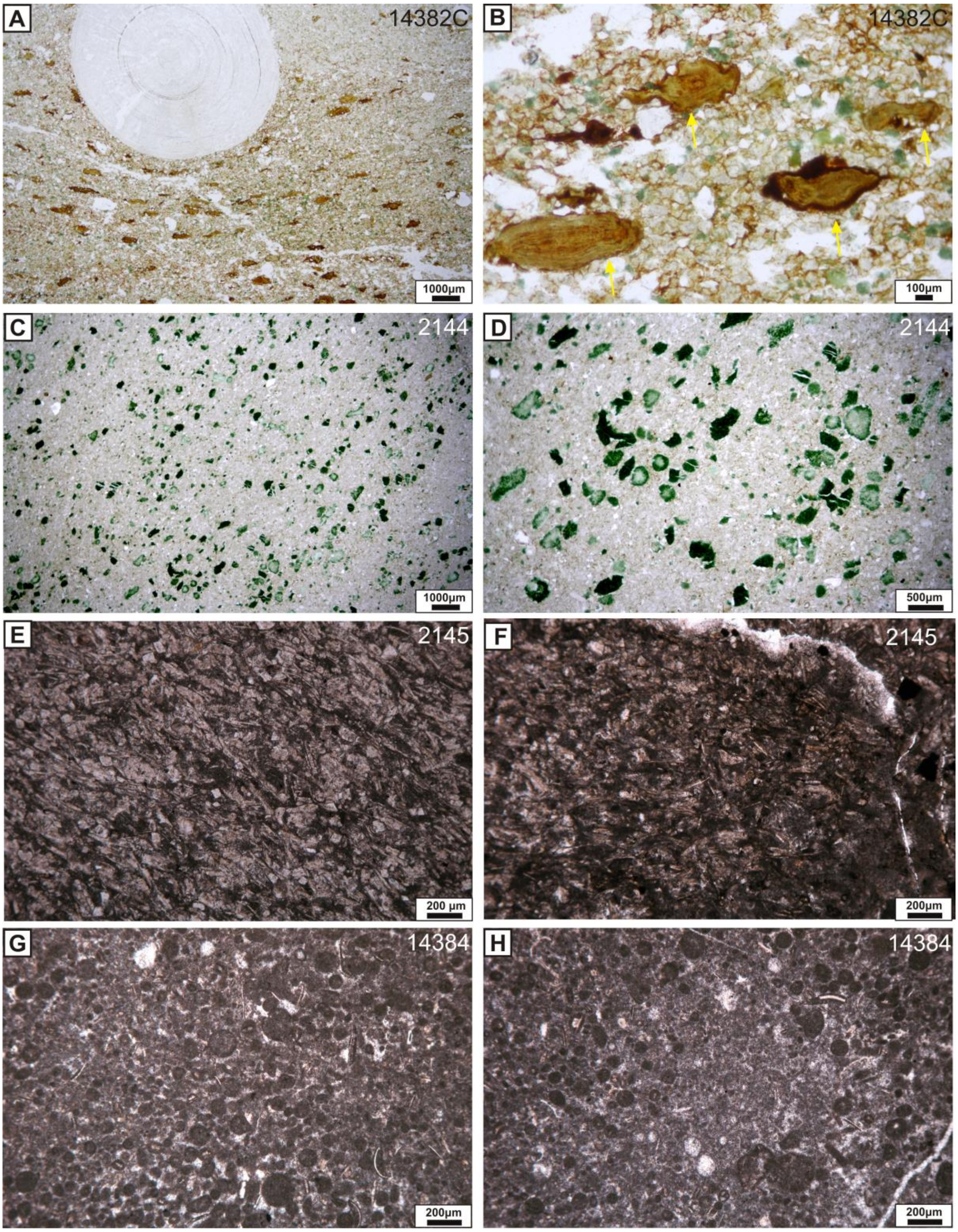

Fig. 8 Representative microfacies of the Middle-Upper Callovia unit: **A,B** Bioclastic packstone-rudstone. B Detail from A with ooids and echinoderm fragments that exhibit compaction indicated by interpenetrating of grains, that exhibit concav-convex and sutured contacts. Flattened ooids and parallel grain contacts (*arrows*). Note the almost complete absence of matrix. **C,D** Bioclastic glaucony-rich wackestone. **E,F** Bioclastic packstone-wackestone with abundant pelagic filaments. **G,H** Bioclastic packstone-wackestone with micritized and calcified radiolarians.

