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A CAMEL SKELETON FROM THE VIMINACIUM AMPHITHEATRE

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Abstract. – Camel remains have occasionally been found in Roman provincial sites throughout the Empire. In Serbia, several camel bones were found on Roman period sites. In the course of the excavations of the Viminacium amphitheatre, a partial camel skeleton was found in the western part of the arena. This find dates back to the middle, or the second half, of the 4th century AD, the period after the amphitheatre lost its function. As no other camel skeleton has been found throughout the European part of the Empire until now, this one represents a unique find in this territory. According to mixed morphometric features of the skeleton, it is suggested that the skeleton belonged to a hybrid individual. Based on taphonomic analysis of the skeleton, assumptions have been made as to how the corpse of this animal was treated after death. In this paper the role and significance of camels in Roman provinces in the territory of Serbia is also discussed.

Key words. – Late Roman period, Viminacium, amphitheatre, camel, camel hybridisation.

INTRODUCTION[1]

Camel bone finds indicate that these animals lived throughout the Roman provinces in Europe. Camel remains were detected in the fauna of Roman period sites in Italy (De Grossi Mazzorin 2006; De Grossi Mazzorin 2011), the Iberian Peninsula (Morales Muīiz et al. 1995), France (Clutton-Brock 1987), Belgium (Pigière, Henrotay 2012), Switzerland (Bökönyi 1974), Germany (Benecke 1994), England (Applebaum 2002), Austria (Riedel 1999), Slovenia (Bartosiewicz 1999; Bartosiewicz, Dirjec 2001), Hungary (Bökönyi 1974; Bökönyi 1989; Bartosiewicz 1995; Bartosiewicz 1996), Ukraine (Bökönyi 1974) and Bulgaria (Schramm 1975; Beech 2007). In Serbia, camel bones were found in the following sites: Sirmium (Lauwerier 1978), Viminacium, Gomolava, Vranj near Hrtkovci (Vuković, Blažić in press), Davidovac–Gradište and Pirot–Sarlah Bazilika.

Among 14 camel bones that were found so far in the territory of Viminacium, 13 were found in the area

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of the amphitheatre (Vuković, Blažić in press), while a single bone was detected in the area of the Eastern necropolis (Vuković 2010). Those specimens belonged to two-humped camels and hybrids, while one humped camels were not detected.

In the course of excavations of the Viminacium amphitheatre in 2011, in the area of arena, a partial camel skeleton was discovered. In this paper, the taxonomic position of this animal is discussed, according to the morphometric features of the skeleton. The age at death of the animal is determined, while taphonomic analysis of the skeleton is used to assume how the corpse of this animal was treated after death. Based on the context of the find, the time of burial of this camel is specified. In this way it was possible to define the chronological relationship between the camel find and the amphitheatre and other archaeological features discovered in this area. In this paper the role and significance of the camels in Roman provinces in the territory of Serbia is also discussed.

VIMINACIUM AMPHITHEATRE

Viminacium is situated on the right bank of the Mlava River, close to its confluence with the Danube River (Fig. 1). Firstly, in the course of the 1st century AD, a military camp was built. By the camp, a city developed that became the capital of the province of *Moesia Superior* and later of *Moesia Prima* (Mirković 1968; Поповић 1968).

The Viminacium amphitheatre was discovered in the north-eastern corner of the surface defined as the city area, approximately 50 m away from the north-western corner of the legionary fortress (Fig. 2). The first small-scale archaeological excavations of the amphitheatre were conducted by M. Valtrović in 1882 (Валтровић 1884, 11–12, 100–103).

Systematic archaeological excavations began at the end of 2007 and are still in progress. So far the following parts of the amphitheatre have been discovered: the arena, the arena wall, the main entrances, the outer

