A CASE OF CYNOPHAGY AT RADOVANU – *GORGANA A DOUA* SETTLEMENT, CĂLĂRAȘI COUNTY (2nd–1st CENTURIES BC)

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Abstract: *Zooarchaeological study of the faunal remains unearthed at Radovanu during the 2016 field season from three pits (P.1, P.7 and P.8), revealed the presence of dog bones displaying traces of anthropogenic disarticulation, defleshing and burning. Of the 68 dog skeletal remains, 20 exhibit such anthropogenic traces. The minimum number of individuals (MNI) represented by the 68 remains is four, all of them adults, of which two individuals produced the 20 remains with anthropogenic modifications. The average withers height of these animals is 56.5 cm based on the Koudelka index (52.9–58.0 cm; N = 6) or 57.4 cm based on the Harcourt index (55.7–58.9 cm; N = 6). Estimates of the gracility index, on average 7.09 (6.68–7.85; N = 5), indicates that medium size dogs (between 50 and 60 cm) of average robustness (diaphyseal index = 6.6–8.9) were present at Radovanu. The case of the Radovanu cynophagy is unique, today, in the Romanian zooarchaeological context. However, observations made more than 20 years ago might suggest that this phenomenon existed in the Geto-Dacian world if we consider only the degree of fragmentation and the burning traces observed in the case of the dog remains. Now, the cut marks found on the Radovanu dog bones provide irrefutable evidence that the species was, indeed, consumed by the Geto-Dacian population.*

Cuvinte-cheie: *arheozoologie, cynofagie, a doua perioadă a fierului, Canis familiaris, Radovanu*
Rezumat: *Studiul arheozoologic al faunei de la Radovanu care provine din campania de cercetări arheologice din anul 2016 a evidențiat existența unor oase de câine cu urme antropice de dezarticulare, descărnare și ardere descoperite în trei gropi (Gr. 1, Gr. 7 și Gr. 8). Dintre cele 68 resturi de câine determinate specific, 20 prezintă astfel de urme antropice. Numărul minim de indivizi cărora le-au aparținut aceste resturi (68) este de cel puțin patru, toți adulți, iar dintre aceștia doi au fost consumați (20 de resturi prezintă stigmate antropice). Talia acestor animale are o valoare de 56,5 cm după Koudelka (N = 6, limite 52,9–58 cm) sau de 57,4 cm după Harcourt (N = 6; limite 55,7–58,9 cm). De asemenea, estimarea indicelui de gracilitate care are o valoare medie de 7,09 (N = 5; limite 6,68–7,85) ne permite să concluzionăm că la Radovanu existau câini de talie medie (între 50 și 60 cm) și cu o robustețe medie (indice diafizar între 6,6–8,9). Cazul cynofagiei de la Radovanu este unic în acest moment în peisajul arheozoologic românesc. Totuşi, observaţii formulate în urmă cu mai bine de 20 de ani ar fi putut sugera că acest fenomen exista în lumea geto-dacică numai dacă ne gândim la fragmentaritatea şi urmele de ardere observate în cazul oaselor de câine. În prezent, urmele de tăiere ale câinilor de la Radovanu sunt de necontestat, fapt care ne arată că specia era consumată.*

INTRODUCTION

The Getic settlement from *Gorgana a doua* (*Second Gorgana*) and *Gorgana întâi* (*First Gorgana*) are both located on the high terrace of the Argeș River (Figs. 1 and 2), about 15 km upstream from its flow into the Danube, on the perimeter of the Radovanu commune (Călărași County). Two fortresses forming one fortification system functioned here during the Getic period (2nd–1st centuries BC). The Argeș River, now flowing 2–2.5 km east of the settlement, was flowing next to the base of the terrace during the Getic period and probably even before it, as indicated by traces of a paleochannel still visible on aerial photos.

The terrace edge on which the *Gorgana a doua* settlement was raised has a triangular shape, with a surface area of about 4000 m^2 (Fig. 2). The northwest-southeast oriented side of this triangle is parallel with the riverbed (Fig. 3). A 9 to 13 meters deep valley, 10–16 meters wide and narrowing to 3–5 meters at the base separates the northern side of the settlement from the terrace. Most likely, both natural factors and human activity (starting perhaps with the *Getae*) may have increased the valley's size, providing the settlement with a more effective defence. The southwest-northeast oriented side is flanked by a wide natural valley (Fig. 2). Over time, all three sides were affected by erosion, which is easy to recognize on the northeastern side of the edge, where a portion of the settlement was destroyed as a result of massive landslides.

The archaeological investigations on the *Gorgana a doua* were carried out in two stages. During the first stage, between 1971–1988, the research was conducted by S. Morintz and D. Șerbănescu[1]. This led to the introduction of the Radovanu – *Gorgana a doua* site into the scientific

[1] Morintz, Şerbănescu 1985.

literature, through investigations of both the Getic settlement and the late Bronze Age, initially named *the Radovanu aspect*, and then defined as *the Radovanu culture*[2]. The second stage of research started in 2004 (and continues until today), aimed to complement the existing information, as well as to expand the investigations of *Gorgana întâi*. The results of this stage of research have been published in a series of studies[3]. Starting with 2006, the method of investigation by sections (trenches) was replaced by the opening of 4 x 4 m surfaces (cassettes), in order to identify the spatial layout of the buildings investigated during previous excavations. Geophysical measurements were also performed[4] in order to establish a long-term strategy of investigations.

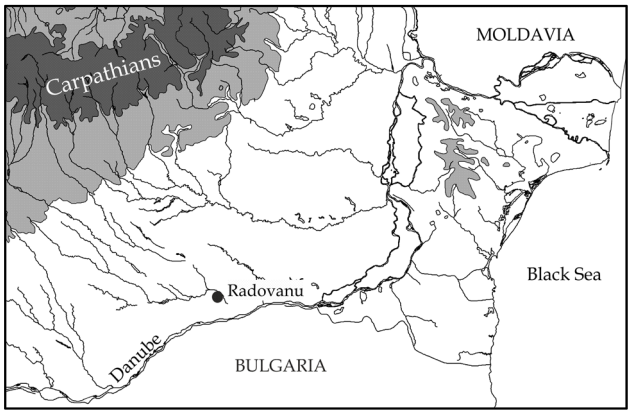

Figure 1. *The geographic position of the Radovanu archaeological site in southeastern Romania.*

Figure 2. *Aerial image of the Radovanu area, view from northwest. Gorgana a doua site is visible in the right part of the image (© Carmen Bem).*

The present study reports a discovery made during the 2016 field season, in the area of cassettes 4, 5, Y and Z (Fig. 3). In 2014, the unexcavated portions separating these cassettes were taken down, which resulted in the excavation surface L. This decision was made after identifying in these unexcavated portions an agglomeration of wattle and daub, rocks and pottery fragments. Two overlapping Getic houses were documented in 2015, the first at a depth between -1.48 and -1.75 m and the second between -1.80 and -1.98 m. Following the excavation of these houses, nine pits (P.) of variable size were identified in 2016 (Fig. 4). Only one of these (P.2) can be described as a provisions pit. It contained a vessel with two circular handles stuck to the body, deposited in vertical position and exhibiting traces of mending. The other eight pits (1, 3–5 and 7–10) were used, at least in their later stages of utilization, for garbage disposal. They contained pottery fragments and animal bones. All pits were sectioned, recorded and all the material excavated[5].

[2] The area investigated by S. Morintz and D. Șerbănescu is located in the southwestern corner of the site (see Fig. 2).