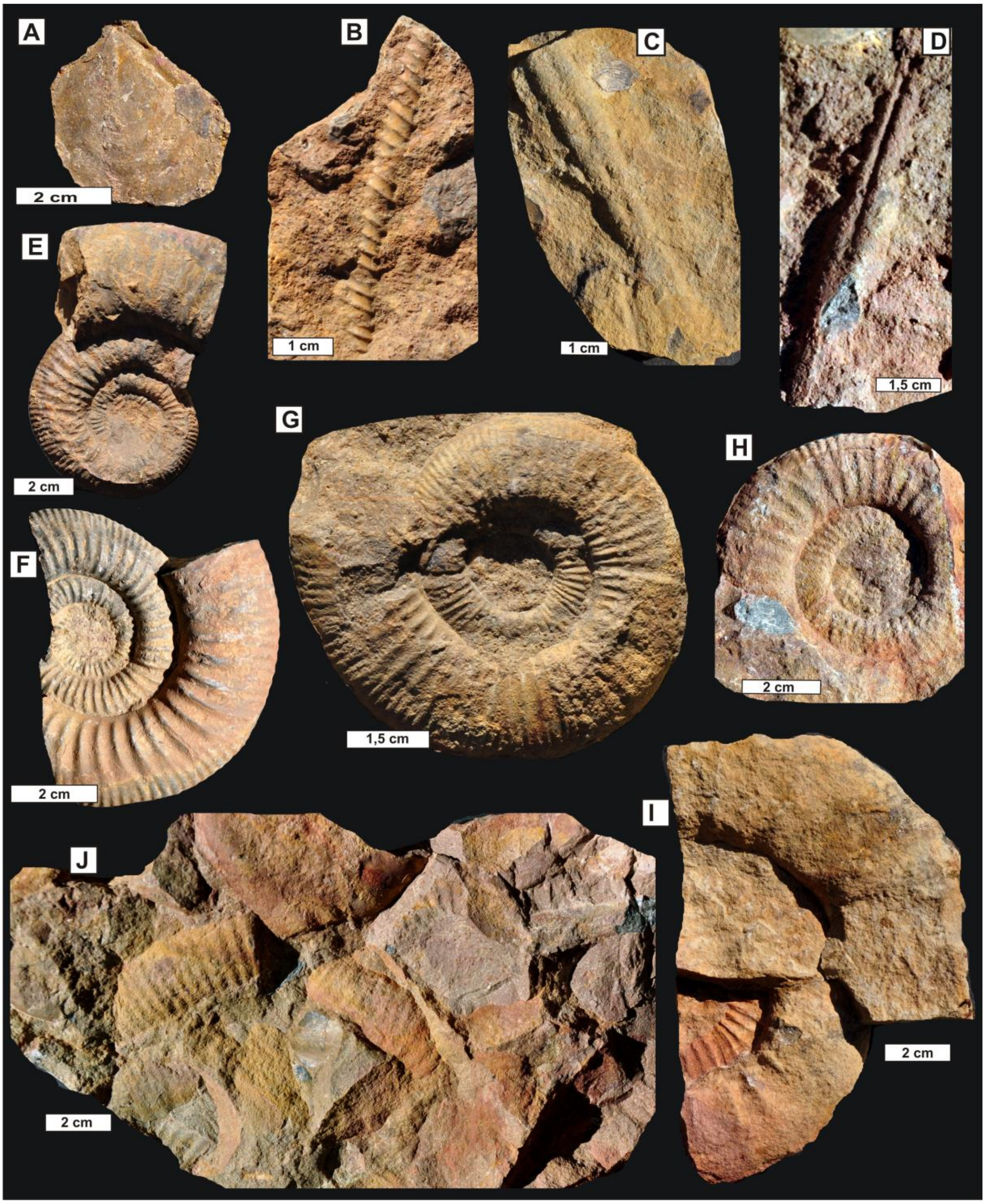

Fig. 9. Fossil fauna from the Bajocian – Callovian condensed units: A *Entolium (Entolium) corneolum*; **B** Heteromorf ammonite *Parapatoceras* sp.; **C, D** belemnites (*Hibolites* sp.); **E-I** Reelaborated ammonites preserved as fragmentary concretionary internal moulds; **J** Fragmentary internal moulds showing disarticulation surfaces and fractures with sharp margins and truncational abrasion facets.

Taphonomic observations and discussions

The recorded associations of ammonites of the condensed Bathonian – Early Callovian and Middle-Upper Callovian beds are dominated by reworked elements (i.e., reelaborated or resedimented elements *sensu* Fernández-López, 1991). Accumulated elements, showing no evidence of removal, are absent. Reelaborated internal moulds, exhumed and displaced before their final burial, are dominant. Broken and resedimented shells, displaced on the sea-bottom before their burial, are also common. These associations are condensed assemblages formed by reelaborated, calcareous, concretionary internal moulds, maintaining their original volume and form (Figs. 9E-I) as a result from rapid early cementation. Within the condensed bed there are abundant uncompressed, complete sedimentary internal moulds especially of the phragmocone (but probably also of the body-chamber) that are indicative of low rate of sedimentation and low degree of accommodation of sediments (cf. Fernández-López et al., 1999). Concretionary internal moulds with septa are also abundant fossils. Reworked concretions, shell fragments and concretionary internal moulds show thin encrusting structures such as ferruginous microstromatolites. However, skeletal remains of encrusting organisms such as serpulids, bryozoans or oysters and biogenic borings are present with moderate frequency. Reelaborated internal moulds show often disarticulation surfaces and fractures with sharp margins and also they may show truncational abrasion facets. Fragmentary internal moulds (Fig. 9J) also occur, bearing signs of rounding or bioerosion (cf. Fernández-López et al., 1999).

These beds shows faunal condensation (sensu Fürsich, 1978) and taphonomic condensation (sensu Gómez and Fernández-López, 1994), considering the mixture of non-contemporaneous fossil specimens with very different degrees of preservation, belonging to different populations or communities, as well as the occurrence of numerous macro-oncoids that have nuclei represented by ammonites showing different preservation states and belonging to several biozones. These data also suggest a deep subtidal environment (proximal to distal offshore) affected by intervals of omission/non-deposition, erosion and in situ reworking, produced by temporarily active strong bottom currents and/or by storm events.

