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PREDRAG RADOVIĆ
National Museum Kraljevo

ZORAN MARKOVIĆ
Natural History Museum in Belgrade

MILOŠ RADONJIĆ
University of Belgrade, Faculty of Mining and Geology,
Department of Regional Geology

SANJA ALABURIĆ
Natural History Museum in Belgrade

NEOGENE PROBOSCIDEANS (MAMMALIA, PROBOSCIDEA) AND OTHER MAMMALS FROM THE VICINITY OF KRALJEVO, SERBIA

Abstract: The paper provides an overview of the Neogene fossil mammals recorded in the vicinity of Kraljevo in Central Serbia. Large mammals are represented exclusively by the accidental finds of proboscidean dental specimens, deposited both in the Čačak-Kraljevo and Gruža basins. We provide re-descriptions and comparative analyses of the proboscidean material. The following taxa are recorded: *Deinotherium giganteum* at Ravanica and Adrani; *Gomphotherium angustidens* at Bogutovac; *Tetralophodon longirostris* at Godačica and at an unidentified sand pit (majdan) near Kraljevo; *Anancus* sp. at Miločaj; Proboscidea indet. at Oplanići. Small fossil mammals are recorded at three sites. The Progorelica assemblage is currently attributed to the MN6 zone of the Middle Miocene (Langhian), based on the finds of Eulipotyphla sp., *Eomyops* sp., *Cricetodon* sp., *Megacricetodon* sp. and *Alloptox* sp. – one of the first finds of this Asian genus in the Balkan Peninsula. At Tavnik, more than 120 remains of small mammals were attributed to the MN9 zone of the Late Miocene (Tortonian); the site yielded remains of Eulipotyphla indet., *Prolagus* sp., *Megacricetodon similis* and *Miodyromys* sp. Two fossil teeth of Talpidae sp. were also recorded at Oplanići.

Keywords: Kraljevo, Neogene, Miocene, proboscideans, small mammals

INTRODUCTION

After their emergence and early evolution in the Paleogene of Africa (Van der Made and Mazo 2003), members of the order Proboscidea Illiger 1811 dispersed into Eurasia during the Early Miocene, as a part of a major faunal exchange known as the "Proboscidean Datum Event" (Madden and Van Couvering 1976). The collision of the Arabian and Anatolian plates at the end of MN3 (later Burdigalian) established a terrestrial connection between Africa and Eurasia, which enabled proboscideans and numerous

other mammalian taxa to migrate between Africa and Eurasia for the first time since the early Paleogene (Rögl 1999; Koufos *et al*. 2005; Van der Made 2010). Proboscideans likely dispersed into Europe in two waves (Antunes 1990; Tassy 1996a). Members of the genera *Gomphotherium*, *Zygolophodon* and (probably) *Prodeinotherium* were the first to arrive in Europe in MN3b, followed by *Archaeobelodon* in MN4a (Mein 1999; Koufos *et al*. 2003). Throughout the Neogene period, proboscideans were well represented in Europe by deinotheres and diverse forms of "mastodonts" (e.g. mammutids, gomphotheriines, anancines) (Göhlich 1999, 2010; Sanders *et al*. 2010). Representatives of deinotheres (*Prodeinotherium*, *Deinotherium*) and five genera of elephantimorph proboscideans (*Gomphotherium*, *Tetralophodon*, *Anancus*, *Zygolophodon*, and *Mammut*) had been previously recorded in the Miocene of Serbia (Pavlović M.B. 1981, 1998; Radović and Bradić-Milinović 2018).

The current paper presents an overview of the known Neogene fossil fauna from the vicinity of Kraljevo in Central Serbia. Large mammalian remains consist exclusively of the various extinct representatives of Proboscidea, which represent the focus of the current paper. Unfortunately, the proboscidean fossils are almost exclusively accidental finds of (mostly isolated) teeth with uncertain stratigraphic provenances. As the majority of proboscidean specimens studied here were published a long time ago and mostly in Serbian, we provide re-descriptions and taxonomic revisions of (some of) the specimens. The paper also considers localities with small mammalian taxa, mostly as important biostratigraphic indicators.

MATERIAL AND METHODS

Dental terminology for proboscidean teeth follows Tassy (1996b) and Aiglstorfer et al. (2014). Measurements were taken with digital calipers (precision 0.1 mm). Systematics for proboscidean taxa follows Shoshani and Tassy (2005). Abbreviations: D, deciduous tooth; dext., right; Lmax, maximum crown length; m/M, lower/upper molar; MN, Neogene Mammalian Faunal Zone; NHMBEO - Natural History Museum in Belgrade; NMKVRS - National Museum Kraljevo; p/P, lower/upper premolar; sin., left; W1-4, width of loph(id)s; Wmax, maximum crown width.

GEOLOGIC SETTING

The city of Kraljevo is located within the broad river valley of Zapadna Morava (Fig. 1). In a geological context, the morphology of the surrounding area of Kraljevo is formed as a consequence of the collisional processes between tectonic units of African affinity (Dinarides in broader scenes) and the crustal remnants of the former Tethys ocean (Schmid *et al*. 2008). The events of extensional regimes of orogen building processes led to the formation of the large Čačak-Kraljevo intermontane basin during the Neogene period. The basement of the Čačak-Kraljevo basin is made of several formations of pre-Neogene age. The oldest are Paleozoic metamorphics of the Goč Mts. south of Kraljevo (Marković B. *et al*. 1963). Structurally above these are the obducted ophiolites of Stolovi Mts. which are represented by serpentinites and harzburgites (Robertson *et al*. 2009). Terrains of the Gledićke Mts. east of Kraljevo are mostly made of Cretaceous siliciclastic flysch formation (Dimitrijević 1997).

