Camels from Roman imperial sites in Serbia

Sonja VUKOVIĆ-BOGDANOVIĆ
Laboratory of Bioarchaeology, Department of Archaeology,
Faculty of Philosophy - University of Belgrade,
Čika Ljubina 18-20, Belgrade (Serbia)
sonja.vukovic@gmail.com

Svetlana BLAŽIĆ
Museum of Vojvodina Dunavska,
35 Novi Sad (Serbia)
blazicsvetlana@gmail.com

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ABSTRACT
This paper presents camel remains identified in Roman sites in Serbia. The remains originate from Viminacium, the capital of Roman province Moesia, and from the 3rd-4th century *villa rustica* in the locality of Vranj, in the province of Pannonia. In Viminacium, they were found in a 4th century dump, near the Eastern necropolis of the city, and in the 4th century layers in the area of the amphitheatre. In order to conclude whether these bones belonged to *Camelus dromedarius* or *Camelus bactrianus*, measurements and morphology of our specimens were compared with camel bones found at other Roman sites, and with modern specimens. We have identified two-humped camels and also hybrid individuals. The role of the camels is also discussed here: whether they were used in public games (*ludi*), for military purposes, or as transportation animals. As a conclusion, we acknowledge that camels were not rare animals in Roman provinces as it was considered before.

KEY WORDS
Camels,
Bactrians,
camel hybrids,
Roman archaeozoology,
Viminacium,
Sirmium,
Vranj,
amphitheatre,
villa rustica.

RÉSUMÉ

Des chameaux de site impériaux de la Serbie.

Cet article présente des restes de chameaux découverts sur des sites archéologiques romains de Serbie. Les restes proviennent de Viminacium, capitale de la province romaine de Moesia et d'une villa rurale du 3e-4e siècle, dans la localité de Vranj, dans la province de Pannonia. À Viminacium, ils ont été trouvés dans les dépôts du 4e siècle près de la nécropole orientale de la cité et dans les niveaux du 4e siècle dans la zone de l'amphithéâtre. Pour décider si ces os appartenaient à *Camelus dromedarius* ou *Camelus bactrianus,* les mesures et la morphologie de nos spécimens ont été comparées avec celles des ossements de chameaux d'autres sites romains. Nous avons pu déterminer des chameaux à deux bosses et des hybrides. Le rôle du chameau est aussi discuté ici : utilisation pour les jeux publiques (*ludi*), à des fins militaires ou comme bête de somme. Nous concluons que les chameaux n'étaient pas si rares qu'on l'aurait cru auparavant dans les provinces de l'empire romain.

MOTS CLÉS
Chameau,
hybrides,
Archaeozoologie romaine,
Viminacium,
Sirmium,
Vranj,
amphithéâtre,
villa rustica.

INTRODUCTION

One-humped camels, *Camelus dromedarius,* nowadays occupy arid areas from North Africa to the Caspian sea and from Arabia to Northwestern India, while two-humped camels, *Camelus bactrianus,* spread from the Caspian sea to Central Asia (Zeuner 1967).

Unlike on other common domesticates, data that deal with camel domestication are very scarce. It is considered that dromedaries and Bactrians are domesticated independently from different wild sub-species of *Camelus ferus* (Peters & Driesch 1997). The fact that there are no clear morphological differences between wild and domestic camels complicates the understanding of domestication (Olsen 1988). Ancient writers were familiar with both camel species. Aristotle (Hist. Anim. B. II. c. 1) wrote that '*The Bactrian camel differs from the Arabian in having two humps as against the latter's one*', while Pliny (Plin. Nat. 8.26) took this account from him.

According to camel skeletal remains that were found at the site of *Shar-I Sokhta* in Iran, it was considered that Bactrian camel was domesticated in the region ca 4500 years ago (Zeder *et al.* 2006 after Compagnoni & Tossi 1978). More recent archaeozoological evidences moved the center of camel domestication to the east. Camelid skeletal remains, which were found in Neolithic sites (6100-5300 BCE) in Inner Mongolia and China (Olsen 1988) are considered to be of domestic Bactrian (Peters & Driesch 1997). By the middle of the 4th millennium Bactrian camels were already in Turkmenistan and by the middle of the 3rd millennium B.C., they were present in Bactria and the surrounding area to the north and south (Potts 2003).

Evidence of early domesticated dromedaries comes from the sites in the area of Arabian Peninsula (*Umm an-Nar,* etc) and date back to the 1st half of the 3rd millennia BC. After it was domesticated, one-humped camel started to spread to the east in the beginning of the 2nd millennium BC and until the middle of the millennium it reached its most easterly point -India (Köller-Rollefson 1996). Towards the end of the 2nd millennia BC, camels started to move with camel riding tribes to the center of the Middle East (Köller-Rollefson 1993: 184). It is uncertain when the one-humped camel reached North Africa, but it is believed that it was introduced either in the Iron Age or by Romans, where Septimius Severus (194-211 AD) moved Syrian troops to fight nomads (Morales Muñiz *et al.* 1995).

Both camel species appeared in Europe in the Roman period and in the Middle Ages. It is believed that Bactrian camel reached Europe first and then

turned up in southern Russia between the 5th and the 3rd century BC. Rare finds of Bactrians were also found among animal bones from Greek colonies on the northern coast of the Black sea (Bökönyi 1974: 226-227).

Camel remains are known from Roman period sites in Italy (Mazzorin 2006), the Iberian Peninsula (Morales Muñiz *et al.* 1995), Austria (Riedel 1999), Switzerland, Ukraine (Bökönyi 1974), France (Clutton-Brock 1987), Germany (Benecke 1994), England (Applebaum 2002), Slovenia (Bartosiewicz & Dirjec 2001; Bartosiewicz 1999), Hungary (Bartosiewicz 1995; Bartosiewicz 1996; Bökönyi 1989; Bökönyi 1974) and Bulgaria (Beech 2007; Schramm 1975).