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UPPER CRETACEOUS RUDIST-BEARING SHALLOW-MARINE DEPOSITS FROM BOROD BASIN

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STOP 2

Introduction

The Upper Cretaceous rudist-bearing shallow-marine deposits widely exposed in the southeastern part of Borod Basin, close to the Valea Crişului village, consists of conglomerates, microconglomerates and bioclastic sandstones intercalated with rudist-bearing limestones. These sequences rest unconformably on the Jurassic deposits by an erosional surface at the bottom, and are covered by Sarmatian marls at the top. Two rudist assemblages belonging to the Radiolitidae, Hippuritidae and Plagiopthychidae family have been identified, indicating Santonian-Campanian age.

Location

The Upper Cretaceous mixed siliciclastic-carbonate sequences from the southeastern extremity of Borod Basin (Northern Apuseni Mountains) represent a well-known cropping out area of rudists bearing deposits. These deposits are located in the area of Valea Crişului village (Valea Neagra de Criş after old denomination) on right flank of Pietrele de Moară Brook (Fig. 1).

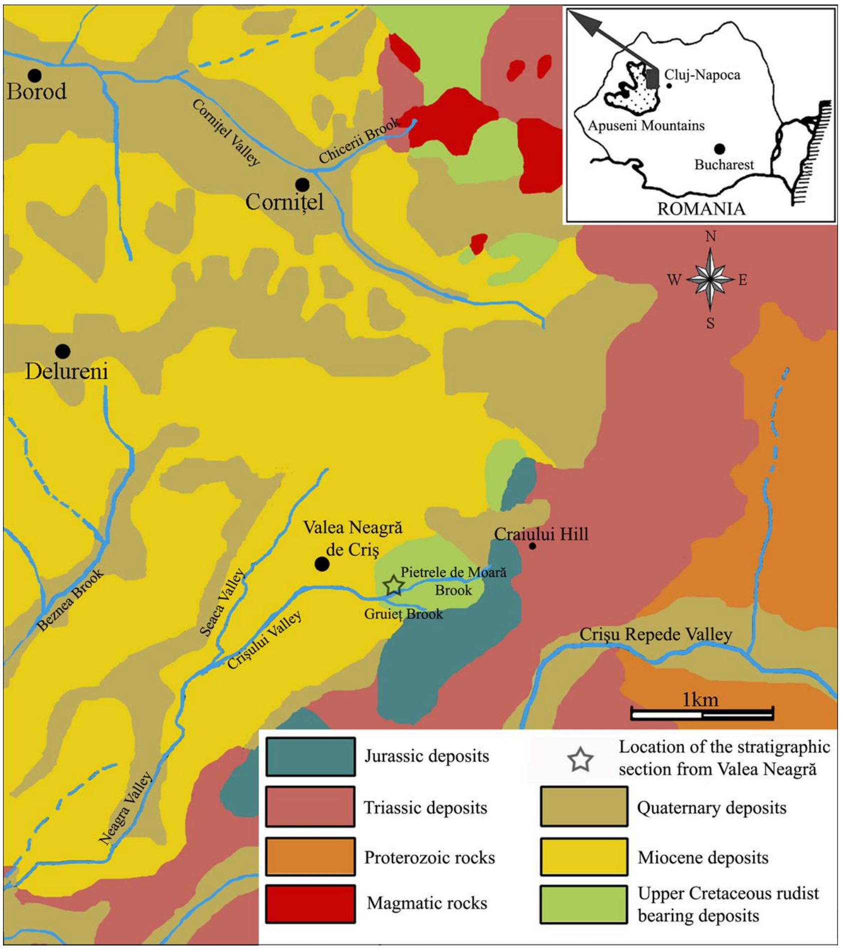

Fig. 1 Geological map of Borod Basin showing the distribution of the Upper Cretaceous rudist bearing shallow-marine deposits and the location of stratigraphic section from Pietrele de Moară Brook (modified after Patrulius et al., 1973).

The Upper Cretaceous deposits are delimited to the west, from Neogene deposits of Borod Basin, by Negruţii fault and to the southwest by a fault which follows the Gruieţ Brook so that the Upper Cretaceous sediments get in the position of dithering with the Jurassic deposits (Şuraru, 1972; Patrulius et al. 1973; Lupu, 1976).

Litostratigraphy of the rudist-bearing deposits from Pietrele de Moară Brook

The mixed siliciclastic-carbonate sequence crop out along the right flank of Pietrele de Moară Brook and consists of conglomerates and bioclastic sandstones intercalated with rudist-bearing limestones (Figs. 2; 3a). The sequence starts with a conglomerate horizon ~0.50 m thick, on the top of which, after a gap, the first level with rudist-bearing limestones (hippuritid lithosome), 0.80 m thick, are installed (Fig. 3c). These are covered on top by another conglomerate level of 0.50 m. The following two others hippuritid lithosomes (~2 and respectively 3 m thick) are also covered by conglomerate levels (Săsăran *et al.* 2010). The bioconstructions' internal sediment is represented by bioclastic-extraclastic grainstone, bioclastic-extraclastic rudstone and bioclastic wakestone/packstone. The internal sediment contains fragments of rudists and corals, of red algae, benthic foraminifers, echinoid plates and spines, and gastropods (Săsăran *et al*., 2010).

