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Ośrodek Badań nad Antykiem Europy
Południowo-Wschodniej
00–927 Warszawa
ul. Krakowskie Przedmieście 32
novae@uw.edu.pl

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Urszula Iwaszczuk
Marcin Matera

MAN'S BEST FRIEND ON THE BORDERS OF THE GREEK *OIKUMENE*: THE SO-CALLED DOG BURIALS AND THE ROLE OF DOGS IN TANAIS

Abstract: Tanais, the town located in the steppe zone of the northern coast of the Sea of Azov, was founded at the end of the 1st / the beginning of the 2nd quarter of the third century BC. At the end of the first century BC, Tanais was destroyed, rebuilt in the first century AD, and existed until the mid-third century AD, however the settlement in this area existed until the turn of the 3rd and 4th quarters of the fifth century AD. During the four seasons of excavations of the Trench XXV (2016–2019) at Tanais, the number of 42,217 animal remains were discovered. These elements came from wild and domestic mammals, birds, amphibians and fish. The remains of domestic mammals included many dog elements accounted for 17.4% of all the remains in this group dated to the Hellenistic times, and only 11.7% dated to the Roman period. The dog bones were found in the layers and pits located in the defensive ditch and represented all the skeleton elements. This paper discusses all dog remains, including the dog remains described during the excavations and in the course of the preliminary analysis as "the dog burials" that were preserved in the material as more or less complete skeletons in Hellenistic and Roman structures. Additionally, the dog burial from the earlier excavated Pit 17/2003 was reexamined. The morphological and statistical analysis showed that the dogs represented three different morphotypes. The measurements showed a change in the size of the dogs between the Hellenistic and Roman times with a swift towards larger individuals. Large breeds were commonly used as shepherd dogs, which was probably reflected in the material from Roman times. Such a change can be connected with arriving of nomadic tribes. Additionally, at least one of the pits dated to the Hellenistic period contained the dog's burial, together with bird bones and a goat horn, a ritual practice used in ancient Greek construction of public buildings and fortifications.

Keywords: Tanais, Hellenistic period, Roman period, dog remains, dog burial

1. Introduction

The dog remains discovered at the settlements usually constitute only a few per cent of the bone materials, if any, therefore their presence in a more significant number must be considered exceptional. The excavations carried on by the Polish team within the Archaeological Expedition of Museum-Reserve "Tanais" within the Hellenistic and Roman period contexts at Tanais, the most northeastern Greek colony [Fig. 1], brought a large quantity of animal remains, and among them, numerous dog remains. The excavations have been conducted in Western Tanais, in Trench XXV.[1]

[1] This paper is a result of the implementation of a research project funded by the National Science Centre (Poland): 2016/21/B/HS3/03423.

Fig. 1. Location of Tanais (based on map tiles by CartoDB, under CC BY 3.0.
Data by OpenStreetMap, under ODbL)

So far, remains of a defensive ditch, stone-wooden bridge, two curtains of defensive walls with a town gate, and some buildings confined within the fortifications have been unearthed.[2] Layers and pits contained mostly disarticulated dog skeletons, although articulated or partially articulated skeletons were also discovered. Unlike the other remains, a large number of dog bones were preserved as the whole bone elements. Considering the number and character of dog remains from these excavations, we analysed them separately.

1.1. Chronology and topography of the ancient Tanais

Tanais was founded at the end of the 1st / the beginning of the 2nd quarter of the third century BC[3] at the mouth of the Don River (ancient Tanais River), where it enters the Sea of Azov (ancient Lake Maeotis). The site is located on the right bank of the Don River delta, in the steppe zone of the northern coast of the Sea of Azov.[4] It was a periphery of the *oikumene* in ancient times, where Greeks coexisted with local barbarian tribes.[5]

Presumably, Eastern Tanais was founded earlier than Western Tanais and a suburb. Little is known about the town's history in the Hellenistic period beyond what is mentioned by Strabo, who emphasises its leading role in commercial exchange with the Barbarians.[6] At the very end of the first century BC Tanais was destroyed by Polemon, king of Bosporus: νεωστὶ μὲν οὖν ἐξεπόρθησεν αὐτὴν Πολέμων ὁ βασιλεύς.[7] Tanais was rebuilt in the first century AD. The town

[2] Scholl 2014, pp. 202–206; Matera 2019; Matera, Scholl 2020.
[3] Šelov 1968, p. 306; Šelov 1970, pp. 15–23.
[4] Šelov 1970, p. 82.
[5] Naumenko, Scholl 2014, p. 187.
[6] Strabo 11.2.3.
[7] *Ibidem*.

existed until the mid-third century AD, when it was completely destroyed. According to Šelov, the area of the town was inhabited again in the last quarter of the fourth century AD.[8] The results of recent studies of red slip pottery from Tanais suggest a slightly later date — the very end of the fourth century AD.[9] The settlement existed until around the middle of the fifth century AD or even a little longer to the turn of the 3rd and 4th quarters of the fifth century AD.[10] The problem of periodisation of ancient Tanais was discussed by Arsen'eva, Il'âšenko and Naumenko.[11]

2. Material and methods

Material. During the four seasons of excavations carried out in Trench XXV (2016–2019), the number of 42,217 bones, bone fragments, teeth and shells were discovered. These elements came from domestic and wild mammals, birds, amphibians, fish and molluscs; however, only mammal and fish remains were numerous — the other groups were poorly represented. The faunal material was found in the layers and pits located mainly in the defensive ditch and partially also in the buildings' area, and it was dated to the Hellenistic and Roman times.

The best-preserved dog skeletons and parts of the skeletons were discovered in Hellenistic (contexts 271, 294, 348 as well as pits 1/2017 and 6/2018) and Roman structures (contexts 290, 326 and 333). Some of the skeletons were partially articulated; in other contexts, dog remains were scattered and disarticulated, but they evidently belonged to one or more individuals which could be distinguished. Unfortunately, only one dog skeleton from the excavation seasons 2016–2019, deposited in Pit 6/2017, was almost complete. The same situation concerned the dog located in Pit 17 excavated in 2003. This skeleton was briefly described by Balûkevič in her report[12] and mentioned once more by Scholl,[13] but in our opinion, it deserves a more extensive discussion.

Age at death and sex estimation. Dogs' age at death was established based on the fusion of epiphyses with diaphysis, the fusion of pelvis bones and the degree of development of the glenoid articulation of scapula,[14] as well as the degree of tooth development.[15] Unfortunately, it was impossible to determine the sex of the analysed animals with the certainly as no baculum was found at the site. It must be emphasised that the lack of baculum does not necessarily indicate that only female remains were present in the material. In general, a large number of small bone elements was not present at all. Two factors might be responsible for this: the post-deposit movements of the bones and the excavation methods, as the materials from layers were hand-collected and only the content of the pits was sieved.

Morphology. The dog morphotypes were discussed based on the measurements taken according to the method elaborated by Driesch.[16] The analysis of the skulls of two dogs from the layers (Dog 3 / Context 348 and Dog 9 / Context 290) was conducted based on the following skull indices:[17]
cephalic index: maximum zygomatic width (Zy-Zy) × 100 / skull length (A-P)
cranial index: greatest neurocranium breadth (Eu-Eu) × 100 / neurocranium length (A-N)
snout width index: breadth at the canine alveoli (BdCalv) × 100 / viscerocranial length (N-P)
facial index: maximum zygomatic width (Zy-Zy) x 100 / viscerocranial length (N-P).

[8] Šelov 1972, p. 307 sq.
[9] Domżalski 2021, p. 32.
[10] *Ibidem*, p. 33.
[11] Arsen'eva, Il'âšenko, Naumenko 2010.
[12] Balûkevič 2003, p. 95.
[13] Scholl 2011, p. 60.
[14] Schmid 1972, pp. 75, 77.
[15] Silver 1969, p. 299.
[16] Driesch 1976.
[17] Alpak, Mutus, Onar 2004; Harcourt 1974.

Indices were used to reconstruct the cranial types and reduce the effect of size between the different morphotypes. The reconstruction is based on the measurements and indices of dog skulls collected by Knoest[18] and based on the collection deposited in the Warsaw University of Life Sciences — SGGW. The indices were mapped in the Principal component analysis (multivariate analysis). The statistic and graphic analyses were performed with RStudio Version 1.1.463. Mapping the cranial types was conducted by Principal Component Analysis with autoscaling method to reduce the dimensionality. The data set was obtained from calculating three indices listed in Appendix 1 (cephalic index, snout width index and facial index). The analysis showed that only one principal component (PC1) was responsible for 93.85% of the variance.

The withers heights (WH) of the dogs from Tanais were calculated using coefficients prepared by Koudelka in 1885.[19] In the case of the skulls, we were able to count the withers height using the equation proposed by Wyrost and Kucharczyk.[20] In the case of both methods, the bias must be considered. The withers height based on the length of the long bones was counted for each bone in the case of most of the contexts; however, in the case of discussed skeletons, the average of the results based on all measured long bones was calculated.

3. Results

The dog remains constituted a remarkably high percentage among the domesticates. Interestingly, the archaeological contexts from the Hellenistic period contained clearly more numerous dog bone elements (17.4%) than contexts from the Roman times (11.7%) [Table 1]. The dog remains discovered in contexts dated to both periods represented all anatomical elements. They were present in layers and pits together with other animal remains; however, their share in pits was low, usually only some isolated bones were found there, and in some pits, they were not registered at all. There were only three exceptions to this rule of Hellenistic chronology that will be discussed below.

Table 1. Zoological distribution of the domesticates in the Hellenistic and Roman contexts

	Hellenistic period		**Roman period**	
	n.	**%**	**n.**	**%**
Cattle (*Bos taurus*)	912	36.0	2220	30.9
Pig (*Sus domestica*)	137	5.4	249	3.5
Sheep (*Ovis aries*)	66	2.6	393	5.5
Goat (*Capra hircus*)	17	0.7	99	1.4
Sheep/goat (*Ovis aries*/*Capra hircus*)	714	28.2	1978	27.5
Horse (*Equus caballus*)	243	9.6	1374	19.1
Dog (*Canis familiaris*)	441	17.4	842	11.7
Cat (*Felis catus*)			29	0.4
Camel (*Camelus* cf. *bactrianus*)			1	0.0
	2530		**7185**	

[18] Knoest 2015, p. 177.
[19] Driesch, Boessneck 1974.
[20] Chrószcz *et alii* 2007; Wyrost, Kucharczyk 1967.

3.1. Dogs from the Hellenistic contexts

Dog remains were present in most contexts dated to Hellenistic times. They belonged to young as well as adult morphologically individuals; the remains of fetal, newborn or very young animals were not discovered. The reason could be the poor preservation of cartilaginous structures in general, but in the case of fish, cartilaginous elements of the skeleton were quite frequent finds at the site. Therefore, we must assume the other treatment of carcasses belonging to fetuses and puppies. In the case of the bones belonging to adult dogs, it was possible to take some measurements [Table 2] and calculate the size of the animals [Table 3]. The estimated withers height ranges between 41 and 58 cm, with an average of about 50 cm. The plot [Fig. 2], including also the estimated sizes of the dogs 1, 2 and 7 described below, shows three groups of sizes in the case of the Hellenistic period: below 45 cm, between 45 and 50 cm and between 54 and 58 cm, which could represent different breeds. A gap between medium-size and large dogs visible in the plot is remarkable as well as the very low representation of the smallest dogs; however, the number of estimated sizes is, unfortunately, low and can show only the general trends.