In Serbia1 camel bones were found in three Roman sites: Sirmium, Viminacium and Vranj. Sirmium camel finds are known from R. Lauwerier's (1978) unpublished thesis. In this paper we are studying the morphology and osteometry of camel remains from Viminacium and Vranj, along with the usage and cultural implications of those animals in the Roman world, and particularly on the territories of the Roman provinces of Moesia and Pannonia.

ARCHAEOLOGICAL AND ARCHAEOZOOLOGICAL BACKGROUND

Viminacium

Viminacium is situated on the right bank of the river Mlava (Fig. 1), close to its confluence with the Danube, in today's Eastern Serbia. It was founded as a military camp where Legion VII Claudia was stationed from the beginning of the 1st century. By the camp, a city arose, which became the capital of province of *Moesia Superior* and later *Moesia Prima*. Archaeological excavations of Viminacium, conducted by the *Institute of Archaeology* in Belgrade, since the seventies to the present day, have mainly been focused on the necropolis (Korać & Golubović 2009).

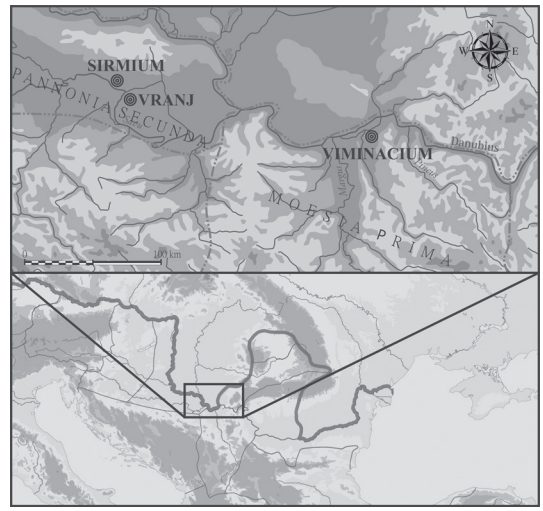

Fig. 1. — Map of the provinces of *Moesia Prima* and *Pannonia Secunda* in the 4th century AD with marked archaeological sites in Serbia where camel bones were discovered.

In the city and the camp, only the *thermae* and northern entrance gate of the camp have been excavated so far, while the systematic excavations of the city amphitheatre have begun in 2007 and are still under way. The amphitheatre was built in the first quarter of the 2nd century AD and it was used until the beginning of the 4th century AD (Nikolić & Bogdanović 2012). Analyses of faunal material from Viminacium amphitheatre are also in progress and until now, 15 camel bones were found. One camel bone was also found in the dump of the Eastern necropolis. Fauna from the Roman city of Viminacium (Vuković 2010) consists mainly of domestic animals: cattle, pigs, equids, dogs, sheep, goats, cats and camels, while wild animals: bears, wild boars, red deer and hare are also present although in small numbers.

Sirmium

Sirmium is located on the left bank of the river Sava (Fig.1), beneath the modern city of Sremska Mitrovica, in present day Northern Serbia. The city was the capital of the province of *Pannonia Secunda* in late antiquity. After the establishment of tetrarchy, Sirmium was one of four capitals of the Roman Empire. Archaeological excavations of Sirmium, conducted by the *Institute of Archaeology* in Belgrade and *Museum of Srem* have been carried

1. Since this paper was submitted for publication more camel bones were unearthed in Roman sites in Serbia. Among them is an almost entire camel skeleton from Viminacium (Vuković & Bogdanović 2013) and a few specimens from two other sites in Serbia: Davidovac-Gradište, near Vranje and Pirot, which have not been published yet.

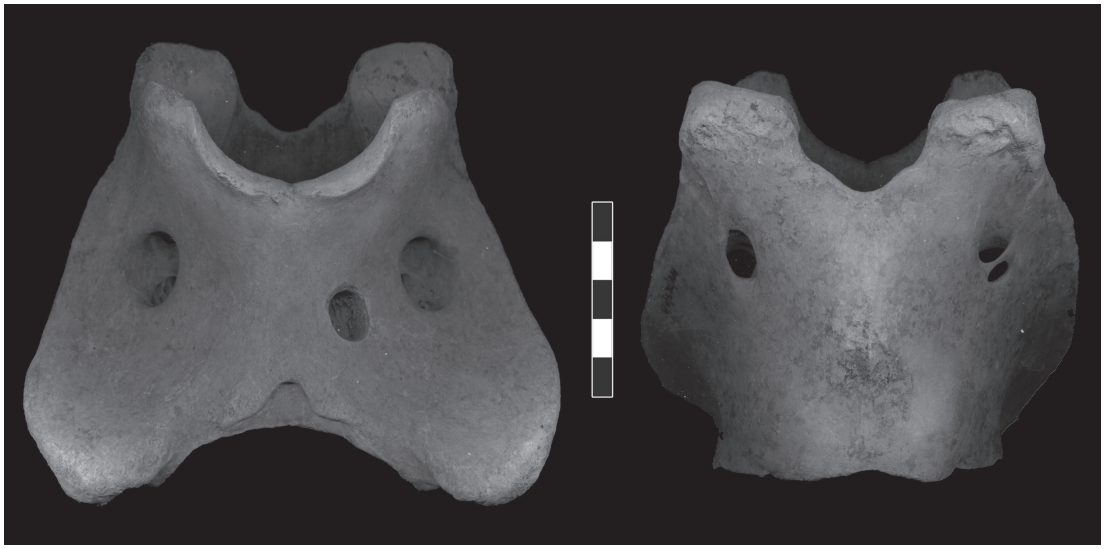

Fig. 2. — Ventral and dorsal views of the first cervical vertebra discovered in Viminacium amphitheatre. Scale in cm.