The median part of the succesion (Fig. 3b) is dominated by siliciclastic deposits (conglomerates and bioclastic sandstones), erosionally overlaid. The bioclastic sandstones display a layered geometry, while conglomerates are present as lenses. The pebbles contained in the conglomerates are mainly represented by angular to subrounded fragments of metamorphic rocks (quartzites, micaschists and chloritic schists). As a rule, conglomerates are poorly sorted, the ruditic pebbles being chaotically embedded by a bioclastic arenitic matrix. Both the sandstones and the conglomerates matrix contain fragments of rudists, red algae, gastropods, ostreids, echinoid plates and radioles, and benthic foraminifers.

In the upper part of the succesion, a few levels with rudist-bearing limestones rich in radiolitids are intercalated in siliciclastic deposits. They form the radiolitid lithosomes, in which the internal sediment consists of bioclastic extraclastic wackestone/packstone. Its matrix includes fragments of red algae, corals, rudists, echinoid plates and spines, and benthic foraminifers (miliolids and encrusting foraminifers). The infilling, associated with the encrustations are arguments for low sedimentary rates, which favoured the installation and the development of the radiolitids (Săsăran *et al*., 2010).

Biostratigraphy of the rudist bearing deposits from Pietrele de Moara Brook

Within the stratigrafic succession from Pietrele de Moară Brook, rudists represent the main biostratigraphic markers. The gastropods (actaeonelids and nerineids) and corals are isolated and completely subordinated. The corals occur solitary or as small colonies, being identified a limited number of species: *Actinastrea* cf. *octolamellosa*, *Columastrea striata, Heterocoenia verrucosa, Cunnolites* cf. *barrerei*, *Cunnolites* (*Plesiocunnolites) macrostoma,* and *Diploctenium* sp. (Şuraru, 1972).

The rudist assemblages from this area have been previously investigated by several authors, as classical case studies for Gosau-type facies deposits in the Apuseni Mountains (Givulescu, 1954; Şuraru, 1972; Lupu, 1960, 1976). New data concerning the composition of the Upper Cretaceous rudist assemblages of Borod basin were obtained by Săsăran *et al*. (2010), Săsăran and Özer (2011) and two rudist assemblages are distinguished, from bottom to top: hippuritid and radiolitid lithosomes indicating Santonian- Campanian age.

From the hippuritids lithosomes have been identified species of *Vaccinites gosaviensis* DOUVILLÉ (Fig. 4a,b)*, V. sulcatus* DEFRANCE (Fig. 4c, f), *V. archiaci* DOUVILLÉ, very rare specimens of *V. oppeli* DOUVILLÉ, *V. inaequicostatus* MUNSTER, *Hippurites nabresinensis* FUTTERER (Fig. 4d), *Hippuritella variabilis* MUNIER-CHALMAS (Fig. 4e), and two plagioptychids species: *Plagioptychus aguilloni* d'ORBIGNY and *P. toucasi* MATHERON. The specimens of *Hippurites* and *Vaccinites* have elevator growth (*sensu* Skelton & Gilli, 1991) and occur as thickets of hundreds of specimens (Fig.3c). They develop bioconstructions clearly differentiated from the neighbouring facies types. Species of *Plagioptychus* are elevator to clinger rudists having an inequivalve right valve, smaller than free left valve. The elevator morphotype of *Plagioptychus* is characterized by a strong, curved umbo of the free valve and an elongated or low conical, attached valve (Fig 5a-e).