[3] Schuster *et alii* 2005; Schuster, Șerbănescu 2007; El Susi 2009; Mecu, Nălbitoru 2009; Șerbănescu *et alii* 2009; 2010–2011; 2012; Schuster *et alii* 2012–2013a; 2012–2013b.

[4] Markussen *et alii* 2010.

[5] The two overlapping houses and the pits related to them will be reported in a future study.

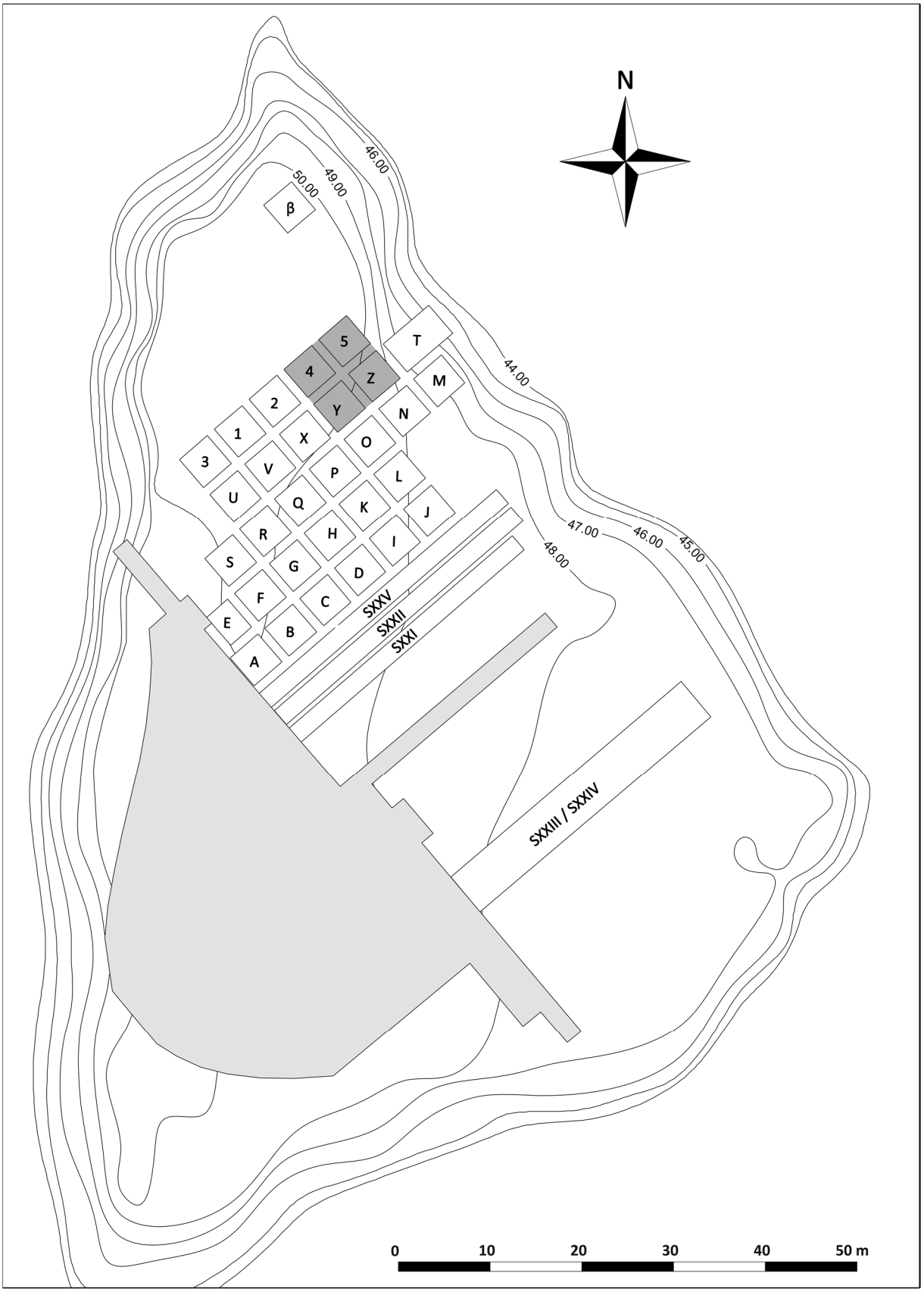

Figure 3. *The archaeological plan of the Radovanu – Gorgana a doua site. The area indicated only by a contour in the southwest was investigated by S. Morintz and D. Şerbănescu.*

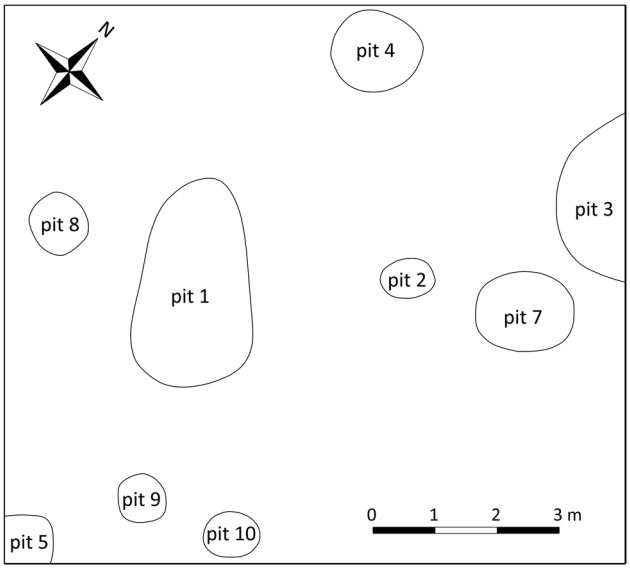

Figure 4. *The spatial distribution of the pits from Radovanu – Gorgana a doua.*

FAUNAL MATERIAL

The fauna discussed in this study comes exclusively from pits, that provided 373 skeletal remains, of which 367 (98.4%) belong to mammals (Tables 1–3). We have also identified a red deer (*Cervus elaphus*) antler fragment (that could represent either a hunted animal or a shed picked up by the prehistoric population), three fish bones (Pisces) and two bird remains (Aves). Of the mammal remains, 295 (80.4%) were identified to species level. It is worth noting that most of these animal remains have all the characteristics of domestic waste, namely a high degree of fragmentation caused by human actions – mainly disarticulation and defleshing, burning traces and teeth marks left by carnivores or pigs.

The faunal material was unevenly distributed between the archaeological features studied. The richest complex is P.8, with 260 remains (69.7% of the total remains). Most of the archaeological structures generally have less than 10–11 fragments (P.2, P.3, P.4, P.5, P.9, P.10), and two of them are slightly richer: 29 faunal fragments in P.1 and 38 in P. 7 (Tables 1–3).

The number of identified species is relatively low and combines both domestic taxa – cattle (*Bos taurus*), sheep (*Ovis aries*), goat (*Capra hircus*), pig (*Sus domesticus*), dog (*Canis familiaris*), horse (*Equus caballus*) – and wild taxa – red deer (*Cervus elaphus*), wild boar (*Sus scrofa*) and beaver (*Castor fiber*). The presence of the beaver confirms the hypothesis that the Argeş River was flowing in the vicinity of the settlement.

Domestic mammals are predominant (98% of the fragments; Tables 1–3), with cattle being most abundant (27.1%), followed by pig (24.7%), dog (23%) and sheep/goat (21.3%). Horse remains are very rare and we did not identify any traces indicating its consumption, to date. Hunting has a very reduced importance (under 2% of all fragments). Surprising in this relatively small sample is the presence of the beaver, which would suggest the existence of a rich network of rivers near the site, favourable for this mammal.