Table 2. Measurements (mm) of the dogs from the Hellenistic contexts (other than dogs 1–7)

skull		**mandible**		**atlas**	**scapula**			**pelvis**
length of cheektooth row		**length of cheektooth row**		**GB**	**GLP**	**BG**	**SLC**	**LA**
64		78.2		77	27.9	17.0	24.1	21.8
humerus					29.1	16.1	22	24.2
GL	**GLC**	**Bp**	**Bd**	**SD**	31.1	19.0	26	25.1
161.8			32.9	12.3	31.2	18.4		25.1
165.1		36.2		12.5	31.2	18.4		26.3
165.1		36.2		12.5			28	26.3
	172.9		35.8	14.4			28	
			29.4		**radius**			
			31.2		**GL**	**Bp**	**Bd**	**SD**
			31.2		144.2	19	23.8	13.1
			33.9		148	16.8	21.2	11
			34.1		148	16.8	21.2	11
			34.2		153.1	17.2	22.8	13
			34.2		170.9	19.1	28.4	15.1
			35.4			21.8		
			35.4			16.3		
ulna	**femur**					16		
GL	**GL**	**Bp**	**Bd**	**SD**	**tibia**			
186	194.4	39.3	31.2	15	**GL**	**Bp**	**Bd**	**SD**
		34.2						
calcaneus		34.2			143.7	24.4	16.3	8.8

GL	Mc IV	Mt II	Mt III	Mt IV	143.7	24.4	16.3	8.8
44	GL	GL	GL	GL	186	33.2	22.2	13.1
Mc III	43.4	67.1	75.1	78.1				
GL	43.4				186	33.2	22.2	13.1
61.8	60.9							
Ph I					Ph II			
GL	Bp	Bd	SD		GL	Bp	Bd	SD
25	8.8	7.3	5.9		18.6	8.1	7.8	5.8
26.4	8.9	7.1	6.1		18			

Abbreviations (von den Driesch 1976)
Atlas measurements: greatest breadth over the wings (GB)
Scapula measurements: greatest length of the glenoid process (GLP), breadth of the glenoid cavity (BG), smallest length of the neck of the scapula (SLC)
Pelvis measurement: length of acetabulum including the lip (LA)
Long bones measurements: greatest length (GL), greatest breadth of the proximal end (Bp), greatest breadth of the distal end (Bd), smallest breadth of diaphysis (SD)

Table 3. Withers height of the dogs from the Hellenistic and Roman contexts (other than dogs 1–11)

	Hellenistic period			Roman period		
bone	GL (mm)	coefficient	WH (cm)	GL (mm)	coefficient	WH (cm)
scapula				121	4.06	**49.1**
humerus	161.8	3.37	**54.5**	155.4	3.37	**52.4**
	165.1	3.37	**55.6**			
	165.1	3.37	**55.6**			
radius	144.2	3.22	**46.4**	158.9	3.22	**51.2**
	148	3.22	**47.7**			
	148	3.22	**47.7**			
	153.1	3.22	**49.3**			
	170.9	3.22	**55.0**			
ulna	186	2.67	**49.7**			
femur	194.4	3.01	**58.5**	135.8	3.01	**40.9**
				189	3.01	**56.9**
				197.4	3.01	**59.4**
				199.2	3.01	**60.0**
tibia	143.7	2.92	**42.0**	205	2.92	**59.9**
	143.7	2.92	**42.0**	202.8	2.92	**59.2**
	186	2.92	**54.3**			
	186	2.92	**54.3**			

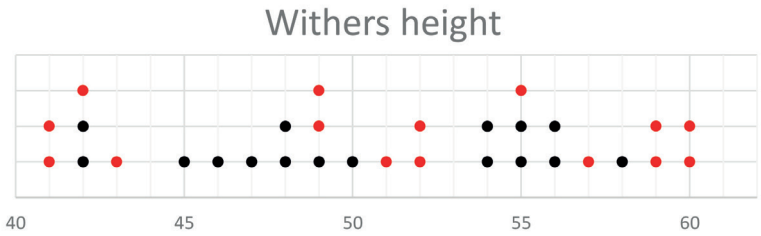

Fig. 2. Plot showing the withers heights (cm) of the Hellenistic (black dots) and Roman period dogs (red dots)

The characteristic feature of the Hellenistic period in Tanais is the presence of the more or less complete dog skeletons in the pits and layers located within the defensive ditch. At least seven dog skeletons were found in these contexts [Fig. 3]. They were in a different state of preservation, and the contexts of their discovery varied notably.

Dog 1 / Pit 17/2003. One of the dog skeletons was discovered in Pit 17 in 2003, and it was analysed in a very general way and published by Balûkevič directly after the excavations.[21] The feature was located in squares 8 and 9 on the western slope of the defensive ditch in the place where the wooden causeway of the bridge rested on a stone single-faced wall. This wall ran south perpendicularly to the western end of the stone pier of the bridge [Fig. 3].

Pit 17 was circular, with a diameter of 0.65 m and a depth of 1.17 m. At the bottom of this pit, there was a skeleton of a dog laying on a stone pavement. The animal lay on its right side along the E–W axis with its head thrown back (Fig. 4.I). There was a goat horn near the dog's paws, and next to the skull — ten unidentified bird bones. Most likely, a similar pavement covered the dog from above, since at a depth of 0.50 m, there was a stretch of stones cemented by the river silt in the side of the pit.[22] According to Balûkevič,[23] the animal unearthed in Pit 17 was of the size of a spitz and was about 4 or 5 years old when its neck was broken intentionally.

It was impossible to re-investigate this skeleton, but some remarks can be made on the basis of the photo of poor quality [Fig. 4.I.c] published originally in black and white.[24] The bones [Table 4] were in a very good state of preservation; most of them were complete, only a few (left scapula, radius and ulna) were broken. In the case of the left radius and ulna, it seems that the cause of such a state of preservation was the fact that the profile of the pit cut the forelimbs into two parts [Figs. 4.I.a and 4.I.b]. All the bones (including vertebrae) were fused; therefore, the animal was at least 20–24 months old but probably older.[25] The approximate size of the dog could be calculated based on the greatest length of the left tibia, which was about 160 mm, so the withers height should be estimated at 47 cm. An identical result (WH about 47 cm) was achieved based on the greatest length of the left humerus (GL about 140 mm). It is impossible to confirm the theory about the intentional breaking of the neck suggested by Balûkevič, because such action should not leave any marks on the bones, although the position of the head located in the caudal direction along the body might suggest such an interpretation. Additionally, no marks, including cut marks, were visible on the bones, but the picture [Fig. 4.I.c] cannot be conclusive evidence in this matter. The pit content, with only a few additional elements, as well as the arrangement of the carcass suggest a special treatment, different than in the case of other dog carcasses discovered at the site; remarkable is also the location of the pit, at the mouth of the pier of the bridge.

[21] Balûkevič 2003.
[22] Arsen'eva, Šoll' 2003, pp. 93–95.
[23] Scholl 2011, p. 60.
[24] Šoll' 2008, p. 328, fig. 30.
[25] Kolda 1936.

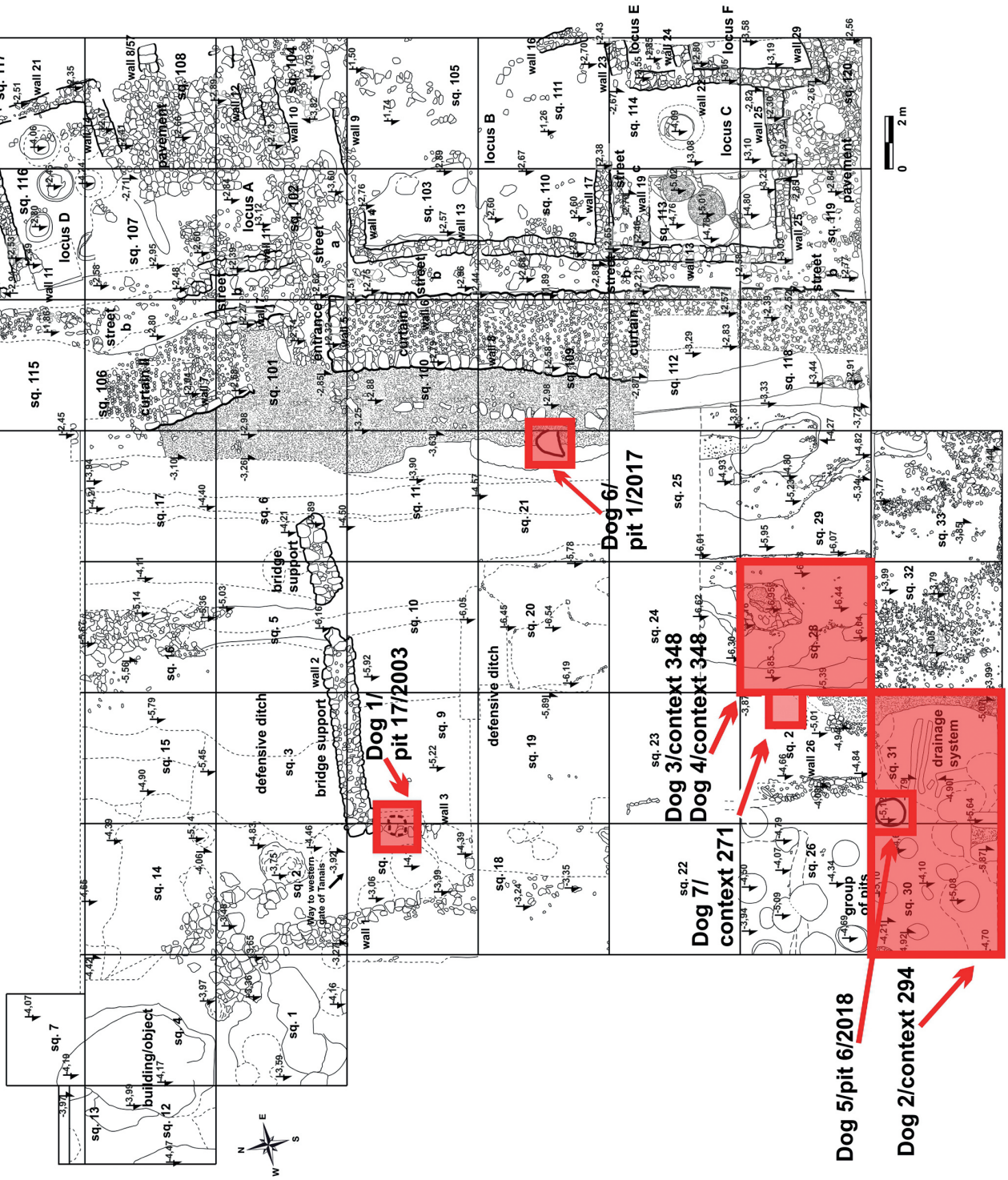

Fig. 3. Tanais, plan of Trench XXV. Dog skeletons dated to the Hellenistic period marked red (drawing by A. Graczyk)