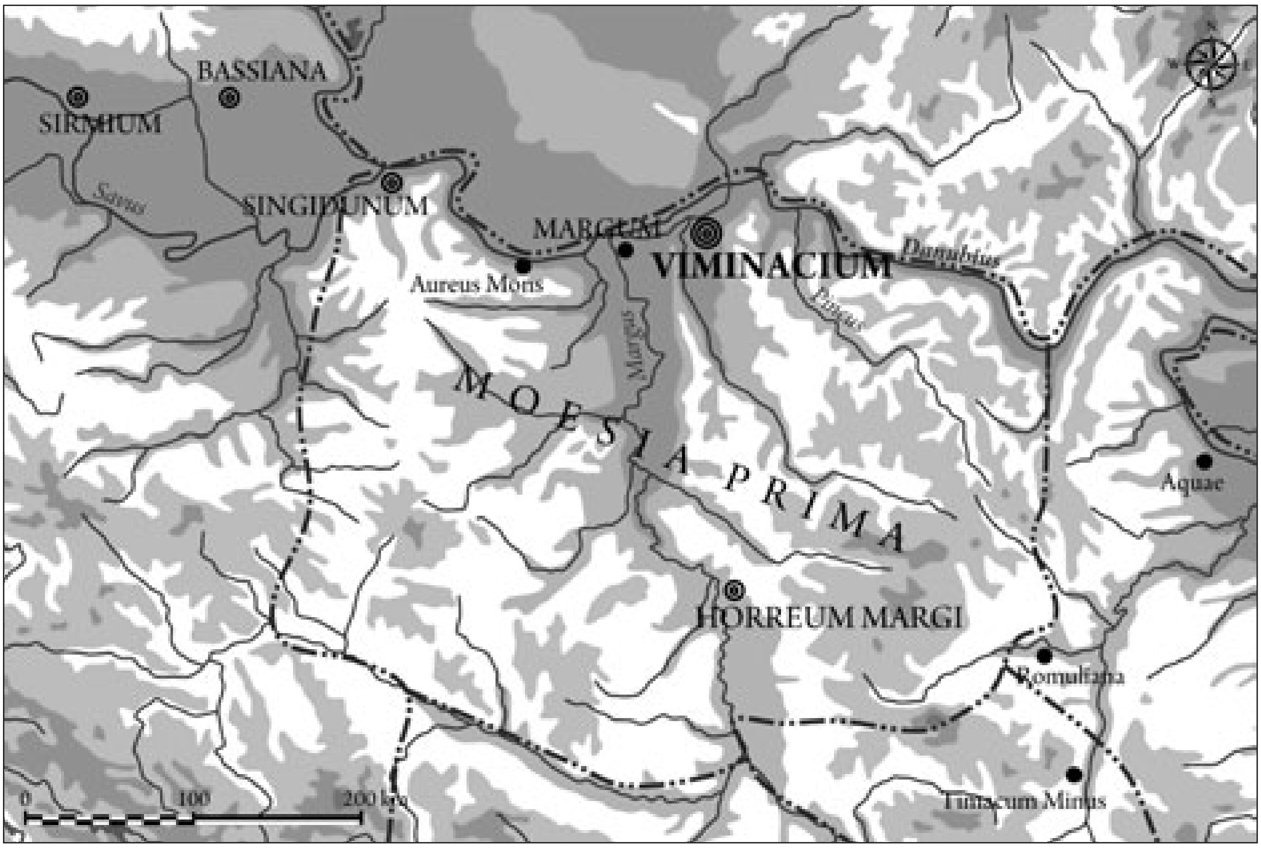


Fig. 1. Location of Viminacium within the province of Moesia Prima

Сл. 1. Локација Виминацијума у оквиру ӣровинције Moesia Prima

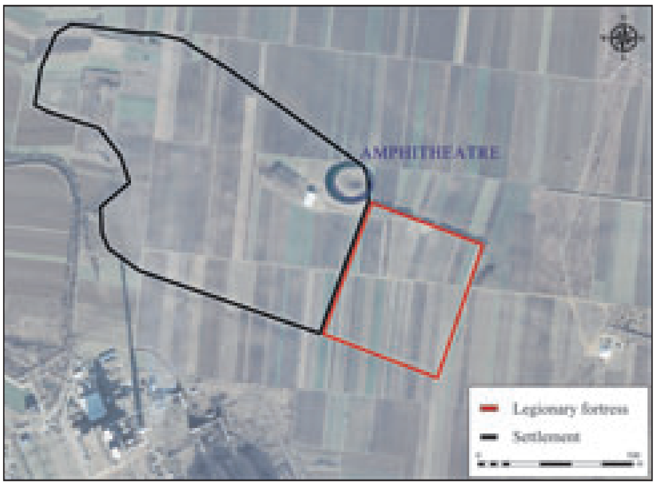


Fig. 2. Location of the amphitheatre in an aerial photo of Viminacium (taken in 2007)
Fig. 3. Viminacium amphitheatre in an aerial photo (taken in 2012)

Сл. 2. Позиција амфишеашра на авио-снимку Виминацијума из 2007. године
Сл. 3. Аеро-снимак виминацијумског амфишеашра из 2012. године

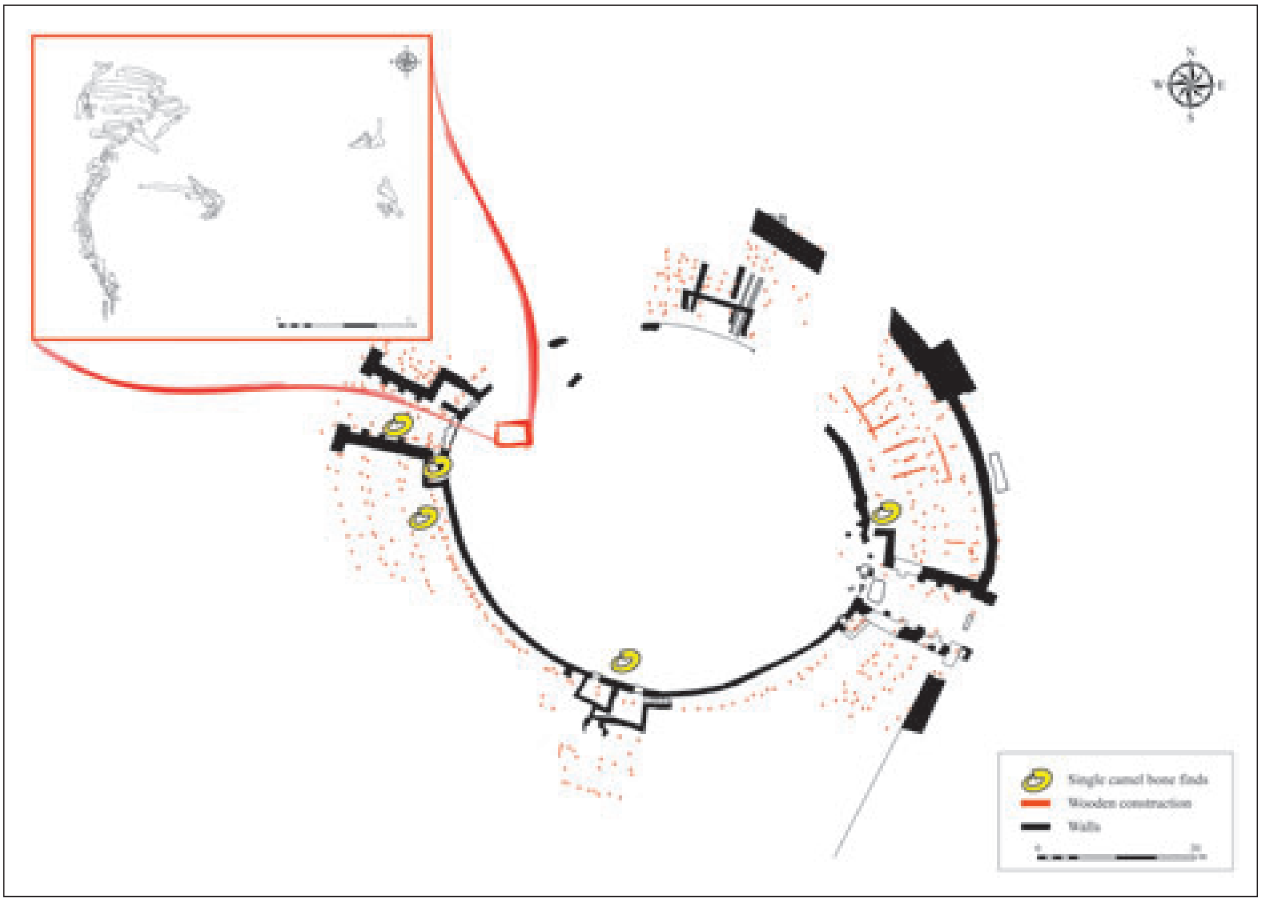


Fig. 4. Location of the camel skeleton and other camel bones at the plan of the amphitheatre

Сл. 4. Месша налаза скелеша камиле и йојединачних косшију камила на йлану амфишеашра wall of the amphitheatre, the chambers that flanked the main entrances, recesses on the short axis of the building and traces of the timber-framed seating (Fig. 3). To the north and to the southeast of the object, city ramparts were defined and partly excavated (Nikolić, Bogdanović 2012).

Based on previous archaeological excavations, it can be assumed that the amphitheatre was built in the beginning of the 2nd century AD and that it was used until the end of the 3rd, or beginning of the 4th century AD. So far it has been possible to determine several phases of the construction of the object. However, the time and reasons for the abandonment of the Viminacium amphitheatre are not completely clear. After the amphitheatre lost its function, the surface of the building was abandoned and buried. Soon after, in the second half of the 4th century AD, a graveyard was set within this area (Nikolić, Bogdanović 2012, 44; Nikolić, Bogdanović in press).