out continuously since the mid 20th century. The most important excavated objects include: imperial palace, hippodrome, horrea, Licinus thermae and Jupiter sanctuary (Milošević 2001). The fauna of Sirmium (Gilić 1994; Nedeljković 1997; Nedeljković 2009) consists mainly of domestic animals (cattle, pig, sheep, goat, horse, dog, cat, poultry), while wild animals (aurochs, red deer, row deer, hare, wolf, wild birds) represent less than 5% of the total assemblage. In the faunal material from the '*site 45*', which is known from R. Lauwerier (1978) unpublished thesis, 11 camel bones were found. Among them two phalanges dated back to the 4th century AD, while seven articulating vertebras and one scapula and calcaneus were from mixed Roman and Migration period layers (Lauwerier 1978). Sirmium camel bones were not at our disposal, so we have not included them in this study.

Vranj

Locality of 'Vranj' is situated in the village of Hrtkovci (Fig.1), close to the left bank of the Sava river, in present-day Northern Serbia. In the period between 1991 and 2004 in Vranj, a Roman *villa rustica* was excavated by the *Museum of Vojvodina.* The villa, which was located in the wider region of Sirmium, was an agricultural establishment with well equipped rooms. The villa was continuously habitated from the mid 3rd century, until the mid 4th century (Ruševljan 2004; Ruševljan 2005). Among faunal remains from Vranj (Blažić 1993) domestic animals: cattle, sheep, goat, pig, horse and dog predominate, while wild animals: red deer, roe deer, wild pig and wolf, are present in small number. In this assemblage three camel bones were found.

MATERIALS AND METHOD

We have analyzed sixteen camel bones from Viminacium and three camel bones from Vranj. Viminacium camel finds include: atlas, three thoracic and one lumbar vertebra, one rib, distal fused radius and ulna, a distal femur, distal tibia, an astragalus and two first phalanges. Majority of those specimens were found in the area of the amphitheatre, while one phalanx was found in the dump of the Eastern necropolis in locality of Pirivoj (Vuković 2010). All camel bones are from the layers that, according to ceramics and other finds, date back to the end of the 3rd and the beginning of the 4th century AD. In villa rustica in Vranj, one astragalus, one fourth

TABLE 1. — Table of measurements of studied camel specimens. Measurements taken following Von den Driesch (1976). Abreviations: **GL**, greatest length/greatest length of lateral half; **GLm**, greatest length of medial half; **GB**, greatest breadth; **GLF**, greatest length from the *Facies articularis cranialis* to the *Facies articularis caudalis*; **BFcr**, breadth of the *Facies articularis cranialis*; **BFcd**, breadth of the *Facies articularis caudalis*; **Bp**, breadth of the proximal end; **Dp**, depth of the proximal end; **SD**, smallest breadth of the diaphysis; **Bd**, breadth of the distal end; **BFd**, breadth of the *Facies articularis distalis*; **Dd**, depth of the distal end; DI, depth of the lateral half. Measurements taken following Steiger (1990): **Lfavr**, length of *fossa alaris ventralis*, **BrFd**, length of articular surface for *oscarpi radiale*; **BuFd**, length of *facies articularis* for *os carpi ulnare*; **BFOm**, breadth of articular facet for *Os malleolare*.

site	skeletal part	GL	GLm	GB	GLF	BFcr	BFcd	Lfavr	Bp	Dp	SD	Bd	BFd	Dd	BrFd	BuFd	BFOm	DI
Viminacium, *Amphitheatre*	Atlas	145.2		126.6	110	94.5	92.6	16										
Viminacium, *Amphitheatre*	Radius											104	88.2		32	40		
Viminacium, *Amphitheatre*	Femur											128						
Viminacium, *Amphitheatre*	Tibia										50.8	81.7		51.2			20.4	
Viminacium, *Amphitheatre*	Astragalus	80.4	74.9									54.3						44.6
Vranj, *villa rustica*		77.7	72.7									51.6						44.5
Vranj, *villa rustica*	Os tarsale quartum			59														
Viminacium, *Amphitheatre*	Ph I -posterior	100							38.2	30.6	20.6	34.9						
Viminacium, *Pirivoj*		96.3							41.2	32	23.4							
Vranj, *villa rustica*											20.4							

tarsal and the first phalanx were found in the layers contemporary to those of Viminacium finds. According to the size and fusion of epiphyses, all specimens originate from adult animals.

In order to conclude whether they belong to *C. bactrianus* or *C. dromedarius,* the measurements and morphology of our specimens were compared with contemporary camels which were studied in detail by C. Steiger (1990) in her thesis. We have also used metric data of ancient specimens from Roman and medieval sites in the region (Bartosiewicz&Dirjec 2001; Bartosiewicz 1995) and from United Arab Emirates (Uerpmann 1999). All measurements (Fig. 12) were taken following Von den Driesch (1976) and Steiger (1990). As we included both morphology and metrics in species identification, specimens that could not be identified according to both criteria remained indeterminate. The context and dating of finds, historical sources and archaeological finds were considered in the explanation of the presence of camels in the Roman provinces in Serbia.

