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Exposing mammoths: From loess research discovery to public palaeontological park

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ABSTRACT

This paper is dedicated to the palaeontological and geoheritage potential and conservation values of recently discovered mammoth fossils in the Drmno open-cast mine area. These palaeontological resources provide an excellent basis for the establishment of the first ever palaeontological park in Serbia. In addition, the paper also proposes possible interpretation methods and to determine the current state and tourism potential of the Drmno mammoth fossils, by using the M-GAM model for geosite assessment and comparing this site with two similar world famous sites, the Mammoth Site of Hot Springs and the La Brea Tar Pits in the USA. Results of the assessment indicate that the fossils from the Drmno open mine have similar scientific and educational values as the fossils from two other analysed sites, whereas scenic and tourist values are much lower in comparison with those sites. This means that the Drmno site possesses great potential and resources which should be used and managed in a better way. Hopefully, the newly constructed palaeontological park with all of its supporting infrastructure and newly employed people will eliminate the currently existing gap between the Drmno fossil site and other similar world famous fossil sites.

1. Introduction

The accessible and scientifically valuable palaeontological resources of the world are fast disappearing due to continuously and rapidly growing urban development, infrastructure construction, industrialization, neglect, vandalism, and fossil harvesting (by professionals, amateurs and commercial collectors; see Burek and Prosser, 2008). Protecting areas of significant palaeontological treasures is essential, from small local sites to national or international areas, if we are to preserve, research and understand the history of life on Earth, and by some inferences palaeoclimates, and also to provide materials for current and future scientific research. In addition, these sites have values other than those associated with scientific research, including public and K-16 education, recreation, tourism, literature, and even the visual arts and cooking (Lipps, 2009). This raises the status of environmental protection and conservation measures as significant issues for modern society. The current development of environmental protection approaches has been characterised by several phases. The first one was related to the detection of human induced pollution or some other types of environmental destruction. During the next period, the focus was on biodiversity, often leading to the neglect of geodiversity protection. Finally, the current phase promotes the holistic concept of sustainable development. All of these environmental protection approaches are mostly anthropocentric and without a significant long-term perspective. This can lead to a paradoxical situation where mining, as one of the most destructive of human activities for the natural environment, can provide essential information about the Earth's history but threaten the natural environment and the very resources it extracts. The understanding of long-term geological environmental dynamics, with such opportunities provided by discoveries at many mining sites, can provide ancient analogues of climate changes respecting the heliocentric approach of Milanković's theory (Petrović and Marković, 2010, 2012). Following this concept, many mining sites are potential geoheritage

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and palaeontological localities deserving of some protection both during and after resource extraction.

A good example of such a locality is the second largest Serbian lignite open mine area of Drmno, near Kostolac in northeastern Serbia (Fig. 1A); this is where several important archaeological, palaeontological and geological sites are located. This place came into the focus of the word's scientific community due to the spectacular discoveries of the Kostolac steppe mammoth skeleton from the Middle Pleistocene fluvial deposits, uncovered in 2009 (Lister et al., 2012); the revelation of a rich palaeontological layer with mammoth fossils from the latest Middle Pleistocene loess-palaeosol succession, found at the Nosak site (Fig. 1B) in 2012 (Marković et al., 2014) again focussed attention on the place.

Fortunately, due to the lengthy sustainable cooperation and mutual understanding between the management of the Drmno thermal power plant, which manages the site, and the team of archaeologists of the adjacent Roman site of Viminacium, these recently discovered fossils were kept from certain destruction and relocated to a new nearby site where they awaited the construction of the first ever palaeontological park in Serbia. This park now displays all of the discovered fossils and it is located near the area where the first fossils were found in 2009. Although not formally designated a geopark (see Andrasanu, 2010) the park shares many of their characteristics and aspirations. Both the park's host community and its visitors are seemingly interested in this type of multi-interest attraction; the former typically endorse the park's development because they benefit from the income, attention and educational opportunities it generates. Similar developments elsewhere attest to the likely success of such venture if they are well managed and appropriately funded. Sites with somewhat similar geology if not archaeology with visitor centres can be found in the USA (most notably the Yukon Beringia Interpretive Center opened in 1997 in Alaska and the Loess Hills Archaeological and Interpretive Center in Iowa) and China (especially the Louchuan Geopark – see Dong et al., 2014).