The Radovanu – *Gorgana a doua* site also benefited from two older zooarchaeological studies, one undertaken by Udrescu in 1982[6] and one by El Susi in 2009[7]. Both of these authors noted that the amount of dog remains is very low, about 1.2% (MNI[8] = 8) of a total of 3916 identified remains[9] and 1.4% (MNI = 2) of a total of 295 remains identified to species level[10].

THE CYNOPHAGY CASE AT RADOVANU

In this study, we do not focus on the characteristics of the animal palaeoeconomy of the ancient community because of the small size of the zooarchaeological sample (fewer than 300 remains identified to species). Instead, we discuss the high percentage of dog (*Canis familiaris*) remains (68, or 23% of all remains). The dog remains include complete elements, as well as fragments broken in ancient times (Tables 1–3). This large amount of dog remains is all the more striking if compared to those reported in previous studies, where the percentage of dog remains represents less than 1.4%[11].

The biological age of the dogs found at Radovanu is adult, older than 2 years[12], given that all epiphyses are fused, including vertebrae, and dentition wear is above average (stage D)[13]. The estimated minimum number of dogs in the sample, based on four upper right jaws, is of four individuals. At least two of these were consumed, as demonstrated by several remains that exhibit typical butchery marks (two coxae and two femurs from the same side). Concerning the sex of these animals, in the absence of penile bones, which provide the only way to sex skeletons, we can assume that they are females.

The cranial length, obtained by measuring a single mandible, has a very high value. Based on the Brinkman index, the cranial length is 171 mm, while based on Dahr it is 172.05 mm[14]. These values are superior to those encountered at the dogs of Brănești – *Vadu Anei*[15], dated in the 2nd–1st centuries BC[16].

[6] Udrescu 1982.
[7] El Susi 2009.
[8] MNI – Miminum Number of Individuals.
[9] Udrescu 1982, p. 140, table 2.
[10] El Susi 2009, p. 139, table 1.
[11] Udrescu 1982, p. 140, table 2; El Susi 2009, p. 139, table 1.
[12] Schmid 1972, p. 75, tabel IX.
[13] Horard-Herbin 1997, p. 152.
[14] von den Driesch 1976, p. 61.
[15] Moise 2000.
[16] Again, we express our gratitude to Dr. Paul Damian (National Museum of Romanian History) who led the archaeological rescue research at Brănești – *Vadu Anei* between 1991–1993 and helped us to chronologically fit this site.

Biometric data, obtained as recommended by von den Driesch (1976)[17], and the existence of several complete long bones, allowed us to estimate the withers height of these animals. Thus, based on measurements of a humerus, a radius, an ulna, two femurs, and a tibia, we infer a withers weight of 56.5 cm based on the Koudelka index[18] (52.9–58.0 cm; N = 6) or of 57.4 cm based on the Harcourt index[19] (55.7–58.9 cm; N = 6). The estimated gracility index[20] is 7.09 (6.68–7.85; N = 5). These data indicate that the Radovanu dogs were medium sized (between 50 and 60 cm) and of average robustness (diaphysis index = 6.6–8.9) (see biometrics appendix).

From a taphonomic standpoint, it is surprising that the dog bones exhibit a variety of anthropogenic traces (Fig. 5). Thus, we note subtle burning traces, rough cut marks attesting disarticulation (achieved by use of heavy metal tools with relatively thick blade, such as an axe, hatchet or cleaver), and fine cut marks left by a knife-like thinner blade, as a result of disarticulation and meat removal actions. This is notable because previous zooarchaeological studies at Radovanu did not reveal evidence for consumption of dogs (cynophagy)[21].

The dog remains with anthropogenic cutting and burning traces demonstrating consumption of dogs for food have been identified in P.1 – a mandible and a femur –, P.7 – a femur – and P.8 – a mandible, two humeri, a radius, an ulna, three coxae, a femur, a tibia, two thoracic vertebrae and five ribs (17 remains, representing 28.3% of the 60 remains were found here) (Tables 2–4 and Fig. 5). If we consider the spatial distribution of these pits (Fig. 4) within the archaeological excavation, we observe that P.8, which is located westwards and is among the smallest in diameter, contains 60 dog remains, 17 with anthropogenic traces; P.1, which is one of the largest pits is located 0.25 m east of P.8 and contains six dog remains, two of which have anthropogenic modifications; and P.7, with two dog remains of which one has cut marks, is located about 3.6 m east of P.1. The biometric analysis of two complete femurs, one found in P.8 and the other in P.7, indicates that they come from the same individual, suggesting contemporaneity of the two archaeological features.

Burning traces were observed only on the canines of two mandibles, one discovered in P.1 and the other in P.8 (Pl. 1/1–2), and on the ilium of a left coxal bone discovered in P.8. In the latter case, the coxal is inconspicuously burned (1–2 mm width on 10 mm length; Pl. 3/1, the middle coxal) at the level of a cut mark. The relatively mild burning caused the destruction of the canine's occlusal surface, which could suggest burning of the fur immediately after slaughtering and before the animal was consumed. The high temperatures reached by burning of the fur cause the retraction of the lips, thus leaving the tip of the more prominent teeth, especially of canines, directly exposed to the flames. This process associated with the burning of hair is well known and documented, especially in the case of pigs, since prehistory, and is still observed in traditional rural communities today. Even within the faunal material studied at Radovanu, a pig jaw also demonstrates such burning marks on the canine. This observation is consistent with the absence of any anthropogenic traces associated with skinning from areas where skinning marks are usually found, such as the lateral external side of mandibles or the metapodials (four metacarpals and five metatarsals) (Tables 2–4). We also note that, apart from the two teeth and the left ilium (the latter may have been burned secondarily), no traces of burning were observed on other dog bones, which supports our hypothesis that the animal's hair was burned before skinning and before consumption. In present day North Africa, dogs are burned whole in some communities in order to remove their hair (fur)[22].

One of the mandibles discussed above (from P.8) exhibits three fine knife marks on the lingual (internal) face near M_1 and M_2, which indicate evisceration and, more precisely, removal of the tongue for consumption (Pl. 1/3–4). Evisceration cut marks were also identified on the interior face of five ribs (from P.8) that suggest the extraction of the internal organs (lungs and heart) from the rib cage (Pl. 1/7). All these anatomical elements displaying cut marks demonstrate that evisceration targeted both the cranial cavity (tongue cutting) and the thoracic chest region of animals (extraction of internal organs – heart and lungs).

Disarticulation traces are much more numerous and involve a wider variety of skeletal elements. They were produced with two types of tools: some rougher (like a hatchet) and some finer (knife-type). Thus, a complete humerus (P.8) bears a fine knife mark on the proximal articular surface (Pl. 2/2); multiple fine cuts are present on a radius and a pair of ulnae (P.8) at the level of the distal epiphyses (Pl. 2/3–8); two of the three studied coxae (P.8) bear multiple coarse and fine traces aimed at detaching the proximal epiphysis of the femur from the acetabular cavity of the pelvis, which in one case is destroyed by a blow from the left side; there are also heavy strikes at the level of the pubic symphysis meant to separate the two coxae, and on the ventral face of the ilium that articulates with the sacral region (Pl. 3/1–4); two of the three femurs (P.1 – proximal extremity and P.7 – complete, with fused epiphyses) exhibit fine knife marks at the level of the proximal epiphysis (Pl. 2/9–11) and diaphysis (Pl. 3/5), but also at the level of the distal epiphysis (P.7 and P.8, both femurs are complete, with fused epiphyses and seem to come from the same individual – Pl. 2/12); a complete tibia (P.8) shows several knife marks towards the distal extremity (Pl. 3/6–8); disarticulation traces were identified also on two thoracic vertebrae (P.8) – produced from the inside of the thoracic cage with the intent of portioning the spine after the animal was eviscerated (Pl. 1/5–6).

