

# Studies

## ARCHAEOLOGICAL MATERIAL

### IDENTIFICATION OF ANIMAL RESOURCES FROM THE DOBROVĂȚ-LA LIVADĂ LATE IRON AGE SETTLEMENT (4<sup>TH</sup>-3<sup>RD</sup> CENTURIES BC)

**Abstract:** The material comes from the Late Iron Age settlement of Dobrovăț-La Livadă in Iași County and represents food waste presenting butchering, burning, and disarticulation marks. Considering the total number of specifically identified mammals, 90.36% of them belong to domestic mammals and the rest of 9.64% belongs to the only identified wild mammals – *Sus scrofa* and *Cervus elaphus*. Estimating the slaughter ages provided little data, both due to the high degree of bone fragmentation and the small sample size studied. Based on the meat yield, domestic cattle provided the largest part of the amount of meat (89.63%). Wild boar is the next meat provider with a share of 4.61%, while due to their small size, the sheep/goat group and the domestic pig offered the lowest amounts of meat (3.20% and 2.56% respectively).

**Keywords:** Zooarchaeology; Taphonomy; Animal husbandry; Hunting; Late Iron Age; Moldavian Plateau.

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#### INTRODUCTION

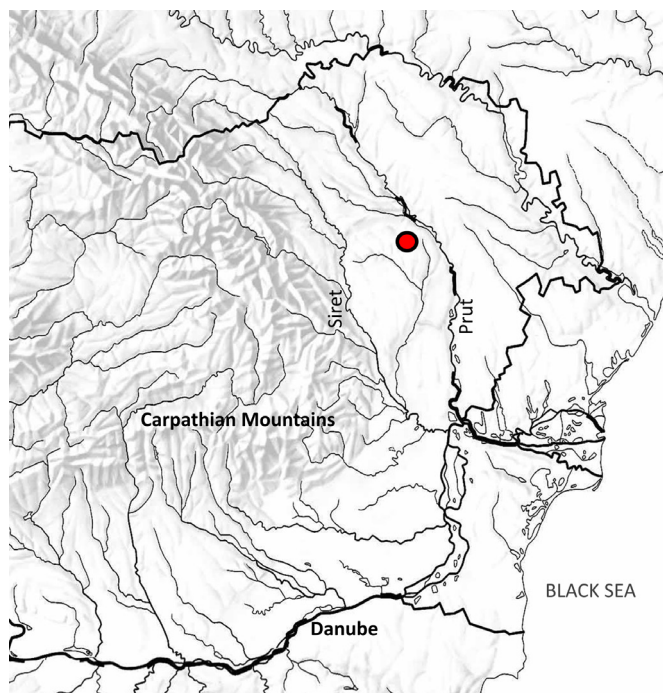
The commune of Dobrovăț is located in Iași County, in the Central Moldavian Plateau (**Fig. 1**), more precisely on the southern edge of the Iasi Coast. The field research carried out in recent years in the area of this locality have brought to light rich discoveries from various historical and prehistoric periods<sup>1</sup>.

The site called *La Livada* is located to the west of the locality, on the valley of a small stream called Dobrovicior or Surugiu, in the Coloneasa Forest area. On both sides of the valley, over a fairly large area, scattered vestiges from the Late Iron Age can be found, suggesting a densely inhabited area during the 4<sup>th</sup>-3<sup>rd</sup> centuries BC period. The discoveries here can be linked to the existence of the Dobrovăț - *Cetățuia* hillfort, located about 1,5 km south-east, archaeologically researched in 2019 and 2021<sup>2</sup> (**Fig. 2**).

In 2020, A. Berzovan carried out an archaeological excavation at a point located on the eastern slope of Cujba Hill, in the *La Livada* site. The area was affected by a prehistoric landslide, which generated an interesting microrelief

<sup>1</sup> BERZOVAN 2016, 222-223; BERZOVAN 2019, 83; BERZOVAN/BORANGIC 2019; BERZOVAN 2022, 102-106.