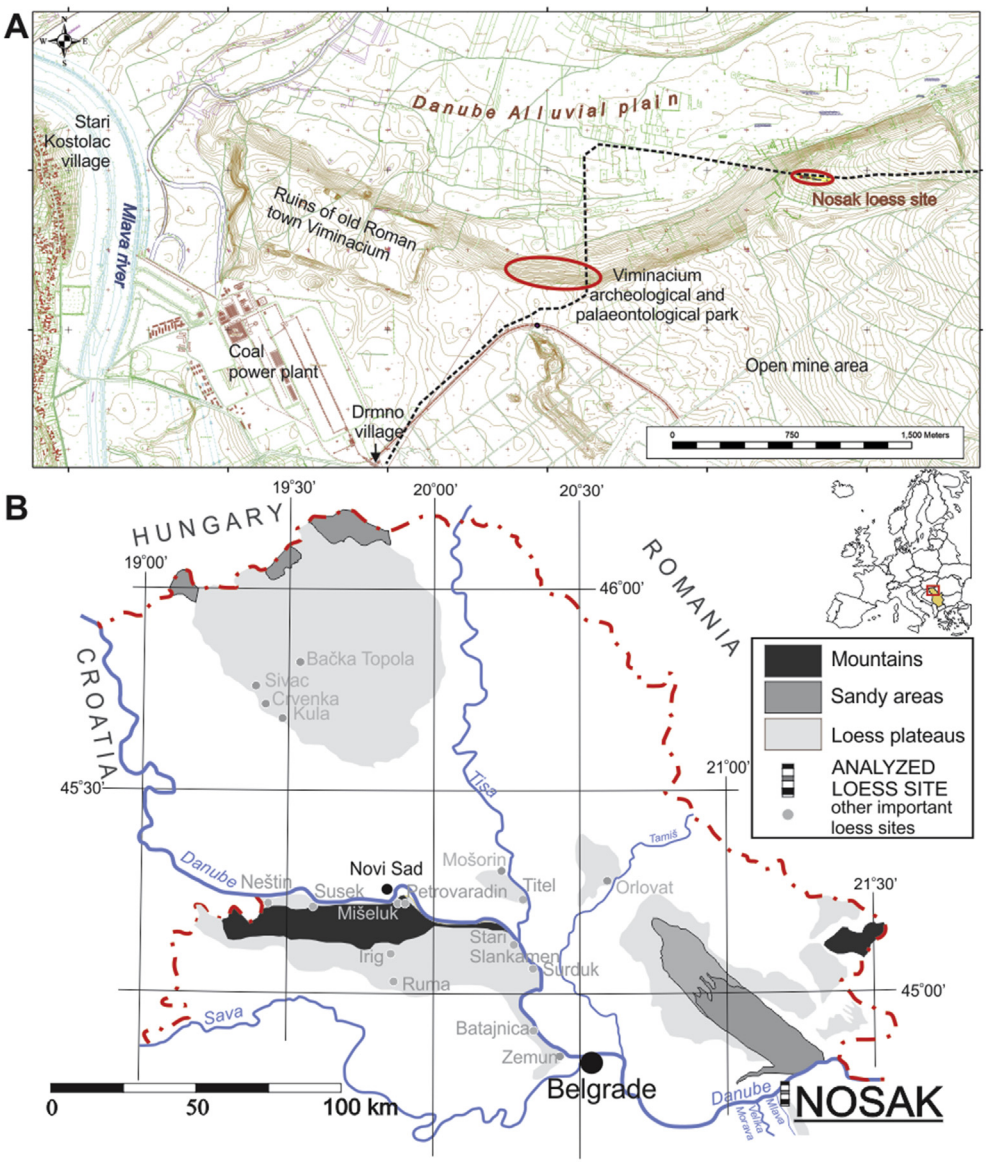

Fig. 1. (A) Topographic map showing the location of the Viminacium palaeontological and archaeological park and the Nosak loess-palaeosol sequence at the surrounding open mine area (Map by Marković et al., 2014). (B) Map of the loess distribution in the Vojvodina and adjacent regions showing the geographical position of the investigated section and other main loess sites (Map by Marković et al., 2014).

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