The Čačak-Kraljevo basin, and similarly the Gruža basin to the east, were filled with a variety of sediment types during the Miocene (Obradović and Vasić 2007). The Lower

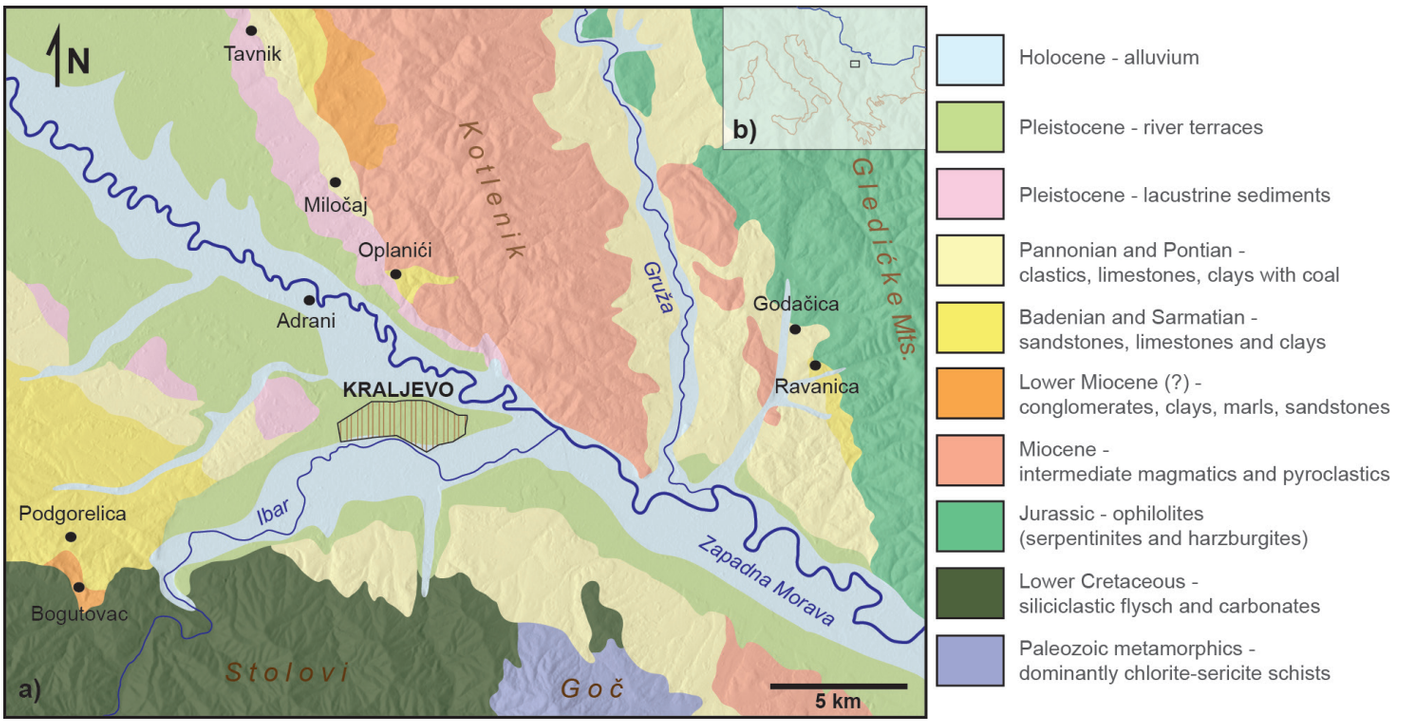

Figure 1. a) Geologic sketch map of the vicinity of Kraljevo with positions of the localities discussed in the text; b) Position of the studied area within the Balkan Peninsula (modified after Marković et al. 1963).

Слика 1. а) Геолошка скица околине Краљева са положајима локалитета о којима се говори у тексту; b) положај истраживаног подручја на Балканском полуострву (модификовано према Marković et al. 1963).

to Middle Miocene sediments are mostly represented by lacustrine coarse-grained siliciclastics which turn into more fine-grained sediments in the upper levels (Anđelković *et al.* 1991). The Upper Miocene is represented dominantly by fine-grained sediments with occurrences of brown coal beds (Marković B. *et al.* 1963). Another important consequence of collisional processes are magmatic events which took place during much of the Miocene and formed the central part of the Kotlenik Mts. which is made out of andesitic rocks and their volcaniclastic products (Cvetković *et al.* 2001). Locally, the simultaneous sedimentation took place with deposition of mostly varicolored siliciclastics i.e. the western slopes of the Kotlenik Mts. (Marković B. *et al.* 1963).

The final stage of formation of the terrains of Kraljevo and its vicinity took place during the Quaternary period (Marović *et al.* 2007). The climate conditions played an important role in shaping the Zapadna Morava valley during the Pleistocene. A variety of river terraces, deluvial and limnic sediments were formed in the Čačak-Kraljevo basin (Marković B. *et al.* 1963).

LARGE MAMMALS
SYSTEMATIC PALEONTOLOGY

Class Mammalia Linnaeus 1758
Order Proboscidea Illiger 1811
Family Deinotheriidae Bonaparte 1845
Genus *Deinotherium* Kaup 1829
Deinotherium giganteum Kaup 1829

ADRANI – A well-preserved crown of a left upper third molar (M3) of *D. giganteum* (NMKVRS.P1; Fig. 2a) was recovered from the fluvial deposits of the Zapadna Morava River in Adrani near Kraljevo. The specimen was discovered by sand pit workers, during commercial extraction works in 2008 (Čkonjević and Radović 2012). In the

Figure 2. Neogene proboscidean fossils from the vicinity of Kraljevo: M3 dext. of *Deinotherium giganteum* from Adrani (a); p4 sin. (b), m1 sin. fragment (c), m2 sin. (d) and posterior part of m3 sin. (e) of *Deinotherium giganteum* from Ravanica; anterior fragment of m3 dext. of *Gomphotherium angustidens* from Bogutovac (f); M2 sin. of *Tetralophodon longirostris* from Godačica (g); M3 dext. of *Anancus* sp. from Miločaj (h), where dotted ellipses mark the alternate contacts between anterior pretrite central conules (lingual side) and posterior postrite central conules (buccal side); M1 sin. of *T. longirostris* from a sand pit near Kraljevo (i). Figures b) and h) are reprinted from Petronijević (1956, Pl. III, V).

