

NEW RECORDS OF MAMMAL REMAINS FROM THE MIOCENE SEDIMENTS OF THE CEMENT MINE IN POPOVAC (SERBIA)

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Teeth of small and large mammals were separated from the sediments brought into the Natural History Museum in Belgrade for sedimentological analysis in the 1960s. The identification was made based on their morphological characteristics. The determined species included: *Galerix exilis*, *Cricetodon mein*, *?Dorcatherium* sp. and *Eotragus sansaniensis*. According to data on small mammals it was determined that these mammals belonged to the association of MN5 zone.

Key words: Mammals, Miocene, Popovac.

INTRODUCTION

Remains of small and large mammals from Popovac described in this paper were collected from the sediment stored in the Museum's storage facilities, but the site of their collecting could not be precisely determined. The sediment was brought to the Museum in the 1960s for sedimentological analysis which was never performed. The samples were taken from the same layer that bears remains of mastodon and crocodile. Small mammals are represented by two separated whole teeth and several

fragments. According to the identified remains of small mammals they were assigned to zone MN5 (Lower Badenian).

The Middle Miocene sediments form an almost uninterrupted belt along the western edge of Paleozoic-Mesozoic rocks. There were two lithological types of sediments, belonging to two stratigraphic units. The first type includes conglomerate-sandstone sediments as counterparts of fringe and overlaid facies. The second type of sediments, lying over the red conglomerate and sandstone-marl tufa layers in most of the area, is represented by sandstones, marls and clays. The most prominent lithological member of this series is "cement marl" of Popovac, where remains of *Mastodon angustidens* (Luković 1950) and *Crocodilus agenburgensis* (Pejović 1951) were recorded immediately under the plant layers.

The greatest distribution of marl zone was recorded in village areas of Popovac, Bošnjani and Mutnica. The stratigraphic determination of Middle Miocene sediments was mostly performed according to the superposition of layers, where they were compared to cement marls of Popovac. According to these data, the Middle Miocene was mostly represented by freshwater counterparts of Helvetian and Tortonian. When records of mastodon and crocodile are considered, it may be concluded that the age of flora-bearing layers from Popovac basin was most probably Helvetian. This is supported by the vegetation type which closely matches the Helvetian flora from the vicinity of Tuzla. The age of flora from Tuzla was precisely determined by using marine remains of *Solenomya doederleini*, *Pecten denudatus* etc. (Pantić 1956.).

METHODS

The small mammals measurements were taken by using the movable ruler on the binoculars and given in 0.01 mm units.

PALEONTOLOGY

Insectivora Bodwich, 1821

Family **Erinaceidae** Bonaparte, 1872

Subfamily **Galericinae** Pomel, 1848

Genus **Galerix** Pomel, 1848

Galerix exilis (Blainville, 1839) (Fig. 1A).

Material: 1 M3 dext (L-1.52; W-2.23) (NHMBEO/TVSM 1303).

This tooth has a triangular shape. The metacone is connected to the protocone by a small ridge. The anterior arm of the protocone ends at the anterolingual base of the paracone. The parastyle is well developed at the end of the very strong and long anterocingulum. The posterior cingulum is weak and low.

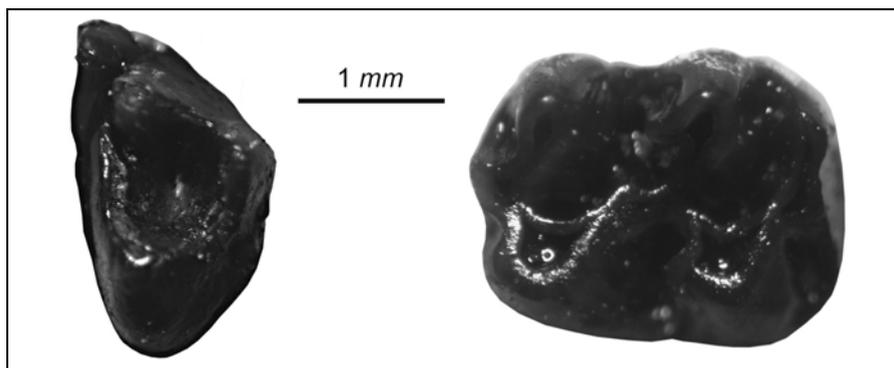


Fig. 1. - A - *Galerix exilis*, M3 dext (NHMBEO/TVSM 1303). B - *Cricetodon meini*, M2 dext (NHMBEO/TVSM 1302).