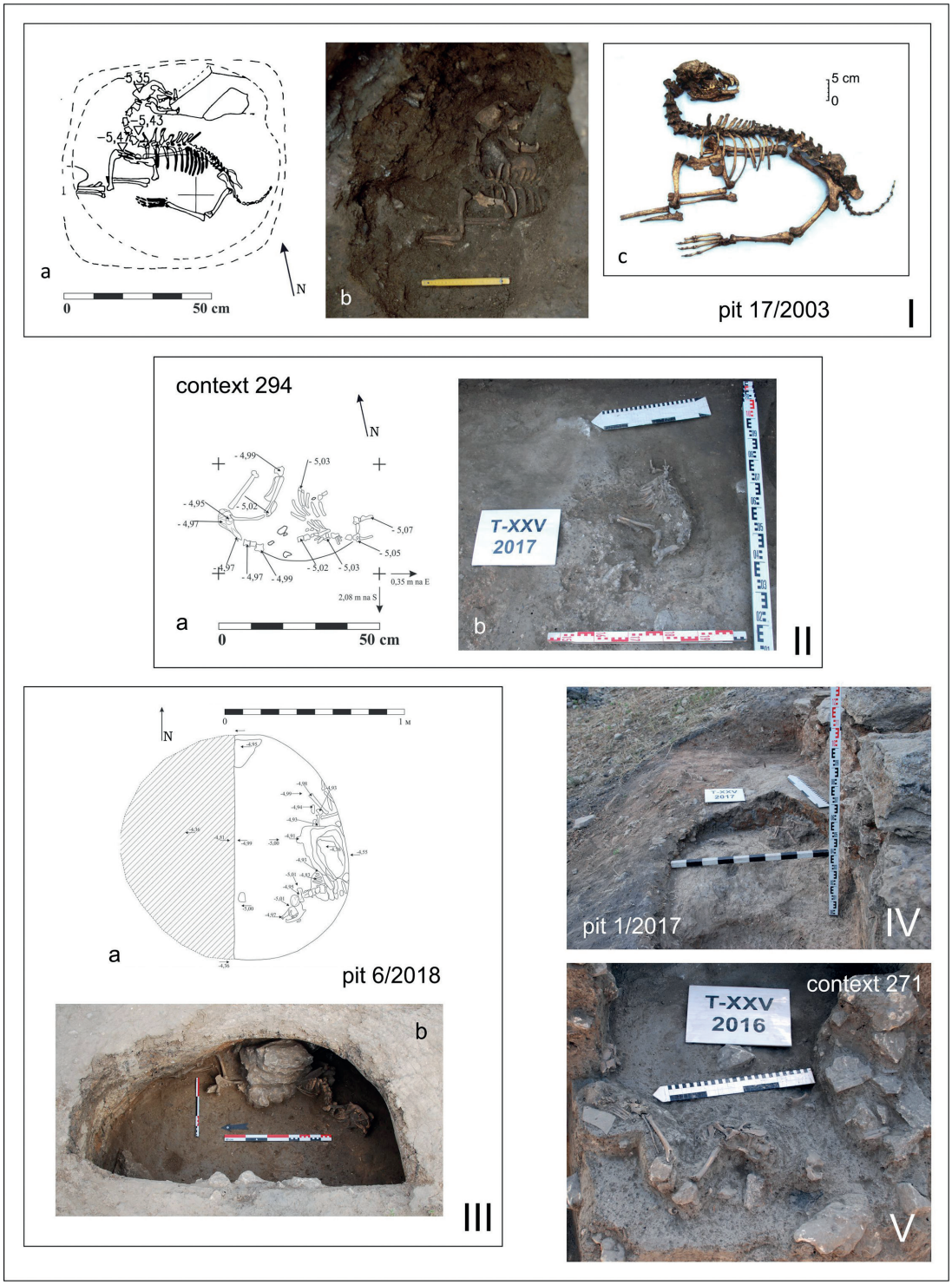

Fig. 4. Dogs in the archaeological contexts. I. Pit 17/2003: a. plan of the foundation deposit (drawing by J. Zwolińska, digit. M. Wolski), b. photo in situ during the excavations (by T. Scholl), c. dog remains arranged in the original position (photo by T. Scholl, digit. and retouching J. Iwaszczuk); II. Dog 2 / Context 294: a. plan (drawing by A. Miernik, digit. A. Graczyk, M. Matera), b. photo in situ (by M. Matera); III. Pit 6/2018: a. plan (drawing by M. Sugalska), b. photo in situ (by M. Matera); IV. Dog 6 / Pit 1/2017: photo in situ (by M. Matera); V. Dog 7 / Context 271: photo in situ (by P. Lech)

Dog 2 / Context 294. The partially preserved skeleton was revealed on the western slope of the defensive ditch in square 31 [Figs. 3 and 4.II]. Part of the spine, ribs, pelvis and long bones of the hind limbs were found *in situ*. Interestingly, one of the bones, the right radius, bore marks of gnawing by carnivores. The dog lay on its right side along the E–W axis with its head directed to the east. The burial pit could not be reconstructed; presumably, it did not exist at all. There were no traces of any treatment or ritual.

It is worth mentioning that some of the bone elements were articulated, especially a big part of the spine, namely the lumbar vertebrae [Table 4]. Some of the bones (ribs and vertebrae) were fragmented; the rest was in a good state of preservation. The posterior part of the skeleton was more complete; most of the elements from this part came from both left and right sides of the body, unlike the forelimb elements [Table 4]. The withers height calculated based on the long bones gave results between 44 and 46 cm, with the average about 45 cm [Table 5]. Both femurs bear traces of a pathological process visible as a bone loss in the vicinity of the distal epiphyses; the left femur was affected to a higher degree. Additionally, one of the last right ribs was broken and not healed entirely at the moment of the animal's death. It is not evident whether this injury or the pathological process could cause this dog's death. The animal was certainly older than 20–24 months.[26]

Table 4. Anatomical distribution of the remains of the dogs 1–7 from the Hellenistic contexts

Dog 1 / pit 17/2003				
bone	**NISP**	**MNE**	**side**	**notes**
skull	at least 3	1		
mandible	2	2	R+L	
atlas	1	1		
axis	1	1		
cervical vertebrae	5	5		
thoracic vertebrae	10	10		
lumbar vertebrae	7	7		
sacrum	1	1		
caudal vertebrae	at least 13	13		
rib	12	12	L	
scapula	2	1	L	
humerus	2	2	R+L	
radius	2	2	R+L	L bone was broken
ulna	2	2	R+L	L bone was broken
pelvis	1	1	R+L	
femur	2	2	R+L	
tibia	2	2	R+L	
fibula	1	1	R	

[26] Schmid 1972, p. 75.

talus	at least 1	at least 1	at least L	
calcaneus	at least 1	at least 1	at least L	
metatarsus	7	7	3R+4R	
phalanx I (Ph I) hind limb	4	4	L	
phalanx II (Ph II) hind limb	3	3	L	
phalanx III (Ph III) hind limb	3	3	L	
TOTAL	**88**	**85**		

Dog 2 / context 294				
bone	**NISP**	**MNE**	**side**	**notes**
mandible	1	1	L	
atlas	1	1		
thoracic vertebrae	10	8		
lumbar vertebrae	11	8		in anatomical order
caudal vertebrae	1	1		
rib	39	22	10R+12L	
scapula	1	1	L	
humerus	1	1	L	
radius	1	1	R	gnawed on distal end
ulna	1	1	R	
pelvis	4	1	R+L	
femur	2	2	R+L	bone loss visible close to distal ends of both bones; more advanced in left femur
tibia	2	2	R+L	
fibula	2	2	R+L	
talus	1	1	R	
calcaneus	1	1	L	
metatarsus II (Mt II)	1	1	L	
metatarsus III (Mt III)	1	1	L	
metatarsus IV (Mt IV)	1	1	L	
phalanx II (Ph II)	1	1	R	
TOTAL	**83**	**58**		

Dog 3 / context 348				
bone	**NISP**	**MNE**	**side**	**notes**
skull	1	1		
mandible	2	1	R+L	
cervical vertebrae	1	1		
thoracic vertebrae	8	8		
lumbar vertebrae	1	1		
rib	11	11	5R+6L	
metacarpus V (Mc V)	1	1		
femur	2	1	L	
TOTAL	**27**	**25**		
Dog 4 / context 348				
bone	**NISP**	**MNE**	**side**	**notes**
mandible	1	1	R	
rib	6	5	R+L	
scapula	1	1	L	
humerus	2	1	L	
radius	2	2	R+L	
ulna	2	2	R+L	
femur	2	1	R	
TOTAL	**16**	**13**		
Dog 5 / pit 6/2018				
bone	**NISP**	**MNE**	**side**	**notes**
skull	34	1		
mandible	14	2	R+L	
atlas	1	1		
axis	2	1		
cervical vertebrae	10	7		
thoracic vertebrae	25	7		
lumbar vertebrae	20	6		
sacrum	1	1		
caudal vertebrae	9	9		
sternum	6	6		
rib	80	22	11R+11L	
scapula	3	2	R+L	

humerus	5	2	R+L	
ulna	6	2	R+L	
metacarpus II (Mc II)	2	2	R+L	
metacarpus III (Mc III)	2	2	R+L	
metacarpus IV (Mc IV)	2	2	R+L	
metacarpus V (Mc V)	2	2	R+L	
ossa carpi	7	7	4R+3L	
pelvis	2	2	R+L	
femur	6	2	R+L	
patella	1	1	R	
tibia	2	2	R+L	
fibula	4	2	R+L	
metatarsus II (Mt II)	2	2	R+L	
metatarsus III (Mt III)	1	1	L	
metatarsus IV (Mt IV)	1	1	L	
metatarsus V (Mt V)	2	2	R+L	
talus	2	2	R+L	
calcaneus	2	2	R+L	
ossa tarsi (other)	2	2		
sesamoid	1	1		
phalanx I (Ph I)	2	2		
phalanx II (Ph II)	8	9		
phalanx III (Ph III)	3	5		
phalanx IV (Ph IV)	3	3		
TOTAL	**275**	**125**		

Dog 6 / pit 1/2017				
bone	**NISP**	**MNE**	**side**	**notes**
cervical vertebrae	5	4		
humerus	4	2	R+L	
radius	4	2	R+L	
ulna	5	2	R+L	
TOTAL	**18**	**10**		

Dog 7 / context 271				
bone	**NISP**	**MNE**	**side**	**notes**
skull	3	1		

mandible	2	1	R+L	
lumbar vertebrae	4	4		
sacrum	1	1		
caudal vertebrae	11	11		
rib	4	2	L	
humerus	1	1	L	gnawed by carnivores
radius	2	1	L	
ulna	1	1	R	gnawed by carnivores
pelvis	1	1	R+L	
femur	5	2	R+L	
tibia	2	2	R+L	
fibula	5	2	R+L	
metatarsus II (Mt II)	2	2	R+L	
metatarsus III (Mt III)	2	2	R+L	
metatarsus IV (Mt IV)	2	2	R+L	
metatarsus V (Mt V)	2	2	R+L	
talus	1	1	R	
calcaneus	1	1	R	
ossa tarsi (other)	4	4		
sesamoid	3	3		
phalanx I (Ph I)	4	4	L	
phalanx II (Ph II)	1	1	L	
TOTAL	**64**	**52**		

Dog 3 / Context 348. The Hellenistic layer of the defensive ditch fill in square 28 [Fig. 3] contained the remains of two dogs and some other accidentally deposited bone elements belonging to this species. The bones were scattered over the whole square.

