

Lower Miocene freshwater deposits in the area of Kašina, Medvednica Mt., Croatia

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INTRODUCTION

Miocene clastic deposits crop out in a 3 km long succession along the road from Kašina to Laz Bistrički (Medvednica Mt.) (Basch, 1983a, 1983b). Our research was focused towards the three Miocene outcrops representing different types of taphofacies (Figure 1 and 2).

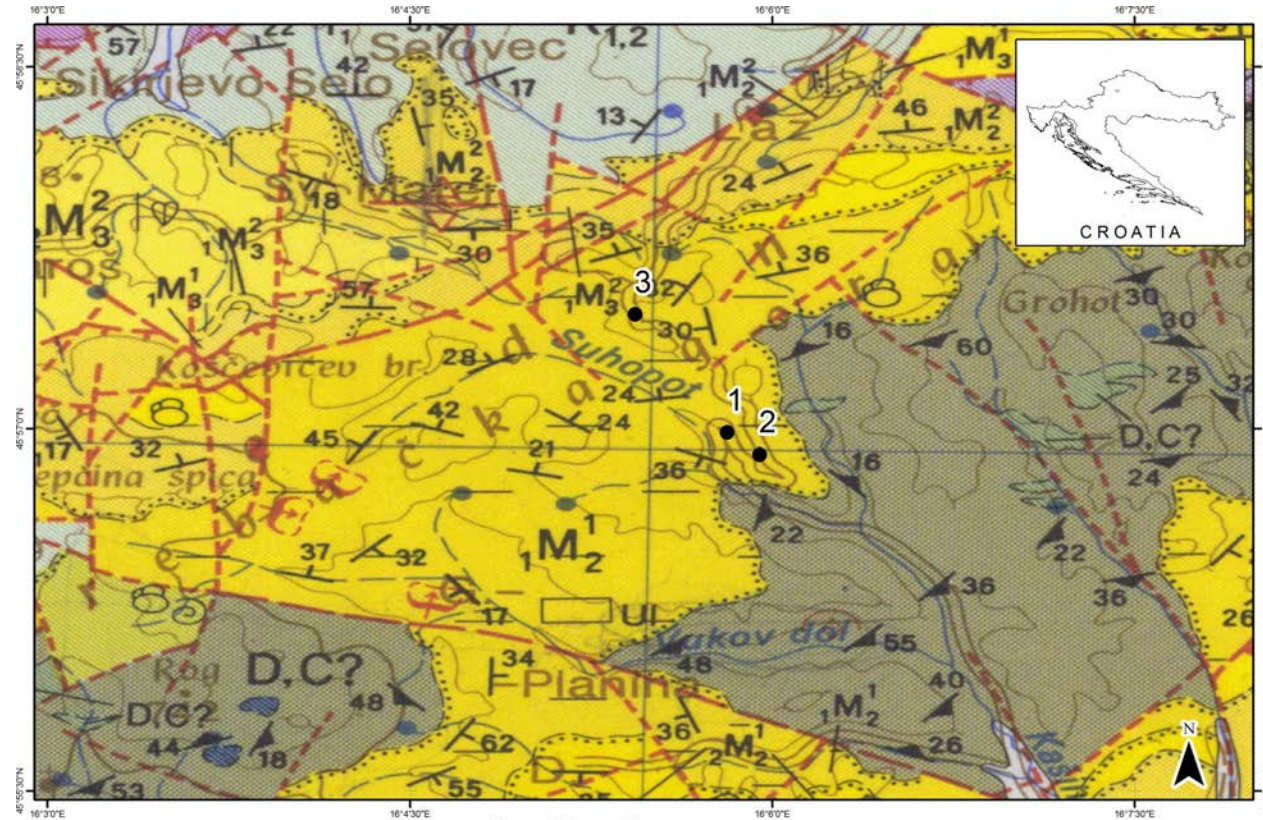


Figure 1: Position of Lower Miocene outcrops (1, 2, 3) along the road from Kašina to Laz Bistrički on Basic Geological Map (in World Geodetic System 1984, after Basch 1983a, modified)