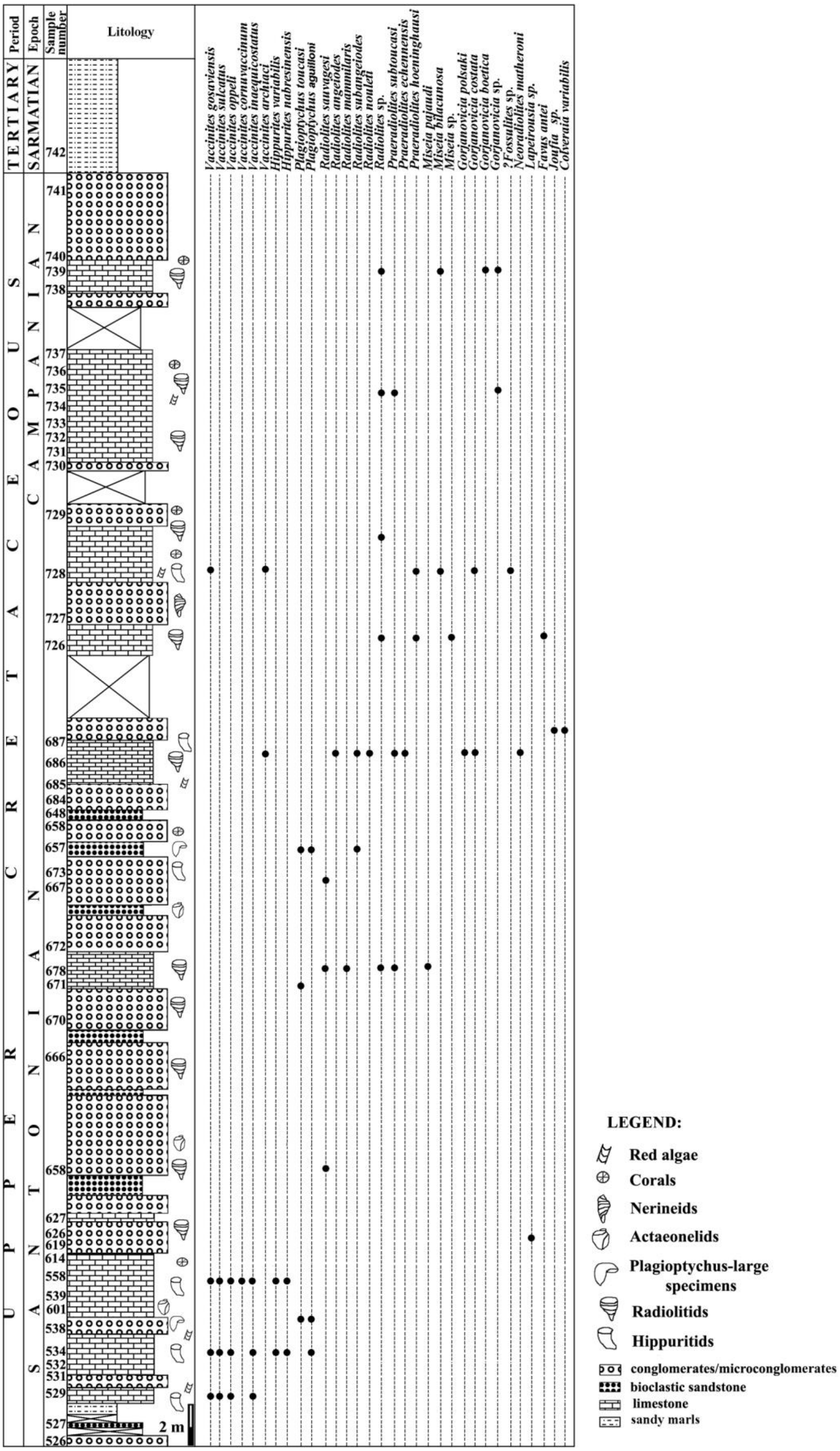

Fig. 2 Lithostratigraphic section of Santonian-Campanian deposits from Pietrele de Moară Brook, showing the distributions of the rudists.

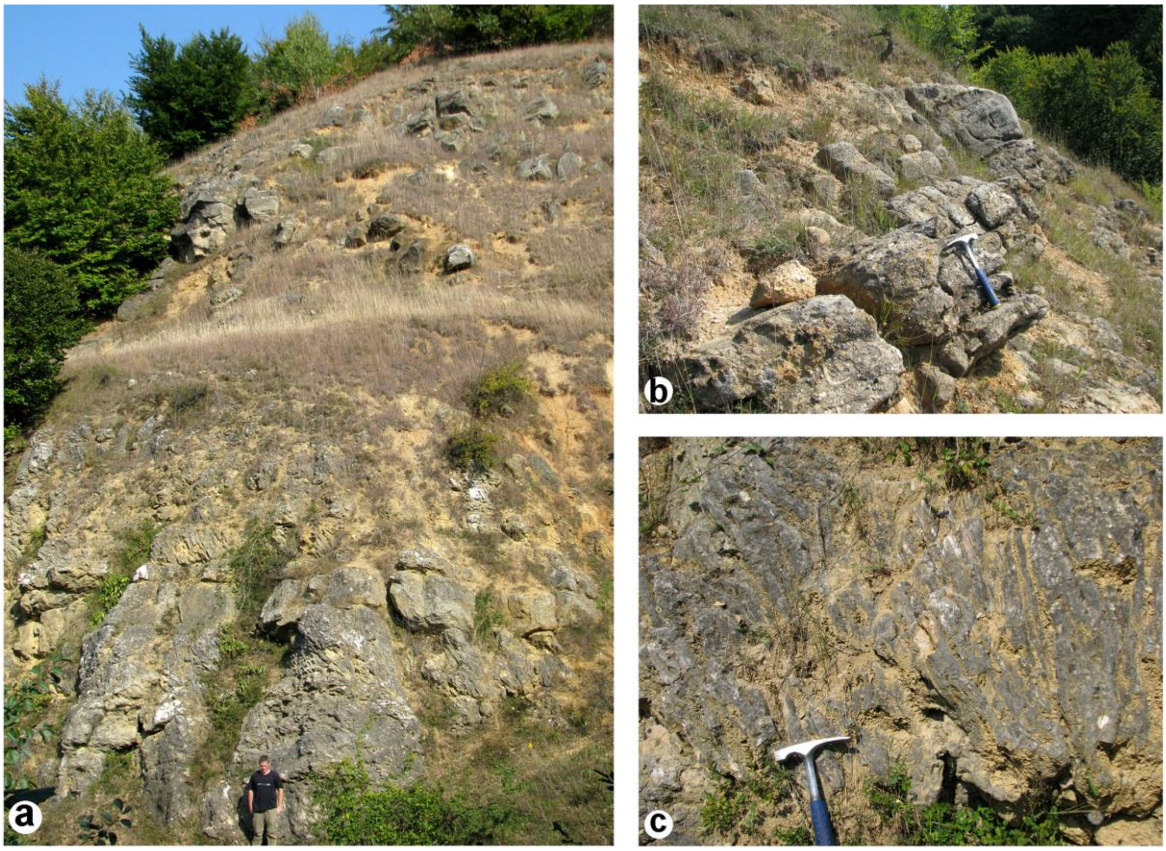

Fig. 3 a) General view of mixed siliciclastic- carbonate sequences from Pietrele de Moară Brook, Borod Basin. b) siliciclastic deposits consists of conglomerates and bioclastic sandstones from upper part of the succession; c) hippuritid lithosmes from base of the succession.