Слика 2. Фосили неогених сурлаша из околине Краљева: M3 dext. *Deinotherium giganteum* из Адрана (a); p4 sin. (b), фрагмент m1 sin. (c), m2 sin. (d) из задњи део m3 sin. (e) *Deinotherium giganteum* из Раванице; предњи фрагмент m3 dext. *Gomphotherium angustidens* из Богутовца (f); M2 sin. *Tetralophodon longirostris* из Годачице (g); M3 dext. *Anancus* sp. из Милочаја (h), где испрекидане елипсе обележавају наизменичне контакте између предњих централних конула претрита (лингвална страна) и задњих централних конула пострита (букална страна); M1 sin. *T. longirostris* из мајдана песка у околини Краљева (i). Слике b) и h) су преузете од Petronijević (1956, Таб. III, V).

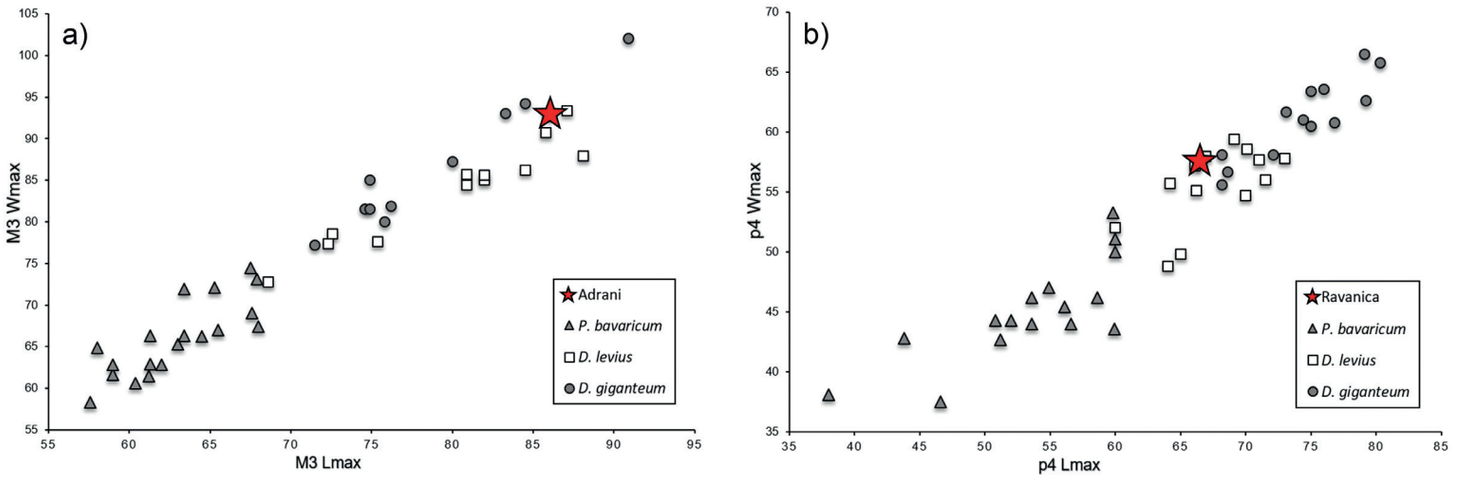

Figure 3. Bivariate comparisons (Lmax versus Wmax, in mm) for the deinothere dental remains from the vicinity of Kraljevo: Adrani M3 (a) and Ravanica p4 (b) compared to the samples for *Prodeinotherium bavaricum*, *Deinotherium levius* and *D. giganteum* (comparative data from: Aiglstorfer et al. 2014).

Слика 3. Биваријатне компарације (максимална дужина и максимална ширина, у милиметрима) за зубне остатке динотерида из околине Краљева: M3 из Адрана (a) и p4 из Раванице (b) у поређењу са узорцима *Prodeinotherium bavaricum*, *Deinotherium levius* и *D. giganteum* (компаративни подаци из: Aiglstorfer et al. 2014).

occlusal view, this simple bilophodont molar displays a trapezoidal shape, widening anteriorly, which is typical for *Deinotherium* M3 (Aigstofer *et al*. 2014). The lophs are concave posteriorly, and the protoloph is buccolingually wider than the metaloph. Both lophs show slight anteriorly facing wear, exposing a small circle of dentine and revealing thick enamel as is typical for deinotheres (Shoshani *et al*. 1996: 71). There is a thick and blunt postprotocone crest, a sharper postparacrista (which displays wear), a short weak premetacrista, a strong posthypocrista, and long crenulated postmetacrista, terminating beyond the midline of tooth. The crown displays both the anterior (more strongly developed) and posterior crenulated cingula. The size of the specimen (Lmax = 86 mm, W1 = 93 mm, W2 = 81 mm) groups it with the larger specimens attributed to *D. giganteum* and *D. levius*, far away from the small-sized *Prodeinotherium bavaricu*m (Fig. 3a).