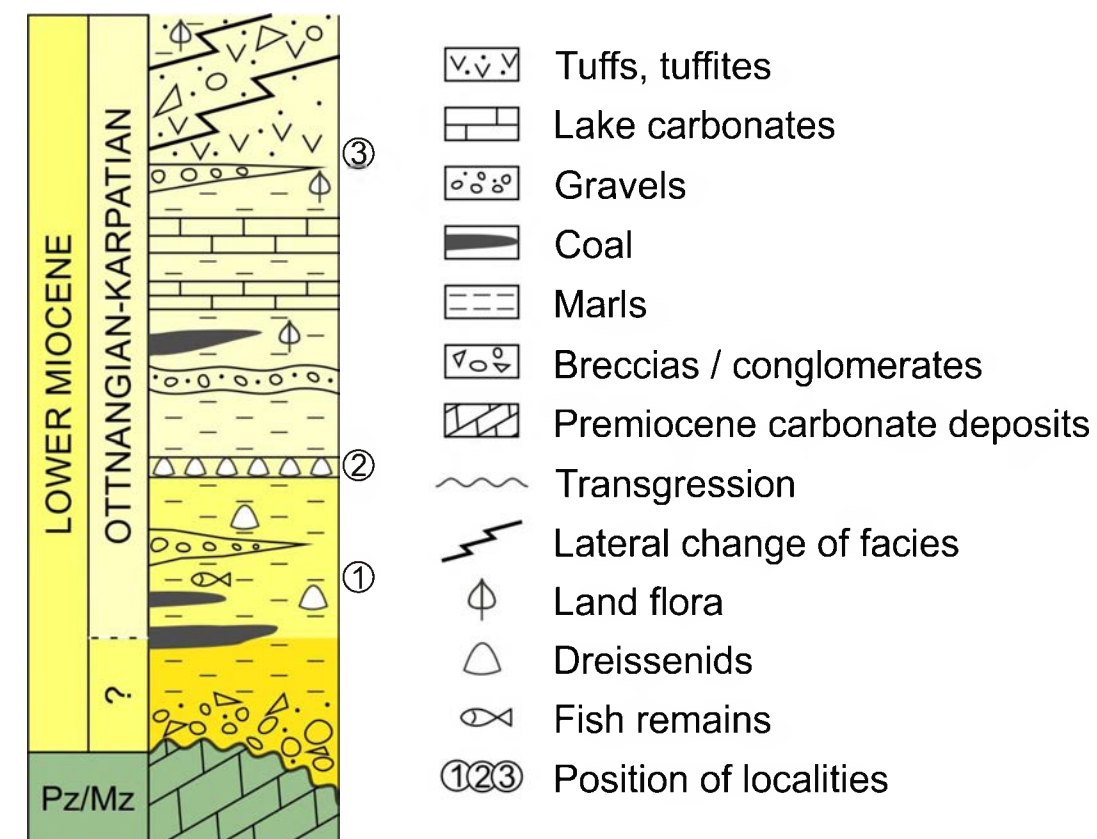


Figure 2: Schematic geological column of the investigated area (after Vrsaljko et al., 2015, modified)

LOCALITY 1

Base of the succession (Locality 1; Figures 1, 2, 3 and 4) is represented with bioturbated grey marls with Mollusca (bivalve and gastropod shell fragments), fish fragments (bones and teeth), ostracods and land flora remains.



Figure 3: Locality 1, base of the succession

LOCALITY 2

Dreissenid coquina horizon (Locality 2) is 30 m wide, composed of 10 to 30 cm thick beds (Figure 1, 2, and 5). Upper bed surfaces are rough and completely covered with dreissenid remains (Figure 6). Present dreissenid shells are small, thin and elongated, with maximum size of about 15 mm (Figure 7). Their poor preservation hinders their determination. Kochansky-Devidé & Sliškoivić (1978) described several dreissenid taxa from this area, including: *Congeria socialis* KOCHANSKY-DEVIDÉ & SLIŠKOVIĆ, *C. venusta* KOCHANSKY and others. Similar fauna at the neighbouring locality Planina contains dreissenids: *Congeria venusta* KOCHANSKY, *Congeria cvitanovici* BRUSINA, *Congeria cvitanovici* BRUSINA - *Congeria dalmatica* (BRUSINA) (transitional forms), *Congeria scaphula* ANDRUSOV - *Congeria cvitanovici* BRUSINA (transitional forms), imprints of a bivalve *Pisidium* sp. and gastropod *Planorbis* sp., Fish and land flora remnants (Kochansky-Devidé & Sliškoivić, 1978; Avanić et al., 1995).