[17] von den Driesch 1976.
[18] Koudelka 1885.
[19] Harcourt 1974.
[20] Udrescu 1990, p. 5.
[21] Udrescu 1982; El Susi 2009.
[22] Camps 1994, p. 2161–2164.

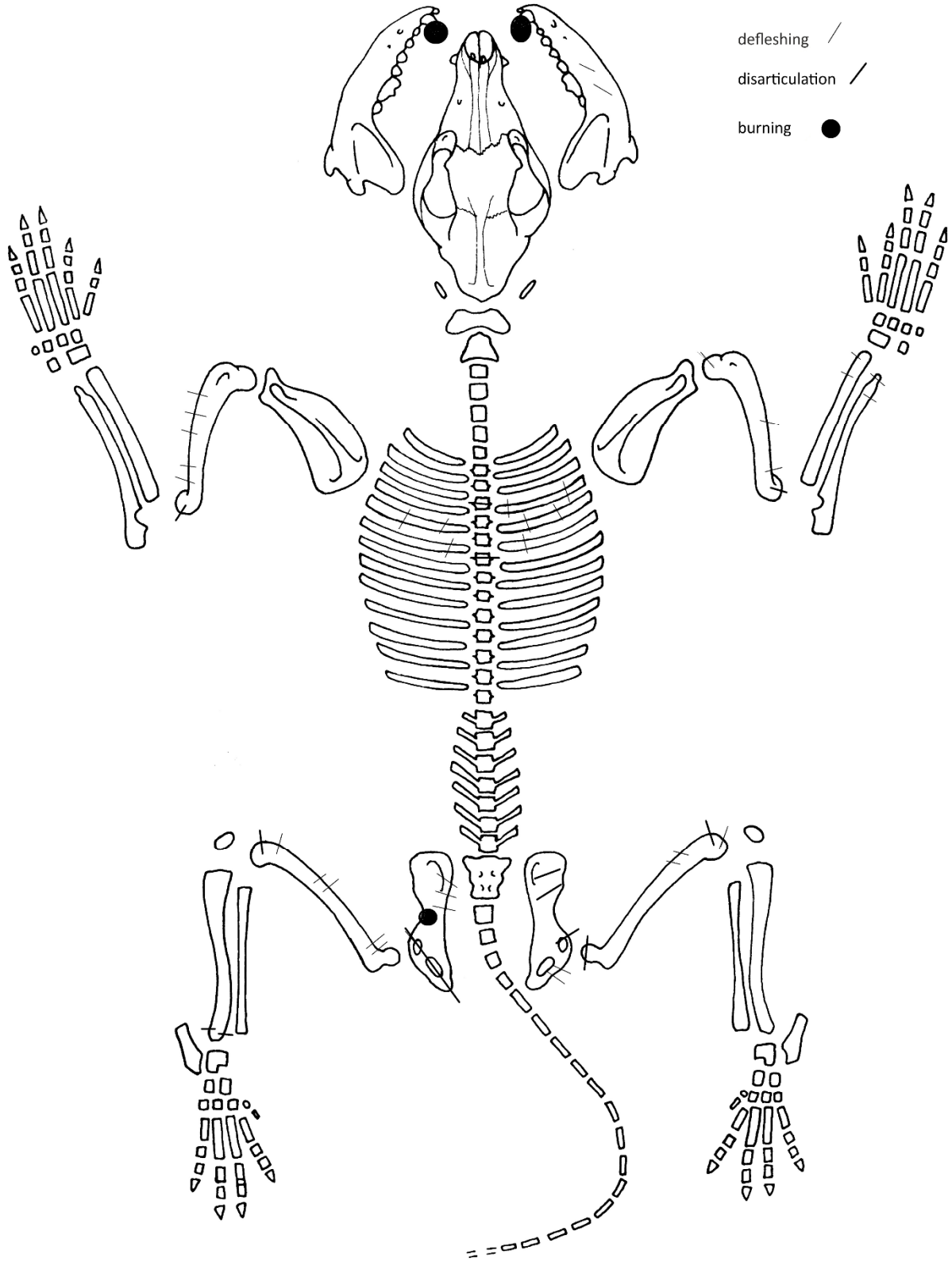

Figure 5. *Traces pointing to man's alimentary activity noticed in the remains of dog (Canis familiaris) discovered at Radovanu – Gorgana a doua (after Helmer 1987).*

Flesh removal was conducted primarily with knives, and its traces are found mainly on the diaphysis of long bones, such as a complete humerus (on the distal third of the diaphysis, on the dorso-median face; Pl. 2/1), three coxae that exhibit multiple traces of defleshing especially on the pubis (Pl. 3/3–4), and all three femurs (two of which are complete) that have multiple knife traces located on the proximal, median and distal diaphysis (Pls. 2/12 and 3/5).

Several coarse butchery marks intended to reduce pieces of meat have been identified on the diaphysis of long bones. Both humeri have such cuts: in one case the bone was severed in two fragments (the blow of a hatchet is located on the medial face); in the second case the humerus is complete but has five heavy strike marks, seemingly unsuccessful, spread over 8 cm of length on the medial face (Pl. 2/1–2).

One of the consumed dogs shows pathologic evidence at the level of the distal third of an ulna (Pl. 2/5–8): an infectious process (not a fracture) healed during life, displaying extremely rich callus that spreads tangentially to the correspondent radius (Pl. 2/3–4). We note with interest that this affected region was given special attention during butchery, as suggested by the large number of fine cut marks observed around it.

DISCUSSION

The roles performed by dogs within a human community are extremely varied, ranging from protection and guarding of goods, livestock and humans, to hunting, war, traction (or carrying), as well as entertainment (dog fights, company, etc.). Some of these roles are difficult to prove in archaeological studies, but some evidence can be provided by zooarchaeological research for practices that involve animal sacrifices. The site of Radovanu is one such case where evidence points to cynophagy.

Cynophagy, as demonstrated at Radovanu, is a novel finding for the Late Iron Age in Romania, although some years ago it was hypothesized based on the fragmentation and burning traces of dog remains found in various Geto-Dacian archaeological contexts[23]. Now, for the first time, disarticulation and defleshing cut marks identified on dog skeletal remains confirm beyond doubt the alimentary consumption of this species in the Late Iron Age.

Sacrificing and transforming the dog into pieces of meat has nothing special or extraordinary in itself. The process of burning the hair is the same as documented in pigs, and the butchery procedures follow the same pattern as for other domestic animals (cattle, sheep, goat, pig). The *chaîne opératoire* is similar to the other domesticated species consumed, both in terms of butchery methods and the two types of tools used: coarser tools, such as axe, hatchet or cleaver, and finer tools (knives).

At this point we do not know whether cynophagy was more widely spread among the Geto-Dacians populating the territory of present-day Romania. However, considering that dogs are smaller than the other domestic animals used in the alimentation of these populations and that dog percentages in the Geto-Dacian faunistic spectra are much lower compared to other species [both as number of remains (NR) and as minimum number of individuals (MNI)], perhaps the alimentary importance of dogs in the palaeoeconomy was reduced too. We cannot overlook the hypothesis of a ritual consumption of this species, but nothing from the study of the archaeological inventory of the three pits from Radovanu (P.1, P.7, P.8) provides evidence that would support this hypothesis; the three archaeological features fall in the category of domestic waste pits, at least for the last part of the duration of their use.