RAVANICA – A small collection of lower jaw fragments and four teeth (left lower p4, m1, m2, and m3; Fig. 2b-e) of *D. giganteum* were discovered in 1948 at Ravanica (Petronijević 1956) a village located some 15 km east from Kraljevo. According to the data published by Luković (1950) and Petronijević (1956), the fossils were collected at Mirkovački Potok stream (around 300-350 m upstream from the confluence with Ravanička river) from the coarse-grained conglomeratic sandstone bed positioned at the bottom of the section exposed by fluvial action (Petronijević 1956, Fig. 2). However, the sedimentary section discussed by Petronijević is no longer exposed at the site. The fossils were discovered by Dobrivoje Stojadinović, preparator of the former Museum of Serbian Land (now NHMBEO), who included them in the Museum's collection. Unfortunately, only three dental specimens (m1-m3) are still curated at the NHMBEO. All specimens show thick enamel and dental morphologies typical for deinotheres. Although damaged, the m1 (NHMBEO 11356) was evidently a trilophodont tooth, missing its entire metalophid (first lophid), a large part of the mesial face of hypolophid (second lophid), and distolingual part of the tritolophid (third lophid). The hypolophid is wider than the tritolophid, which is clearly wider buccally. Both lophids show significant, posteriorly facing wear. There is a distinct praeentocristid, as well as an anterior cristid of buccal tritolophid. The bilophodont m2 (NHMBEO 11357) presents an almost complete crown, with slight anterior damage, roots and a small section of the mandible. The anteriorly concave lophids are separated by a wide transverse valley, and the metalophid is slightly wider than the hypolophid. The lophids show oblique, posteriorly facing and elongated wear figures. There are anterior (damaged) and posterior

crenulated cingula. The anterior side of the first lophid shows a strong praeprotocristid and less developed praemetacristid; the anterior face of the second lophid shows distinct praehypocristid and praeentocristid. The m3 (NHMBEO 11358) preserves only the posterior part of the crown, with the second lophid and posterior cingulid. The hypolophid is crenulated, and the wear is present only on the hypoconid, exposing a small triangle of dentine; praehypocristid and praeentocristid can both be observed. The cingulid is strong, crenulated and positioned slightly buccally. The p4 is no longer present in NHMBEO collections, so the following description is based on the information and illustrations published by Petronijević (1956, Pl. V). The bilophodont specimen was a fairly complete crown, with parts of the root system preserved. The lophids were anteriorly concave, and the hypolophid was straighter and slightly longer compared to the metalophid. A strong paracristid ascended from the protoconid lingually, ending in the anterior cingulid; there was a (strong?) ectoloph descending from the hypoconid antero-lingually towards the median valley. The molar possessed a straight posterior cingulid, and (judging by the available illustrations) a weak buccal cingulid. Both lophids displayed significant wear, as well as the contact facets with p3 and m1. As exemplified by the p4 size (Lmax = 66.4 mm, Wmax = 57.5 mm), the Ravanica deinothere is clearly larger than *P. bavaricum*, and in accordance with the attribution to *D. giganteum* or *D. levius* (Fig. 3b). Ravanica molars show the following measurements: m1 – W2 = 59.7 mm; m2 – Lmax = 76.3 mm, W1 = 68.8 mm, W2 = 65.2 mm; m3 – W2 = 59.9 mm.

Clade Elephantimorpha Tassy and Shoshani 1997 (in Shoshani *et al*. 1998)
Family Gomphotheriidae Hay 1922
Subfamily Gomphotheriinae Hay 1922
Genus *Gomphotherium* Burmeister 1837
Gomphotherium angustidens Cuvier 1817

BOGUTOVAC – The right lower third molar (m3) fragment of *G. angustidens* (NMKVRS.P67; Fig. 2f) comes from Bogutovac, a village located around 13 km southwest from Kraljevo. According to Petronijević (1956), the tooth probably originated from the coarse-grained coastal lacustrine sediments exposed at the lower section at the banks of the Lopatnica river, a small tributary of the Ibar river. The specimen preserves only the anterior part of the crown with the first two lophids, but it reveals much morphological detail as there is no wear whatsoever (i.e. it was an unerupted tooth). This bunodont molar shows features typical for *G. angustidens*: binary subdivision of the lophids; the subdivided pretrite central conules (of the first pretrite); weak or absent posttrite central conules; a weak cingulum present on the pretrite side (Tassy 2014). While Petronijević (1956) originally classified the Bogutovac fossil as "*Mastodon angustidens* Cuv. forma *subtapiroidea* Schles.", he reassigned it to "*Mastodon angustidens* Cuvier" a decade later (Petronijević 1967, 93). The Schlesinger's (1917) "forma *subtapiroidea*" was first considered to be separate species by Osborn (1936), an opinion also held by Gaiziry (1994), and more recently by Göhlich (1998, 2010) who used the name *Gomphotherium subtapiroideum* Schlesinger 1917 to designate the "subtapiroid" dental material from MN5 and MN8 of southern Germany. According to Göhlich (2010: 182), lower third molars of *G. subtapiroideum* are different from those of *G. angustidens* by their more pronounced "subtapiroid" crown structure (i.e. wider interlophid valleys, anteroposteriorly more compressed lophids, weaker central conules). Comparisons with the specimens published by Göhlich (2010, Figs. 7-8)