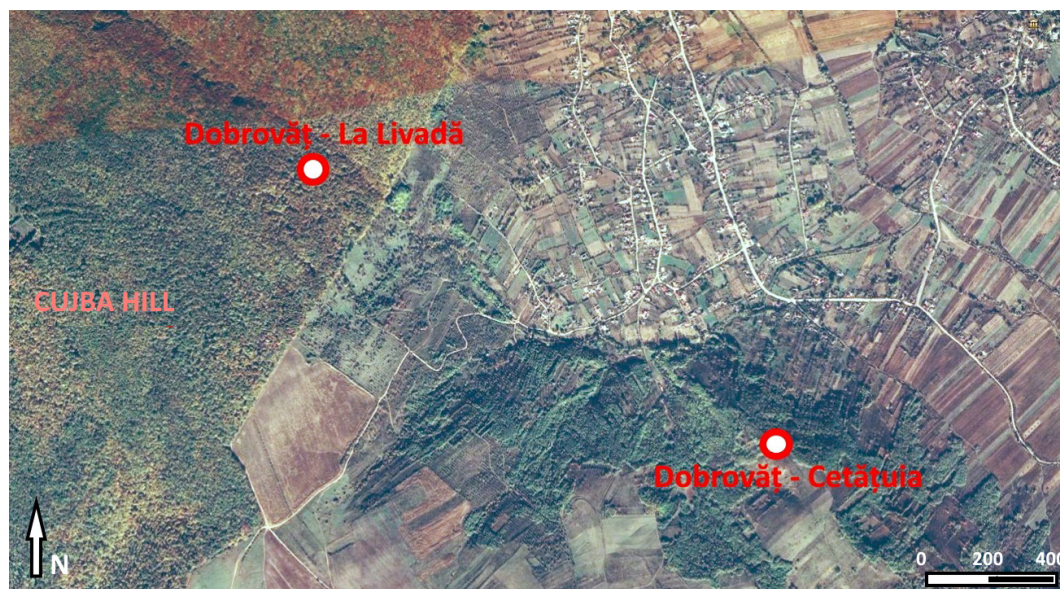
<sup>2</sup> BERZOVAN, BORANGIC 2019; BERZOVAN 2022, 102-106.



**Fig. 1.** The location of the site on the north-western shores of the Black Sea and neighbouring area.

dominated by hillocks, ravines and small terraces, stabilised at least since the Late Iron Age.

The archaeological trench (S 1/2020), despite having a rather limited size of only 7x5 meters, provided very



**Fig. 2.** Dobrovăț – *La Livadă* settlement and Dobrovăț – *Cetățuia* hillfort locations on satellite image.

significant results. Two distinct levels of habitation from the period of the 4<sup>th</sup>-3<sup>rd</sup> centuries BC period were documented, conventionally called level I (older) and level II (newer). In level II, several pits, agglomerations of ceramic vessels and a fire hearth were discovered; in level I, multiple features were noticed, including a dwelling with a fire hearth. The present paper aims to discuss the archaeozoological material in S 1 / 2020.

