QUANTITATIVE AND QUALITATIVE ANALYSIS OF FORAMINIFERA IN THE MIDDLE MIOCENE OF SALT DEPOSIT TETIMA (NORTH-EAST BOSNIA)

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Abstract

Based on samples taken from the exploratory borehole B-71 were carried out qualitative and quantitative micropaleontological research aimed at determining the stratigraphic levels overlying sediments, and the frequency and abundance of foraminifera in isolated areas. Research of foraminifera has been performed on 98 samples. Biostratigraphic analysis of overlying sediments of salt formation was made to the relevant Badenian and Sarmatian Zone. According to foraminifera it was done the detailed stratigraphic division and proved the Lower, Middle, Upper Badenian and Lower Sarmatian. Lower Badenian is divided into two zones: Ammonia viennensis and Nonion commune Zone (older part) and Globigerinoides trilobus and Orbulina suturalis Zone (younger part). Middle Badenian is represented by of Pappina parkeri Zone while the Upper Badenian is represented by Bolivina dilatata maxima Zone. The Lower Sarmatian is presented by two zones: Elphidium hauerinum Zone and younger Porosononion granosum Zone.

Introduction

During 2010 in the section of the investigative and exploitation borehole B-71 to the rock salt deposit Tetima were conducted qualitative and quantitative micropaleontological research of foraminifera. The goals of micropaleontological research of foraminifera were: determination of the association of foraminifera, defining biostratigraphical zones and determination of significant levels for directing of investigative and exploitation drilling. Based on the association of foraminifera from 98 samples were defined stratigraphic levels of drilled sediments (Lower, Middle and Upper Badenian and Lower Sarmatian; Fig. 1, 2) and defined quantitative representation of foraminifera in specific zones.

According to this research the decision was made to change the regime of drilling to a depth 478 m (beginning of core drilling).

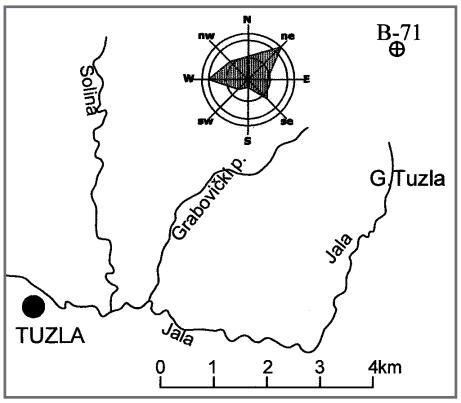
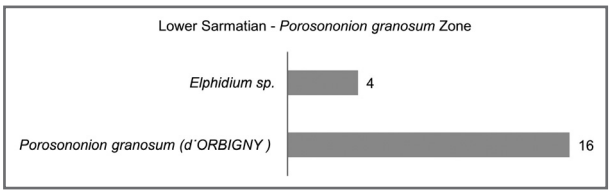


Fig. 1: The localization the borehole B-71 near Tuzla.

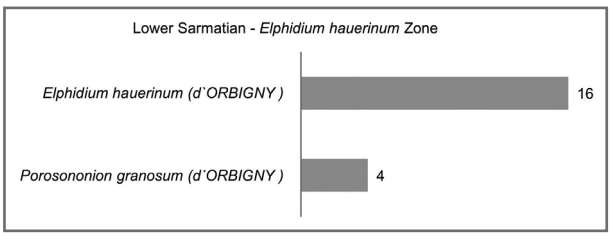
Material and methods

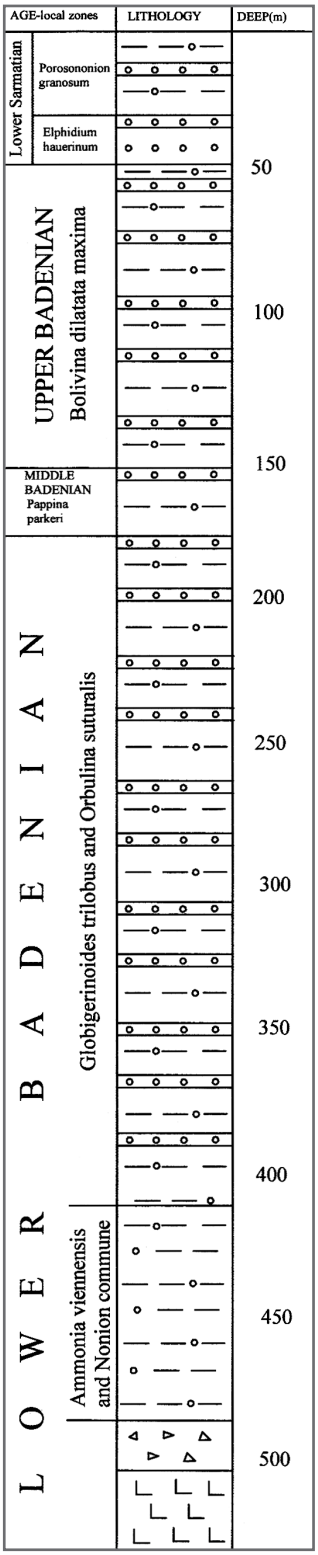
Methodology of research was designed from the field-work, laboratory examination and work in cabinet. The aim of this study was to define biostratigraphic characteristics of overlying sediments of rock salt deposit Tetima based on samples from borehole B-71. Research of foraminifera was performed on 98 samples taken from investigative and exploratory borehole B-71. Schedule of sampling is defined by initially taking samples every 10 meters and with approaching to salt formation every 5 or 2 meters. The initial phase of the study consisted of collecting samples from the overlying sediments of rocks salt formation with sieves from borehole B-71, their packing in special bags and labeling. Thereafter, the samples were leached on labo-