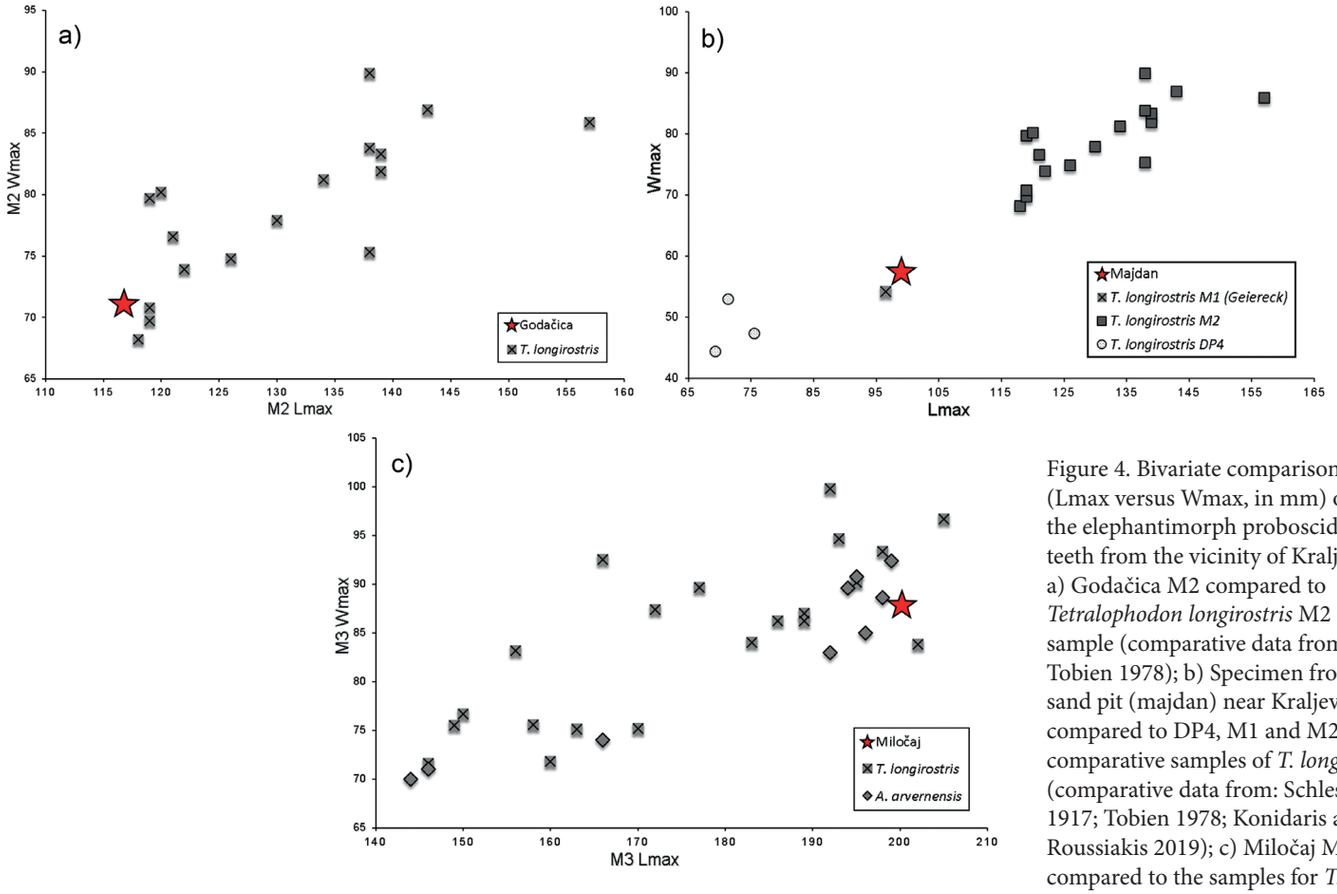

Figure 4. Bivariate comparisons (Lmax versus Wmax, in mm) of the elephantimorph proboscidean teeth from the vicinity of Kraljevo: a) Godačica M2 compared to *Tetralophodon longirostris* M2 sample (comparative data from: Tobien 1978); b) Specimen from sand pit (majdan) near Kraljevo compared to DP4, M1 and M2 comparative samples of *T. longirostris* (comparative data from: Schlesinger 1917; Tobien 1978; Konidaris and Roussiakis 2019); c) Miločaj M3 compared to the samples for *T. longirostris* and *Anancus arvernensis* (comparative data from: Tobien 1978; Garido and Arribas 2014).

Слика 4. Биваријатне компарације (максимална дужина и максимална ширина, у милиметрима) за зубе елефантиморфних сурлаша из околине Краљева: M2 из Годачице у поређењу са узорком за врсту *Tetralophodon longirostris* (компаративни подаци из: Tobien 1978); b) примерак из мајдана покрај Краљева у поређењу са компаративним узорцима DP4, M1 и M2 врсте *T. longirostris* (компаративни подаци из: Schlesinger 1917; Tobien 1978; Konidaris and Roussiakis 2019); c) M3 из Милочаја у поређењу са узорцима за врсте *T. longirostris* and *Anancus arvernensis* (компаративни подаци из: Tobien 1978; Garido and Arribas 2014).

revealed no subtapiroid features in the Bogutovac fossil. The size of the specimen (W1 = 61.7 mm, W2 = 66.8 mm) is also in accordance with the attribution to *G. angustidens* (W1 range = 52-73 mm, W2 range = 54.5-79 mm, based on the data from Göhlich 1998 and Tassy 2014).

