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Eucladoceros montenegrensis n. sp. and other Cervidae from the Lower Pleistocene of Trlica (Montenegro)

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ABSTRACT

The fossil remains of cervids from Trlica in Montenegro are described and assigned to the elk or moose *Alces* cf. *carnutorum*, the roe deer ?*Capreolus* sp., the red deer *Cervus elaphus*, and *Eucladoceros*. The new species *Eucladoceros montenegrensis* n. sp. is named on the basis of 169 bones and teeth. The Early and early Middle Pleistocene was a time with a great diversity in giant deer. Their features are discussed, where possible described by morphometrics, and compared to the material from Trlica. On this basis the new species *Eucladoceros montenegrensis* is named. At present, the oldest well dated record of a red deer (*Cervus elaphus*) in Europe is from 936 to 990 ka. Various ages have been proposed for Trlica, both younger and older than the Jaramillo Subchron. The age of the locality is discussed.

1. Introduction

Trlica is a karst cavern, probably remnant of a cave, which opens at 950 m above sea level in Triassic limestones, near the city of Pljevlja in northern Montenegro (Fig. 1-1, 1-2). It is named after Trlica Hill, which surmounts a Cenozoic coal basin and the valley of the Ćehotina River. Paleontological excavations were performed in three short campaigns (1988, 1990, and 2001). Several layers are distinguished in the cave profile (layers I–V; Dimitrijević, 1990, 1991) (Fig. 1-3), showing that the conditions were changing during deposition, although probably not during a long time span.

Abundant remains of mammals were found embedded in clastic deposits, which fill the karst cavern (Fig. 1-4). There are carnivore tooth marks on some of the bones, probably made by hyena, and many coprolites. No complete skeletons or articulated parts of skeletons have been found. The bones are mostly fragmentary, and some show slight wear probably due to water transportation. The bones and teeth were probably scattered in the vicinity of the locality and were brought into the cavern after short transport by water and/or gravity.

The stratigraphic age has initially been correlated to the later part of the Early Pleistocene on the basis of the thirteen taxa identified: *Dolomys dalmatinus* Kormos, *Hystrix* sp., *Canis* sp, *Ursus* sp., *Pachycrocuta brevirostris* (Aymard), Elephantidae indet., *Equus stenonis* Cochi, *Dicerorhinus etruscus* Falconer, Megacerini indet., ? *Cervus* sp., *Bison schoetensacki* Freudenberg, *Megalovis* sp., and Caprinae indet. (Dimitrijević, 1990). The revision of the rhinocerotid remains and the identification of *Stephanorhinus* cf. *hundsheimensis* (Codrea and Dimitrijević, 1997) more precisely defined the stratigraphic age and allowed correlation of the fauna with biozones MNQ 20–22 (Guérin, 1980) and MmQ3 (late Early Pleistocene) (Agusti et al. 1987). In the study of the Pleistocene horses from the central Balkan, a revision of the equids from Trlica was undertaken and *Equus* cf. *major* Boule was added to the faunal list of Trlica (Forsten and Dimitrijević, 2003).

The study of carnivores and bovids showed diversity of large mammals from the site of Trlica (Crégut-Bonnoure and Dimitrijević, 2006). The following species of carnivores were identified: *Canis etruscus* Major, *Canis falconeri* Major, *Vulpes* sp., *Ursus etruscus* Cuvier, Mustelidae gen. et sp. indet., *Homotherium* cf. *crenatidens* Fabrini, *Panthera* cf. *gombaszoegensis* Kretzoi, *Lynx* sp., and *Pachycrocuta brevirostris* (Aymard). Four distinct species of bovids were identified: *Megalovis balcanicus* Crégut-Bonnoure and Dimitrijević, *Soergelia intermedia* Crégut-Bonnoure and Dimitrijević, cf. Rupicaprini, and *Bison* (*Eobison*) sp. nov. (Crégut-Bonnoure and Dimitrijević, 2006). The two new species of Ovibovini were named on the basis of material from Trlica, and possible occurrence of a new bison species was suggested. On the base of the evolutionary level of the Ovibovini species, *Megalovis balcanicus*, which is

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interpreted as more evolved than *M. latifrons*, and *Soergelia intermedia*, which is intermediate between the Early and the Middle Pleistocene representatives, as well as the discovery of the small-sized *Bison*, it is suggested that the fauna from Trlica dates to the Early Pleistocene (Crégut-Bonnoure and Dimitrijević, 2006).

Samples were analyzed from six coprolites from Trlica (Argant and Dimitrijević, 2007). Two coprolites were completely sterile, two others contained a single grain each, one contained three pollen grains and a single coprolite showed a relatively rich content, with a total of 56 pollen grains. Pollen analysis enabled a tentative reconstruction of the environment. Fresh and temperate humid climatic conditions are indicated, as well as the co-existence of several biotype which formed a mosaic landscape in the vicinity of the cave. Bellow the cave, at the bottom of the valley, the humid bank of a stream or a pond was mostly occupied by alder, at the foot of which a moss (*Sphagnum*) carpet had developed. Mesothermophilous trees (oak, hornbeam, hazelnut), as well as shrubs (juniper, ground box and broom) were growing on the slopes, while at higher levels there were fir-beech forests. In the area of Trlica, open spaces were interspersed (Argant and Dimitrijević, 2007).