CAMEL SKELETON FROM THE VIMINACIUM AMPHITHEATRE

The camel skeleton was unearthed in the western part of the arena, in the vicinity of the amphitheatre entrance (Fig. 4, Fig. 5). It was found in the layer of brown friable soil that extended above pits in the area of arena. The skeleton was oriented south-north, with a deviation of 15 degrees of the southern part to the west. Of the skeleton, the following parts were discovered: most of the vertebral column, sternum and ribs, parts of forelegs and hind legs and the skull, which was damaged during the excavation (Fig. 6). The axial skeleton was found in the anatomical position, while the legs of the animal were discovered fragmented and dislocated.

According to archaeological finds, the layer where the camel was found dates back to the middle and the second half of the 4th century AD. The amphitheatre had lost its function at the end of the 3rd, or the beginning

Fig. 5. Camel skeleton from the Viminacium amphitheatre

Сл. 5. Скелет камиле из амфитеатра у Виминацијуму

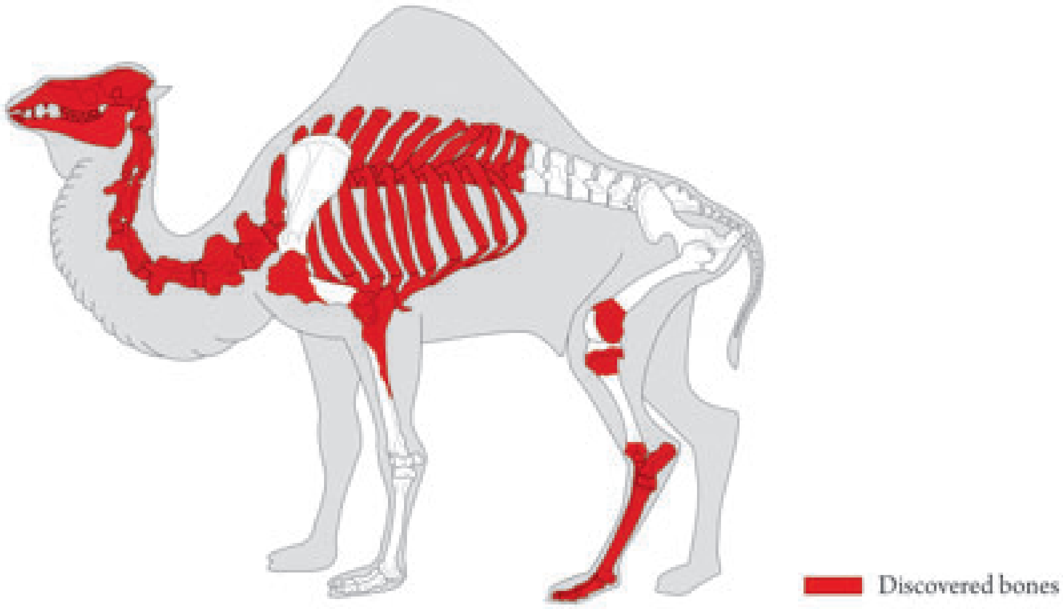


Fig. 6. Drawing of a camel skeleton, with marked skeletal parts found in Viminacium amphitheatre

Сл. 6. Схематски приказ скелета камиле, на коме су приказане пронађене кости

of the 4th century AD. After that, the whole area was abandoned. In the area of arena, a significant number of pits, which date back to the first half of the 4th century AD, were found. Above the pits and above the amphitheatre, in the course of the middle and second half of the 4th century AD, the layer in which the camel was found, was formed. After, in this layer, human graves were sunk. They constitute a graveyard that was formed in the course of the second half of the 4th century AD in the central and south-western part of the amphitheatre (Nikolić, Bogdanović 2012, 44; Nikolić, Bogdanović in press).

In the course of previous excavations of the amphitheatre in Viminacium, in the areas of the western entrance, the southern part of the arena and the grandstands, 13 individual camel bones were discovered (an atlas, three thoracic and three lumbar vertebrae, a rib, distal radius and ulna, distal femur, distal tibia and the first phalanx). All of the bones originate from the 4th century layer that was formed above the amphitheatre. Although they are likely contemporaneous with the camel skeleton, they are not related to it. As the presence of the same bones and differences in bone sizes are observed between individual bones and the camel skeleton, those bones, for sure, belong to different animals and not to the camel whose skeleton was discovered in the arena.

TAPHONOMY

The skull, mandibles, sternum, cervical and lumbar vertebrae were found in an anatomical position, while the camel legs were found fragmented and dislocated (Fig. 5). The distal right humerus and proximal radius were in an anatomical position, but dislocated in relation to the axial skeleton. The proximal right humerus was found ca. 5 m away from its distal end. The distal left femur and proximal tibia were also found in an anatomical position, but dislocated in relation to the remaining skeleton parts. The lower part of the right hind leg (distal tibia, metatarsus, tarsal bones and phalanges), which was also in articulation, but dislocated from the other skeletal parts, was found next to the proximal humerus. During the excavation, the skull and the lower part of the right hind leg were damaged and dislocated afterwards. Aside from limb parts, the scapulae, the pelvic bone and the lumbar and caudal vertebrae of this camel were missing and have not been discovered.

All leg bones were broken prior to the burying of the camel (Fig. 7, Fig. 8). Breakage patterns indicate that the bones were broken in a fresh state, not long after the death of the camel. The fresh fracture surface is smooth, has a spiral outline and the fracture angle is obtuse to the cortical surface (Outram 2001). At the