The clinger morphotype is characterized by a globose or grypheate left valve having a strong umbo with asymmetrical curvature towards the anterior face (Fig. 5f-g). The attached valve is gyropleuriform with thin to medium outer calcitic shell layer and thin inner layer without pallial canals. Both elevator and clinger morphotypes record great variations in dimensions of valves. Thus, the thick shelled, robust, and commonly larger *Plagioptychus* with commissural diameter of upper valve ranging from 60 to 120 mm occur usually like attached clingers or elevators at the base of the coral-rudists bioconstructions or hippuritid/radiolitid lithosomes acting as “pioneer shells” to colonize and provided a substrate for installation of the coral-rudist bioconstructions and/or hippuritid/radiolitid lithosomes.

In the radiolitid lithosomes the following taxa have been recognized: *Radiolites mammilaris* MATHERON (Fig. 4g), *Miseia bilacunosa* OZER (Fig. 4h), *Miseia pajaudi* PATRULIUS*, Miseia* sp., *Praeradiolites subtoucasi* TOUCAS (Fig. 4i), *Radiolites sauvagesi* HOMBRES-FIRMAS (Fig. 4j)*, Radiolites angeiodes* LAPEIROUSSE*, Radiolites nouleti* BAYLE (Fig. 4n), *Radiolites subsquamosus* TOUCAS, *Radiolites subangeiodes* TOUCAS, *Praeradiolites echennensis* ASTRE, *Gorjanovicia polsaki* ÖZER, *Gorjanovicia costata* POLSAK, *Favus antei* LAVIANO&SKELTON (Fig. 4k), *Colveraia variabilis* KLINGARDT (Fig. 4l-m), *Joufia* sp. (Fig. 4p), *Lapeirousia* sp. (Fig. 4r). Locally, isolated specimens of *Vaccinites gosaviensis* DOUVILLÉ and *Plagioptychus aguilloni* MATHERON (Fig. 4n) may be also present. The radiolitids assemblage showing a wide diversity of species, typical for Gosau province but also for the south-European, Mediterranean province: *Miseia* (Turkey-Karacabey-Oztemur, 1979; Ozer, 1992)*, Gorjanovicia* (Turkey-Ozer, 1982)*, Favus antei* and *Colveraia variabilis* (Italy and Turkey: Laviano&Skelton,1992; Karacabey-Oztemur, 1974).

