New data on palaeoecology of Stanyantsi Basin

Нови данни за палеоекологията на Станянския басейн

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Inroduction

In the frames of the Bulgarian-Slovakian bilateral project “Model distribution of diatoms and ostracods in Neogene lake systems in Slovakia and Bulgaria” Stanyantsi-Mozgosh Neogene basin is investigated. It is situated at about 60 km NNW of Sofia. Basin is 3 km wide and 10 km long, NW-SE oriented intramontane basin, continuing to the northwest in Serbian territory (Mozgosh). The bedrock is of Mesozoic carbonate rocks (limestones of Middle Triassic age). Basin fill is of Neogene sediments, represented by proluvial, alluvial, palustrine and lacustrine deposits, referred to four formal lithostratigraphic units (Vatsev, 1999). The present study is focused on the coal-bearing Belozem shale Formation, which crops out in the Stanyantsi open coal mine. It is built of cyclic alternation of coal, clay, lacustrine chalk, sandy clay, fine sand in typical palustrine and lacustrine facies. The formation thickness is between 30 and 60 m, with 15–30 m thick coal bed. In Mozgosh part sediments similar to these of the Belozem shale Formation are traced, but the coal layer is getting thinner – up to 17 m (Petkovich, 1977). Ostracod fauna is determined and described for the first time in the coal-bearing deposits.

During the last decade a couple of palaeoclimate investigations are conducted in the Stanyantsi coal mine area, based on palynomorphs, molluscs, and vertebrate fauna (Utescher et al., 2009; Boehme et al., 2013). These results show that the amplitudes of climate change were moderate, and that no dramatic changes occurred over the time span concerned. An oligo- to mesotrophic slightly alkaline lake became repeatedly established with a diverse mollusc fauna and dense hydrophytic vegetation with characean meadows. This trend is paralleled by the mollusc fauna, which yields several terrestrial taxa. Phases of low water level led to a fragmentation of the lake, and open areas became settled even by some xerophilous gastropods (Utescher et al., 2009). The vertebrate fauna contains swamp and moist forest dwellers (e.g. tapir, pigs, desman, divers and abundant deers and castorids), but also elements commonly attributed to dry and open environments (e.g. thick-shelled ostrich, Chilotherium) (Boehme et al., 2013).

Results and discussion

Our last investigations from 2015 are focused on diatoms, ostracods and molluscs. Samples are collected from the westernmost part of the coal mine and from the upper part of the last coal layer and sediments above it. The studied section comprises >10 m coal bed, intercalated by 0.2–0.4 m thick layers of dark grayish clay or lacustrine chalk, 1 m charcoal clay, 0.30 m lacustrine chalk, 5 m gray clay (alternation of darker gray and lighter gray clay, enriched in molluscs in the upper 60 cm).

Lacustrine chalk and clay layers, intercalating and covering the coal are submitted to Differential thermal analysis (DTA) and X-ray powder diffraction analysis (XRD). Clayey layers, hosting the ostracods, are composed mainly of smectite type clay minerals (montmorillonite), less kaolinite, illite 2M1 type and traces of chlorite. Quartz and feldspars are also present. Aragonite which built molluscs shells is registered. Lacustrine chalk contains about 86% Mg-rich calcite, the rest are illite, aragonite, rodochrosite and low-temperature organic matter.

Twenty two ostracod species of four families have been identified in the clay deposits of the coal mine Stanyantsi. Very abundant to mass occurrence of the disarticulated valves were present in the wash residuum but absolute majority of the valves crushed.

Cyprididae are the most abundant family on species (11 taxa) and the individuals comprising the genera *Cypris, Eucypris, Heterocypris, Scottia, Cypridopsis, Virgatocypris* and *Potamocypris*. Candonidae are represented by eight species of *Candona, Pseudocandona, Fabaeformiscandona, Candonopsis* and *Cyclocypris. Vestalenula, Darwinula stevensoni* (both family Darwinulidae) and *Ilyocypris* (family Ilyocyprididae)

rarely occurred in the assemblages. At this state of knowledge of the European Miocene and Quaternary ostracods it seems that the assemblage is composed of several new species, mainly of the family *Cyprididae*.

Overall, the assemblage of the Holarctic and cosmopolitan genera document the shallow freshwater limnic environment influenced by slowly flowing river with oxbows (*Vestalenula, Ilyocypris*). A presence of 3 species of *Heterocypris* indicates that the lake water was enriched in H_2S.

The identified mollusc fauna in the lowermost sediments contain *Radix* cf. *peregra* (Müller, 1774), *Gyraulus* sp. (aff. *laevis* Alder, 1838), *Gyraulus* sp. and *Planorbarius* sp. *Radix* cf. *peregra* dominates with abundant representatives. It characterizes slow running waters or shallow small ponds, and swamps. Among this assemblage *Radix* cf. *peregra* (Müller, 1774) is dominant again, and subdominant is *Gyraulus (Armiger) crista* (Linné, 1758). *Planorbis planorbis* (Linné, 1758), *Oxyloma* sp. (aff. *sursii* Esmark, Hoyer, 1886), *Vallonia* cf. *pulchella* (Müller, 1774), *Vertigo* sp. (aff. *pusilla* Müller, 1774), operculums of *Bithynia* sp. are identified. Terrestrial representatives *Oxyloma*, *Vallonia*, and *Vertigo* are determined, but they prefer high humidity. The uppermost sample contains *Anisus* cf. *vortex* (Linné, 1758), *Segmentina nitida* (Müller, 1774), *Bathyomphallus contortus* (Linné, 1758), *Lymnaea* sp. (aff. *alpestris* Müller, 1774), *Planorbis planorbis* (Linné, 1758), *Radix* cf. *peregra* (Müller, 1774), *Vertigo* sp. (aff. *pusilla* Müller, 1774), *Vertigo* sp., and operculums of *Bithynia* sp. *Segmentina nitida* is the dominant and prefers wetlands, ponds and lakes enriched in organic matter. Other taxa are characteristic for vegetated swells and swamps. All identified molluscs prefer alkaline environment.

Conclusion

The analyses of the ostracod and mollusc fauna prove the palustrine and lacustrine environment with slow, but sustainable fresh water inflow during the coal formation. The abundance of ostracods, molluscs, and Charophytes along with the presence of magnesium-rich calcite and rodochrosite suppose a karst origin of this inflow. These results explained the absence of fossil diatoms in the sediments.

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