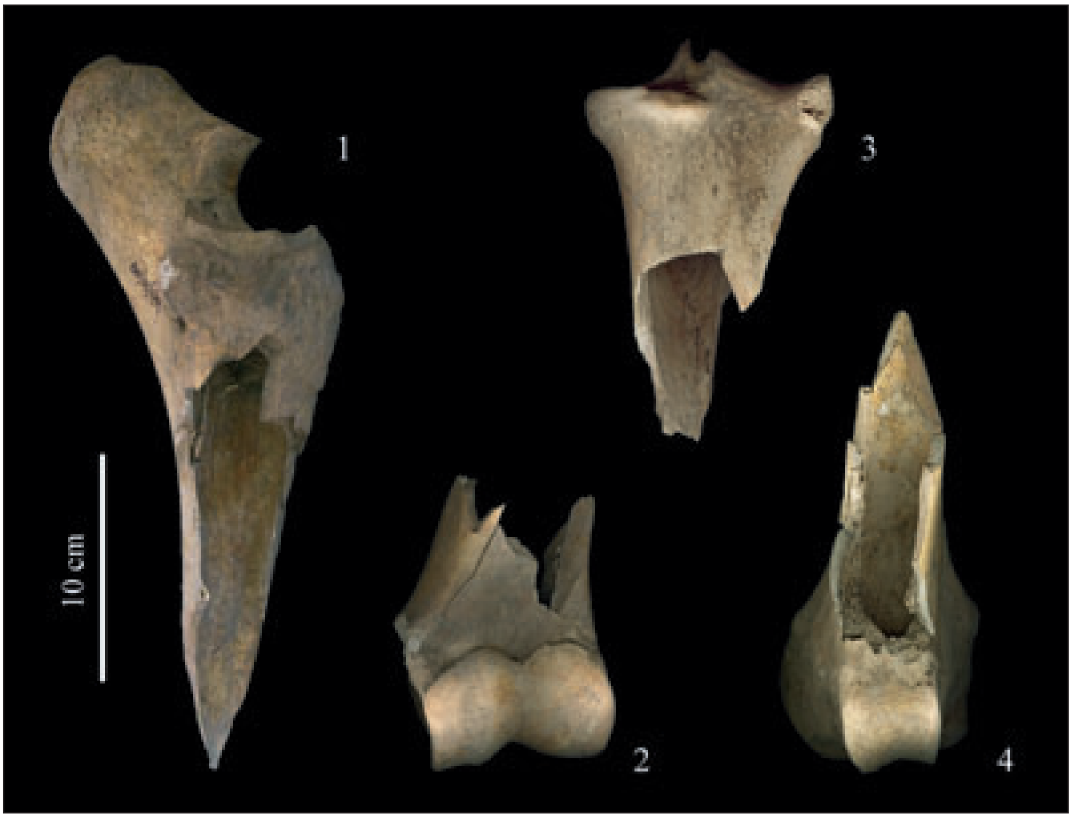


Fig. 7. Camel long bones broken for the extraction of marrow: 1) Proximal joint of ulna and radius, lateral view; 2) Distal humerus, anterior view; 3) Proximal tibia, caudal view; 4) Distal femur, anterior view

Сл. 7. Дуге кости камиле, које су поломљене због експлоатације коштане сржи: 1) Проксимални радијус и улна, латерална површина; 2) Дистални хумерус, антериорна површина; 3) Проксимална тибија, каудална површина; 4) Дистални фемур, антериорна површина

caudolateral area of the humerus midshaft, four impact marks, made by a blunt object, were detected (Fig. 8), while from those marks a smooth spiral fracture flares. The impact marks and the smooth spiral fracture are also detected in the anterior area of the radius proximal shaft (Fig. 7–1). Although impact marks were not detected on other long bones, according to their fractures, it can be assumed that they were broken in the same manner as the humerus and radius. This kind of fracturing of long bone shafts is typical for marrow extraction (Binford 1981, 148–163; Outram 2001). Bone marrow has a high nutritive value and is highly caloric. Aside from its usage in the diet, in the Roman period, marrow fat was used as oil for lamps, as a cosmetic or medicinal base, and as a lubricant by artisans (Seetah 2006, 48). All of the long bone epiphyses are complete and no butchering marks were detected on their surface. The intentional breakages of long bone shafts and the untouched epiphysis and axial skeleton parts (without modifications) are typical only for marrow processing activities without grease exploitation (Binford 1981, 157). As the long bone parts were found in an anatomical position, it can be assumed that the joints were not disarticulated prior to the breaking of the bones.

Six butchering marks, made by a knife, were detected only at the distal shaft of the metatarsus and indicate that the animal had been skinned (Fig. 9). As no other butchering marks were detected on other bones, it can be assumed that the marrow was extracted while there was still flesh on the bones. Although possible meat removal marks could be hypothesised on the skeletal parts that had been taken from this place, their absence on discovered bones is uncommon. While studying the patterns of bone modifications, L. Binford (1981), in his famous ethnographic monograph of Nunamiut Eskimos, investigated bone marrow and grease extraction. He noted that, on some occasions during marrow extraction, bones were broken prior to skinning and meat removal.

Fig. 8. Proximal humerus with impact marks, caudolateral view
Fig. 9. Metatarsal bone with skinning marks, anterior view

Сл. 8. Проксимални хумерус камиле са траговима удараца, каудолатерална површина
Сл. 9. Метатарзус камиле са траговима драња коже, антериорна површина

The pelvic bones, scapulas, lumbar vertebrae and leg parts were not found, and it is suggested that they were taken from the site, as these skeleton parts carry most of the flesh. Traces of the dismemberment of the scapula-humerus and pelvis-femur joints were not detected. However, it is possible to disjoint the scapula and humerus easily by leverage (Binford 1981, 122). As the proximal femurs were missing, it can be assumed that they were taken from the site together with the pelvis.

The bones were well preserved and some of the bones were slightly weathered. The weathering of the bones is a consequence of different atmospheric conditions that affected the bone before its burial. Gnaw marks, probably made by a dog, were detected on one of the phalanges (Fig. 13–4). Based on these taphonomic features, it is concluded that the skeleton was buried not long after it was left in the area of the amphitheatre.

TAXONOMY AND MORPHOMETRIC STUDY OF THE CAMEL SKELETON

The taxonomic identification of Viminacium camel is important because camel species originate from different parts of the world. Two-humped camels[2] (*Camelus bactrianus*) originate from Central Asia, while one-humped camels[3] (*Camelus dromedarius*) are from North Africa and Western Asia.

The adaptation to different temperature conditions of the two camel species resulted in the difference in their size and appearance. Dromedaries, which live in hot deserts, have shorter hair and generally longer limbs

[2] Sometimes, the synonym *bactrian camel* is used in the text.
[3] Sometimes, the synonym *dromedary camel* is used in the text.

Fig. 10 . Cervical vertebrae with distinct morphometric features:
1) Atlas, ventral view; 2) Atlas, dorsal view; 3) Axixs, lateral view

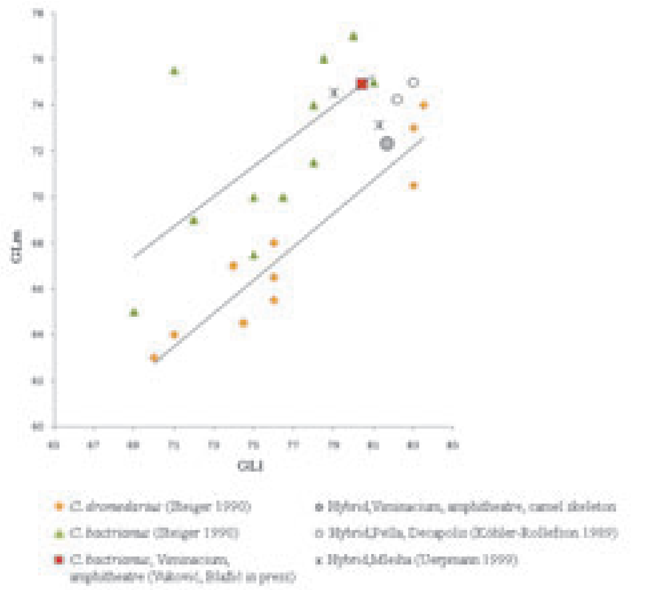
Сл. 10. Вратни пршљенови са израженим морфометријским карактеристикама:
1) Атлас, вентрална страна; 2) Атлас, дорзална страна; 3) Аксис, латерална страна

in contrast to bactrians, which are adapted to colder climates, and have a more massive stature (Köhler-Rollefson 1991). Accordingly, there are important morphometric differences in their skeletons (Olsen 1988; Köhler-Rollefson 1989; Steiger 1990; Studer, Schneider 2008). However, there are variations in the morphology of bones within both species (Olsen 1988), making taxonomic identification rather difficult. Identifying the species of ancient camel bones is further complicated by the possible appearance of hybrids. It is believed that camel hybridisation has been practiced from the 1st century AD (Uerpmann 1999). Three camel bones from previous excavations of the Viminacium amphitheatre were determined as hybrid individuals (Vuković, Blažić in press).