Figure 5: Locality 2, Dreissenid coquina horizon



Figure 6: Surface covered with dreissenid remains



Figure 4: Marl with fragments of fossil Mollusca, fish and flora

LOCALITY 3

The third locality, composed of 3 lithological units, is exposed near the mountain saddle (Figure 1, 2 and 8). Lower unit, more than 2 m thick, is composed of greyish-yellow marl with rich fossil megafauna. Middle unit is a 2-3 cm thick bentonite layer of pyroclastic origin (Figure 9). Its coarse-grained lower part is strongly weathered and dark brown, and its homogenous and fine-grained upper part is dark green in colour. Alteration product within the lower part of the layer is heulandite (zeolite), and within the upper part it is smectite. Based on discrimination diagrams, the investigated material is classified as trachyte (Pearce, 1996). Upper unit, more than 2 m thick, is again composed of marl with fossil flora and small Mollusca. Land megafauna was collected from the grey marlstone (from lower and upper unit) near the mountain saddle. Plant megafossils are poorly preserved, fragmented mostly with unclear leaf architecture. Leaf imprints were identified according to their morphological features (Wolfe, 1971; Wilf, 1997). *Myrica lignitum*, *Cinnamomum* leaves (*Daphnogene polymorpha* and *Daphnogene polymorpha* forma *bilinica* (shape of sun-grown loaf)) and lauroid type leaves prevail (Figure 10). Various small leguminous leaves are also common at the locality. Secondary venation of angiosperm leaves is generally brochidodromous or eucamptodromous. Coniferales are represented by *Pinus tadeaformis*.