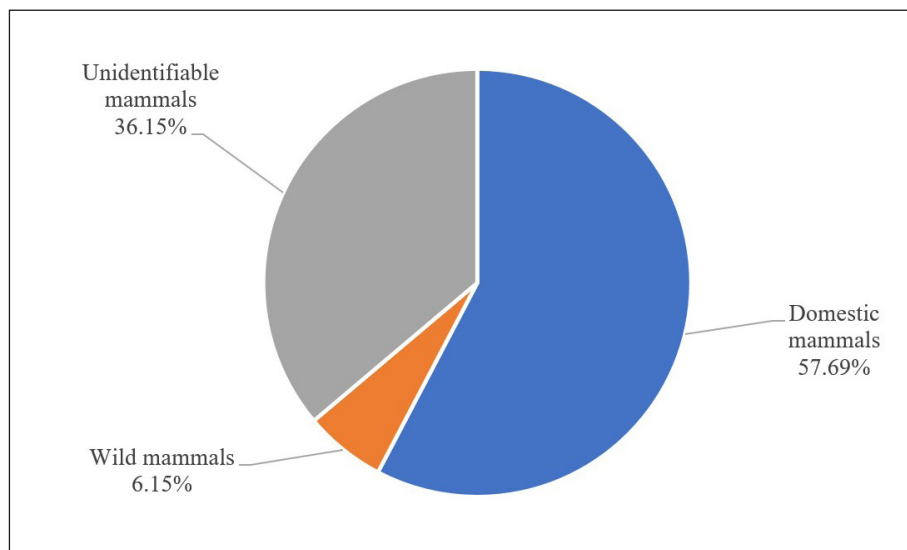
**MATERIAL AND METHODS**

The material comes from the Late Iron Age settlement of Dobrovăț-*La Livadă* and represents food waste presenting butchering, burning, and disarticulation marks as we would discuss later in this paper. The faunal fragments come from two archaeological levels, noted I and II. From the first level were recovered 65 bones and from the second level 67 fragments. The material is evenly distributed, the proportions of the identified species being relatively similar between the two levels. On the first level was discovered a dwelling from which were excavated 52 faunal remains: seven remains from cattle, an antler of red deer with anthropic traces, a mandible from a dog and one from a sheep/goat, 10 bones from the horse, 9 from domestic pig, two from wild boar and one fragment of river mussel (*Unio* sp.). The remaining 20 bones were not identified up to species level due to the high degree of fragmentation, but all came from small, medium and large-size mammals. The bone fragments from the dwelling also presented traces of consumption, such as burning, cutting and disarticulation marks. Some of the bones presented gnawing marks, made by dogs, which means that the bones stayed for a while at the surface until they get buried. These gnawed remains could also tell us that it is possible the people who inhabited that dwelling threw their food waste in it and the dogs had also access to the dwelling. Also, from this dwelling were recovered two male canines, one superior and one inferior, coming from domestic pigs and two inferior canines from male wild boars.

The study methodology consisted of anatomical and taxonomic identifications, quantification by number of remains (NISP<sup>3</sup>) and minimum number of individuals (MNI<sup>4</sup>), estimation of slaughter age and sex, and evaluation of the meat yield for each species. By establishing the NISP, but especially the MNI and the meat yield, the relative importance of each species was assessed. MNI was established on account of the most frequent skeletal element, taking into account laterality (right-left), age and sex<sup>5</sup>. The calculation of

the amount of meat and conversion to “sheep units” (s.u.) was based on the MNI and the mean absolute weight for the main species identified in the archaeozoological samples<sup>6</sup>.

<sup>3</sup> Number of identified specimens.  
<sup>4</sup> Minimum number of individuals.  
<sup>5</sup> REITZ/WING 1999, 202-210.  
<sup>6</sup> CLASON 1971, 3-33.



**Fig. 3.** Proportions of mammal remains (NISP) from the archaeozoological sample from Dobrovăț-La Livadă.

This method offers an alternative for assessing the strictly food importance of different species in the food economy of ancient human settlements<sup>7</sup>.

The estimation of the age of mammals was based on the stage of development of the various bones (skeletal age) and on the dental wear, following the stages of tooth eruption and tooth wear respectively (dental age)<sup>8</sup>.

### DISCUSSION

The material from the Dobrovăț-La livadă settlement consists of 132 faunal fragments from mammals, except for a femur from *Gallus* sp. which was recovered from level I, features Cx1 + Cx2 and a fragment of *Unio* sp. (river mussel) recovered from the dwelling, feature Cx6. Besides the animal remains, was discovered a fragment of a human decayed tooth. Among the identified mammal remains, domestic ones predominate with a share of approximately 58%. They are followed by the remains of mammals that could not be identified at the species level due to the high degree of fragmentation (about 36%). The unidentifiable remains were assigned to large mammals in a proportion of 74% (35 fragments), to medium mammals - 23% (11 fragments) and to small mammals - 2% (one fragment). Finally, the least frequent group of mammals is that of wild mammals, with a percentage of approximately 6% (**Fig. 3**).