On the other hand, cynophagy has been reported in several European countries during the Late Iron Age. In our opinion, this behaviour is best documented in France, thanks to the large number of zooarchaeologists involved in archaeological research. In France, cynophagy seems to have been more widely spread at the beginning of the Late Iron Age (4th century BC), subsequently decreasing in incidence in the times nearing the Roman conquest and during the Roman period[24]. Evidence of dog consumption during the Late Iron Age was also found in Great Britain[25], Belgium[26], Slovakia[27] and Poland[28], where it shows that the species was used as food but with very low incidence.

The phenomenon of cynophagy is also encountered during prehistory as early as the Neolithic period, also at relatively low incidence, based on zooarchaeological data available thus far. Usually, dogs were kept for other utilitarian purposes, such as herd and house guarding, hunting, or simply as companion animals. However, in several prehistoric settlements of the Vinča (Liubcova – *Orniţa*), Dudeşti (Beciu and Măgura – *Buduiasca*), Boian (Isaccea – *Suhat*, Siliştea – *Conac*, Hârşova – *tell*, Izvoarele) and Gumelniţa (Hârşova – *tell*, Borduşani – *Popină*, Măriuţa, Sultana – *Malu Roşu*, Vităneşti, Taraschina) cultures, evidence is present that the species *Canis familiaris* was also used as food, if we consider cut marks (for disarticulation and flesh removal); dog fur seems to have also been used by these prehistoric populations, as suggested by skinning cut marks identified on different bone fragments[29].

[23] Tărcan *et alii* 2000, p. 127; Hrișcu *et alii* 1996.
[24] Horard-Herbin 2014.
[25] Hambleton 2008.
[26] Tărcan *et alii* 2000.
[27] Chrószcz *et alii* 2015.
[28] Sielicka 2015, p. 175.
[29] Bălășescu 2014; Bălășescu, Radu 2012; Bălășescu *et alii* 2005; Lazăr *et alii* 2016.

Evidence of dog meat consumption is absent for the Bronze Age and the Hallstatt period, if ritual deposits are not taken into account, so this new discovery of evidence for cynophagy in the Late Iron Age is all the more exciting.

CONCLUSIONS

Zooarchaeological study of the Radovanu faunal remains uncovered during the 2016 field season has revealed the presence of dog bones with anthropogenic traces of disarticulation, defleshing and burning, discovered in three pits (P.1, P.7 and P.8). Of the 68 identified dog remains, 20 (23%) exhibit these types of anthropogenic modifications. The minimum number of individuals to whom the 68 dog remains can be attributed is four, all adults; of these, at least two (represented by the 20 remains) were consumed. These animals were characterized by average withers heights and medium robustness.

The case of cynophagy from Radovanu is the only one documented to date in Romanian zooarchaeology, although burning traces and the fragmentation of dog bones have been called upon previously to hypothesize the presence of this phenomenon in the Geto-Dacian world. The cut marks identified on the dog bones from Radovanu provide now irrefutable evidence indicating that the species was consumed.

The fact that it took us so long to recognize and demonstrate the presence of cynophagy may be due to a strong Romanian historiographic and archaeological tradition that denied the idea of dog meat consumption, considering it unbelievable. This perspective may also be a consequence of the communist period, when it was taboo to suggest that the Geto-Dacian ancestors of the Romanian people were sometimes butchering and preparing their dogs like they did with any other domestic species (cattle, pigs, sheep and goats).

A way forward in studying the phenomenon of cynophagy and ascertaining how usual or unusual it was in prehistory, would be (1) to reassess old collections (samples) within a taphonomic framework, and (2) to give more importance, in future archaeological research, to zooarchaeological studies that can provide new and important information for understanding of pre- and proto-historical populations. Last, but not least, we would like to point out the disastrous situation of zooarchaeological research in Romania, where the number of specialists has seen continuous decrease (fewer than ten are active, as this article is going to press) while the number of excavations and archaeological investigations has stayed relatively high. In 2016 only, 138 archaeological interventions[30] (systematic, preventive and diagnostic research) were carried out, producing quantities of faunal material on par with those of other archaeological vestiges, such as pottery.

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Specie	P. 1	P. 2	P. 3	P. 4	P. 5	P. 7	P. 8	P. 9	P. 10	Total	%
Bos taurus (cattle)	10	1	2	7	6	7	43	4		80	27.12
Ovis aries (sheep)	1						8			9	3.05
Capra hircus (goat)	1						1			2	0.68
Ovis aries/Capra hircus (caprins)		3	1			1	44	3		52	17.63
Sus domesticus (pig)	3		1	3	4	16	44	2		73	24.75
Equus caballus (horse)	1		1				2		1	5	1.69
Canis familiaris (dog)	6					2	60			68	23.05
Sus scrofa (wild boar)						2				2	0.68
Cervus elaphus (red deer)			1					1		2	0.68
Castor fiber (beaver)					1	1				2	0.68
Total mammals determined	**22**	**4**	**6**	**10**	**11**	**29**	**202**	**10**	**1**	**295**	**100.00**
Big size mammals indetermined	6	1				7	22	1		37	
Medium size mammals indetermined	1	1				2	31			35	
Total mammals	**29**	**6**	**6**	**10**	**11**	**38**	**255**	**11**	**1**	**367**	
deer antlers			1							1	
Pisces							3			3	
Aves							2			2	
Total mammals	**29**	**6**	**7**	**10**	**11**	**38**	**260**	**11**	**1**	**373**	

Table 1. *The numerical and percentage distribution of the animal remains found in various archaeological features at Radovanu.*

ANATOMICAL ELEMENT	*Bos taurus*	*Ovis aries*	*Capra hircus*	*caprins*	*Sus domesticus*	*Canis familiaris*	*Equus caballus*	*Cervus elaphus*	*Sus scrofa*	*Castor fiber*
Cornua								1		
Neurocranium	3	1		1	2	3				
Viscerocranium	6			3	5	5				
Dentes sup.	2			2	1	1				
Mandibula	3	5			14	2				
Dentes inf.	1				5					
Hyoid	1			1						
Atlas	1				1	2				
et Vert. cv.						3				
Vert. thor.	3			1	1	4				
Vert. lumb.					7	5				
Sacrum	1									
Costae	35			17	5	13	1			1
Scapula	2			4	5	2				
Humerus	2		2	1	4	2				
Radius	1			2	2	2	1			
Ulna	2				2	3				
Metacarpus	1			4	3	4				
Pelvis	4			4	5	3				
Femur	2			2	3	4		2		1
Patella	1									
Tibia	2	1		6	2	4				
Fibula					2					
Talus	1	1			1				1	
Calcaneus	2	1			2	1			1	
Metatarsus	1			3		5	1			
Phalanx 1	2			1	1					
Phalanx 2	1						2			
TOTAL	**80**	**9**	**2**	**52**	**73**	**68**	**5**	**3**	**2**	**2**

Table 2. *The numerical distribution on the anatomical elements of the mammal's remains discovered at Radovanu.*