The morphology and measurements of the Viminacium camel's postcranial bones were compared with contemporary camels which were studied in detail by C. Steiger (1990) in her thesis and with other camel bones from Viminacium (Vuković, Blažić in press), as well as with camel bones from other ancient sites (eg. Uerpmann 1999). Bones from the camel skeleton, which have characteristic morphometric features for taxonomic identification, were studied in detail: atlas, axis, humerus, radius, ulna, femur, tibia, astragalus, calcaneus, metatarsus and phalanges. Cranium features did not contribute to the identification, due to its damage.

The morphological features of the first cervical vertebra (Fig. 10–1, 2) correspond to contemporary dromedaries, as described in Steiger (1990, 14–17). The ventral and dorsal sides are of a trapezoidal shape. On the dorsal side, *foramine alarie* are present, this is a feature of dromedaries, while bactrian camels have *incisurae* instead of these apertures. Both openings on the dorsal side *(foramen vertebrale laterale)* are divided into two parts and this feature also corresponds to one humped camels, while in bactrians there should be only one on each side. The length of the *fossa alaris ventralis*, on the ventral side of the atlas wings is 24.9 mm and exceeds the dimensions of dromedaries, but is smaller than bactrians. Other dimensions correspond to both camel species (Steiger 1990, 90).

Unlike the features of the first cervical vertebra, the morphometric features of the second cervical vertebra



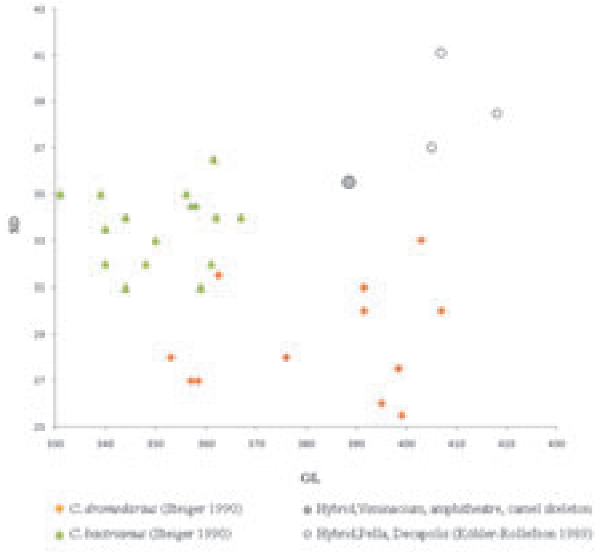


Fig. 11. The ratio between the greatest lateral length (GLl) and the greatest medial length (GLm) of astragali of contemporary (Steiger 1990) and Viminacium specimens
Fig. 12. The ratio between the greatest length (GL) and smallest breadth of diaphysis (SD) of metatarsal bones of contemporary camels (Steiger 1990), Viminacium camel and camel hybrids from Pella, Dacapolis (Köhler-Rollefson 1989)

Сл. 11. Однос латералне (GLl) и медијалне дужине (GLm) астрагалуса савремених камила (Steiger 1990) и камила из Виминацијума
Сл. 12. Однос између максималне дужине и најмање ширине дијафизе метатарзуса савремених камила (Steiger 1990), камиле из Виминацијума и хибридних јединки са налазишта Пела, Декаполис (Köhler-Rollefson 1989)

(Fig. 10–3) correspond to two-humped camels. The axis of the camel from Viminacium does not have a crest, which should be located between the lateral and transversal foramen of the body of this vertebra in dromedaries (Steiger 1990, 18–19). The dimensions of the axis fall within the range consistent with bactrian camels (Steiger 1990, 90)

According to the morphological criteria (Steiger 1990, 30–31), the proximal humerus (Fig. 8) corresponds to bactrian camels. The sulcus, located between the *tuberculum minus* and the *tuberculum intermedium*, is pronounced and this is characteristic of two humped camels. On the cranial side there is a groove between both tuberculi and the bone shaft, which is only present in bactrian camels. As for the metrics (Steiger 1990, 93), the proximal epiphysis width falls within the range of both camel species, while the width of the *trochlea distalis* (Fig. 7–2) corresponds only to bactrian camel.

On the lateral side of the radius proximal epiphysis (Fig. 7–1) there is a pronounced crest and, according to this feature, it corresponds to dromedaries (Steiger 1990, 32). The proximal epiphysis breadth falls within the range of both camel species, while the length of the ulna's olecranon exceeds that of one humped camel and corresponds to two humped camels (Steiger 1990, 94).

According to the morphology (Steiger 1990, 49), the distal femur (Fig. 7–4) corresponds to two humped camels as there is no groove, which is present only in one humped camels on the lateral side of the femur distal shaft. Based on the measurements of the distal epiphysis breadth and the breadth of the medial condylus (Steiger 1990, 97), this femur also corresponds to two humped camels.

The breadth and depth of the proximal epiphysis of the tibia (Fig. 7–3) falls within the range of both camels species (Steiger 1990, 99), while the breadth of the distal epiphysis corresponds only to two humped camels. The breadth of the articular facet for the *Os malleolare* (21 mm), which is wider in bactrians, corresponds only to two humped camels.