Tab. 1: Representation of foraminifera in the samples from 1 (0 m) to 3 (28 m).



Tab. 2: Representation of foraminifera in the sample (4) from 28 to 45 m.





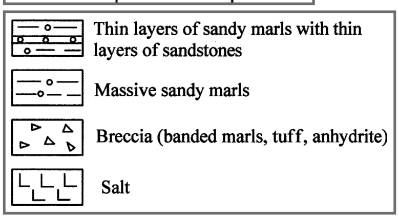


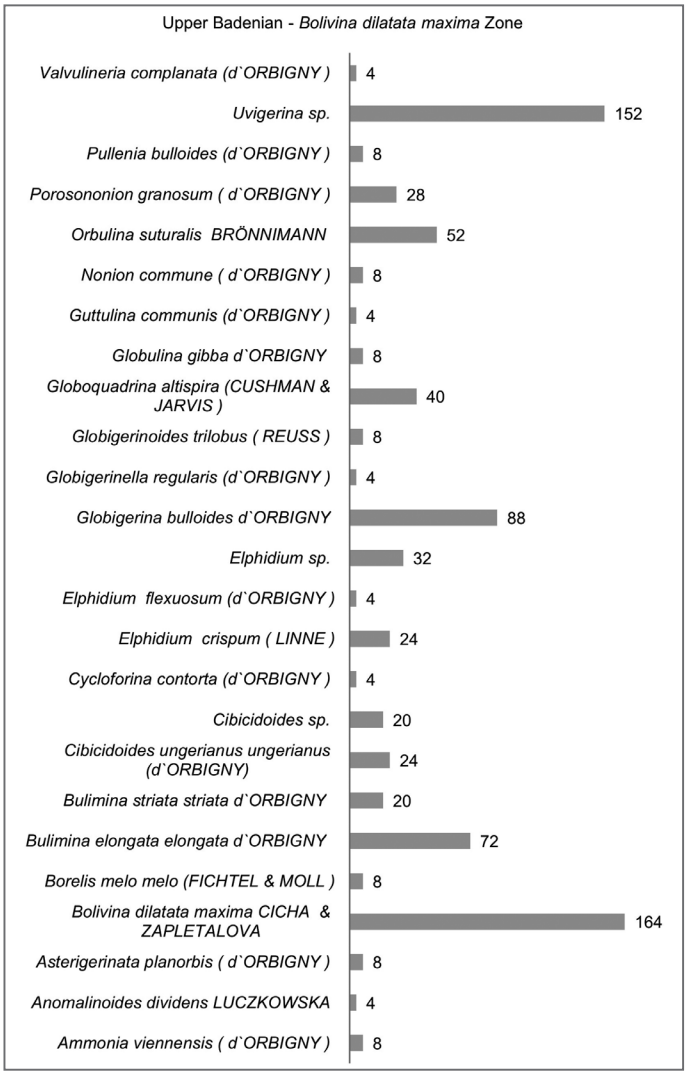
Fig. 2: The stratigraphic column of Badenian and Sarmatian sediments in the borehole B-71. Annotation: Until 478,0 m drilling was without coring.

ratory sieves diameter 0.80 mm and 0.15 mm in the laboratory for Mineralogy and Petrology at the Faculty of Mining, Geology and Civil Engineering in Tuzla. A fraction in amount of 6 grams with the 0.15 mm sieve was dried and analyzed using a Leica stereomicroscope EZ4D in increasing 40 times. Quantitative analysis was performed for each sample and shown by the diagram with a proportional share of individual fossils. According to the association of fossils in the individual samples were defined stratigraphic levels.