Considering the total number of specifically identified mammals,

<sup>7</sup> UDRESCU/BEJENARU/HRIȘCU 1999, 33-34.

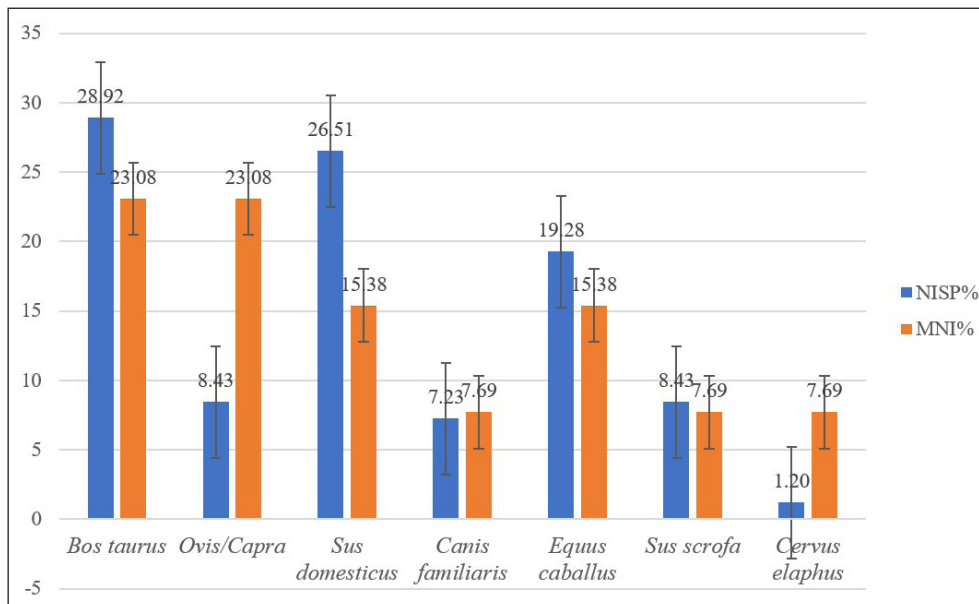
<sup>8</sup> CHAIX/MENIEL 2001, 63-73.

90.36% of them belong to domestic mammals. With such a high percentage of domesticated taxa, animal husbandry was the primary meat-producing activity for this community. The identified domestic taxa are *Bos taurus* (domestic cattle), *Ovis aries* (sheep), *Capra hircus* (goat), *Sus domesticus* (domestic pig), *Canis familiaris* (dog) and *Equus caballus* (horse). The majority of domestic mammal remains come from domestic cattle with a share of approximately 29%. The domestic pig closely follows the cattle with a percentage of 27%. A high frequency is also presented by horse remains, which add up to a proportion of about 19%. The sheep/goat group has a share of about 8%, and the dog ranks last with a proportion of 7.23%. Estimating the

MNI, domestic mammals add up to a percentage of 84.62%. After MNI, the domestic pig loses its importance within the settlement, representing about 15%, while for the sheep/goat group an increase from about 8% NISP to 23% MNI can be observed. The same percentage of estimated individuals presented cattle, which together with sheep/goats ranks first as MNI. The horse, with two estimated individuals, has the same weight as the domestic pig (about 15%), and the dog with one estimated individual shares 7.69%, a percentage similar with that of NISP. Taking into account the number of specimens, but also the number of estimated individuals, cattle and pigs play a central role in the animal economy of the settlement, where they are closely followed by the sheep/goat group and the horse (**Table 1**).