In the case of Dog 3, only a part of the skeleton was preserved; there was a skull and both halves of a mandible fitting each other. Some ribs from both parts of the body and vertebrae (mainly thoracic) also belonged to the same specimen together with the left femur and V metacarpal bone [Table 4]. The animal was adult at the moment of death. Based on the long bones, it was older than 18 months.[27] Additionally, all the vertebrae had fused bodies and articulation surfaces; therefore, the dog was older than 20–24 months.[28] The mandibular and cranial teeth were permanent and worn. The skull [Fig. 5.I.a] revealed additional information concerning the dog's morphology. The cranium was mesocephalic with a cephalic index of 60.9. Facial and snout width indices suggest that the muzzle was relatively short but wide [Appendix 1]. Principal

[27] Kolda 1936.
[28] Schmid 1972, p. 75.

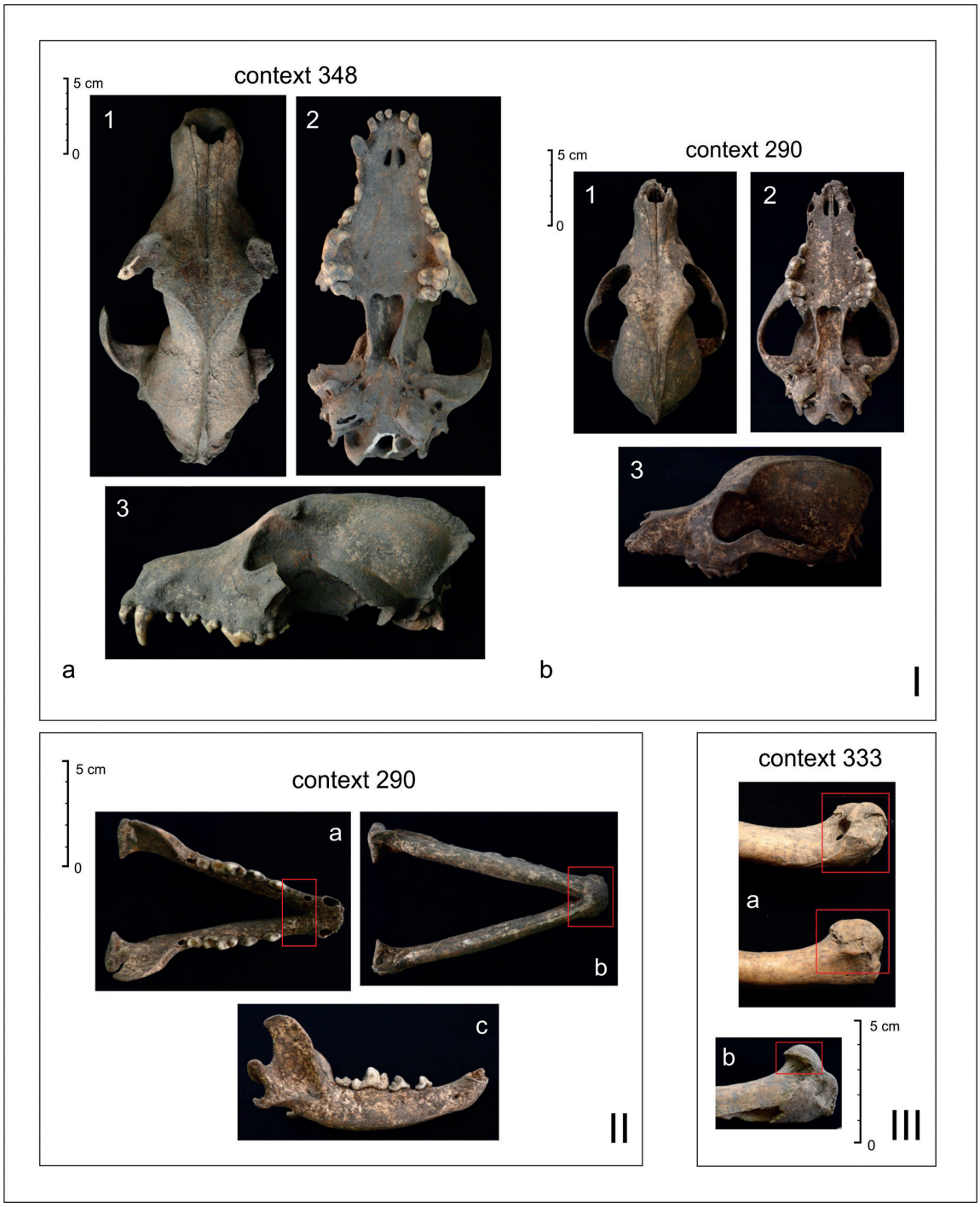

Fig. 5. Selected dog bones from the Hellenistic and Roman periods. I. Skulls of the dogs:
a. Dog 3 / Context 348: a1. dorsal view, a2. ventral view, a3. lateral view;
b. Dog 9 / Context 290: b1. dorsal view, b2. ventral view, b3. lateral view (photo by U. Iwaszczuk);
II. Mandible of Dog 9 / Context 290: a. occlusal view; b. dorsal view; c. buccal view;
III. Humeri of Dog 11 / Context 333 with the irregular degenerative change on the distal epiphysis and a degenerative change in the form of a regular "ribbon" visible around *caput humeri*

Component Analysis [Fig. 6] showed the closest similarity of Dog 3 / Context 294 to Lundehund, the Norwegian primitive breed in the type of spitz (the cluster was formed by four Lundehunds, Dog 3 / Context 294 and Yorkshire Terrier 4 while the other Yorkshire Terriers were at some distance from this cluster). The dimensions of a skull suggest that it belonged to a large animal; however, the only long bone measurement, the greatest breadth of the proximal end of the femur [Table 5], returned a similar result to an evidently smaller dog, such as Buhund.[29]

Fig. 6. Plot showing the results of PCA analysis for Dog 3 / Context 348 and Dog 9 / Context 290 compared with selected modern dog breeds; eigenvectors marked red

[29] Knoest 2015, p. 177.

Table 5. Measurements (mm) and withers height (cm) of the dogs 1–7 from the Hellenistic contexts

Dog 2 / context 294							
scapula							
side		**GLP**		**BG**		**SLC**	
L		26.8		16.2		20.9	
radius			**femur**				
side	**Bp**	**SD**	**side**	**GL**	**Bp**	**Bd**	**SD**
R	18.2	12.8	L	151.8	34.7	28.8	
pelvis			R	152.6	34.8	28.2	12
side		**LA**	**tibia**				
R		21.2	**side**	**GL**	**Bp**	**Bd**	**SD**
calcaneus							
side		**GL**	L	151.4	31.3	20.8	11.6
L		28.7	R		32.1		11.6
talus		**Mt II**		**Mt III**		**Mt IV**	
side	**GL**	**side**	**GL**	**side**	**GL**	**side**	**GL**
R	23.2	L	50.3	L	57.7	L	59.7
Withers height (WH)							
bone		**measurement**		**coefficient**		**WH (cm)**	
femur L		151.8		3.01		45.7	
femur R		152.6		3.01		45.9	
tibia L		151.4		2.92		44.2	
Dog 3 / context 348							
skull							
A-P	**condylo-basal length**	**Zy-Zy**	**P-St**	**length of the cheek-tooth row**		**P-N**	**BdCalv**
207	193.7	126	111.7	70.9		93	46.4
mandible						**femur**	
side		**total length**		**length of the cheek-tooth row**		**side**	**Bp**
R		154.9				L	31.6
L				76.3			

Dog 7 / context 271						
humerus					**pelvis**	
side	**GL**	**Bp**	**Bd**		**side**	**LA**
L	140.9	28.1	27.9		R	21.1
femur			**tibia**		L	20.9
side	**Bd**		**side**	**Bd**	**calcaneus**	
R	34.1		R	21	**side**	**GL**
Mt II			L	20.8	R	40.3
side	**GL**		**Mt III**		**Mt IV**	
R	21		**side**	**GL**	**side**	**GL**
Mt V			R	68	R	69.1
side	GL		L	68.5	L	69.6
R	61.8					
L	62.1					
Withers height (WH)						
bone	**measurement**		**coefficient**		**WH (cm)**	
humerus L	140.9		3.37		47.5	

Abbreviations (von den Driesch 1976)
Skull measurements: akrokranion-prosthion (A-P), median palatal length: staphylion-prosthion (P-St), neurocranium length: basion-nasion (B-N), viscerocranium length: nasion-prosthion (P-N), zygomatic breadth: zygion-zygion (Zy-Zy), breadth at the canine alveoli (BdCalv)
Scapula measurements: greatest length of the glenoid process (GLP), breadth of the glenoid cavity (BG), smallest length of the neck of the scapula (SLC)
Pelvis measurement: length of acetabulum including the lip (LA)
Long bones measurements: greatest length (GL), greatest breadth of the proximal end (Bp), greatest breadth of the distal end (Bd), smallest breadth of diaphysis (SD)

Dog 4 / Context 348. The remains of the other dog from the Hellenistic Context 348 [Fig. 3] were less numerous [Table 4]. However, the remains were interesting because they came from the youngest individual in this group, aged between 5–8 weeks and 4–5 months.[30] The bones were in a good state of preservation. The left side of the body was preserved better, but some ribs and two bones from the proximal part of the forelimb represented both sides of the body.

Dog 5 / Pit 6/2018. Pit 6/2018 was located in the northwestern corner of square 31 [Fig. 3]. It functioned before the defensive ditch had been dug, which is confirmed by the fact that the eastern part

[30] Silver 1969, pp. 285–286.

of its outlet was cut down during the construction of the fortifications. The pit's shape was close to circular, with a diameter of 1.10 m (N–S) and 1.00 m (W–E) and depth 0.60–0.80 m. About 0.30 m above the bottom level, an almost complete dog's skeleton was found next to the eastern wall of the feature [Fig. 4.III]. The dog was laid on its right side along the NE–SW axis; its head was directed to the southwest. The thorax had been pelted with rather large stones. The stones almost completely crushed the ribs and spine. The skull and mandible were also broken into many pieces [Table 4]. The bones belonged to a subadult animal aged about 18 months.[31] There were no traces of any unusual practices connected with the dog's carcass, and it seems that no gifts were placed in the pit together with it; however, the pit contained numerous remains of other domestic animals as well as fish, amphibians and molluscs unevenly dispersed within the fill. We cannot be sure of the original purpose of digging the pit and decide definitely whether the original dog's burial was later covered with wastes or the dog's carcass was a part of these wastes.