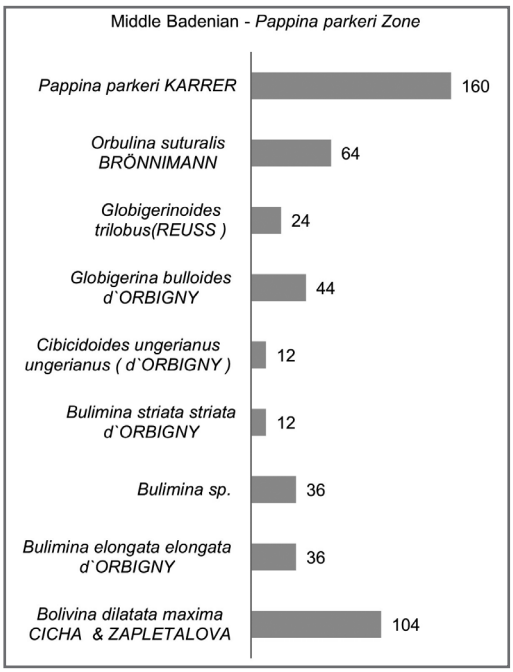
Results

Based on the data obtained by the individual analysis has been formed descriptive tables. In the tables are given lists of determined foraminifera with their quantitative participation in the sample. According to the characteristic microfossil communities have been defined stratigraphic levels which correspond to the individual sample. It was determinated a total of 45 species of foraminifera from 98 samples. The most of them belongs to Lower Badenian (*Globigerinoides trilobus* and *Orbulina suturalis* Zone, 25 species), higher Lower Badenian (*Ammonia viennensis* and *Nonion commune* Zone, 23 species), Middle Badenian (*Pappina parkeri* Zone,

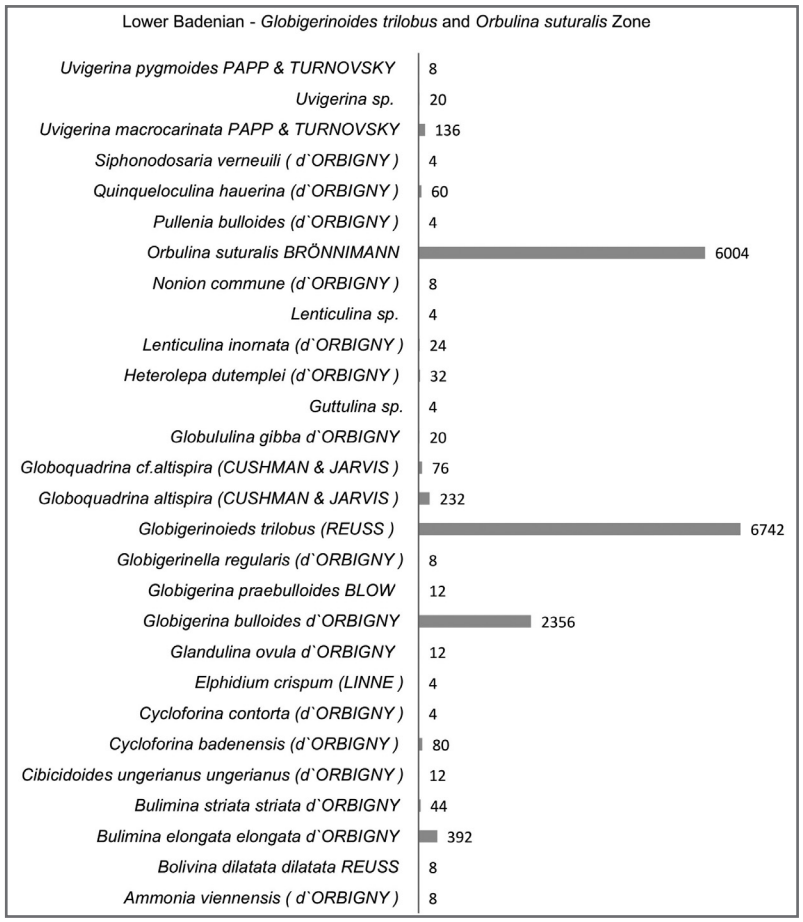
Tab. 3: Representation of foraminifera in the samples from 5 (50 m) to 15 (153 m).



Tab. 4: Representation of foraminifera in the samples from 16 (153 m) to 20 (177.5 m).



Tab. 5: Representation of foraminifera in the samples from 21 (177.5 m) to 67 (409 m).



Tab. 6: Representation of foraminifera in the samples from 68 (409 m) to 98 (483 m).