Rodentia Bodwich, 1821

Family **Cricetidae** Rochebrune, 1883

Genus *Cricetodon* Lartet, 1851

Cricetodon meini Freudenthal, 1963 (Fig. 1B).

Material: 1 M1 dext (L-2.88; W-/-) (NHMBEO/TVSM 1301), 1M2 dext (L-2.08; W-1.67) (NHMBEO/TVSM 1302).

Fig.1B.

The M1 is damaged, missing the labial side. The anterocone is not clearly split into two cusps. The lingual branch of anterolophule is long. It extends to the lingual edge of the tooth. The paracone of the M2 has a posterior spur. All the sinuses are open.

Ruminantia Scopoli, 1777

Family **Tragulidae** Milne-Edwards, 1864

Genus *?Dorcatherium* Kaup, 1833

?Dorcatherium sp.

Material: 1m3 dext (Inv. № 428)

The precise species was impossible to determine as only a single tooth was recorded at the site. However, according to the morphological characteristics of the masticating surface and the dimensions of the tooth, it

may be assumed that this was a representative of genus *?Dorcatherium*. The length of the tooth crown was approximately 9.5 mm while the width was 5.9 mm. The tooth was poorly preserved and the anterior part was broken at the level of the paraconid. The talonid is missing.

Family **Bovidae** Gray, 1821

Genus *Eotragus* Pilgrim, 1939

Eotragus sansaniensis (Lartet, 1851) (Plate 1)

Material: M3 sup.sin (Inv. № 421), p2 inf.sin (Inv. № 422), p3 inf.dext (Inv. № 423), p4 inf.sin (Inv. № 424), m1 inf.sin with part of jaw bone (Inv. № 425), m2 inf.dext (Inv. № 426), m3 inf.dext (Inv. № 427). (Tab. 1-3).

The state of preservation of the upper molar is average. It has selenodont morphology and is broken at the root level. The anterior half of the crown is wider than the posterior half and the front side bears a small hollow at the place of contact with the second molar. It is formed by four crescent-shaped cusps. The anterior branch of the protocone is fused to the anterior side of the paracone, while the hypocone is fused to the ends of metacone. Therefore they close like narrow deep median valleys with almost vertical cliffs. The buccal walls are relatively straight.

Table 1. - Dental mesurments of lower premolars.

p2 (Inv. № 422)				p3 (Inv. № 423)				p4 (Inv. № 424)			
DAP	DTa	DTp	h	DAP	DTa	DTp	h	DAP	DTa	DTp	h
9.2	3.5	3.9	4.8	10.3	4.6	5.5	6.9	11.9	4.7	6.8	7.3

Table 2. - Dental mesurments of lower molars.

m1 (Inv. № 425)				m2 (Inv. № 426)				m3 (Inv. № 427)			
DAP	DTa	DTp	h	DAP	DTa	DTp	h	DAP	DTa	DTp	h
12.2	7.4	8.1	~9	12.1	7.6	8.1	11.7	~13.5	13.9	5.6	6.2

Table 3. - Dental mesurments of upper molar.

M3 (Inv. № 421)			
DAP	DTa	DTp	h
12.5	12.9	11.8	12.4

Legend: DAP-antero-posterior length, DTa-maximum width of anterior lobe, DTp-maximum width of posterior lobe, h-crown height

The lower premolars are relatively well-preserved, with a medium degree of abrasion. The roots are missing. The highest part of the premolar is the protoconid. In the third and fourth premolar there is a ridge on the lingual side of the protoconid, curving backwards and fusing with the transversal ridge on the talonid. In the fourth premolar the median transversal ridge starts at the protoconid on the lingual side of the tooth, under an angle of approximately 45°. The talonid is separated from the protoconid by a vertical furrow on the buccal side of the tooth. The posteriorly elongated metaconid forms a closed fosseta with the hypoconid.

The lower molars are mesodont. The ratio in height and width of the second molar is 0.96. The lingual walls are smooth and flat. The crowns are narrow, while the inner and outer cusps are very close to each other. In the first and second molar, at the end of the transversal furrow, on the buccal side there is a basal cusp. The third lower molar was broken at the level of talonid, with a poorly developed basal cusp.

DISCUSSION

By size and morphology *Galerix exilis* fits into the typical representatives of the species (de Jong, 1988). The teeth of *Cricetodon meini* show the greatest morphological similarity to the teeth from Komotini (de Bruijn *et al.* 1993). Their dimensions are also relevant.