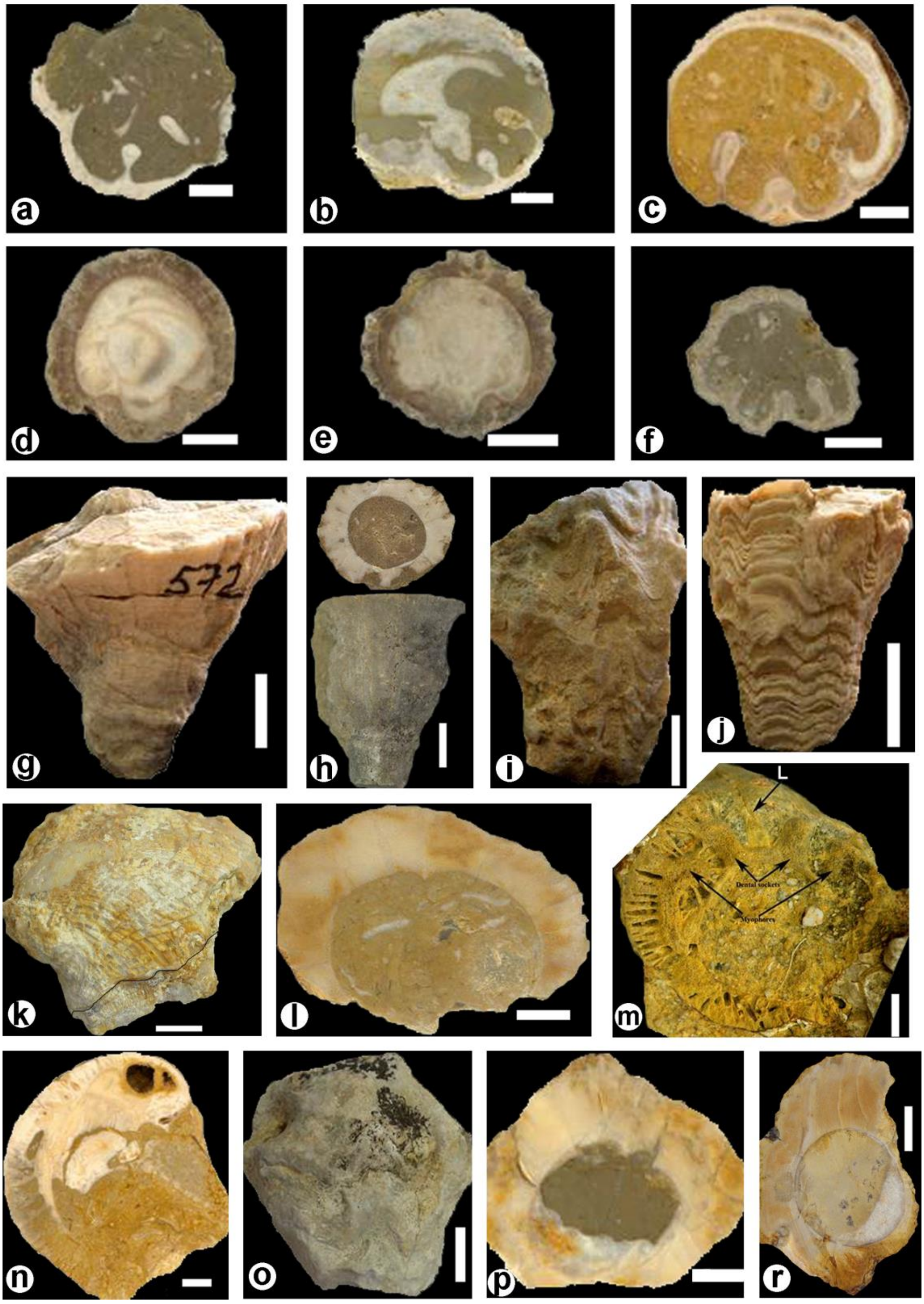

Fig. 4 Species of rudists identified from Upper Cretaceous deposits crop out in Pietrele de Moară Brook: a,b) Transversal section through right valve (RV) of *Vaccinites gosaviensis*; c , f) Transversal section through RV *of Vaccinites sulcatus*; d) Transversal section through RV of *Hippurites nabresinensis*; e) Transversal section through RV of *Hippuritella variabilis*; g) RV of *Radiolites mammilaris*; h) RV *of Miseia bilacunosa*; i) RV showing ventral bands of *Praeradiolites subtoucasi*; j) RV showing ventral bands of *Radiolites sauvagesi*; k) Left valve (LV) of *Favus antei* showing large cell of outer shell layer; l) Transversal section through RV of *Colveraia variabilis* showing cellular outer shell layer; m) transversal section through *Colveraia variabilis* showing cannals of LV; n) transversal section through LV of *Plagioptychus aguilloni*; o) ventral bands of RV of *Radiolites nouleti*; p) Transversal section through RV of *Joufia* sp. showing the thickness of celuloprismatic shell layer; r) Transversal section through RV of *Lapeirousia* sp.