Family *incertae sedis*
Genus *Tetralophodon* Falconer, 1857 (tetralophodont gomphothere)
Tetralophodon longirostris Kaup 1832

GODAČICA – A left upper second molar (M2) of *T. longirostris* (NMKVRS. P68; Fig. 2g) was discovered in Godačica, about 15 km northeast from Kraljevo. According to Petronijević (1956), the fossil was collected at the left bank of Godačica river, about 200 m above the riverbed; as indicated by the matrix preserved between the roots, the specimen originated from yellow iron-rich sandstone. The molar preserves a fairly complete and slightly worn crown (missing most of the anterior cingulum) and a three-parted root (without its most apical portions); in occlusal view, the crown outline is rectangular-oval. The crown is bunodont and tetralophodont (i.e. presents four lophs) which is typical for the intermediate molars (i.e. DP4, M1, and M2) of *Tetralophodon* (Tobien 1973; Gasparik 2005). It lacks cement and shows no anancoidy (i.e. alternating arrangement of pretrite and posttrite halfloph(id)s; Tobien 1973). The first pretrite halfloph shows an incipient trefoil wear figure. Both the posterior and anterior (as judged by the preserved portion) cingula are crenulated. The molar's dimensions are as follows: Lmax

= 116.7 mm, W1 = 70.4 mm, W2 = 71.1 mm, W3 = 70.6 mm, W4 = 58 mm; as demonstrated in Figure 4a, the specimen is at the smaller end of the size spectrum of *T. longirostris* second upper molars.

MAJDAN (SAND PIT) NEAR KRALJEVO – A left upper first molar (M1) of *T. longirostris* (NHMBEO 113346; Fig. 2i) was donated to NHMBEO in 1911 by the famous Kraljevo-born industrialist Mihailo Čebinac. Apparently, the tooth was found in a sand pit located in the vicinity of Kraljevo. It preserves a complete crown and an almost complete three-parted root. The bunodont tetralophodont tooth shows primary trefoil wear figures but lacks cement and anancoidy. The roots are well preserved, with the arrangement typical for upper molars. The size of the specimen (Lmax = 99 mm, W1 = 48.7 mm, W2 = 56.3 mm, W3 = 55.4 mm, W4 = 57.3 mm) is comparable to the size of M1 from Geiereck (Laaerberg) in Austria (Schlesinger 1917, 97, Pl. XIV, Fig. 3), dated as early Tortonian – MN9 (Huttunen 2003); see Figure 4b.

Family *incertae sedis*
Genus *Anancus* Aymard in Dorlhac 1855 (tetralophodont gomphothere)
Anancus sp.

MILOČAJ – The specimen is a right upper third molar (M3) of *Anancus* (Fig. 2h), discovered in the village of Miločaj, at Surdulija stream below the Gradina hill (some 8.5 km northwest from Kraljevo). Stevanović (1951) noted that the specimen originated from *Congeria* beds, and Petronijević (1956) further remarked that the parts of the matrix preserved on the specimen itself indicate yellow iron-rich beds. At the time when Petronijević (1956) described the molar, it had apparently been curated at NHMBEO (under collector number 22). Unfortunately, the specimen is no longer kept at NHMBEO, and its whereabouts are currently unknown. Based on the detailed description and available photographs (Petronijević 1956, Pl. III-IV), the specimen consisted of an elongated crown with damaged protoloph and talon, and broken roots. As exposed by wear, the enamel was fairly thick. The rather simple crown was composed of five strong lophs plus a smaller talon, and it showed weak anancoidy; the characteristic alternate contact between anterior pretrite central conules and posterior posttrite central conules (Tassy 1986) can be observed. Petronijević originally identified the tooth as belonging to "a transitional form between *Mastodon longirostris* Kaup. and *M. arvernensis* Croiz. et Job., somewhat closer to the latter", emphasizing the specimen's weak anancoidy. The molar also showed the reduction of the pretrite posterior central conule, as expected for *Anancus* upper molars (Garido and Arribas 2014). No cement is visible in the valleys between the cusps, although this feature is hard to evaluate based on the available (poor-quality) illustrations. Nevertheless, it should be noted that cement deposition can be quite variable in *Anancus*, ranging from thick crown cement coatings to no cement at all (Tobien 1973; Garido and Arribas 2014; Mayda *et al*. 2014). The Miločaj M3 was rather large-sized (Lmax = ~200 mm; W2 = 88 mm), close to the larger M3 specimens of *T. longirostris* and *A. arvernensis* (Fig. 4c).

LOCALITIES WITH SMALL MAMMALS

TAVNIK – Located around 15 km northwest from Kraljevo, the village of Tavnik has long been known for its Miocene fossil invertebrate fauna (Pavlović P. 1901;