TAXONOMY AND MORPHOMETRICS OF CAMEL BONES

Bactrian and dromedary camels differ in their adaptations to different temperature conditions. Dromedaries which live in hot deserts, have shorter hair and generally longer limbs in contrast to Bactrians, adopted to colder climate, which have more massive stature (Köller-Rollefson 1991). Consequently, differences in morphology and proportions allow a distinction between these two species in almost all of the postcranial bones (Steiger 1990). However, as archaeological material is usually fragmented, osteological differentiation between dromedaries and Bactrians is not a simple task. Identifying the species of ancient camel bones is further compli-

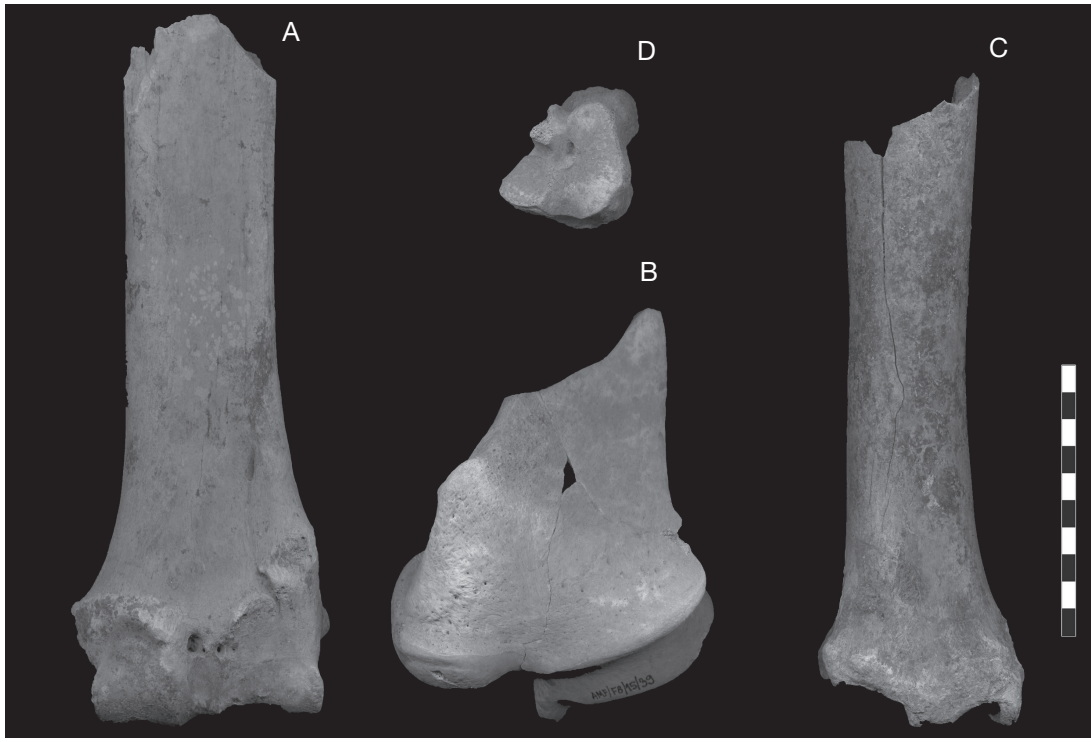

Fig. 4. — Camel specimens from Viminacium amphitheatre: **A**, Radius, posterior view; **B**, Femur, medial view; **C**, Tibia, anterior view, and villa rustica in Vranj; **D**, 4th tarsus, proximal view. Scale in cm.

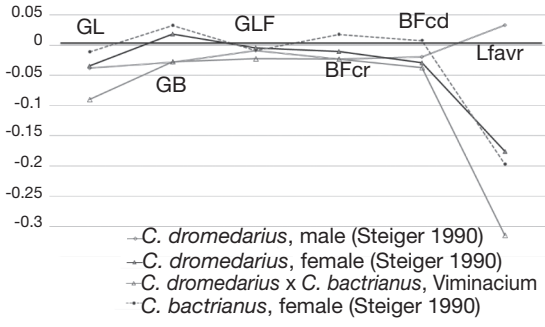

Fig. 3. — Simpson's (1941) ratio diagram. This graph shows arithmetic differences between the reference values (logarithms of measurements of contemporary male bactrians) and logarithms of the specific measurements of female bactrians, male and female dromedaries and Vimiancium specimen. Abbreviations: **GL**, greatest length; **GB**, greatest breadth; **GLF**, greatest length from the *Facies articularis cranialis* to the *Facies articularis caudalis*; **BFcr**, breadth of the *Facies articularis cranialis*; **BFcd**, breadth of the *Facies articularis caudalis*; **Lfavr**, length of *fossa alaris ventralis*.

cated by possible appearance of hybrids, as camel hybridization has been practiced from the first centuries AD until recently (Uerpmann 1999).

Vertebrae and ribs

An atlas (Fig. 2), thoracic and lumbar vertebrae, and one rib were found together with a first anterior phalanx in the area of a room next to the western entrance of the amphitheatre. As they originate from the same context, we suppose, at least for the vertebrae, that they originate from a single animal.

The measurements of the atlas (Table 1) were compared with the mean values of Bactrian camels and dromedaries from a comparative material studied by Steiger (1990) in Simpson's (1941) ratio diagram (Fig. 3). Bactrian males were taken as the reference value and logarithms of their dimensions were placed on the '0' line of the graph, and arithmetic differences between them and the logarithms of female