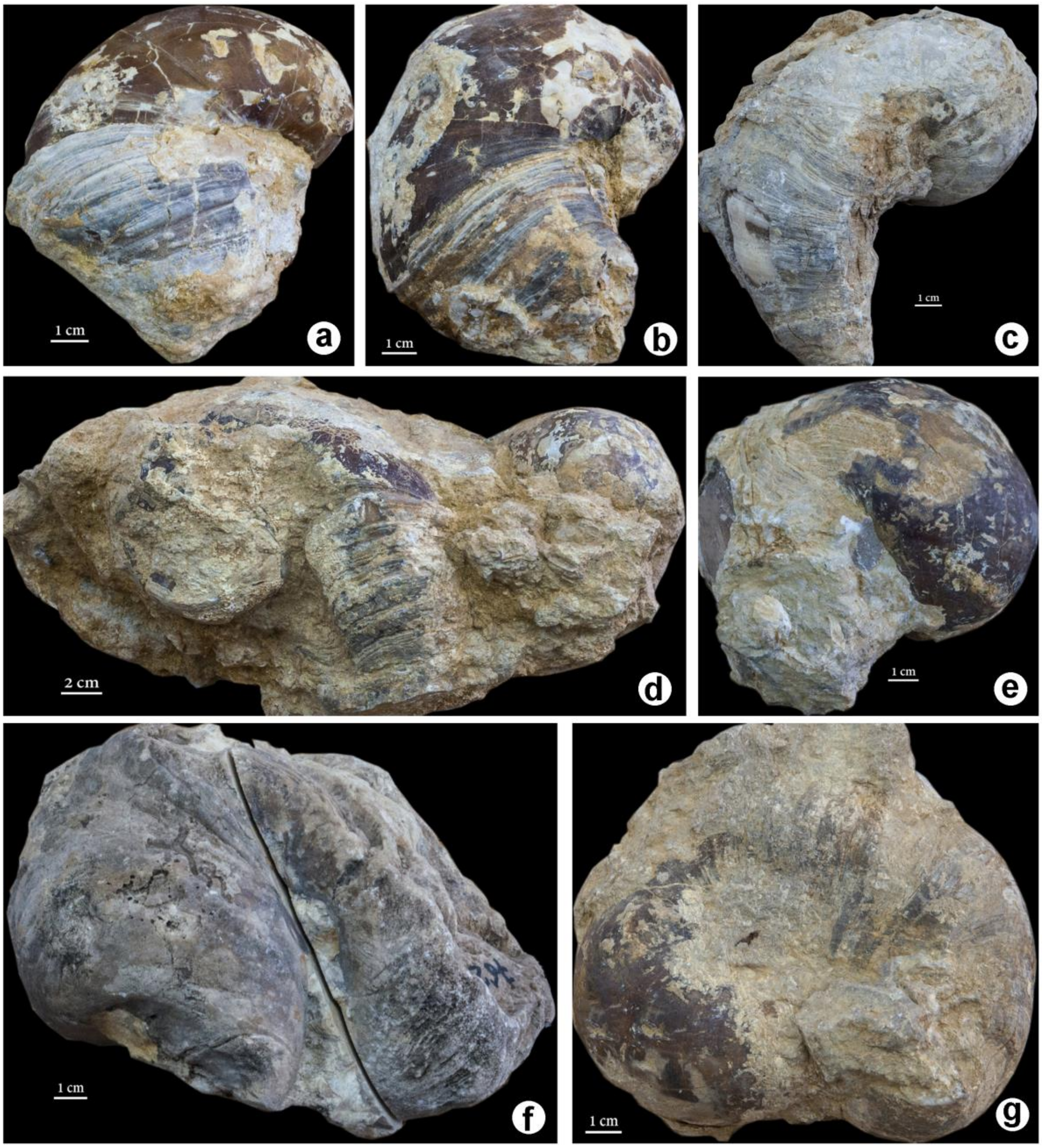

Fig. 5 Specimens of *Plagioptychus aguilloni* identified from Pietrele de Moară Brook: a-e) elevator morphotype of *Plagioptychus aguilloni* with a strong, curved umbo of the free valve and an elongated or low conical, attached valve; f-g) clinger morphotype of *Plagioptychus aguilloni* with a globose or grypheate left valve and gyropleuriform attached valve.

The microfossil associations being scarce generally contain fragments of foraminiferal-algal assemblages present in the stratigraphic succession both in the siliciclastic and carbonate deposits. However, within the hippuritid lithosome have been identified several levels of peyssonneliacean and sporolithacean encrusting red algae: *Polystrata alba* PFENDER (Fig. 6f), *Sporolithon* sp. (Fig. 6a-c), *Lithophyllum* sp., and also benthic foraminifera (Fig. 6d-e) as well as encrusting and agglutinated foraminifers (Fig. 6g). The foram-algal assemblages from the rudist-bearing limestone have been found in three types of microfacies: the bioclastic-extraclastic grainstone, bioclastic-extraclastic rudstone and bioclastic-extraclastic wakestone/packstone.

The carbonate sequence illustrates a normal shallow marine palaeoenvironment along a shelf margin, with low sedimentary rates and low to higher energy. In the siliciclastic deposits the matrix also contains fragments of red algae and benthic foraminifers besides fragments of rudists, gastropods and echinoid plates and radioles. These typically marine bioclasts mixed with pebbles originating from alluvial-fluvial fans suggest that the siliciclastic deposits within the succession represent submarine fan deltas accumulated at the shelf margin.

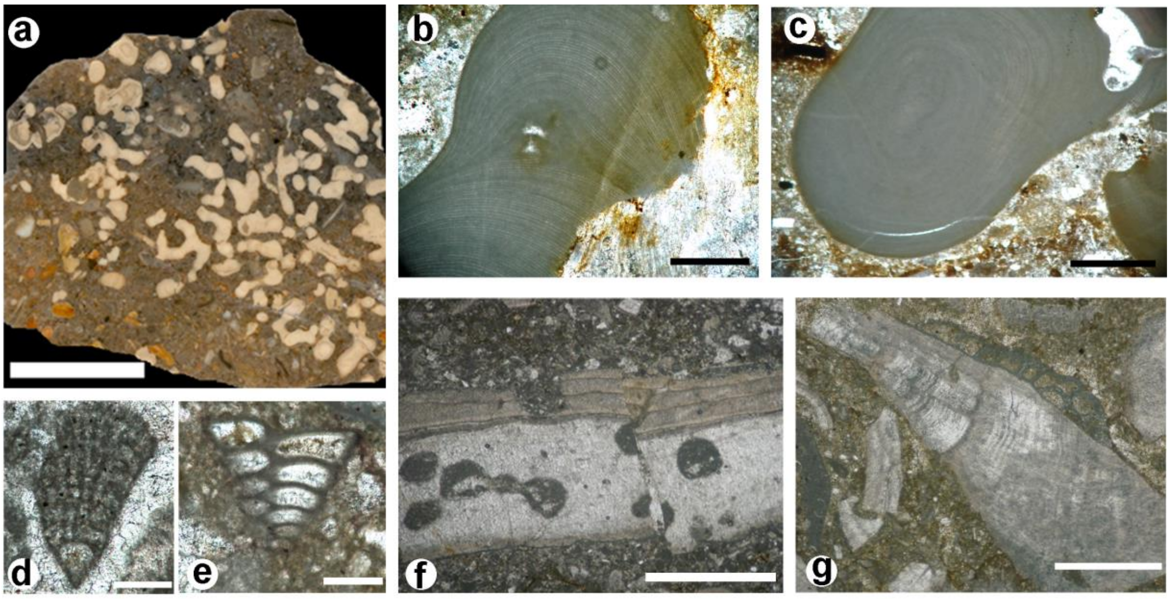

Fig. 6 a) Algal rhodoid with *Sporolithon* sp. (scale bar 1 cm); b-c) *Sporolithon* sp. (scale bar 0,5 mm); d) *Cuneolina* sp. (scale bar 0,25 mm); e) benthic foraminifer (scale bar 0,25 mm); f) *Polystrata alba* (PFENDER) encrusting fragment of hippuritid (scale bar 0,5 mm); g) encrusting and agglutinated foraminifers on hippuritid fragment (scale bar 0,5 mm).

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