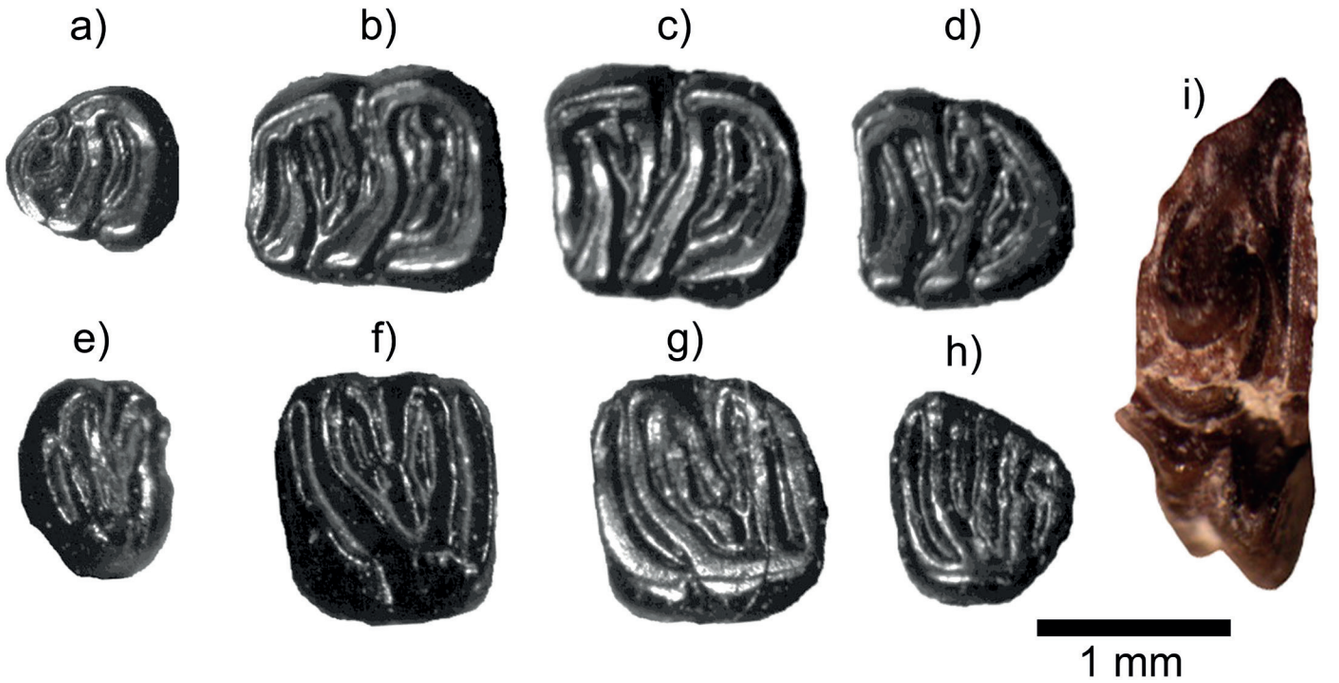

Figure 5. Unidentified species of dormouse (*Miodyromys* sp.) from Tavnik – p4 sin. (a), m1 sin. (b), m2 dext. (c), m3 dext. (d), P4 sin. (e), M1 dext. (f), M2 sin. (g), and M3 dext. (h) – and *Alloptox* sp. P3 sin. (i) from Progorelica.

Слика 5. Неидентификована врста пуха (*Miodyromys* sp.) из Тавника: p4 sin. (a), m1 sin. (b), m2 dext. (c), m3 dext. (d), P4 sin. (e), M1 dext. (f), M2 sin. (g) и M3 dext. (h) – и *Alloptox* sp. P3 sin. (i) из Прогорелице.

Stevanović 1951). A gully created by the Voljavča stream near its confluence into the small Bumbaruša river exposed a 3 m high succession of marls and clays, intercalated with thin layers of loose sandstone/sand and brown coal. A rich small vertebrate assemblage originated from a single clay lens within the sandy marls, positioned directly below a 0.5 m thick coal layer. This coal layer was considered by Popović and Novković (1966/67) to lie concordantly on the Middle Miocene conglomerate-sandy series. More than 120 teeth of small mammals were found in the clay lens (by wet-screening), recording the following taxa: Lipotyphla indet., *Prolagus* sp., *Megacricetodon similis* Fahlbusch 1964, as well as yet unidentified species of dormouse *Miodyromys*sp. (NHMBEO 012121-160). In addition to mammals, the remains of various plant seeds, mollusks, fishes, amphibians and reptiles were also recovered. The assemblage was attributed to the MN9 zone of the Late Miocene (Marković 2008; Marković and Milivojević 2010).

PROGORELICA – Total of 23 small mammals teeth have been washed from greenish clay in the Progorelica village, about 10 km southwest from the Kraljevo city center. The fossil dental material had been collected in 2013 by the NHMBEO team. The following taxa have been identified: Insectivora sp.; Rodentia – *Eomyops* sp., *Cricetodon* sp., and *Megacricetodon* sp.; Lagomorpha – *Alloptox* sp. Importantly, the left P3 (Fig. 5i) from Progorelica represents one of the first finds of this Asian genus in the Balkan Peninsula. For now, it is assumed that the fossils belong to the MN6 zone of the Middle Miocene (Langhian).

OPLANIĆI – Remains of both large and small mammals were collected in 2004 by the team from NHMBEO at the village of Oplanići, located about 4 km north from the Kraljevo city center. The fossils originated from greenish-gray clays exposed at the

Madžarski Potok stream, around 100 m upstream from the local church. The mammalian remains consist of two dental specimens (NHMBEO 004501) attributed to Talpidae sp. (Marković and Milivojević 2010), and tusk fragments (NHMBEO 004350) of an unidentified proboscidean (Proboscidea indet.).

DISCUSSION AND CONCLUSIONS

As our reassessment shows, the territory of Kraljevo documents diverse forms of Neogene proboscideans, including both the deinotheres (Deinotheriidae) and the elephantimorphs (Elephantimorpha). The studied remains originated both from Čačak-Kraljevo and Gruža Neogene basins. However, taxonomic attributions of the fossils are based exclusively on their morphologies and metrics, due to the lack of reliable stratigraphic data. This also means that dating of the recorded proboscidean taxa can only be assessed in very broad terms.

Based on the morphology and relatively large size of the specimens, the finds from Ravanica and Adrani most likely both represent *Deinotherium giganteum*. For the Ravanica material, the attribution to *D. levius* also can not be excluded, since the diagnostically important p3 (Gräf 1957; Aiglstorfer *et al*. 2014) did not represent part of the find. However, it must be noted that *D. levius* is not uniformly accepted as a valid taxon, and other authors (e.g. Bergounioux and Crouzel 1962; Huttunen 2002) consider it to be a junior synonym of *D. giganteum*. Either way, the M3 from Adrani does not show the configuration typical for *D. levius*, with "a long postmetacrista turning to anterior at midline and tapering in the postmetaloph valley parallel to the posthypocrista" (Aiglstorfer *et al*. 2014: 57). *D. giganteum* has been recorded from the Middle to Late Miocene – MN7/8 to MN10 according to Göhlich and Huttunen (2009).