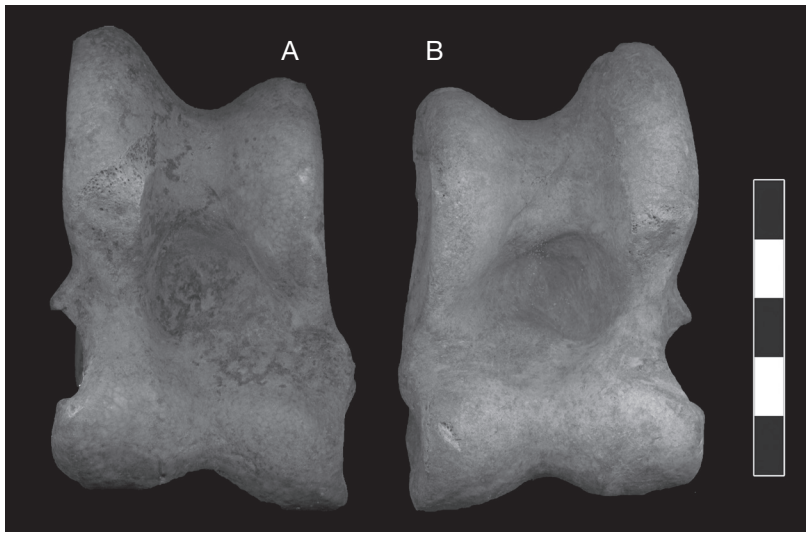

Fig. 5. — Anterior aspect of astragali from: **A**, VIminacium amphitheatre; **B**, Vranj. Scale in cm.

Bactrians, female and male dromedaries and Viminacium specimen were shown. Larger dimensions are above the reference line, while smaller ones are below it. This graph illustrates that almost all the dimensions of theViminacium atlas fall within or are even greater than mean values of male Bactrians. However, proportions of Viminacium atlas correspond to dromedaries. The length of *fossa alaris ventralis,* one of the morphometric features that apparently separates the two camel species (Steiger 1990:14), is 16mm in our specimen, which is the mean value for dromedaries, while Bactrians have an aperture almost twice as big. *Foramen vertebrale laterale* is divided into two parts only on one side of our specimen. This foramen is divided into two or three parts in dromedaries, while in Bactrians there should be only one on each side. A Bactrian specimen studied by Steiger (1990) was an exception, with two apertures on one side and one on the other, like in our specimen. Our specimen also manifests mixed features in the morphology of *foramen alare,* which is developed on one side, while there is only an incisures on the other. The presence of *foramen alare* in our specimen is a feature typical of dromedaries, while Bactrians have only *incisura* instead. Other morphological features mainly correspond to the morphology of one-humped camels. As this specimen is extremely robust, with the measurements that exceed those of Bactrians and proportions of dromedaries, and since it manifests morphologically mixed features between those of dromedaries and Bactrians, we have determined it to be a hybrid, *Camelus dromedarius x Camelus bactrianus.*

Other vertebrae: thoracic and lumbar, along with the rib do not have enough characteristics for reliable species identification.

Radius and ulna

A distal epiphysis with preserved half shaft of right fused radius and ulna (Fig. 4A) were found within the inner walls of the eastern part of Viminacium amphitheatre. Measurements of the radius – the breadth of distal epiphysis (104mm) and the breadth of *facies articularis* (88.2mm) both correspond to a large male two-humped camel and exceed the measurements of contemporary dromedaries studied by Steiger (1990: 94). On the other hand, the morphology of the distal shaft and articulation suggest a one-humped camel: the length of *facies articularis* for *os carpi ulnare* (40 mm) is larger than the length of articular surface for *os carpi radiale* (32 mm). Since the morphology and proportions correspond to a one-humped camel and measure-

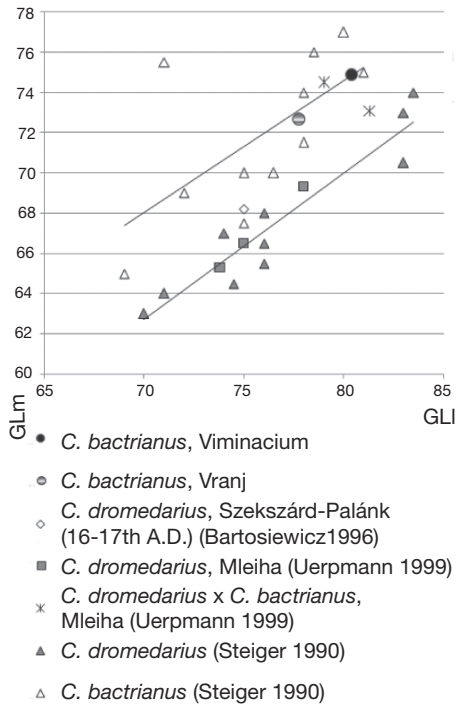

Fig. 6. — The ratio between the greatest lateral length (**GLl**) and the greatest medial length (**GLm**) of astragali of contemporary and archaeological specimens.

ments correspond to a two-humped camel, these bones are ascribed to a hybrid *C. dromedarius* x *C. bactrianus*.

Femur

A fragment of a distal shaft and epiphysis of a left femur (Fig.4B) was found in the southern part of the arena of Viminacium amphitheatre. The lateral part of the femur distal diaphysis has a distinguishing groove of dromedaries, while this groove is missing in Bactrians (Steiger 1990: 49). The lateral part of the distal shaft in our specimen is broken, therefore, identification of the species according to this morphological feature is not possible. The breadth (128 mm) of the distal epiphysis of our specimen exceeds measurements of dromedaries and corresponds to Bactrians (Steiger 1990: 97). Since metrics corresponds to a bactrian, but neither metrics nor morphology exclude a hybrid, this specimen is identified as *Camelus* sp.