Dog 6 / Pit 1/2017. A part of a dog's skeleton was also discovered in another pit, Pit 1/2017 [Figs. 3 and 4.IV]. Unfortunately, no datable archaeological material has been found in this feature. However, based on its stratigraphy, the pit should be dated to Hellenistic times.

Only 18 dog bone fragments were found in the pit [Table 4], mixed with other animal remains (mostly fish bones) and some artefacts. It seems that the pit was a mere waste pit, and the dog remains were collected with other trash. The dog bones came from a juvenile individual, younger than the one buried in Pit 6/2018. Its age at death was about 6–8 months.[32]

Dog 7 / Context 271. The dog remains were also unearthed in square 27 [Fig. 3]. Traces of a burial pit were not discovered. The bones were found in the mixed layer of the fill of the defensive ditch [Fig. 4.V]. Taking into consideration the pottery fragments unearthed in this layer, its formation could be dated to Hellenistic times. Among them, fragments of Rhodian amphorae predominate, including stamped ones. From other production centres, Sinopean, Koan and Knidian amphorae fragments have been recorded.

The incomplete dog skeleton [Table 4] was laid on its left side along the NE–SW axis. Most of the vertebrae and ribs were missing. Only three fragments of the skull were found, among them the right canine and two bigger parts of the neurocranium. The hind limb elements were preserved better than the remains of the thorax. Almost the whole right hind limb and a big part of the left one were found articulated *in situ* as well as a part of the left forelimb [Table 4]. It is possible that smaller elements were lost during exploration. Interestingly, two of the bones, a humerus and an ulna, bore marks of gnawing by carnivores.

Considering the degree of the fusion of epiphyses with diaphysis and the fusion of pelvis bones, it is certain that the animal was adult at the moment of death, older than 18 months old.[33] It must have been older than 20–24 months old looking at the completely fused body of the vertebrae with the articulation surfaces.[34] The withers height was calculated based on the left humerus [Table 5][35] and reached 47.5 cm.

[31] Kolda 1936.
[32] *Ibidem*.
[33] Kolda 1936; Silver 1969.
[34] Schmid 1972, p. 75.
[35] Driesch, Boessneck 1974.

3.2. Dogs from the Roman period contexts

The dog remains from the Roman period contexts were in a similar state of preservation as the Hellenistic ones; however, articulated or partially articulated skeletons were rare. As it was in the case of the Hellenistic period, the bones discovered in the layers belonged to both young and morphologically adult animals, and no fetal or newborn remains were found. The size of the dogs varied; the calculated withers height was between 41 and 60 cm [Tables 3 and 6] with an average of 52 cm, which is somewhat more than in the case of the dogs from the Hellenistic period. The majority of the estimated sizes were between 49 and 60 cm, so they came from medium-sized and large individuals; only two bones belonged to smaller dogs about 41 cm high. Some of the sizes filled the gap between medium-sized and large animals [Fig. 2], which suggests that the dogs representing the potential breeds that could have been distinguished based on the sizes of the Hellenistic dogs had a possibility of crossbreeding in the later period. The plot also included the sizes of the dogs 8, 10 and 11 described below. The bones bore almost no marks; however, one fragment was remarkable. Atlas found in the layer of Roman chronology was chopped in the parasagittal plane along the right edge of the vertebral arch (part of the transverse process was cut off), which can suggest the way of slaughtering of the animal. Additionally, one of the ribs found in one of the layers dated to the Roman period bore marks of a healed breakage with a visible inflammatory process around the breakage — such an injury could have been of anthropogenic origin or could have happened during the fights of the animals.

Table 6. Measurements (mm) of the dogs from the Roman contexts (other than dogs 8–11)

skull				mandible		axis		
Zy-Zy	**length of cheektooth row**	**B-N**	**Zy-Zy**	**total length**	**length of cheektooth row**	**LAPa**	**LCDe**	**BFcr**
/97/	51.3			155	104.6			
		97	108		63	59.8		31.1
scapula					67			
GL	**GLP**	**BG**	**SLC**		69.5			
121	28.3	16.2	24		70.5	59.8	51	
	28.4	16.4	23					
	30.1	18.2	28.4					
	31.9	19.9	16.9		71.2	64.2	51.4	
	33.2	19.9	28.1					
humerus					**radius**			
GL	**Bp**	**Bd**	**SD**	**BT**	**GL**	**Bp**	**Bd**	**SD**
155.4	26	31.9	12.8		158.9	17.2	22.3	14.1
		20.7				15.7		
		31.2		24.5		16.8		
		31.2				17.3		
		31.2	12.5				23.1	

		32	12.4		**femur**			
		34.1			**GL**	**Bp**	**Bd**	**SD**
		36.4			135.8	28.3	21.4	
pelvis	**tibia**				189	34.8	33.6	13.5
LA	**GL**	**Bp**	**Bd**	**SD**	197.4	40		14.4
16.1	/205/		26		199.2	38.9	33.3	14.7
21.2	202.8	37.4	22.9	13.6			32	
24.2		26.8			**talus**		**Mc II**	**Mc III**
25		31.5			**GLl**	**Bd**	**GL**	**GL**
27.4		36.1			28	16.3	49.1	68.1
calcaneus			18.1		28.1	20.1		
GL			19.5		**Mc IV**		**Mt III**	**Mt IV**
47.9			21.3		**GL**		**GL**	**GL**
58.2			21.4		61.1		61	62.2
			25.5		62.2		66	66.2
Ph I					68.4		67	74.2
GL	**Bp**	**Bd**	**SD**		72.3		67.6	77.2
25.1	9.3	7.4	6.2				70.5	
34.8	10.2	18.4	6.2				84.4	
					Ph II			
36.8	11	9.3			**GL**	**Bp**	**Bd**	**SD**
38.2	10.5	9.1	7		22	8.3	7.1	5.7
					23.2	8.3	7.1	5.3
					23.3	8.3	7.2	5.2

Abbreviations (von den Driesch 1976)
Skull measurement: zygomatic breadth: zygion-zygion (Zy-Zy)
Axis measurements: greatest length of the arch including the Processus articulares caudales (LAPa), greatest length in the region of the corpus including the dens (LCDe), greatest length of the cranial articular surface (BFcr)
Scapula measurements: greatest length of the glenoid process (GLP), breadth of the glenoid cavity (BG), smallest length of the neck of the scapula (SLC)
Pelvis measurement: length of acetabulum including the lip (LA)
Long bones measurements: greatest length (GL), greatest breadth of the proximal end (Bp), greatest breadth of the distal end (Bd), smallest breadth of diaphysis (SD)
Talus measurements: greatest height (GH), greatest breadth (GB)

Four dog skeletons were found in the area of Western Tanais [Fig. 7] and dated to the first as well as second–third century AD.

Dog 8 / Context 290. Numerous animal bones, including remains of two incomplete dog skeletons, were discovered in Context 290, scattered over the area of squares 30 and 31 [Fig. 7] in the mixed layers of the defensive ditch fill dated to Roman times.

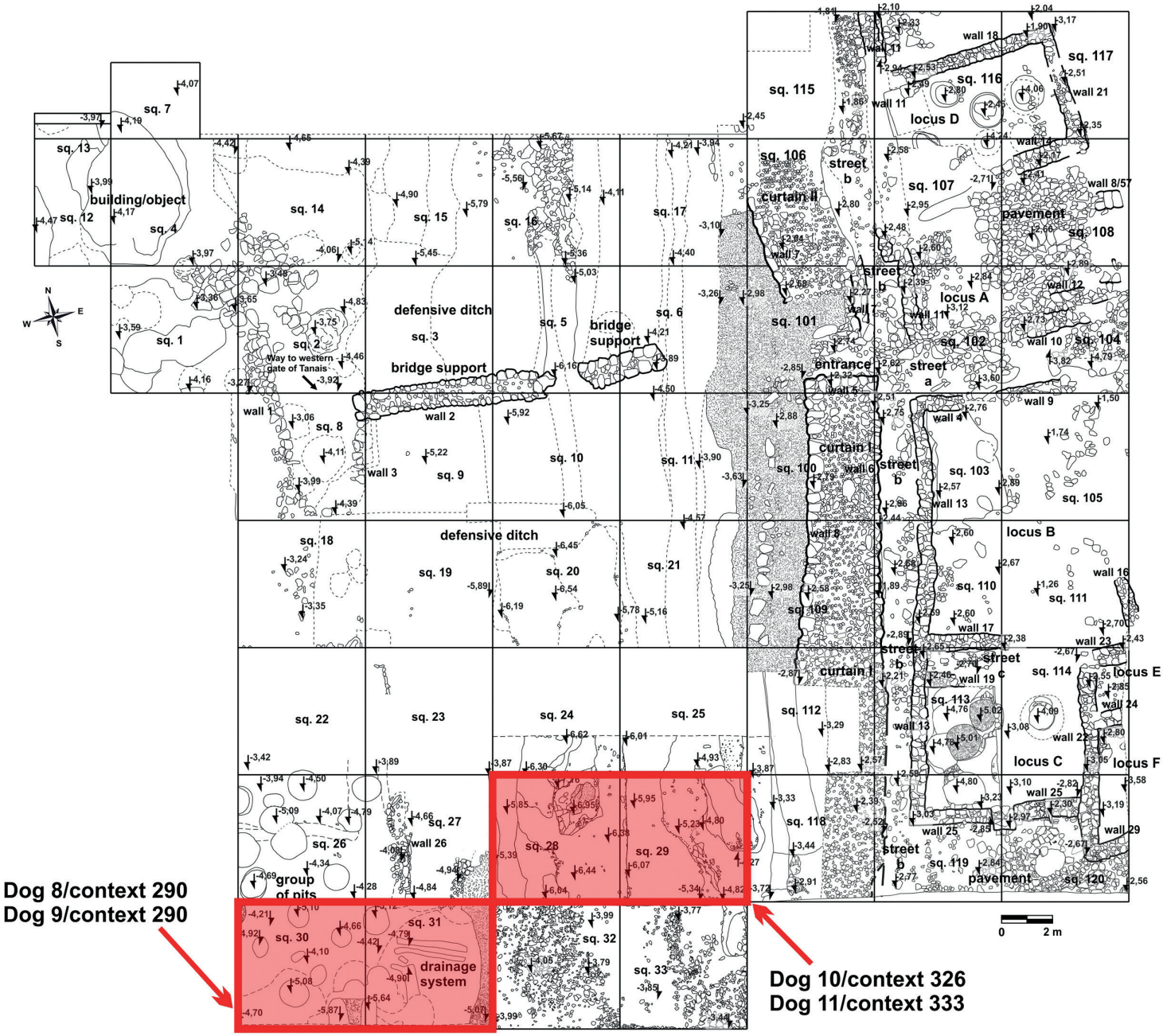

Fig. 7. Tanais, plan of Trench XXV. Dog skeletons dated to the Roman period marked red (drawing by A. Graczyk)

Only some bones could be attributed to the skeleton of Dog 8, including head and thorax elements as well as the right bones from the proximal part of the forelimb [Table 7]. The skull was preserved only partially. Therefore, it was possible to take only the median palatal length measurement (P-St) [Table 8], which returned a very similar result to the measurement of the other dog's skull from this context (discussed below). Only the humerus could be used for estimation of

the withers height. The animal was about 42 cm, which indicates one of the smallest dogs at the site. The dog was definitely older than 20–24 months old.[36] The degenerative change visible on the humerus as a kind of callus on the rim of the *caput humeri* suggests an old age of the animal.