	L_P3	B_P3	L_P4	B_P4	L_M1	B_M1	L_M3	B_M3	LM
mandible (left)					29.1	25	60.7	27.2	
mandible (right)					31.5	24.6	63.1	26.8	
maxilla	21	16.5	24.2	27.6	28.1	33.9	48.2	35.1	109

Table 1. Cranial measurements (mm) of camel skeleton after Driesch (1976)
***L_P3** – length of P3, **B_P3** – breadth of P3, **L_P4** – length of P4, **B_P4** – breadth of P4, **L_M1** – length of M1, **B_M1** – breadth of M1, **L_M3** – length of M3, **B_M3** – breadth of M3, **LM** – length of molar raw*

Табела 1. Кранијалне димензије скелета камиле (mm) по Driesch (1976)
***L_P3** – дужина P3, **B_P3** – ширина P3, **L_P4** – дужина P4, **B_P4** – ширина P4, **L_M1** – дужина M1, **B_M1** – ширина M1, **L_M3** – дужина M3, **B_M3** – ширина M3, **LM** – дужина низа молара*

	GL	GLl	GLm	GB	SD	BFcr/Bp	BFp	Dp	BFcd/Bd	Dd	GLF/Dl	Lfavr/Dm	LAPa	SBV	BT	HT	BC	LO	DPA	SDO	BCm	Bfom
atlas	118.9			134.8		97.7			87.7		98.2	24.9										
axis									94.8				182.5	32.3								
humerus						126.6		127.8		94.8					89.7	67	83					
radius						100.2	89.2															
ulna																		98.6	93.8	80.1		
femur									118.7	125.2											46.3	
tibia (sin.)						121.4																
tibia (dext.)									88.5	51.3												23
metatarsus	388.6				35.5	64.9																
astragalus	81.8	81.7	72.3						54.1		47.3	45										
calcaneus	154.2			70.6																		
I[st] posterior phalanx					21.4	37.9		31.2														
1[st] posterior phalanx	97.1				20.7	40.4		32.3	36.4													
2[nd] posterior phalanx	62.7				30.5	31		23.6	37.7													
tarsale 4+5	41.5			60																		
centrotarsale	36.1			51																		
tarsale 2+3	21.5			33.8																		

Table 2. Postcranial measurements of camel skeleton (mm) after Driesch (1976)
***GL**: Greatest length, **GLl**: Greatest lateral length, **GLm**: Greatest medial length, **GB**: Greatest breadth, **SD**: Smallest breadth of diaphysis, **BFcr**: Breadth of the Facies articularis cranialis, **Bp**: Breadth of the proximal end, **BFp**: Breadth of the Facies articularis proximalis, **Dp**: Deapth of the proximal end, **BFcd**: Breadth of the Facies articularis caudalis, **Bd**: Breadth of the distal end, **Dd**: Depth of the distal end, **GLF**: Greatest length from the Facies articularis cranialis to the Facies articularis caudalis, **Dl**: Depth of the lateral half, **Dm**: Depth of the medial half, **LAPa**: Length of the arch including the Processus articulares caudales, **SBV**: Smallest breadth of the vertebra, **BT**: Breadth of the tochlea, **LO**: Length of the olecranon, **DPA**: Depth across the Processus anconaeus, **SDO**: Smallest depth of the olecranon; and after Steiger (1990): **Lfavr**: Greatest length of Fossa alaris ventralis, **HT**: Height of the trochlea, **BC**: Greatest breadth of Caput humeri, **BCm**: Smallest breadth of Condylus medialis, **Bfom**: Breadth of Facies articularis for Os malleolare*

Табела 2. Посткранијалне димензије скелета камиле (mm) по Driesch (1976)
***GL**: Максимална дужина, **GLl**: Максимална латерална дужина, **GLm**: Максимална медијална дужина, **GB**: Максимална ширина, **SD**: Најмања ширина дијафизе, **BFcr**: Ширина кранијалне зглобне површине, **Bp**: Медио-латерална ширина проксималне епифизе, **BFp**: Ширина проксималне зглобне површине, **Dp**: Антеро-постериорна ширина проксималне епифизе, **BFcd**: Ширина каудалне зглобне површине, **Bd**: Медио-латерлна ширина дисталне епифизе, **Dd**: Антеро-постериорна ширина дисталне епифизе, **GLF**: Максимална дужина од кранијалне до каудалне зглобне површине, **Dl**: Ширина латерлане половине, **Dm**: Ширина медијалне половине, **LAPa**: Дужина лука укључујући каудални зглобни наставак, **SBV**: Најмања ширина пршљена, **BT**: Ширина трохлее, **LO**: Дужина олекранона, **DPA**: Ширина Processus anconaeus, **SDO**: Најмања ширина олекранона; и по Steiger (1990): **Lfavr**: Највећа дужина вентралног крилног отвора, **HT**: Висина трохлее, **BC**: Максимална ширина главе хумеруса, **BCm**: Најмања ширина медијалног кондилуса, **Bfom**: Ширина зглобне површине за Os malleolare*

Fig. 13. Distal leg bones: 1) Calcaneus, medial view; 2) Astragalus, ventral view; 3) 1st posterior phalanx, plantar view; 4) 2nd posterior phalanx, plantar view

Сл. 13. Доњи делови задње ноге: 1) Калканеус, медијална страна; 2) Астрагалус, вентрална страна; 3) Прва постериорна фаланга, плантарна страна; 4) Друга постериорна фаланга, плантарна страна

Based on the morphology (breadth of the trochlea tali distalis, etc.), the astragalus (Fig. 13–2) corresponds to two humped camels. As the lateral part of the *trochlea tali* extends further than the proximal in dromedaries (Steiger 1990, 58), the ratio between the lateral and medial astragali length is different in both camel species. The ratio of the lateral and medial length of this astragalus (Fig. 11) is compared to the bactrian's astragalus from previous excavations of the Viminacium amphitheatre (Vuković, Blažić in press), the modern astragali studied by Steiger (1990, 100), the two astragali that were identified as hybrid individuals from the ancient site of Mleiha (Uerpmann 1999) and two hybrid specimens from Pella, Decapolis (Köhler-Rollefson 1989). The dimensions of the astragalus of the camel skeleton fall within the range of the bigger individuals of modern dromedaries and bactrians. This astragalus is similar to, but smaller than, hybrids from Mleiha and Pella. Although the proportions of this astragalus are somewhere between the two camel species, they show dromedary affinities.

The dimensions of the calcaneus (Fig. 13–1) correspond to both camel species (Steiger 1990, 100), while the morphology of this bone resembles two humped camels. The groove, which is present between the inner extension of the *sustentaculum* and the plantar edge in dromedaries (Steiger 1990, 61), is absent in this calcaneus.

One humped camels have longer and more slender metapodials (Steiger 1990, 70). The metatarsal bone of the Viminacium camel skeleton (Fig. 9) is long, but dumpy: its length falls within the range of dromedaries, while the smallest breadth of the diaphysis corresponds to bactrians (Steiger 1990, 102). The ratio between the greatest length and smallest breadth of the metatarsus of the Viminacium camel skeleton is compared to contemporary camels (Steiger 1990) as well as to hybrids from Pella, Decapolis (Köhler-Rollefson 1989). The graph (Fig. 12) clearly shows that the proportions of the metatarsus of the camel skeleton do not correspond to either contemporary dromedaries or to bactrians. However, it is of smaller size than the metatarsals of hybrid camels from Pella, in Decapolis.