Tibia

A fragment of a right tibia (Fig. 4C) with a preserved distal end and almost half shaft was found in the area to the south of the Western entrance of Viminacium amphitheatre. The only morphological distinction in distal tibia pointed out by Steiger (1990: 54) is articular facet for *Os malleolare*, which is wider in Bactrians than in dromedaries. The breadth of the mentioned articular facet in our specimen (20.4 mm) exceeds the measurements of recent dromedaries and corresponds to Bactrians studied by Steiger (1990: 99). The breadth of the distal epiphysis (81.7 mm) corresponds to male dromedaries and female Bactrians, while the depth (51.2 mm) of distal epiphysis exceeds the measurements of dromedaries and falls within the mean values of Bactrians. According to both morphology and metrics this tibia probably belonged to C. *bactrianus.*

Astragali

A complete right astragalus was discovered in the area south of the West entrance of Viminacium amphitheatre, while a complete left astragalus was found in the *villa rustica* in Vranj (Fig 5; Table 1).

As the lateral part of *trochlea tali* extends further the proximal in dromedaries (Steiger 1990: 58), the ratio between lateral and medial astragali length is different in the two camel species. We have compared the lateral and medial length of astragali from Viminacium and Vranj with contemporary specimens (Steiger 1990) and also with the closest eastern dromedaries and hybrids from the ancient site of Mleiha (Uerpmann 1999) (Fig. 6). The proportions of both our specimens exclude dromedaries and correspond to Bactrians or hybrids. Vranj specimen measurements fall within the mean Bactrian values, while the measurements of Viminacium astragalus fall within the largest Bactrians and hybrids from Mleiha. According to morphological features that distinguish one- from two-humped camel (Steiger 1990), such as the width of the *trochlea tali distalis,* both Viminacium and Vranj astragali

Fig. 7. — Cranial view of the 1st posterior phalanges from: **A**, Viminacium amphitheatre; **B**, Viminacium-Pirivoj; **C**, Vranj. Scale in cm.

correspond to Bactrian camels. As both morphology and metric correspond to Bactrians, we have identified both astragali as C. *bactrianus*.

4th tarsus

An almost complete left fourth tarsus (Fig. 4D) was discovered at *villa rustica* in Vranj. The fourth tarsus differs in dromedaries and Bactrians by the morphology of articular facet, as it is established in modern camels (Steiger 1990: 64). The articular facet for the forth metatarsus is strongly angled in dromedaries, while this facet in Bactrians is wide and flat. According to this feature, our specimen corresponds to a Bactrian. Its size is concordant to mean values for Bactrians, but does not exclude a large male dromedary or a hybrid. Therefore, we identify this specimen as *Camelus* sp.

Phalanges

In a 4th century trench in the dump of the Eastern necropolis of Viminacium, in the locality of Pirivoj, one first posterior phalanx (Fig. 7B)was found. Another first posterior phalanx (Fig. 7A) was found together with the aforementioned vertebrae and ribs in the room next to the amphitheatre west entrance. The third first posterior phalanx (Fig. 7C), which lacks distal epiphysis, was found at *villa rustica* in Vranj.

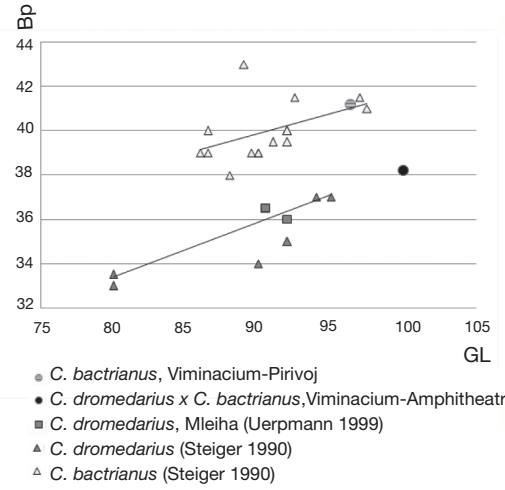

Fig. 8. — The ratio between the greatest length (**GL**) and proximal epiphysis breadth (**Bp**) of the first posterior phalanges of archaeological and contemporary specimens.

Fig. 9. — Detail of frieze of Constantine arch depicting Constantine riding his chariot, with the army departing from Milan to attack Maxentius. Besides army and horses, the procession included a camel. Although, it is poorly presented, with the neck which is too short and an almost invisible hump, the shape of the head, its size and the load on its back indicate that it is a camel. (The photo was taken from web page http://www.rome101.com/Topics/ArchConstantine/ (1.11.2011.)

Fig. 10. — Illustration of different ways of utilization of camels, drawn by B. Hawkins and published by T. Varty c. 1850, in Graphic Illustrations of Animals and Their Utility to Man.

The first phalanges of C. *bactrianus* and C. *dromedarius* differ in both metrics and morphology. Dromedaries have slimmer phalanges, which are stocky in Bactrians. The proximal epiphysis in two-humped camel tends to be wider, while in dromedaries it is more narrow and deep. Morphologically, the only distinguishing feature is the dorsal outline of the proximal articulation which is oval in Bactrians and has a beveled abaxial corner in dromedaries (Steiger 1990: 73). Specimens from Pirivoj and Vranj have oval edges, while in the specimen from the amphitheatre the abaxial edge is distinctly bevelled. The greatest length and proximal breadth of Viminacium phalanges, modern camels (Steiger 1990) and two dromedaries from Mleiha cemetery (Uerpmann 1999) are plotted on the scatter diagram (Fig. 8). The phalanx from Pirivoj falls within the range of Bactrians. The amphitheatre specimen has the proportions of dromedaries, but its length exceeds the lengths of phalanges of both species. According to both morphology and metrics, Viminacium-Pirivoj specimen is determined as C.*bactrianus*. The Amphitheatre specimen morphologically corresponds to dromedaries, but its measurements exceed both species, so we have determined this specimen was a hybrid, C. *dromedarius* x C. *bactrianus*. Vranj specimen remained indeterminate.