**Tab. 1.** Quantification of mammalian remains from the archaeozoological sample from Dobrovăț-La Livadă.

Species		NISP	NISP%	MNI	MNI%
<i>Bos taurus</i>	Domestic cattle	24	28.92	3	23.08
<i>Ovis aries/Capra hircus</i>	Sheep/Goat	7	8.43	3	23.08
<i>Sus domesticus</i>	Domestic pig	22	26.51	2	15.38
<i>Canis familiaris</i>	Dog	6	7.23	1	7.69
<i>Equus caballus</i>	Horse	16	19.28	2	15.38
<b>Domestic mammals</b>		<b>75</b>	<b>90.36</b>	<b>11</b>	<b>84.62</b>
<i>Sus scrofa</i>	Wild boar	7	8.43	1	7.69
<i>Cervus elaphus</i>	Red deer	1	1.20	1	7.69
<b>Wild mammals</b>		<b>8</b>	<b>9.64</b>	<b>2</b>	<b>15.38</b>
Total identifiable mammals		83	100	12	100
Unidentifiable mammals		47			
<i>Gallus</i> sp.		1			
<i>Unio</i> sp.		1			
<b>Total sample</b>		<b>132</b>			



**Fig. 4.** Species frequency in the archaeozoological sample from Dobrovăț - La Livadă.

The only wild species that was identified in the sample was *Sus scrofa* (wild boar) and *Cervus elaphus* (red deer). For wild boar 7 osteological remains were found, representing 8.43% of the total specific identified remains and a minimum number of one individual was estimated, representing 7.69% of the total estimated individuals. Red deer with a single antler identified represented only 1.20% NISP, but as MNI represented 7.69%. Thus, hunting was not an essential activity for this community, the antler could've been gathered from the woods and not necessarily hunted (Fig. 4).

Estimating the slaughter ages provided little data, both due to the high degree of bone fragmentation and the small sample size studied. Therefore, livestock exploitation strategies cannot be assessed for this settlement. Based on the MNI, for domestic cattle and the sheep/goat group, two mature individuals and one immature were estimated for each species. For the domestic pigs and horses were estimated one mature individual and one immature each and for dogs and wild pigs one mature individual each. For red deer we couldn't assess the ages (Table 2). With the help of the dental wear degree, it was possible to estimate the ages of sacrifice for some domestic individuals: an immature cattle individual slaughtered at 18 months and a mature one over 4 years old, a sheep/goat individual slaughtered at the age of about 2 years and another over 3 years old and

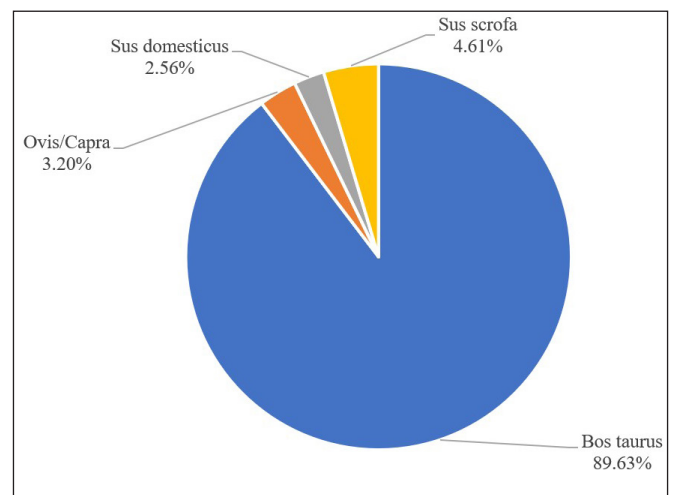
**Tab. 2.** Distribution of MNI by age categories for the main domestic species in the site from Dobrovăț - La livadă.

Species	MNI	
	Mature	Immature
<i>Bos taurus</i>	2	1
<i>Ovis/Capra</i>	2	1
<i>Sus domesticus</i>	1	1
<i>Canis familiaris</i>	1	0
<i>Equus caballus</i>	1	1
<i>Sus scrofa</i>	1	0

an individual of pig that was slaughtered mature, being over 3 years old.

Regarding the sex of the studied specimens, it was estimated only based on upper and lower swine canines. Males have long, continuously growing canines with open roots and enamel along their entire length, while female canines are short, closed-rooted, and without enamel. Thus, for the domestic pig, four lower canines and one upper canine were identified, all originating from males. The same case is for wild boar with four lower and one upper canines, all from males.