The dimensions and proportions of the first posterior phalanx (Fig. 13–3) correspond to two humped camels (Steiger 1990, 103). Its length falls within the uppermost range of bactrians, but is smaller than the first phalanx from previous excavations of the Viminacium amphitheatre, which was ascribed to the hybrid individual (Vuković, Blažić in press). According to the morphological criterion that was recently developed by J. Studer and A. Schneider (2008), at the palmar border of the distal articulation of the first phalanx there is a clear lip-border between the distal epiphysis and the distal shaft only found in dromedaries. As our specimens lack this border, they correspond to bactrians. The dimensions of the second phalanx (Fig. 13–4) correspond to two humped camels (Steiger 1990, 104).

Discussion of the morphometric analysis

The study of the skeletal remains of the camel from the Viminacium amphitheatre indicates mixed morphometric features of both camel species. The morphology of the first cervical vertebra and proximal radius correspond to dromedary camels, while the morphology of other postcranial bones from this skeleton resembles bactrians. The dimensions mostly fall within the range of both camel species (atlas, calcaneus, metatarsus) or within the range of bactrians (axis, ulna, phalanges). Some of the bones have some dimensions that correspond to bactrians and some that correspond to both dromedaries and bactrians (humerus, femur, astragalus). Several specimens stand out due to their proportions. The astragalus, which resembles bactrians in morphology, and bigger individuals of both camel species in its dimensions, has proportions between both camel species, but is more similar to dromedaries. The metatarsal bone has the length of dromedaries, but it is dumpy, as in bactrians. Such mixed morphometric features indicate a hybrid individual between a one humped and two humped camel.

Camel hybridisation in the past were poorly explored and understood and the osteological features of hybrid camels were not studied to any great extent. So far, the osteological remains of large camels from the ancient camel and horse graveyard in Mleiha (United Arab Emirates, 1^{st}–2^{nd} century AD) (Uerpmann 1999) and camels from Pella of the Decapolis, that died in the earthquake of 747 AD (Köhler-Rollefson 1989) were identified as hybrid camels. From the Roman layers of Troy, one phalanx was also ascribed to a hybrid (Uerpmann 1999, 113), while three more single camel bones (atlas, radius and the 1^{st} phalanx), from previous excavations of the Viminacium amphitheatre (Vuković, Blažić in press), were also identified as belonging to hybrid camels. All of the mentioned camel skeletons and single bone finds were determined as hybrids according to their mixed morphological features and enormous size, which usually exceeds the dimensions of both camel species, or falls within the uppermost range of them.

In relation to hybrid camels' bones previously described, the remains of the camel skeleton from the Viminacium amphitheatre have mixed morphological features, but they are not of enormous size. None of the bones exceed the range of both camel species, but they are all among big individuals of eather bactrians or dromedaries. The reason for this might be a different type of hibridisation than previously described.

Fig. 14. Maxilla, basal view

Сл. 14. Максила камиле, базални изглед

According to ethnographic and historical studies of some contemporary pastoral societies (in Anatolia, Syria, Afghanistan, Azerbaijan) (Tapper 2011; Potts 2004), it is known that the most valued hybrids were bred as a mix of male bactrians and female dromedaries. These hybrids are of a greater size, greatest strength and have load bearing abilities that are twice as good as dromedaries. Males of the first generation of hybrids are of particular strength. It is known that they can carry 500kg loads. There are also cases where a male dromedary mates with a female bactrian camel, but that kind of the first generation hybrid is inferior to the other (Tapper 2011, after Leese 1927; Menges 1935). Subsequent generations of the hybrids, either where hybrids mate together, or are cross-bred with pure bactrians and dromedaries, are not desirable, as those animals are of small size, small value and have a bad temperament. That is why male hybrids are usually castrated, resulting in even bigger bones.

To conclude, the partial skeleton from the Viminacium amphitheatre belonged to a hybrid, but probably not to the first generation of a hybrid of a male bactrian and a female dromedary camel.

Age and sex data

The long bone epiphysis and articular surfaces of the vertebrae were fused. In other large mammals, such as horses and cows, the epiphyses close at the end of the third year (Silver 1969). However, camels mature later, at 4–5 years, so it is suggested that their long bone epiphyses fuse during that period, while the articular surfaces of vertebrae fuse later (Studer, Schneider 2008). Camel's teeth erupt in about the fifth year (Silver 1969, 301), when the last, third molar erupts. All of the teeth of the Viminacium camel have erupted and are extremely worn (Fig. 14). According to all the mentioned ageing data, it can be assumed that the camel from the Viminacium amphitheatre was, for sure, older than five years. As the vertebrae are fused and the teeth are moderately worn, it is suggested that the camel was very old.

Unfortunately, the criteria for sexing are not preserved. The entire pelvis was taken away from this site, prior to burial, while the canine tooth, whose size might enable sex determination, is lost, probably during the excavation.

CONCLUSION

The discovery of the camel skeleton from the Viminacium amphitheatre represents a unique find within the territory of the Roman provinces in Europe. To date, only single camel bones, which were not in association have been found, so this is the first camel skeleton from Roman times ever excavated in Europe.

The skeleton is particular, as only the axial skeleton was discovered in an anatomic position, while the legs were fragmented and dislocated. It was not possible to suggest the cause of death of this animal. As it was a very old animal, it may be assumed that it died of old age or that it was killed because it was no longer able to serve its primary purpose. Based on the context of find and taphonomic analyses, intentional burial of the camel and ritual activities are ruled out. After death, the camel was left at the place that used to be an amphitheatre. Shortly after, the animal was skinned, and the bone marrow was extracted from the long bones, while the skeletal parts with high nutritional value were taken from the site. According to the taphonomic study, it is assumed that the remaining skeleton was not exposed for long and that it was buried shortly after deposition.

Analysis of the skeleton and every single bone within it contribute to an understanding of osteological features of camels in the past. According to the mixed morphometric features, it is assumed that the skeleton belonged to a hybrid camel that was bred as a mix of a one humped and two humped camel, or as a subsequent generation of hybrids. The first generation of hybrid camels has greater strength and load-bearing abilities than both parental species. These animals were well adapted to a colder climate and a muddy terrain (Tapper 2011) and they could certainly stand the European climate in Roman times, at least better than dromedaries. Due to all these qualities, their presence in the Roman provinces is not surprising.

The camel skeleton was discovered in the layer that dates back to the middle and second half of the 4th century AD. At the time, the amphitheatre was no longer in use for spectacles. The camel and other archaeological finds were discovered in the layer that covered the amphitheatre. In the course of the second half of the 4th century AD, at the central and south-eastern part of the amphitheatre, the necropolis was raised. The graves were dug into the mentioned layer and, although they seem younger than the time of the burial of the camel, the temporal relationship of the necropolis and the camel skeleton is still not possible to determine. The camel skeleton find raises a new question which refers to the appearance and function of this part of Viminacium in the late antique period. As both the ramparts and the architecture of the amphitheatre were destroyed, it can be assumed that this area, which had been part of the settlement in the preceding period, was abandoned and no longer guarded. In this way, the appearance and urbanistic plan of Viminacium was changed.