TAPHONOMY OF CAMEL REMAINS

Long bones, radius and ulna, femur and tibia are fragmented, while short bones, ribs and vertebrae are almost complete. This is in accordance with meat and bone marrow exploitation. Butchering marks were found on the atlas, radius/ulna and tibia. There is an artificially made puncture (diameter c.15mm) on the ventral plate of the atlas wing, which was probably made by a leaf-shaped spear. Three slice marks were located at the posterior side of the radius mid shaft. On the tibia, there are disarticulation cut-marks on the craniomedial aspect of the distal shaft and chop marks along the breakage. Those butchering marks suggest that camel meat was consumed to some extent. Good preservation of bones indicates that they were not exposed to external conditions before burial. Gnawing marks were noticed on the distal end of the phalanx from the Eastern necropolis.

DISCUSSION: WHAT WERE THE CAMELS USED FOR?

Camels in military use

Dromedary camels and *dromedarii*, camel riders, were included in Roman units in Egypt and Syria

in the 1st and 2nd centuries AD and they were reintroduced during the time of Constantine (Toynbee 1996) (Fig. 9). The Roman army used camels for transporting heavy objects: large supplies of corn, road building equipment, luggage and military equipment, but also letters (Davies 1967: 117). As other beasts of burden, camels were obtained from civilians and trained by the army. A specified standard regarding animals stature and health was required and they were subjected to veterinary examination before inclusion in the units (Davies 1989: 153-156). Except as pack animals, the Roman Army also used dromedaries to frighten horses (Bohec 2000: 27). The atlas with an impact mark probably made by a leaf shaped arrow could indicate that the camel died in battle, so the military use of the camels in Viminacium is also possible. As it was described before, that specimen originates from a large individual, probably a hybrid, certainly of great quality, which is in accordance with Roman military requirements.

Camels as long-distance transportation animals

As animals that carried loads, either for armies or in caravan trade, camels were mentioned by ancient writers (eg: Plin. Nat. 8.26; Strabo XVII, 45) and portrayed in Roman works of art (Toynbee 1996). Sirmium and Viminacium were both located on main roads that connected Aquilea and the Northern parts of the Empire with the Black sea regions, and also with Greece, so that caravans from all over the Empire must have passed this way. Archaeological finds confirm that during the 3rd and the 4th century AD in *Moesia Prima* and *Pannonia Secunda* intensive trade import was going on of cereals, vine, oil and other products from the Black sea region, and to a minor extent from the North Africa and Asia Minor. Great quantities of amphorae that carried wine and olive oil from the Black sea region were imported between the 3rd and the 6th century AD to this region. A small number of amphorae came from North-African region, Egypt and Tunisia, and it is believed that, except for wine and olive oil, they also carried fish, honey, ethereal oil and perfumes. Black Sea imports were probably shipped by waterways, whilst North African goods must have traveled along different and also terrestrial routes (Bjelajac 1996).

Long distance trade was common to the Roman world and it included, aside from luxury objects, low cost products, such as wine, oil, fish, etc. From the time of Augustus, the import of silk from China was intensified (Thorley 2011:71), and camels certainly carried a big portion of the goods from faraway China, along the *Silk Road*.

Camels in Roman games

From historical sources it is known that Emperor Claudius (Dio LX 7 3) organized camel fights and that Emperor Nero (Suetonius Nero III) introduced camel races in Circus Maximus (Toynbee 1996). Camel remains from Viminacium amphitheatre are from the period when this edifice had already lost its function, since they are from the layers that buried the building. Since there are no camel remains from the 2nd and 3rd century AD in Viminacium, we cannot presume that camels participated in public shows in Viminaciumamphitheatre. Elsewhere in the Roman world, camel bones were found in amphitheatres: in Flavian Amphitheatre in Rome (De Grossi Mazzorin *et al.* 2005), in the Roman amphitheatre of Cartago Nova in Spain (Morales Muñiz *et al.* 1995) and in the Roman amphitheatre of Serdica in Bulgaria (Velichkov 2009: 125).

Camel meat and secondary products consumption

Galen (AF 6.666) wrote that camel was eaten only by people who were 'mentally and physically camel-like', while Aristotle (Hist. Anim. B. III. c. 20) wrote about delicate taste of camel milk and meat (Dalby 2003: 71). Pliny wrote (Plin. Nat.28.33) that camel products, such as brain, tail and dung were used in medical and beauty treatments. Meat, milk, fat, hair, wool, leather, dung and other products of dromedaries (Köller-Rollefson 1991) and Bactrians (Potts 2004) have been in use ever since ancient times. Well-fed camels can produce large quantities of meat and fat. Wool of Bactrian camel is valued because of great quality of fibre (Peters & Driesch 1997). Dromedary wool is used for making blankets and tents, while sandals, whips and saddles are

TABLE 2. — Table of studied camel specimens.

site	skeletal part	taxon	
Viminacium, Amphitheatre	Atlas	*Camelus dromedarius x Camelus bactrianus*	fig. 2
Viminacium, Amphitheatre	Vertebra thoracica	*Camelus* sp.	/
Viminacium, Amphitheatre	Vertebra thoracica	*Camelus* sp.	/
Viminacium, Amphitheatre	Vertebra thoracica	*Camelus* sp.	/
Viminacium, Amphitheatre	Vertebra lumbalis	*Camelus* sp.	/
Viminacium, Amphitheatre	Vertebra lumbalis	*Camelus* sp.	/
Viminacium, Amphitheatre	Vertebra lumbalis	*Camelus* sp.	/
Viminacium, Amphitheatre	Costa	*Camelus* sp.	/
Viminacium, Amphitheatre	Radius and ulna	*Camelus dromedarius x Camelus bactrianus*	fig. 4A
Viminacium, Amphitheatre	Femur	*Camelus bactrianus*	fig. 4B
Viminacium, Amphitheatre	Tibia	*Camelus bactrianus*	fig. 4C
Viminacium, Amphitheatre	Astragalus	*Camelus bactrianus*	fig. 5A
Viminacium, Amphitheatre	1st phalanx	*Camelus dromedarius x Camelus bactrianus*	fig. 7A
Viminacium, Pirivoj	1st phalanx	*Camelus bactrianus*	fig. 7B
Vranj, *villa rustica*	Astragalus	*Camelus bactrianus*	fig. 5B
Vranj, *villa rustica*	1st phalanx	*Camelus* sp.	fig. 7C
Vranj, *villa rustica*	Os tarsale quartum	*Camelus bactrianus*	fig. 4D