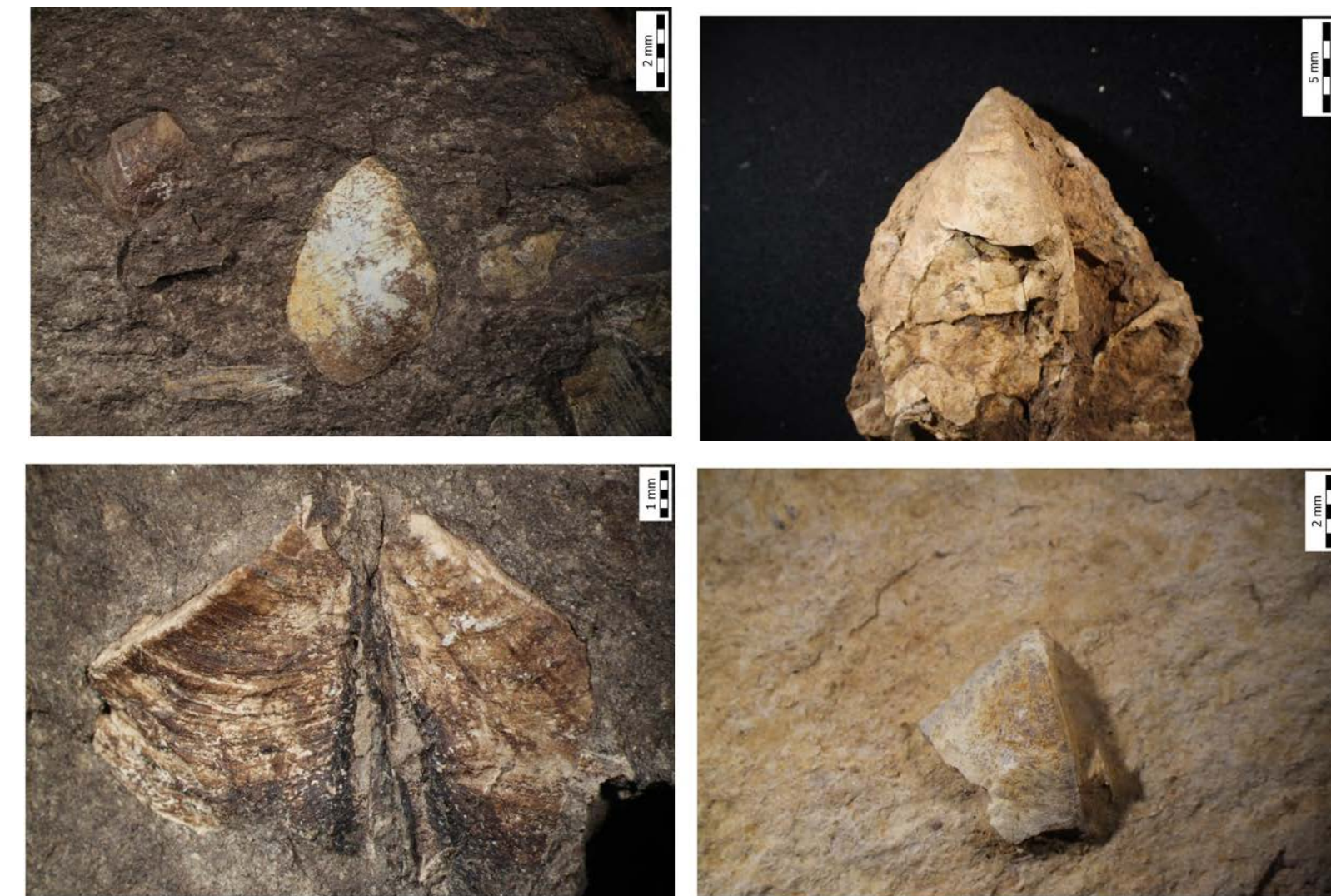


Figure 7: Part of the collected dreissenid fauna



Figure 8: Locality 3



Figure 9: Layer of pyroclastic origin



Figure 10: Part of the collected land megafauna: *Daphnogene polymorpha* (A. BRAUNN) ETT., *Pinus tadeaformis* (UNGER) HEER., *Quercus lonchitis* UNGER, "*Laurus*" *primigenia* UNGER sensu WEYLAND

DISCUSSION

According to Kochansky-Devidé & Sliškoivić (1978) variability and similarity of dreissenid species in Croatia and neighbouring areas indicate the possibility of the temporary lake interconnections. The same authors propose the stratigraphic range of the determined dreissenid taxa from the upper Ottnangian to the Lower Badenian, and Lower Miocene (Otnangian, Karpatian) age of the fresh-water lakes in the wider area (Kochansky-Devidé & Sliškoivić, 1978). This is in accordance with Lower Miocene age of the determined dreissenids proposed by Harzhauser & Mandić (2010), who describe the Lower Miocene as the period of '*Mytilopsis*' hegemony, and exclude the possibility of contemporaneous existence of other dreissenid taxa.

Lower Miocene lake shores were overgrown with vegetation. High percentage of the land plants with entire leaf margins are typical for hygrophite subtropical forests (Wolfe, 1971), and palaeotropical elements generally dominate within the collected assemblage. Collected specimens indicate the mean annual temperatures mainly above 16°C, as suggested by Ivanov et al. (2011).

Based on the presently identified specimens, newly described site can be correlated with, and compared to the neighbouring localities Planina Gornja and Planina Donja localities (Jungwirth & Đerek, 2000). Absolute age determination based upon the minerals from the pyroclastic layer is still in progress, as well as palaeontological research.

CONCLUSION

Initial palaeontological analyses of the road section Kašina - Laz Bistrički indicate the existence of fluvial, lacustrine and marginal shore habitats in the Lower Miocene (Otnangian, Karpatian) of this area. Dreissenid coquina beds were formed by molluscan shell accumulation in lacustrine littoral areas. Fossil megafauna assemblage generally indicates tropical - subtropical dry climate, but with significant amount of hygrophite coastal vegetation. Lower Miocene deposits in the research area can be well compared with the neighbouring Lower Miocene locality Planina on Medvednica Mt., and similar vegetation pattern is characteristic for the Lower Miocene of the wider area in South-Eastern Europe.

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