The discovery of the camel skeleton, together with other camel bones from Viminacium and other sites in Serbia which also date back to the 4th century AD (Lauwerier 1978; Vuković, Blažić u štampi), indicate that camels were in use in the late antique period in the Roman provinces of this part of the world. Although there are no camel finds from earlier centuries in Serbia, the presence of camels can be suggested in that period because of camel remains that were found in earlier times (2nd and 3rd century AD) in the surrounding provinces (Schramm 1975; Bökönyi 1989).

The camel skeleton find also raises a question regarding the usage of camels in Roman times in the Balkan provinces. In Roman times, camels were primarily used as pack animals within the civilian and trading caravans. Camels also played an important role in the Roman army. The Roman army used camels to transport heavy objects such as large supplies of corn, road building equipment, luggage and military equipment, but also letters (Davies 1967, 117). Although special auxilary units of camel riders (*dromedarii*) existed, camels were more often included in other, not specially formed, units (Dobrewa 1991; Toynbee 1996, 137–140). Given that legions from Moesia were engaged in the eastern Roman provinces, there is a possiblity that some camels arrived in the Balkan provinces together with them. Meat and secondary products of camels, such as milk and wool, were also exploited, as is evidenced by the butchery marks on the camel bones from Viminacium (Vuković, Blažić u štampi). Although the participation of camels in Roman games is reported in historical sources (Dio 1914, LX, 7, 3; Suetonius 1914, Nero II, I; Toynbee 1996, 139), the camel from the amphitheatre cannot be related to these spectacles, as it originates from the layer that covered the object. Since other camel bones found within the amphitheatre also date back to the period when the amphitheatre has already lost its function, it is not possbile to presume that camels participated in public shows in the Viminacium amphitheatre.

Two-humped camels that lived in Central Asia were mainly used as pack and draught animals. Therefore, it is believed that the presence of bactrian camels in Roman provinces is related to caravans that were arriving from Central Asia (Bartosiewicz, Dirjec 2001), while dromedaries, that lived in North Africa and the Arabian peninsula were used for both civilian and military purposes. Hybrids, as strong animals, were probably also used as pack animals, either in trade and civilian caravans or in the army. Ethnographic examples show that hybrid camels were bred in regions such as Turkmenistan, Afghanistan and Iran, where both dromedaries and bactrians coexisted (Köhler-Rollefson 1991). Since there are not enough archaeozoological data on camel hybridisation from ancient times, the origin of hybrids identified in Serbia remains uncertain. Wherever it came from, it can be assumed that the camel, whose skeleton was discovered in the Vimiancium amphitheatre, probably arrived carrying trade goods or military equipment from distant parts of the Empire.

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Резиме:

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СКЕЛЕТ КАМИЛЕ ИЗ АМФИТЕАТРА У ВИМИНАЦИЈУМУ

Кључне речи. – Касна антика, Виминацијум, амфитеатар, камила, хибридизација камила.

Остаци камила представљају ретке налазе на римским локалитетима широм Европе. У Србији су кости камила пронађене у Сирмијуму (Lauwerier 1978), Виминацијуму, Гомолави, Врању код Хртковаца (Vuković, Blažić u štampi), као и на локалитетима Давидовац–Градиште и Пирот–Сарлах базилика.

Приликом истраживања виминацијумског амфитеатра пронађен је скелет камиле (Слике 2 и 3). Овај изузетан налаз откривен је у западном делу арене, у близини улаза у амфитеатар (Слике 4 и 5). Налаз скелета камиле јединствен је на читавој територији европског дела Римског царства, у оквиру кога су до сада проналажене само појединачне кости ових животиња. Скелет камиле припада слоју, који се датује у средину, односно другу половину IV века. У том периоду простор амфитеатра више није коришћен за одржавање спектакла, а налаз камиле пронађен је у слоју, који је прекрио сам објекат.

Лобања и доње вилице, део кичменог стуба (вратни и леђни пршљенови), ребра, као и делови грудне кости пронађени су у анатомском положају, док су делови ногу били фрагментовани и дислоцирани (Слика 5). Обрасци ломова дугих костију указују да су кости поломљене убрзо након смрти животиње. На хумерусу и радијусу уочени су трагови удараца тупим предметом. Овакво ломљење дијафиза карактеристично је за експлоатацију коштане сржи. Трагови касапљења уочени су само на дисталном делу дијафизе метатарзуса и они указују на драње коже. Обе лопатице и карлице, лумбални и репни део кичменог стуба, као и делови ногу нису пронађени, па се може претпоставити да су однети са овог простора. Трагови благог површинског распадања присутни су на малом броју костију, док је само једна кост оглодана, и зато се може закључити да је камила затрпана убрзо након депоновања.

На основу мешовитих морфометријских карактеристика појединачних костију скелета камиле, претпостављено је да је скелет припадао хибридној јединки, која је настала укрштањем две врсте камила. Познато је да су хибриди камила крупнији, снажнији и издржљивији од једногрбих и двогрбих камила (Tapper 2011; Potts 2004). Ове животиње се лако прилагођавају хладнијим климама и сигурно је да су лакше могле да поднесу климатске услове у Европи. Тренутно се веома мало зна о хибридизацији камила у антици, а до сада су хибриди идентификовани на налазишту Млеиха (Уједињени арапски емирати, 1–2. в. н.е), римским слојевима у Троји (Uerpmann 1999) и у Виминацијуму (Vuković, Blažić u štampi).

Камиле су у римском периоду коришћене пре свега као товарне животиње, у оквиру цивилних и трговачких каравана. Значајна је била и њихова улога у војсци, где су служиле за пренос војне опреме, намирница и грађевинског материјала (Davies 1967), као и за јахање (Dobrewa 1991; Toynbee 1996, 137–140). Месо и секундарни производи камила (млеко, вуна, итд.) такође су експлоатисани у римском периоду. Присуство двогрбих камила често се доводи у везу са караванима, који су долазили из Централне Азије (Bartosiewicz, Dirjec 2001), док су једногрбе камиле, осим у цивилној, биле и у војној употреби. Хибриди камила су највероватније због своје снаге коришћени као товарне животиње, како у оквиру различитих трговачких и цивилних каравана, тако и у војсци. Познато је да су мезијске легије биле ангажоване у источним провинцијама царства, па постоји могућност да је одређен број камила у Мезију стигао управо са овим војницима. Иако је на основу историјских извора познато да су камиле коришћене и у спектаклима (Dio 1914, LX, 7, 3; Suetonius 1914, Nero II, I; Toynbee 1996, 139), камилу из амфитеатра у Виминацијуму не можемо повезати са дешавањима у овом објекту.