FEATURES	P.1						P.2		P.3					P.4		P.5			P.7						P.8							P.9					P.10
ANATOMICAL ELEMENT	*Bos taurus*	*Ovis aries*	*Capra hircus*	*Sus domesticus*	*Canis familiaris*	*Equus caballus*	*Bos taurus*	caprins	*Bos taurus*	caprins	*Sus domesticus*	*Equus caballus*	*Cervus elaphus*	*Bos taurus*	*Sus domesticus*	*Bos taurus*	*Sus domesticus*	*Castor fiber*	*Bos taurus*	caprins	*Sus domesticus*	*Canis familiaris*	*Sus scrofa*	*Castor fiber*	*Bos taurus*	*Ovis aries*	*Capra hircus*	caprins	*Sus domesticus*	*Canis familiaris*	*Equus caballus*	*Bos taurus*	caprins	*Sus domesticus*	*Cervus elaphus*	*Equus caballus*	
Cornua													1																							
Neurocranium																									3	1		1	2	3						
Viscerocranium	1														1	2	1								3			3	3	5						
Dentes sup.														1											1			2	1	1						
Mandibula	1			3	1											1	2				3				1	5			5	1			1			
Dentes inf.																	1		1										3				1			
Hyoid	1																											1								
Atlas																									1				1	2						
et Vert. cv.																														3						
Vert. thor.							1														1				1			1		4		1				
Vert. lumb.																					4								3	5						
Sacrum	1																																			
Costae					1							1		3	1	2			3	1	3	1		1	24			15	1	11		3	1				
Scapula					1			1			1			1											1			2	4	1			1				
Humerus	1		1											1	1						1						1	1	2	2						
Radius	1					1																						2	2	2						
Ulna																			1						1				2	3						
Metacarpus										1				1							2							3	1	4						
Pelvis	2								1																1			4	5	3						
Femur					1			1					1					1	1			1			1			1	3	2					1	
Patella	1																																			
Tibia		1			1			1								1									1			5	2	3						
Fibula																					1								1							
Talus																							1		1	1			1							
Calcaneus																							1		2	1			2	1						
Metatarsus					1														1									2		4	1		1			
Phalanx 1	1								1												1							1								
Phalanx 2																									1						1					1
TOTAL	**10**	**1**	**1**	**3**	**6**	**1**	**1**	**3**	**2**	**1**	**1**	**1**	**2**	**7**	**3**	**6**	**4**	**1**	**7**	**1**	**16**	**2**	**2**	**1**	**43**	**8**	**1**	**44**	**44**	**60**	**2**	**4**	**3**	**2**	**1**	**1**

Table 3. *The numerical distribution on the anatomical elements of the mammals remains from the various archaeological features discovered at Radovanu.*

FEATURES	P.1		P.7		P.8		
ANATOMICAL ELEMENT	*Canis familiaris*	anthropic marks (taphonomy)	*Canis familiaris*	anthropic marks (taphonomy)	*Canis familiaris*	anthropic marks (taphonomy)	Total
Neurocranium					3		3
Viscerocranium					5		5
Dentes sup.					1		1
Mandibula	1	b (1)			1	b; e (1)	2
Atlas					2		2
et Vert. cv.					3		3
Vert. thor.					4	d (2)	4
Vert. lumb.					5		5
Costae	1		1		11	d; e (5)	13
Scapula	1				1		2
Humerus					2	d; f (2)	2
Radius					2	d; f (1)	2
Ulna					3	d; f (1)	3
Metacarpus					4		4
Pelvis					3	d; f; b (3)	3
Femur	1	d; f (1)	1	d; f (1)	2	d; f (1)	4
Tibia	1				3	d; f (1)	4
Calcaneus					1		1
Metatarsus	1				4		5
TOTAL	**6**	**2**	**2**	**1**	**60**	**17**	68

Table 4. *Numerical distribution on anatomical elements, on archaeological features and types of anthropic traces identified on dog remains at Radovanu (disarticulation – d; defleshing – f; evisceration – e; burning – b). In brackets there is the number of anatomical elements showing anthropic traces.*

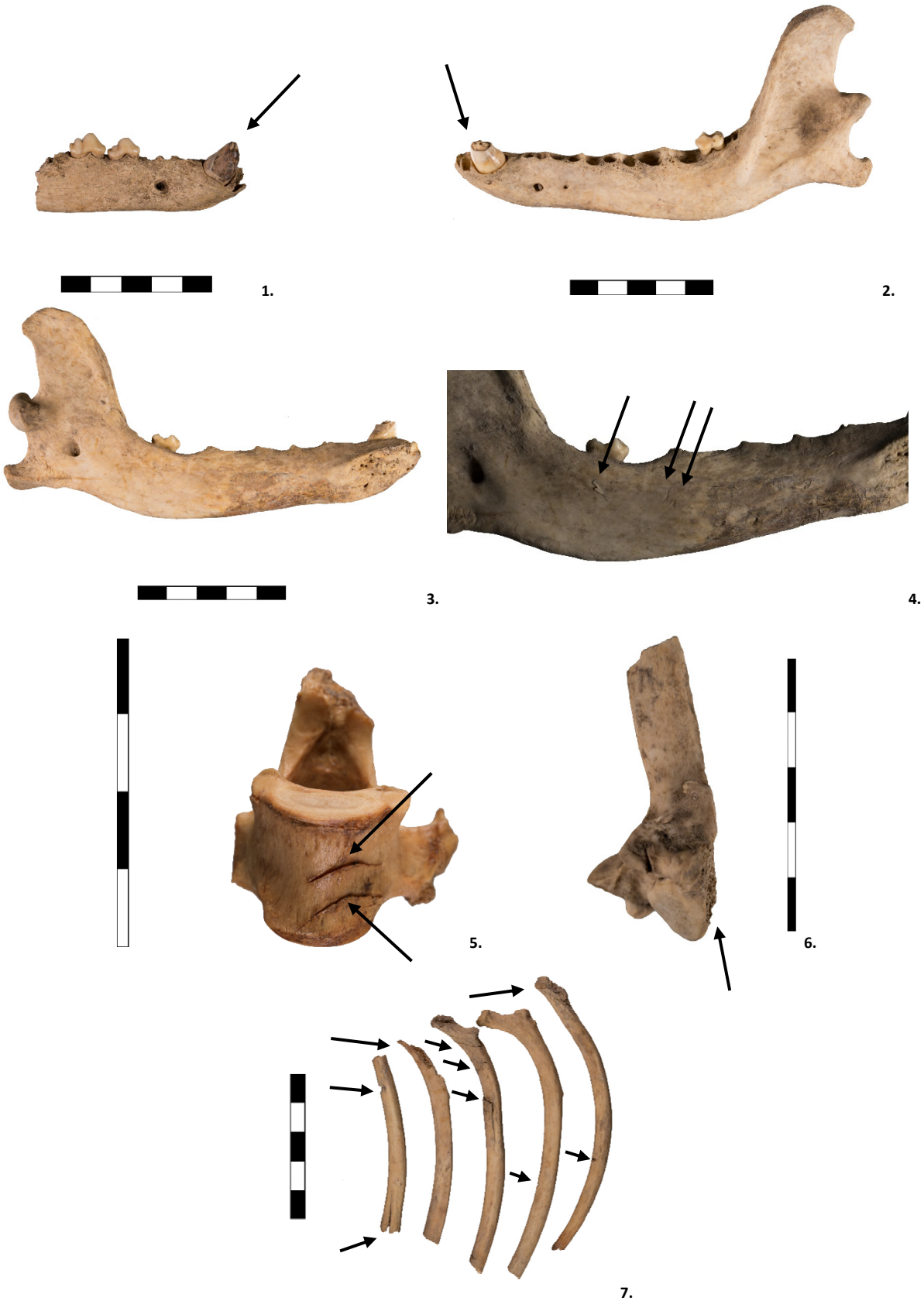

Plate 1. *1. Right mandible with burnt canine, P.1 (lateral view); 2. Left mandible with burnt canine, P.8 (lateral view); 3. Left mandible with cut marks on the internal (lingual) face, P.8; 4. Details of these cut marks (lingual view); 5. Thoracic vertebra with cuts on the ventral side (towards the inside of the chest), P.8 (ventral view); 6. Cross-sectional thoracic vertebra, P.8 (lateral view); 7. Ribs with cutting marks on the lateral and internal side, P.8.*