Table 7. Anatomical distribution of the remains of the dogs 8–11 from the Roman contexts

Dog 8 / context 290				
bone	**NISP**	**MNE**	**side**	**notes**
skull	1	1		
mandible	1	1	R+L	
atlas	1	1		
axis	1	1		
cervical vertebrae	1	1		
thoracic vertebrae	2	2		
lumbar vertebrae	1	1		
sternum	2	2		
rib	17	9	4R+5L	
scapula	2	1	R	
humerus	1	1	R	
radius	1	1	R	
ulna	1	1	R	
TOTAL	**32**	**23**		
Dog 9 / context 290				
bone	**NISP**	**MNE**	**side**	**notes**
skull	1	1		
mandible	1	1	R+L	
atlas	1	1		
axis	1	1		
thoracic vertebrae	2	2		
lumbar vertebrae	2	2		
rib	17	7	4R+3L	
scapula	2	1	L	
radius	1	1	R	
ulna	1	1	R	
TOTAL	**29**	**18**		

[36] Schmid 1972, p. 75.

Dog 10 / context 326				
bone	**NISP**	**MNE**	**side**	**notes**
skull	4	1		
mandible	2	2		only teeth
cervical vertebrae	1	1		
thoracic vertebrae				
lumbar vertebrae	7	7		
sacrum				
caudal vertebrae	1	1		
rib	2	2	1L	
scapula	1	1	L	
humerus	1	1	R	gnawed by carnivores, marks left by larvae
radius	1	1	R+L	
ulna	1	1	R	
pelvis	3	1	R+L	gnawed by carnivores
femur	1	1	R	
tibia	1	1	R	
calcaneus	1	1	L	
metatarsus II (Mt II)	2	2	R+L	
metatarsus III (Mt III)	1	1	L	
metatarsus IV (Mt IV)	1	1	R	
metatarsus V (Mt V)	1	1	L	
TOTAL	**32**	**27**		

Dog 11 / context 333				
bone	**NISP**	**MNE**	**side**	**notes**
mandible	2	1		
axis	1	1		
cervical vertebrae	1	1		
thoracic vertebrae	4	4		
lumbar vertebrae	1	1		
caudal vertebrae	1	1		
rib	9	9	5R+4L	
scapula	3	2	R+L	
humerus	2	2	R+L	

radius	1	1	R
ulna	1	1	R
metacarpus V (Mc V)	1	1	L
pelvis	2	1	R
femur	3	2	R+L
tibia	1	1	R
metatarsus III (Mt III)	1	1	R
TOTAL	**34**	**30**	

Table 8. Measurements (mm) and withers height (cm) of the dogs 8–11 from the Roman contexts

Dog 8 / context 290						
skull		**atlas**				**axis**
P-St		**BFcd**		**GB**		**LCDe**
81.9		25		62.2		35.4
scapula						
side	**GLP**		**BG**		**SLC**	
R	21.6		19.2		17	
humerus				**radius**		
side	**GL**	**Bp**	**Bd**	**side**	**Bd**	**SD**
R	123.8	24.4	24.1	R	28.3	10.2
Withers height (WH)						
bone	**measurement**			**coefficient**		**WH (cm)**
humerus R	123.8			3.37		41.7
Dog 9 / context 290						
skull						
A-P	**condylo-basal length**		**Zy-Zy**	**B-Eth**	**P-St**	
161	146.2		85.8	73.3	79	
length of the cheektooth row	**P-N**		**BdCalv**		**B-N**	
57	65.5		29.8		110.6	
mandible				**radius**		
side	**total length**	**length of the cheek-tooth row**		**side**	**Bp**	**SD**
R+L	112	52		R	18.4	9.8

scapula			
side	**GLP**	**BG**	**SLC**
L	21.9	14	17

Withers height (WH)		
B-Eth	**equation**	**WH (cm)**
73.3	W=(1.016*B-Eth)-31.2	43.3

Dog 10 / context 326

scapula		pelvis		humerus	
side	**SLC**	**side**	**LA**	**side**	**Bd**
L	28.4	R	25.7	R	35.9
		L	22.6		

radius				
side	**GL**	**Bp**	**Bd**	**SD**
R	149.3	167.2	21.2	12.2
L	152.3	15.1	19.3	12.3

tibia		calcaneus		Mt II	
side	**Bd**	**side**	**GL**	**side**	**GL**
R	24.1	L	61.9	L	70.8

Mt III		Mt IV		Mt V	
side	**GL**	**side**	**GL**	**side**	**GL**
L	79	R	64.2	L	72.9
		L	81		

Withers height (WH)			
bone	**measurement**	**coefficient**	**WH (cm)**
radius R	149.3	3.22	48.1
radius L	152.3	3.22	49.0

Dog 11 / context 333

humerus				
side	**GL**	**Bp**	**Bd**	**SD**
R	161.3		33.1	13.3
L	160.2	33.5	33	13.2

radius					Mc V	
side	**GL**	**Bp**	**Bd**	**SD**	**side**	**GL**
R	167.1	18.9	24.2	13.6	L	71

pelvis		femur				
side	**LA**	**side**	**GL**	**Bp**	**Bd**	**SD**
R	24	R	187.6	37	31.7	12.6
		L			31.9	12.6
tibia						
side	**GL**	**Bp**		**Bd**		**SD**
R	185.5	34.8		24.0		12.6
Withers height (WH)						
bone		**measurement**		**coefficient**		**WH**
humerus R		161.3		3.37		54.4
humerus L		160.2		3.37		54.0
radius R		167.1		3.22		53.8
femur R		187.6		3.01		56.5
tibia R		185.5		2.92		54.2

Abbreviations (von den Driesch 1976)
Skull measurements: akrokranion-prosthion (A-P), median palatal length: staphylion-prosthion (P-St), zygomatic breadth: zygion-zygion (Zy-Zy)
Scapula measurements: greatest length (GL), greatest length of the glenoid process (GLP), breadth of the glenoid cavity (BG), smallest length of the neck of the scapula (SLC)
Pelvis measurement: length of acetabulum including the lip (LA)
Long bones measurements: greatest length (GL), greatest breadth of the proximal end (Bp), greatest breadth of the distal end (Bd), smallest breadth of diaphysis (SD)

Dog 9 / Context 290. Context 290 also contained remains of another dog [Fig. 7, Table 7]. The animal was adult at the moment of death — it was definitely older than 18–24 months old.[37] There was an evident fusion of both halves of the mandible in a rigid connection with a callus, which might suggest an old age of the animal. The *intra vitam* loss of the first premolars (P1 and P2) in the right body and the second premolar in the left body of the mandible with a complete remodelling of the empty alveoli may also suggest an old age of the dog [Fig. 4.II]. Other bones from both parts of the body, completely fused, were also discovered [Table 7]. It was possible to calculate the withers height based on the skull (WH = 43.3 cm) [Table 8]; also, the comparison of the measurements of both the scapula and radius indicates a middle-sized dog,[38] similar to the Buhund dog (scapula SLC, GLP, BG and radius SD measurements), but of a much heavier build (radius Bp measurement). The most interesting item was the skull, preserved in one piece [Fig. 5.I.b]. The skull was mesocephalic (cephalic index = 53.3), but the snout was very slim and relatively short (snout width index = 59.1, facial index = 170.2). It displayed a characteristic shape of the lateral profile with an evident concavity from the frontal region to the snout [Fig. 5.I.b]. The skull had no

[37] Kolda 1936; Schmid 1972, p. 75.
[38] Knoest 2015, p. 167.

evident pathological changes. Principal Component Analysis showed that the skull was evidently different from popular modern western breeds, forming no cluster with any other skull [Fig. 6].

Dog 10 / Context 326. An incomplete dog skeleton was discovered scattered in squares 28 and 29 [Fig. 7]. The bones were found in the layer with a predominance of Roman pottery. Fragments of Heraclean amphorae of types Vnukov C IVC and Vnukov C IVD constituted the largest group of materials from this layer;[39] therefore, the layer could be roughly dated to the second and the third centuries AD.

Small bone elements were missing, such as most of the caudal vertebrae and extremities. Very few head elements were preserved. The bones from the proximal parts of the limbs were present, but most of them belonged to the right part of the body; the left side elements were rare [Table 7]. The pelvis and humerus bore marks of gnawing by carnivores. Additionally, the humerus bore marks left by larvae. The animal was adult at the moment of death, and it was older than 20–24 months old.[40] A number of bones were measured [Table 8], and it was possible to calculate the withers height on the basis of both radii, with an average of 48.6 cm.

Dog 11 / Context 333. The last dog skeleton was also discovered as disarticulated bones scattered all over the area of squares 28–29 [Fig. 7]. These dog remains were found in a Roman layer of the defensive ditch fill. The skull and the extremities were missing, as well as a big part of the left side of the skeleton [Table 7]. The age at death was definitely above 20–24 months.[41] However, the degenerative changes visible on both humeri as kind of a regular "ribbon" around the *caput humeri* and in the distal epiphysis as much more irregular change indicate an old age of the animal [Fig. 5.III]. The inflammatory process that left marks on the body of the first thoracic vertebra close to the articulation surfaces could also be connected with the dog's old age. A series of bones were measured [Table 8], and it was possible to calculate a withers height. The calculation returned results between 53.8 and 56.5 cm, with an average of 54.6 cm.

4. Discussion

The share of dog remains at Tanais, including dog skeletons, was incredibly high. There are but few analyses of the mammal remains from the Don Delta region from the Hellenistic or Roman times; at least one of them mentioned a similar percentage of dog bones.[42] Dogs certainly lived together with the town's inhabitants, walking freely and dying within its walls and in its closest vicinity. Their carcasses inside the walls must have been a normal part of the town's life, which can be testified by the marks of gnawing left on some of the bones by other carnivores, or maybe even other dogs, indicating access to the remains. This fact might also be confirmed by disarticulated dog skeletons scattered within the layers, not only within the defensive ditch but also inside the town. It is quite unique that so many dog skeletons or partially preserved skeletons from the settlement can be reconstructed. However, we must consider the specificity of the excavated area — a defensive ditch in which most of the remains were found. Most of the oldest dog remains dated to the Hellenistic times were probably deposited before the ditch was prepared as the defensive structure.