A more detailed study of rodents was presented by Bogićević and Nenadić (2008). The following species were identified: *Dinaromys dalmatinus* Kretzoi, *Allophaiomys* cf. *pliocaenicus* Kormos, *Mimomys* ex. gr. *reidi-pussilus* (Hinton), *Glis sackdilligensis* Heller, and *Hystrix* cf. *refosa* Gervais. The stratigraphic age on the rodent fauna is related to the "lower instead of the upper part of the Early Pleistocene", i.e. *Mimomys savini/pussilus* zone (after Fejfar and Heinrich, 1990), i.e. MmQ2 biozone, of the biozonation proposed by Agustí et al. (1987). However, the authors expressed their opinions on the age with the utmost reservation, regarding the low number of the finds and the level of taxonomic identification (Bogićević and Nenadić, 2008).

In 2009, a sandstone flake, supposedly a Paleolithic artifact, was found in scree near the site. In 2010, new excavations started (Derevjanko et al., 2012). These excavations were organized without consulting the existing excavated material and documentation. Therefore, layers are numerated in the new system, and it is not possible to correlate them with layers designated in the initial previous campaigns.

There are many remains of deer, but these have not yet been described in detail. The locality may have the oldest or one of the oldest records of red deer (*Cervus elaphus*) in Europe and one of the latest of small elk (*Alces carnutorum*). Its giant deer is a new species. Therefore it is the aim of this paper to describe the cervids from Trlica, compare them to other similar deer, and discuss the age of the locality on the basis of the published faunal lists and on the deer in particular.

2. Material and methods

The fossils from Trlica are kept at the Department of Palaeontology, Faculty of mining and geology in Belgrade (DPFMGB). These fossils have been compared to other fossils of deer, above all in the figures. Where this is the case, either the institute where these fossils were studied or where they are presently kept is indicated, or a bibliographic reference is given. The institutes are indicated with the following acronyms:

The nomenclature for the minor details of tooth morphology follows Van der Made (1996); see also Fig. 2.

Measurements were taken according to Van der Made (1989, 1996) and Van der Made and Tong (2008). In the tables and figures these measurements are indicated with acronyms as indicated in the cited publications. In general: DAP = antero-posterior diameter, DT = transverse diameter, DMD = mesio-distal diameter,

AHAPMR	Azov Historical, Archeological and Paleontological Museum-Reserve, Azov.
AMNH	American Museum of Natural History, New York.
AUT	Aristotle University of Thessaloniki.
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover.
DPFMGB	Faculty of Mining and Geology, Belgrade.
FBFSUJ	Forschungstelle Bilzingsleben, Friedrich Schiller-Universität Jena, Bilzingsleben.
HUJ	Hebrew University, Jerusalem.
IGF	Istituto di Geologia, now Museo di Storia Naturale, Firenze.
IPGAS	Institute of Palaeobiology, Georgian Academy of Sciences, Tbilisi.
IPHES	Institut Català de Paleoecologia Humana I Evolució Social, Tarragona.
IQW	Institut für Quartärpaläontologie, Weimar; presently: Senckenberg Forschungsinstitut und Naturmuseum, Forschungsstation für Quartärpaläontologie, Weimar.
IVPP	Institute for Vertebrate Paleontology and Paleoanthopology, Academia Sinica, Beijing.
KU	Kagoshima University.
LVH	Landesmuseum für Vorgeschichte, Halle.
MB	Museo de Burgos, Burgos.
MCNB	Museu de Ciències Naturals, Barcelona.
MCP	Musée Crozatier, Le Puy-en-Velay.
MNB	Museum für Naturkunde, Berlin.
MNCN	Museo Nacional de Ciencias Naturales, Madrid.
MNHN	Muséum National d'Histoire Naturelle, Paris.
MPRM	Musée de Préhistoire Régionale, Menton.
MUB	Medical University, Baku.
NBC	Naturalis Biodiversity Center, Leiden; previously: Nationaal Natuurhistorisch Museum, Leiden.
NHM	Natural History Museum, London.
NMBr	Natuurhistorisch Museum, Brussels.
NMMaa	Natuurhistorisch Museum, Maastricht.
NMMai	Naturhistorisches Museum, Mainz.
PIN	Palaeontological Institute, Moscow.
RRMR	Rostov Regional Museum, Rostov-on-Don.
SAPM	Staatssammlung für Anthropologie und Paläoanatomie, München.
SMS	Spengler Museum, Sangerhausen.
TUC	Technische Universität Clausthal, Insitut für Geologie und Paläontologie.