made of leather. Both dromedaries and Bactrians are also used for traction (Köller-Rollefson 1991; Potts 2004). Fragmentation and butchering marks on long bones from Viminacium suggest that camel meat was consumed. In comparison with other domestic animals which were kept for meat, milk, wool and traction, camels were in much smaller number. All the camel bones discovered come from adult animals, so we can hypothesize that camels were butchered when they were too old2 to serve as pack or riding animals, which was probably their primary function.

CONCLUSION

Among 17 camel bones from Viminacium and Vranj (Table 1), we have identified 6 bactrian remains, 3 hybrids, while the remaining bones were identified as *Camelus* sp., since they did not have enough morphologically distinctive features.

Because of its great size and mixed features, we suggest that the first cervical vertebra, phalanx and radius/ulna found in Viminacium amphitheatre originate from hybrid individuals. In the horse and camel graveyard at Mleiha in United Arab Emirates, which dates back to the 1st-2nd century AD, according to their robustness and morphologically mixed features between dromedaries and Bactrians, three large camel individuals were determined as hybrids between these species. As they had the central position in the graveyard, the author suggested that they were status animals (Uerpmann 1999). In the site of Pella, Decapolis in Jordan, the skeletal remains of camels which died in the earthquake in 747 AD, were also determined as hybrids (Uerpmann 1999, after Köhler-Rollefson 1989). Additionally, the first anterior phalanx from Roman layers in Troy, Turkey, is also designated as a hybrid specimen (Uerpmann 1999: 113). Although there are no reported archaeozoological evidences of crossbreeds between two camel species in Roman period sites in other parts of Europe, L. Bartosiewicz (Bartosiewicz & Dirjec 2001:284) wrote that large camel specimens from Central Europe could either be the remains of castrated animals selected for the army, or of hybrids. Hybrids are larger and stronger, but look more like dromedaries as they have only one hump, which is usually asymmetrical or flattened at the top. They are about 2.15 m high at the shoulder or 2.32 m at the hump. They have long legs and their height is usually greater than their length, their average weight is 650 kg, but they can reach 900-950 kg in weight (Potts

2. Two-humped camel usually live 35-40 years, they are put to work at the age of four and they work for about 20-25 years (Potts 2004: 147, after Epstein 1969).

2004, after Koplakow 1935). In ethnographic sources from Central Asia from the 17th century, it is noted that hybrids could carry 500 kg, which is twice as much as dromedaries (Potts 2004 after Tapper 1985). So, hybrids have greater strength and load-bearing abilities than both species.

Taxonomic identification of Viminacium and Vranj camels is important because camel species originate from different parts of the world: Bactrians from Central Asia and dromedaries from North Africa and Western Asia. Although utilization of both camel species is similar, there is a slight difference. Bactrians are mainly used as pack and draught animals (Potts 2004:1950), while dromedaries are used for riding, as beasts of burden and for traction (Köller-Rollefson 1991). The presence of two-humped camels in Roman sites is probably related to civilian movements, i.e. to long distance caravans from Central Asia (Bartosiewicz&Dirjec 2001), while one-humped camel remains probably refer, aside to civilian, to military usage. Accordingly, their arrival in Roman provinces of *Moesia Prima* and *Pannonia Secunda* has a different connotation. Ethnographic examples showed that hybrid camels were bred in regions such as Turkmenistan, Afghanistan and Iran, where both dromedaries and Bactrians co-existed (Köller-Rollefson 1991). Since there are not enough archaeozoological data on camel hybridization from ancient times, the origin of hybrids identified in Serbia remains uncertain.

The appearance of those strong and capable animals in Roman provinces, in caravans, that carried trade goods or in Roman army units and convoys is more than reasonable. As hybrids were well adapted to colder climate and muddy terrain (Potts 2004, after Tapper 1985), they could certainly withstand European climate better than dromedaries. The habitat of Bactrian camels includes arid continental areas, with large differences in temperature, so they could put up with high and low temperatures (Grzimek 2003: 316) and certainly could manage quite well in the European continental climate.

Although there are few camel bones in regard to other archaeozoological material from Roman period sites in Serbia, we presume that the camel was not a very rare animal in the region. It should be mentioned that while finishing this paper, new camel bones were unearthed in Viminacium and that four new camel bones were also discovered in Southern Serbia, in Davidovac near Vranje, and also in Pirot, in Eastern Serbia. Just a small part of the Roman period fauna from Serbia has been processed until now (Blažić 1993; Blažić 1995; Blažić 2006; Bökönyi 1976; Gilić 1994; Dimitrijevic & Medovic 2007; Nedeljković 1997; Nedeljković 2009; Vuković 2010) and the presence of camel bones on four sites already confirms the assumption that camels were present in the provinces in today's Serbia not in such a small number.

To conclude, camels came here in caravans carrying trade goods or with Roman army units and convoys as riding or pack animals in the beginning of the 4th century AD. Along main roads in the Roman provinces of Moesia and Pannonia, along with horses and mules, but in smaller number, camels were certainly part of not a very unusual landscape.

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