According to Polit, the dog burials in pits located inside settlements are known from the northern Black Sea coasts in the Roman period.[43] Moleva points out, nonetheless, that they were more

[39] Vnukov 2006.
[40] Schmid 1972, p. 75.
[41] *Ibidem*.
[42] E.g. Kuršakov 2014.
[43] Polit 2019, p. 152.

common in necropolises during the Roman period. In her opinion, the practice of burying dogs in settlements was widespread in the Hellenistic times.[44] However, as far as we know, such burials have not been reported from the Don Delta region, neither in the Hellenistic nor Roman times. In the case of Tanais, some contexts, like pits 1/2017 and 6/2018, show features of intentional burials, probably for utilitarian purposes. In these cases, there were no marks of any additional practices associated with the dog cadavers and no offerings were deposited in the pits; therefore, it seems that these dogs were not a form of sacrifice. A similar practice of handling dog remains was noted by Žuravlev at Golubitskaya 2, Taman Peninsula,[45] and such a purpose of burying dog carcasses was recently discussed by Scheibner[46] in the case of the Iron Age remains from Central Europe. On the other hand, the similarity of the burial of the Dog 5 / Pit 6/2018, with the large stones accompanying the dog's skeleton, to the burial discovered in Pit 9 from the Neyzats necropolis is striking.[47] We should also consider the similarity of this burial to the burial of Dog 1 from the Pit 17/2003 in terms of the general body position and locality by the stone wall. Therefore, we cannot entirely exclude this dog's burial for similar ritual purposes as we propose in the case of Pit 17/2003. A dog carcass, accompanied by bird bones and a goat horn core, seems to be typical for ancient Greek ritual practices used in the construction of public buildings and fortifications (foundation deposits). An interpretation of dog burials as foundation offerings was broadly discussed some time ago,[48] as well as dog sacrifices in construction of fortifications.[49] In this context, De Grossi Mazzorin mentioned a similar type of offering consisting of the remains of three dogs accompanied by vessels and bones of other animals discovered on the slopes of the Palatine hill in Rome in a bastion of the Porta Mugonia. The dog bones bore the butchery marks — such marks, however, were not registered on the bones of Dog 1 from the Pit 17/2003 in Tanais. On the other hand, the lack of post-consumption marks seems to fit better the classic description of the dog burials given by Polit.[50] The sacrifice played a symbolic role originating from the everyday role of dogs in human life as guardians.[51] This type of ritual procedure is even more symbolically comprehensible when we consider the location of the dog sacrifice. Pit 17 was located directly at the entrance to the bridge leading to the town gate. It should also be mentioned that guards used dogs in fortresses and fortified towns at least since the Hellenistic period. It is confirmed not only by literary texts but also by epigraphic sources.[52]

It seems that the treatment of dogs differed in Hellenistic and Roman times. In both periods, the dogs accompanied the town's inhabitants; however, they were treated with greater care in Hellenistic times. The bones of the animals from Tanais from the Hellenistic period were partially found in pits, and they bore almost no marks of trauma except for one skeleton with a broken rib. However, the situation was different in the Roman period: the dog remains were found exclusively in the layers. Even in the case of the only articulated skeleton, there was no trace of a pit or any other structure. It seems that throwing dog carcasses into the defensive ditch (no longer fulfilling its functions) was an easy way of disposal of the cadavers. Some of the bones dated to the Roman period bore marks of trauma, such as broken and not entirely healed ribs. There is also another piece of evidence for maltreatment of these animals: one of the dogs was evidently killed by being chopped by the neck, which left marks on the first cervical vertebra.

[44] Moleva 2002a, p. 114.
[45] Žuravlev, Sablin, Strokov 2016, p. 35.
[46] Scheibner 2013, pp. 29–48.
[47] Polit 2019, pp. 152–153.
[48] De Grossi Mazzorin, Minniti 2006, p. 65; Vahtina 2007, p. 141 sq.; Zavojkin 2007, p. 42 sq.
[49] Moleva 2002b; De Grossi Mazzorin, Minniti 2006, p. 65.
[50] Polit 2019, p. 150.
[51] Bodson 1980, pp. 16–17; De Grossi Mazzorin, Minniti 2006, p. 62; Lacam 2008, p. 59.
[52] Roussel 1930, pp. 364–366; Robert, Robert 1976, pp. 206–209; Luce 2008, pp. 278–279.

The morphological analysis showed that the dogs represented at least three different morphotypes. The dogs from the Hellenistic period were medium-size and large animals, with withers height below 45 cm, between 45 and 50 cm and between 54 and 58 cm; however, the smallest dogs (42 cm) were as rare as the largest ones, especially above 56 cm. Most of the long bones belonged to lightly built animals. The skull and snout indices indicate middle-sized animals, resembling the type of the modern primitive breed Lundehund. On the other hand, a skull of Dog 9 / Context 290 dated to the Roman period was different from the analysed modern western breeds in terms of the indices. There are two potential interpretations of this phenomenon. First of all, the origin of this dog might not be derived from the western but rather the eastern dog morphotype, which cannot be confirmed due to the lack of sufficient reference data. Secondly, the skull can reflect the formation of a new breed of relatively small size, as the withers height calculated based on the skull measurements gave a result of about 43 cm. The dog was heavier build than most of the other smaller dogs from Tanais. However, we should have in mind that the data is rather low, so future excavations could show that this morphotype was more popular than it seems now. In general, in the Roman period, bigger dogs were attested; most of the estimated sizes oscillated between 49 and 60 cm. The withers height based on the measurements of the bones from the Roman layers showed a change in the dogs' size and suggested a shift toward the larger animals and crossbreeding of medium-size and large animals, which gave in consequence dogs of intermediate sizes.

Interestingly, the archaeological contexts from the Roman period contained clearly fewer dog bone elements (11.7%) than from the Hellenistic period (17.4%), which indicates a decrease in the significance of these animals for the inhabitants of the town from one point of view, or it shows that the number of dogs kept in the town was lower and the dogs were therefore kept elsewhere. The interpretation of this fact as well as the different types of dogs kept by the inhabitants of Tanais in Hellenistic and Roman times seems to be connected with historical events that took place at the very end of the first century BC and then in the Roman period. At the end of the first century BC the town was destroyed by the Bosporanean king Polemon.[53] Then in the middle of the second century Tanais was destroyed again, at this time by nomadic tribes.[54] According to Šelov[55] there were two waves of infiltration of the Sarmatians into Tanais society — in the first and in the second century AD. Although different kinds of archaeological materials related to the Sarmatian culture are known from the Tanais necropolis already from the Hellenistic and early Roman periods,[56] the mass infiltration of the Sarmatian to the city in the opinion of many researchers took place only after Tanais' destruction in the middle of the second century AD.[57] However, in recent years, specialists have paid attention to the evidence from various sources about the sedentarisation of Iranian-speaking nomads in the city and the Meotian settlements in its vicinity already from the middle of the first half of the second century AD.[58] Therefore, it seems likely that the new inhabitants settled down with their own herds and dogs that were helpful in their semi-pastoral way of life. Larger breeds are commonly used as shepherd dogs, and this fact was reflected in the material from the Roman times at Tanais. The dogs from this period show similarities in the withers height to the dogs from the Sarmatian settlement in Pannonian Gyoma 133, also dated to the same period.[59] Bartosiewicz interprets the difference between the smaller and more various dogs from the Roman town of Tác-Gorsium (in the type of pariah dogs) and larger Sarmatian dogs from the settlement Gyoma 133 (watch dogs) in the context of the functionality of both groups of dogs. It seems that such a situation was also represented in Western Tanais; however, the Hellenistic dogs

[53] Žebelev 1934; Šelov 1969a; Šelov 1969b.
[54] Arsen'eva, Il'âšenko, Naumenko 2010, p.18.
[55] Šelov 1972, p. 238.
[56] Glebov, Toločko 2016; Bazilevič, Guguev 2012, pp. 159–160; Bazilevič 2021, pp. 14–15.
[57] Dan'šin 1990, p.53; Guguev, Il'âšenko, Kazakova 2007, pp. 433–434; Glebov, Toločko 2016, p. 50.
[58] Guguev 2017, pp. 135–137; Guguev, Naumenko 2021, p. 549.
[59] Bartosiewicz 1996, p. 374; Bartosiewicz 2000, p. 186.

there were certainly less variable than the pariah dogs from Tác-Gorsium. This could be caused by one factor — the colony in Tanais was separated from other colonies, so crossbreeding of the dogs could occur mainly among the individuals derived from the original population that came with the town's inhabitants. The similarity between the dog populations in the Roman period in Gyoma 133 and Tanais may show the general trends within the economy of nomadic people from Eastern Europe.

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Bibliography

Alpak, Mutus, Onar 2004 — H. Alpak, R. Mutus, V. Onar, "Correlation analysis of the skull and long bone measurements of the dog", *Annals of Anatomy* 186, pp. 323–330.

Arsen'eva, Šoll' 2003 — T. Arsen'eva, T. Šoll', "Otčet o sovmestnyh issledovaniâh provedennyh v Tanaise v sezon 2003 goda", *Światowit* 5 (46), pp. 91–98.

Arsen'eva, Il'âšenko, Naumenko 2010 — T. M. Arsen'eva, S. M. Il'âšenko, S. A. Naumenko, "Arheologičeskie issledovaniâ i otkrytiâ o hronologii drevnego Tanaisa", [in:] *ΣΥΜΒΟΛΑ. Antičnyj mir Severnogo Pričernomor'â. Novejšie nahodki i otkrytiâ*, ed. A. A. Maslennikov, N. A. Gavrilûk, A. A. Zavojkin, Moscow; pp. 11–21.

Balûkevič 2003 — B. Balûkevič, "Paleozoologičeskij analiz (2003)", *Światowit* 5 (46), pp. 94–96.

Bartosiewicz 1996 — L. Bartosiewicz, "Animal exploitation at the Sarmatian site of Gyoma 133", [in:] *Cultural and Landscape Changes in South-East Hungary*, ed. S. Bökönyi, Budapest, pp. 365–446.

Bartosiewicz 2000 — L. Bartosiewicz, "Metric variability in Roman period dogs in Pannonia provincia and the Barbaricum, Hungary", [in:] *Dogs Through Time: An Archaeological Perspective*, ed. S. J. Crockford, Oxford, pp. 181–192.

Bazilevič 2021 — L. O. Bazilevič, "Kuril'nicy sarmatskoj èpohi iz raskopok nekropolâ Tanaisa I – serediny III vv. n.è.", [in:] *Interdisciplinary Research on the Antiquity of the Black Sea*, ed. M. Matera, R. Karasiewicz-Szczypiorski [= *Światowit Supplement Series C: Pontica et Caucasica* 2], Warsaw, pp. 13–19.

Bazilevič, Guguev 2012 — L. O. Bazilevič, Û. K. Guguev, "O sredne- i pozdnesarmatskom komponentah v sostave naseleniâ Tanaisa v ser. II – pervoj polovine III vv. n.è. po materialam lepnyh kuril'nic sarmatskih tipov", [in:] *Novejšie otkrytiâ v arheologii Severnogo Kavkaza: issledovaniâ i interpretacii. XXVII Krupnovskie čteniâ. Materialy Meždunarodnoj naučnoj konferencii, Mahačkala, 23–28.04.2012 g.*, ed. M. S. Gadžiev, L. B. Gmyrâ, R. G. Magomedov, Makhachkala, pp. 159–161.