The teeth of *Eotragus sansaniensis* are characterized by their pronounced selenodont character; the buccal walls are straight, smooth and shiny with conical tops, indicating the representatives of the Middle Miocene family Boselaphinae. On the other hand, in the described antelope species the tooth crowns are somewhat taller than in the first bovids, but still not hypsodont. They also have smaller dimensions, so it is impossible to assign them to the subfamily Hypsodontinae.

The described teeth have most characteristics of the more progressive species of genus *Eotragus*; they are smooth and shiny, with relatively tall crowns (mesodont), and the median crescent furrows are very deep and narrow, which is not the case in species *Eotragus haplodon*. The described characteristics of the masticating surface and dimensions of individual teeth show that the species from Popovac completely matches the species from Brajkovac (Marković & Pavić 2004), which was determined as *Eotragus* sp.

The size chart shows that the molars of antelope from Popovac have somewhat longer tooth crowns than the species *Eotragus sansaniensis* from Mala Miliva, but they are almost the same size as *Eotragus sansaniensis* from Sansan and Loeben (Tab. 4) (Petronijević 1967).

Table 4. - Dental mesurments of lower molars from Mala Miliva (Petronijević 1967), Leoben (Thenius 1952), Sansan (Filhol 1891) (L-maximum length, W-maximum width).

Locality	m2		m3	
	L	W	L	W
Mala Miliva	10.7	7.8	15	7.6
Leoben	11.1-11.3	8.2-8.4	15.2-17.6	7.5-8.8
Sansan	13.0	8.0	17.0	8.0

Described remains of *Eotragus* species from Popovac show the closest similarity with *Eotragus sansaniensis* from Sansan, where age was determined by using the paleomagnetic method to 15.0-13.6 Ma (MN6) (Şen, 1997; van der Made *et al.* 2007). However, the remains of small mammals *Galerix exilis* and *Cricetodon meini*, characteristic of associations of the MN5 zone of Southeastern Europe (de Bruijn 1992, de Bruijn *et al.* 1996, Rummel 1999), indicate that the fossil-bearing sediment from Popovac was deposited during the Lower Badenian.

In any case further research at the locality of Popovac would yield a more complete picture of the overall composition of the association and therefore also some more precise data on paleoecological conditions at the beginning of Middle Miocene in Central Serbia.

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НОВИ НАЛАЗИ ФОСИЛНИХ СИСАРА ИЗ МИОЦЕНСКИХ СЕДИМЕНАТА ПОПОВЦА (СРБИЈА)

САЊА АЛАБУРИЋ, ЗОРАН МАРКОВИЋ

Р Е З И М Е

Остаци крупних и ситних сисара из Поповца, описани у овом раду, пронађени су у депоу Природњачког музеја, а њихово тачно место налаaska не може се са сигурношћу утврдити. Претпоставља се да су донети у Музеј са непросејаним материјалом из Поповца, шездесетих година прошлог века, а највероватније потичу из истог слоја као и остаци мастодона и крокодила. На основу идентификованих остатака ситних и крупних сисара: *Galerix exilis*, *Cricetodon meini*, *Dorcatherium* sp. и *Eotragus sansaniensis*, утврђена је припадност зони MN5.

Plate I

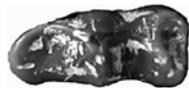
- a: M3 sup sin, okluzal view (Inv. № 421)
- b: M3 sup sin, bucal view (Inv. № 421)
- c: p2 inf sin, okluzal view (Inv. № 422)
- d: p3 inf sin, okluzal view (Inv. № 423)
- e: p4 inf sin, okluzal view (Inv. № 424)
- f: m1 inf sin, okluzal view (Inv. № 425)
- g: m1 inf sin, bucal view (Inv. № 425)
- h: m2 inf sidext, bucal view (Inv. № 426)
- i: m3 inf dext, okluzal view (Inv. № 427)
- j: m3 inf dext, bucal view (Inv. № 427)



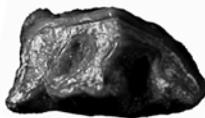
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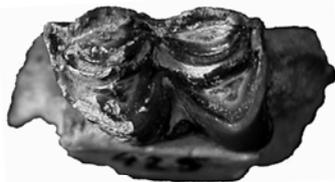
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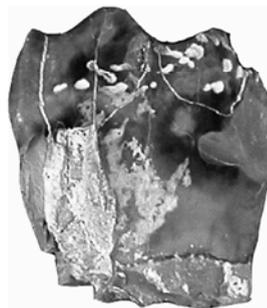
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