The fragmented m3 from Bogutovac is a bunodont specimen typical for *Gomphotherium angustidens*, lacking the "subtapiroid" crown structure seen in *G. subtapiroideum* (Göhlich 2010). The chronostratigraphic range of the trilophodont gomphothere *G. angustidens* in Europe extends from late Early to early Late Miocene – MN4 to MN9 (Tassy 1996a; Mazo and Van der Made 2012). Along with the M2 of *Tetralophodon longirostris* from Godačica, the M1 from the sand pit near Kraljevo was also attributed to this taxon; both specimens show typical features of the species, lacking anancoidy. The earliest member of the "tetralophodon gomphothere" grade in Europe, *T. longirostris* occurred during the late Middle to Late Miocene – MN8 to MN12 (Göhlich 1999; Lungu and Obada 2001; Mazo and Van der Made 2012). During the Late Miocene, *T. longirostris* was displaced by later members of the tetralophodon grade from the genus *Anancus* Aymard in Dorlhac 1855. The M3 from Miločaj is here reassigned to *Anancus* sp., based on the observed weak anancoid pattern. The specimen could belong to either *A. lehmanni* Gaziry 1997 – a Late Miocene (MN12 to MN13) European member of the genus, or to *A. arvernensis* Croizet and Jobert 1828 – a species very common in the Pliocene of Europe, which survived until the early Pleistocene (MN14 to MNQ17; Konidaris and Roussiakis 2019). The high morphological variability within *Anancus* populations (Konidaris and Roussiakis 2017), and the complete lack of stratigraphic information on the Miločaj find, as well as the fact that the specimen is effectively lost, do not permit safe taxonomic attribution at the species level.

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ПРЕДРАГ РАДОВИЋ
Народни музеј Краљево

ЗОРАН МАРКОВИЋ
Природњачки музеј у Београду

МИЛОШ РАДОЊИЋ
Универзитет у Београду, Рударско-геолошки факултет,
Департман за регионалну геологију

САЊА АЛАБУРИЋ
Природњачки музеј у Београду

НЕОГЕНИ СУРЛАШИ (MAMMALIA, PROBOSCIDEA) И ДРУГИ СИСАРИ ИЗ ОКОЛИНЕ КРАЉЕВА

Резиме

У раду је дат преглед свих познатих остатака фосилних сисара из неогена околине Краљева. Изоловани примерци фосилних зуба сурлаша (ред Proboscidea) пореклом из седимената Чачанско-краљевачког и Гружанског басена, а које су раније објавили Петронијевић (Petronijević 1956) и Чкоњевић и Радовић (Čkonjević and Radović 2012), поново су описани и испитани у компаративном контексту. Материјал се чува у Народном музеју у Краљеву (NMKVRS) и Природњачком музеју у Београду (NHMBEO). *Deinotherium giganteum* је посведочен у Адранима наласком левог M3 (NMKVRS.P1) и у Раваници, где су откривени леви p4 (који је данас изгубљен), фрагмент m1, m2 и фрагмент m3 (NHMBEO 11356–11358). На подручју Европе, *D. giganteum* је пронађен на локалитетима средњо- до касно миоценске старости (тј. у зонама MN7/8–10; Göhlich and Huttunen 2009). Из Богутовца потиче предњи део круне десног m3 типичне морфологије за врсту *Gomphotherium angustidens*, чији се хроностратиграфски распон у Европи протеже од каснијег дела раног до ранијег дела касног миоцена (тј. MN4-9; Tassy 1996a; Mazo and Van der Made 2012). Међу тзв. „тетралофодонтним" формама, идентификована су два примерка врсте *Tetralophodon longirostris*: леви M2 из Годачице (NMKVRS. P68) и леви M1 (NHMBEO 113346) са непознате локације (мајдана) у околини Краљева. Остаци врсте *T. longirostris* се у Европи датују између касног средњег и касног миоцена (MN8-12; Göhlich 1999; Lungu and Obada 2002; Mazo and Van der Made 2010). Из Милочаја потиче десни M3, оригинално одређен као „прелазна форма између *Mastodon longirostris* Kaup. и *M. arvernensis* Croiz. et Job." (Petronijević 1956: 190), а овде је ревидиран као *Anancus* sp., на основу јасног присуства тзв. ананкоидије (Tobien 1973). Примерак би могао припадати касномиоценској (MN12-13) врсти *Anancus lehmanni* или пак *A. arvernensis* која је врло честа на подручју Европе током плиоцена и раног плеистоцена (MN14 до MNQ17; Konidaris and Roussiakis 2019). Нажалост, примерак из Милочаја је данас изгубљен и познат је само на основу ранијег описа и илустрација (Petronijević 1956).

Остаци ситних сисара су до сада идентификовани на три локалитета и истражио их је тим Природњачког музеја у Београду. У Прогорелици су пронађена 23 зуба, међу којима су идентификовани следећи таксони: Eulipotyphla sp.; Rodentia – *Eomyops* sp., *Cricetodon* sp. и *Megacricetodon* sp.; Lagomorpha – *Alloptox*

sp. (један од првих налаза овог азијског рода на територији Балканског полуострва). Претпоставља се да фауна потиче из средњег миоцена (MN6). Из Тавника потиче преко 120 зуба ситних сисара, међу којима су идентификовани Eulipotyphla indet., *Prolagus* sp., *Megacricetodon similis*, као и још неидентификована врста пуха *Miodyromys* sp. (NHMBEO 012121-160); фауна је одређена у касни миоцен (MN9). Из Опланића потичу два зуба Talpidae sp., као и фрагменти кљове и дуге кости удова неидентификованог сурлаша – Proboscidea indet. (Marković 2008; Marković and Milivojević 2010).