Bodson 1980 — L. Bodson, "Place et fonction du chien dans le monde antique", *Ethnozootechnie* 25, pp. 13–21.

Chrószcz *et alii* 2007 — A. Chrószcz, M. Janeczek, V. Onar, P. Staniorowski, N. Pospieszny, "The shoulder height estimation in dogs based on the internal dimension of cranial cavity using mathematical formula", *Anatomia Histologia Embryologia* 36, pp. 269–271.

Dan'šin 1990 — D. I. Dan'šin, "Tanaity i tanaiscy vo II–III vv. n.è.", *Kratkie soobŝenija Instituta arheologii* 197, pp. 51–56.

De Grossi Mazzorin, Minniti 2006 — J. De Grossi Mazzorin, C. Minniti, "Dog sacrifice in the ancient world: a ritual passage?", [in:] *Dogs and People in Social, Working, Economic or Symbolic Interaction*, ed. L. M. Snyder, E. A. Moore, Oxford, pp. 62–66.

Domżalski 2021 — K. Domżalski, "Red slip pottery and late Roman Tanais in the light of new research", [in:] *Interdisciplinary Research on the Antiquity of the Black Sea*, ed. M. Matera, R. Karasiewicz-Szczypiorski [= *Światowit Supplement Series C: Pontica et Caucasica* 2], Warsaw, pp. 29–33.

Driesch 1976 — A. von den Driesch, *A Guide to the Measurement of Animal Bone from Archaeological Sites* [= *Peabody Museum Bulletin* 1], Harvard.

Driesch, Boessneck 1974 — A. von den Driesch, J. Boessneck, "Kritische Anmerkungen zur Widerristhöhenberechnung aus Längenmasen vor- und frühgeschichtlicher Tierknochen", *Säugetierkundliche Mitteilungen* 22, pp. 325–347.

Glebov, Toločko 2016 — V. P. Glebov, I. V. Toločko, "Ženskie pogrebeniâ s oružiem na Nižnem Donu v epohu pozdnego èllinizma: Tanais i sarmaty", [in:] *Antičnaâ civilizaciâ i varvarskij mir Ponto-Kaspijskogo regiona. Materialy Vserossijskoj naučnoj konferencii s meždunarodnym učastiem, posvâŝennoj 70-letnemu ûbileû B. A. Raeva (Kagal'nik, 20–21 oktâbrâ 2016 g.)*, ed. S. I. Luk'âško, Rostov-on-Don, pp. 44–84.

Guguev 2017 — V. K. Guguev, "Struktura rituala nekropolej donskih meotov (o roli sarmatov v formirovanii naseleniâ gorodiŝ)", *Vestnik Tanaisa* 4, pp. 128–148.

Guguev, Il'âšenko, Kazakova 2007 — Û. K. Guguev, S. M. Il'âšenko, L. M. Kazakova, "O vozmožnosti etničeskoj i social'noj identifikacii vladel'ca usad'by serediny III v. n.è. v Tanaise", [in:] *Severnyj Kavkaz i mir kočevnikov v rannem železnom veke. Sbornik pamâti M.P. Abramovoj*, ed. V. I. Kozenkova, V. Û. Malašev [= *Materialy i issledovaniâ po arheologii Rossii* 8], Moscow, pp. 432–457.

Guguev, Naumenko 2021 — Û. K. Guguev, S. A. Naumenko, "Podval II v. n.è. v rajone gorodskoj ploŝadi Tanaisa (raskop XIX)", *Materialy po Arheologii i Istorii Antičnogo i Srednevekovogo Pričernomor'â* 13, pp. 535–577.

Harcourt 1974 — R. A. Harcourt, "The dog in prehistoric and early historic Britain", *Journal of Archaeological Science* 1, pp. 151–175.

Knoest 2015 — J. J. T. Knoest, *On the Morphology of the Domesticated Dog in Medieval Norway. An Osteometric Study*, Bergen.

Kolda 1936 — J. Kolda, *Srovnávací anatomie zvířat domácich se zřetelem k anatomii člověka*, Brno.

Kuršakov 2014 — S. V. Kuršakov, "Materialy izučeniâ ostatkov ryb iz meotskih gorodiŝ Nižnego Dona (po rezul'tatam issledovaniâ Krepostnogo gorodiŝa, g. Azov, I v. do n.è. – II v. n.è.)", *Istoriko-arheologičeskie issledovaniâ v g. Azove i na Nižnem Donu* 28, pp. 334–342.

Lacam 2008 — J.-C. Lacam, "Le sacrifice du chien dans les communautés grecques, étrusques, italiques et romaines: approche comparatiste", *Mélanges de l'École française de Rome. Antiquité* 120, pp. 29–80.

Luce 2008 — J.-M. Luce, "Quelques jalons pour une histoire du chien en Grèce antique", *Pallas* 76, pp. 261–293.

Matera 2019 — M. Matera, "Fortifikaciâ zapadnogo rajona Tanaisa", *Vestnik Tanaisa* 5/2, pp. 12–30.

Matera, Scholl 2020 — M. Matera, T. Scholl, „Hellenistic housing in Western Tanais", [in:] *Ex Oriente Lux. Studies in Honour of Jolanta Młynarczyk*, ed. K. Jakubiak, A. Łajtar, Warsaw, pp. 435–448.

Moleva 2002a — N. V. Moleva, "Sobaka v relizgioznyh predstavleniâh bosposrân", [in:] *Očerki sakral'noj žizni Bospora (izbrannye stat'i)*, ed. N. V. Moleva, Nizhny Novgorod , pp. 113–116.

Moleva 2002b — N. V. Moleva, "Žertvoprinošeniâ sobak v fortifikacionnyh sooruženiâh antičnogo Kiteâ", [in:] *Očerki sakral'noj žizni Bospora (izbrannye stat'i)*, ed. N. V. Moleva, Nizhny Novgorod , pp. 121–123.

Naumenko, Scholl 2014 — S. Naumenko, T. Scholl, "New data on the fortifications of Tanais from the last five years of excavations", [in:] *Antique Site at Cimmerian Bosporus. Proceedings of the International Conference, Warsaw, 27–28 November 2013*, ed. A. Twardecki, Warsaw, pp. 187–201.

Polit 2019 — B. Polit, "Canine burials from the Roman period on the northern Black Sea coast in the light of materials from the Neyzats cemetery", *Przegląd Archeologiczny* 67, pp. 149–176.

Robert, Robert 1976 — L. Robert, J. Robert, "Une inscription grecque de Téos en Ionie. L'union de Téos et de Kyrbissos", *Journal des savants* 3–4, pp. 153–235.

Roussel 1930 — P. Roussel, "Les ΚΥΝΗΓΟΙ à l'époque hellénistique et romaine", *Revue des études grecques* 43, pp. 361–371.

Scheibner 2013 — A. Scheibner, *Der Hund in der mitteleuropäischen Eisenzeit: Wirtschaftliche, rituelle und soziale Aspekte*, Rahden / Westf.

Schmid 1972 — E. Schmid, *Atlas of Animals Bones for Prehistorians, Archaeologists and Quaternary Geologists*, New York.

Scholl 2011 — T. Scholl, "The Hellenistic bridge at Tanais", [in:] *Archäeologie der Brücken. Vorgeschichte, Antike, Mittelalter, Neuzeit*, ed. T. Pflederer, S. C. Sommer, Regensburg, pp. 58–60.

Scholl 2014 — T. Scholl, *Miasta bosporańskie od wieku VI po połowę I wieku p.n.e.*, Warsaw.

Silver 1969 — I. A. Silver, "The ageing of domestic animals", [in:] *Science in Archaeology: A Survey of Progress and Research*, ed. D. R. Brothwell, E. Higgs, London, pp. 283–302.

Šelov 1968 — D. B. Šelov, "O vremeni osnovaniâ Tanaisa", [in:] *Antičnaâ istoriâ i kul'tura Sredizemnomor'â i Pričernomor'â*, ed. V. F. Gajdukevič, Leningrad, pp. 77–84.

Šelov 1969a — D. B. Šelov, "Polemon i Tanais", *Kratkie Soobŝeniâ Instituta Arheologii* 116, pp. 70–75.

Šelov 1969b — D. B. Šelov, "Byl li Tanais razrušen Polemonom?", *Vestnik Drevnej Istorii* 2, pp. 56–65.

Šelov 1970 — D. B. Šelov, *Tanais i Nižnij Don v III–I vv. do n.è.*, Moscow.

Šelov 1972 — D. B. Šelov, *Tanais i Nižnij Don v pervye veka našej èry*, Moscow.

Šoll' 2008 — T. Šoll', "Desât' let raskopok Varšavskogo Universiteta v Tanais", *Novensia* 18–19, pp. 307–338.

Vahtina 2007 — M. Û. Vahtina, "Eŝe raz o pogrebeniâh sobak na Bospore", [in:] *Bosporskij fenomen. Sakral'nyj smysl regiona, pamyatnikov, nahodok*, Part 1, ed. V. Û. Zuev, St. Petersburg, pp. 141–144.

Vnukov 2006 — S. Û. Vnukov, *Pričernomorskie amfory I v. do n.è. – II v. n.è. Petrografiâ, hronologiâ, problemy torgovli*, St. Petersburg.

Wyrost, Kucharczyk 1967 — P. Wyrost, J. Kucharczyk, "Versuch der Bestimmung der Widerristhöhe des Hundes mittels der inneren Hirnhöhlenlänge", *Acta Theriologica* 12, pp. 105–110.

Zavojkin 2007 — A. A. Zavojkin, "O stroitel'noj žertve iz Fanagorii", [in:] *Sbornik naučnyh trudov. K 60-letiû professora Evgeniya Aleksandroviča Moleva*, ed. A. V. Mahlaûk, Nizhny Novgorod, pp. 42–54.

Žebelev 1934 — S. A. Žebelev, "Bosporskie ètiudy III: Byl li Tanais razrušen Polemonom?", [in:] *Iz istorii Bospora*, ed. V. F. Gajdukevič *et alii* [= *Izvestiâ Gosudarstvennoj Akademii Istorii Material'noj Kul'tury* 104], Moscow, pp. 37–45.

Žuravlev, Sablin, Strokov 2016 D. V. Žuravlev, M. V. Sablin, A. A. Strokov, "Zahoroneniâ sobak na poselenii Golubickaâ 2", [in:] *Aziatskij Bospor i Prikuban'e v dorimskoe vremâ. Materialy Meždunarodonogo kruglogo stola 7–8 iûnâ 2016 g.*, ed. D. V. Žuravlev, U. Schlotzhauer, Moscow, pp. 34–37.

Urszula Iwaszczuk (corresponding author)
Polish Academy of Sciences
Institute of Mediterranean and Oriental Cultures
orcid.org/0000-0003-2996-1625
uiwaszczuk@iksio.pan.pl

Marcin Matera
University of Warsaw
Faculty of Archaeology
orcid.org/0000-0003-4913-0749
marcinmatera@uw.edu.pl