8 species), Upper Badenian (*Bolivina dilatata maxima* Zone, 22 species), Lower Sarmatian (*Elphidium hauerinum* Zone, 2 species), Lower Sarmatian (*Porosononion granosum* Zone, 2 species). Quantitatively, foraminifera are the most represented in the Lower Badenian, and at least for the Lower Sarmatian. Based on the representation of foraminifera (Table 1) in samples from 1 (0 m) to 2 (28 m) has been defined stratigraphic level of Lower Sarmatian – *Porosononion granosum* Zone. The interval from 28 to 45 m (samples 3 and 4) is represented by Lower Sarmatian – *Elphidium hauerinum* Zone (Table 2). In the interval from 45 to 153 m (samples from 5 to 15) has been proved Upper Badenian – *Bolivina dilatata maxima* Zone (Table 3). According to the distribution of foraminifera in samples from 16 (153 m) to 20 (177.5 m) has been defined stratigraphic level of Middle Badenian – *Pappina parkeri* Zone (Table 4). The highest number of microfossils was registered in samples that belong to the Lower Badenian (interval from 177.5 to 483 m). Within this stratigraphic level were defined two zones: *Ammonia viennensis* and *Nonion commune* (older zone) and *Globigerinoides trilobus* and *Orbulina suturalis* (younger zone). The last named zone (Table 5) has been determined in the samples from 21 (177.5 m) to 67 (409 m) and the first named in the samples from 68 (409 m) to 98 (483 m) – Table 6.

Discussion

Previous studies of the upper part of the salt deposit Tetima was focused on their stratigraphic analysis. Petrović (1979/80) defined the Karpatian with two zones and the Lower Badenian with *Globigerinoides trilobus* Zone in the upper part of the salt formation. In the section of the borehole B-77 Ćorić et al. (2007) determined the Lower, Middle and Upper Badenian and Lower Sarmatian with appropriate foraminiferal zones and nannoplankton zones NN5 and NN6. Lower Badenian *Ammonia viennensis* and *Nonion commune* Zone and the older part of *Globigerinoides trilobus* and *Orbulina suturalis* Zone correspond to nannoplankton zone NN5. Thanks to our research for the first time was performed quantitative analysis of foraminifera in the salt deposit Tetima. It was observed that the number of species of foraminifera decreases from the Lower Badenian to the Lower Sarmatian (Fig. 3).

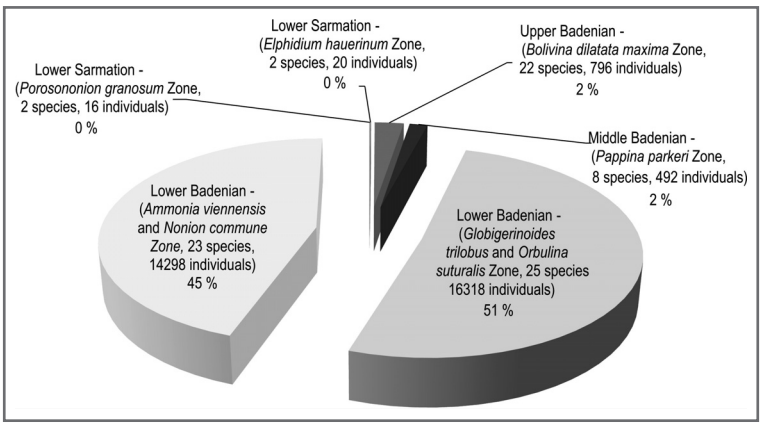


Fig. 3: Number of determinated species and representation of foraminifera by stratigraphic levels.

Precisely defined stratigraphic zones with quantitative data on the participation of individual foraminifera enable reliable directing boreholes in the research and preparation of the exploitation of salt on the Tetima deposit.

Conclusions

The characteristic microfossil communities in the section proved Lower, Middle and Upper Badenian and Lower Sarmatian stratigraphic levels. The Lower Badenian is divided into two zones: *Ammonia viennensis* and *Nonion commune* (older one) and *Globigerinoides trilobus* and *Orbulina suturalis* (younger one). The Middle Badenian is represented by *Pappina parkeri* Zone while the Upper Badenian is represented by *Bolivina dilatata maxima* Zone. In the Lower Sarmatian are presented two zones: *Elphidium hauerinum* Zone on the basis and *Porosononion granosum* Zone in the top. Individual representation of foraminifera varies considerably according to zones and by individual samples. Generally, it can be said that the number of individual foraminifera decreases from the Lower Badenian to Lower Sarmatian. The largest number of species and individuals of foraminifera is represented in Lower Badenian massive marls that are positioned in immediate overlying strata of the salt formation.

References

Ćorić, S. – Vrabac, S. – Ferhatbegović, Z. – Đulović, I. (2007): Biostratigraphy of Middle Miocene Sediments from the Tuzla Basin (North-eastern Bosnia) Based on Foraminifera and Calcareous Nannoplankton. – Neogene of Central and South-Eastern Europe, 2, International Workshop, Joannea – Geologie und Paläontologie, 9, 21–23. Graz.

Petrović, M. (1979/80): Biostratigrafski značaj srednjemiocenskih foraminifera iz bušotina Tuzlanskog bazena. – Geol. anali Balk. pol., 43/44: 155–203. Beograd.