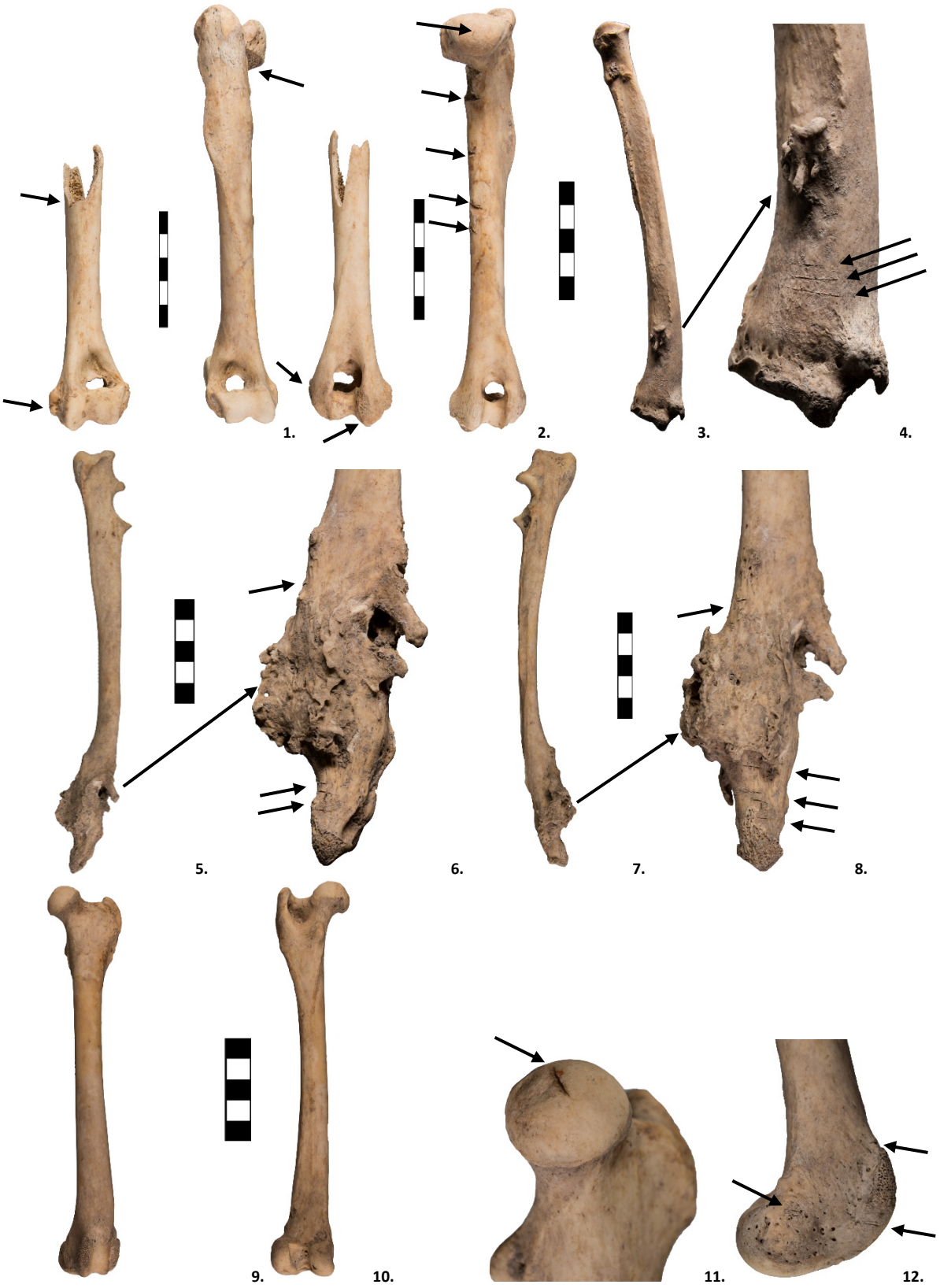

Plate 2. *1. Humerus with cuts marks, P.8 (cranial view); 2. Humerus with cuts marks, P.8 (caudal view); 3. Whole radius, P.8 (palmar view); 4. Distal radius detail with cuts marks and pathology, P.8 (palmar view); 5. Ulna, P.8, (lateral view); 6. Distal ulna with cuts marks and pathology, P.8 (lateral view); 7. Ulna, P.8 (medial view); 8. Distal ulna with cuts marks and pathology, P.8 (medial view); 9. Left femur, P. 8 (cranial view); 10. Left femur, P.8 (caudal view); 11. Proximal femur detail with cut marks, P.8 (medial view); 12. Distal femur detail with cuts marks, P8 (lateral view).*

Plate 3. *1. Coxals (the first on the left is on the right side, the middle and the right are on the left side) with cutting and burning marks, P.8 (lateral view); 2. Coxal left with cut marks, P.8 (medial view); 3. Coxal left with cut marks, P.8 (ventral view); 4. Right coxal detail with cut marks, P.8; 5. Proximal femur with cut marks, P.1 (cranial view); 6. Left tibia, P.8 (dorsal view); 7. Distal tibia detail with cut marks, P.8 (cranial view); 8. Distal tibia detail with cut marks, P.8 (lateral view).*

The biometrics appendix - all measurements are by von den Driesch (1976) and are expressed in millimetres.

Mandible	P.8 - left	P.1 - right
1	142.5	
2	143.9	
3	135.3	
4	123.2	
5	116.6	
6	124.7	
7	79.6	
8	74.5	
9	70.2	
10	37.1	
11	37.6	39.1
12	33.5	33.9
14	20.9	
15	10,05/7,1	
17	12.5	
18	63.9	
19	24.4	
20	19.5	
Brinkmann index (mas. 2 * 1,21)	174.1	
Brinkmann index (mas. 4 * 1,37)	168.8	
Brinkmann index (mas. 5 * 1,46)	170.2	
Average Brinkmann index	171.0	
Dahr index	172.05	

Humerus	P.8 - right	P.8 - left
GL	172	
Bp	30.2	
Dp	40.5	
SD	13.5	13.6
Bd	31.5	33.6
Gracility index	7.85	
Wither height (Koudelka)	579.64	
Wither height (Harcourt)	563.42	

Radius	P.8 - right
GL	179
Bp	18.3
Dp	11.3
SD	12.95
Bd	21.4
Dd	13.1
Gracility index	7.23
Wither height (Koudelka)	576.38
Wither height (Harcourt)	588.73

Ulna	P.8 - right
GL	198
LO	19.9
SDO	21.8
DPA	24.5
Wither height (Koudelka)	528.66
Wither height (Harcourt)	556.65

Coxal	P.8 - right	P.8 - left	P.8 - left
GL	152.9	152.4	
LA	21.4	20.4	
SB	9.7	9.8	
SH	18.1	18	
SC	54.7	55	
Lfo	28		32.8
LS	46.5		

Femur	P.8 - right	P.7 - left	P.1 - right
GLC	190	189	
Bp	37.4	36.2	38.2
DC	19	18.7	17.5
SD	13.1	12.8	
CD	46.2	43.5	
Bd	30.3	29.9	
Gracility index	6.89	6.77	
Wither height (Koudelka)	571.9	568.89	
Wither height (Harcourt)	583.64	580.5	

Tibie	P.8 - left
GL	193
Bp	33.4
SD	12.9
Bd	22.1
Dd	16.1
Gracility index	6.68
Wither height (Koudelka)	563.56
Wither height (Harcourt)	572.97

ABRÉVIATIONS / ABBREVIATIONS / ABREVIERI

AA – Archäologischer Anzeiger. Deutsches Archäologisches Institut, Darmstadt, München, Tübingen–Berlin
ACMI – Anuarul Comisiunii Monumentelor Istorice, Bucureşti
ActaMN – Acta Musei Napocensis, Cluj
ActaMP – Acta Musei Porolissensis, Zalău
ActaTS – Acta Terrae Septemcastrensis, Universitatea Lucian Blaga, Sibiu
Acta Siculica – Acta Siculica. Anuarul Muzeului Naţional Secuiesc, Sfântu Gheorghe
l'Anthropologie (Paris) – l'Anthropologie, Paris
Antiquity – Antiquity. A Quarterly Review of Archaeology, University of York
Anuarul MJIAP – Anuarul Muzeului Județean de Istorie și Arheologie Prahova, Ploiești
ARA – Annuaire Roumain d'Anthropologie
Archaeometry – Archaeometry, Research Laboratory for Archaeology and the History of Art, Oxford University
ArchBulg – Archaeologia Bulgarica, Sofia
Area – Area, Royal Geographical Society, London
ArheologijaKiiv – Arheologija. Nacional'na akademija nauk Ukraini. Institut archeologii, Kiiv
ArheologijaSSSR – Arheologija SSSR. Svod Archeologičeskih Istočnikov, Moskva
ArhMold – Arheologia Moldovei, Iaşi
BA – Biblioteca de Arheologie, Bucureşti
BARIntSer – British Archaeological Reports. International Series, Oxford
BiblThrac – Bibliotheca Thracologica, Bucureşti
BMC – *Coins of the Roman Empire in the British Museum*, London. I, *Augustus to Vitellius*, 1923; II, *Vespasian to Domitian*, 1930; III, *Nerva to Hadrian*, 1936; IV, *Antoninus Pius to Commodus*, 1968; V, *Pertinax to Elagabalus*, 1950 (H. Mattingly); VI, *Severus Alexander to Balbinus and Pupienus*, 1962 (R.A.G. Carson)
BMJT – Buletinul Muzeului Judeţean Teleorman, Alexandria
BMJTAG – Buletinul Muzeului Județean „Teohari Antonescu", Giurgiu
BSNR – Buletinul Societăţii Numismatice Române, București
Bull. et Mém. de la Soc. d'Anthrop. de Paris – Bulletins et Mémoires de la Société d'Anthropologie de Paris
CA – Cercetări Arheologice, Bucureşti
Caiete ARA - Caietele ARA, Revistă de Arhitectură, Restaurare şi Arheologie, Asociaţia ARA, Bucureşti
CCA – Cronica Cercetărilor Arheologice din România, Bucureşti
CercNum – Cercetări Numismatice, București
Dacia / Dacia NS – Dacia / Dacia Nouvelle Série. Revue d'archéologie et d'histoire ancienne. Académie Roumaine. Institut d'archéologie « Vasile Pârvan », Bucarest
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EphemNap - Ephemeris Napocensis. Academia Română, Institutul de Arheologie şi Istoria Artei, Cluj-Napoca
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FolArch – Folia Archaeologica, Budapest
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IJO – International Journal of Osteoarchaeology
IstMitt – Istanbuler Mitteilungen, Istanbul
Istros – Istros, Muzeul Brăilei, Brăila
JAS – Journal of Archaeological Science, London
JEA – Journal of European Archaeology
JFA – Journal of Field Archaeology

KSIA (Kiiv) – Kratkije Soobščenija Instituta Arheologij Akademij Nauk SSSR, Kiiv
KSIA (Moskva) – Kratkije Soobščenija Instituta Arheologij Akademij Nauk SSSR, Moskva
Ktèma – Civilisations de l'Orient, de la Grèce et de Rome antiques, Strasbourg
MCA – Materiale şi Cercetări Arheologice, Bucureşti
MemAnt – Memoria Antiquitatis, Piatra Neamţ
MIAR – Materialy i issledovanija po arheologii Rossii
MIBE – W. Hahn, M.A. Metlich, *Money of the Incipient Byzantine Empire (Anastasius I – Iustinian I, 491–565)*, Viena, 2000
Mousaios – Mousaios. Buletinul Ştiinţific al Muzeului Judeţean Buzău
MuzNaţ – Muzeul Naţional, Bucureşti
NZ – Numismatische Zeitschrift, Viena
Peuce – Peuce, Studii şi cercetări de istorie şi arheologie, Institutul de Cercetări Eco-Muzeale, Tulcea
Pick, Regling – B. Pick, K. Regling, *Die antiken Münzen Nord-Griechenlands*, I, *Die antiken Münzen von Dacien und Moesien*, Berlin, 1, 1898 (B. Pick), 2, 1910 (B. Pick, K. Regling)
Pink, NZ – K. Pink, *Der Aufbau der Römischen Münzprägung in der Kaiserzeit*. VI/1, *Probus*, NZ, 71, 1946, p. 13-74
Pontica – Pontica. Studii şi materiale de istorie, arheologie şi muzeografie, Muzeul de Istorie Naţională şi Arheologie Constanţa
PZ – Prähistorische Zeitschrift, Berlin-Mainz
RA – Revue Archéologique, Paris
Radiocarbon – An International Journal of Cosmogenic Isotope Research, Cambridge
REA – Revue des Études Anciennes, Bordeaux
RevBistr – Revista Bistriței. Complexul Muzeal Bistriţa-Năsăud, Bistriţa
RevMuz – Revista Muzeelor, Bucureşti
RIC III – H. Mattingly, E.A. Sydenham, *The Roman Imperial Coinage*, III, *Antoninus Pius to Commodus*, London, 1930
RIC IV, 1 – H. Mattingly, E.A. Sydenham, *The Roman Imperial Coinage*, IV, 1, *Pertinax to Geta*, London, 1968
RIC IV, 2 – H. Mattingly, E.A. Sydenham, C.H.V. Sutherland, *The Roman Imperial Coinage*, IV, 2, *Macrinus to Pupienus*, London, 1938
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RIC VI – C.H.V. Sutherland, *The Roman Imperial Coinage*, VI, *From Diocletian's reform (A.D. 294) to the death of Maximinus (A.D. 313)*, London, 1967
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Ruzicka, *Inedita* – L. Ruzicka, *Inedita aus Moesia Inferior*, NZ, 50, 1917, p. 73–173
Quaternary International – Quaternary International. The Journal of the International Union for Quaternary Research
SAA – Studia Antiqua et Archaeologica, Iaşi
SCA – Studii și Cercetări de Antropologie, București
SCIV(A) – Studii şi Cercetări de Istorie Veche (şi Arheologie), Bucureşti
SCN – Studii şi Cercetări de Numismatică, Bucureşti
SNG IX, BM – Silloge Nummorum Graecorum, IX, The British Museum, I, *Black Sea*, London, 1993
SNG XI, *Stancomb* – Silloge Nummorum Graecorum, XI, *The William Stancomb Collection of coins of the Black Sea Region*, Oxford, 2000
SovArh – Sovetskaja Arheologija, Moskva
SP – Studii de Preistorie, Bucureşti
Stratum(Plus) – Stratum (Plus), Şcoala Superioară de Antropologie, Chişinău, Sankt Petersburg, Bucureşti
StudCom Satu Mare – Studii şi comunicări Satu Mare
StudCom Sibiu – Studii şi Comunicări, Sibiu
Th-D – Thraco-Dacica, București
Tyragetia – Tyragetia. Anuarul Muzeului Naţional de Istorie a Moldovei, Chişinău
Vărbanov – I. Vărbanov, *Greek Imperial Coins and their Values (The Local Coinage of the Roman Empire)*, I, *Dacia, Moesia Superior, Moesia Inferior*, Burgas, 2005
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