For a better interpretation of the relative importance of the main species used in food, the amount of meat provided by each species was estimated and transformed into "sheep units". We chose that the red deer would be excluded from this analysis given the fact that we don't know for sure if this species was hunted and consumed or if the identified antler was gathered from woods as a raw material for the local bone industry. Based on the meat yield, domestic cattle provided the largest part of the amount of meat (89.63%). Wild boar is the next meat provider with a share of 4.61%, while due to their small size, the sheep/goat group and the domestic pig offered the lowest amounts of meat (3.20% and 2.56% respectively) (Table 3 and Fig. 5).



**Fig. 5.** Estimation of the amount of meat of the main species consumed in the Dobrovăț-La Livadă settlement.

The analyzed material is of domestic origin, 3.76% of the remains having traces of burning, 3% traces of cutting, 1.5% traces of skinning, 1.5% disarticulation marks, one fragment presented defleshing marks, and two bones processing marks. A percentage of 8.27% showed traces of carnivores, remains that were gnawed mainly by dogs. This

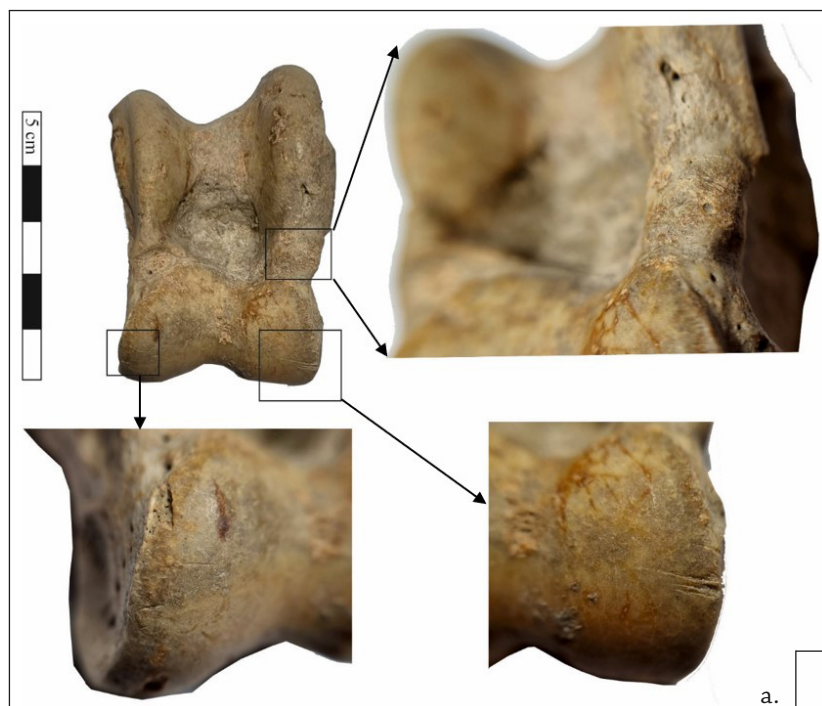
**Tab. 3.** Estimation of the amount of meat offered by the main species consumed in the Dobrovăț - *La Livadă* settlement.

Species	Estimated MNI	Absolute weight (kg)	Estimated meat	% Estimated meat	„Sheep units” (s.u.)
<i>Bos taurus</i>	3	700	2100	89,63	84
<i>Ovis aries/Capra hircus</i>	3	25	75	3,20	3
<i>Sus domesticus</i>	2	30	60	2,56	2,4
<i>Sus scrofa</i>	1	108	108	4,61	4,32
<b>Total amount of estimated meat</b>			<b>2343</b>	<b>100</b>	



**Fig. 6.** *Sus domesticus* tibia fragment with skinning marks.

tells us that these remains were on the surface for a certain period of time before they were buried. Traces of roots were recorded on 3.76% of the fragments. Burned were a fragment of the left jaw from a cow, a metacarpus of a horse that also showed signs of gnawing, a fragment of a tibia from a medium-sized mammal, a distal fragment of the calcaneus from a domestic pig and a long bone fragment from a medium-sized mammal. Four fragments were cut, a distal bovine tibia fragment, a metatarsal fragment, possibly also from a bovine, a domestic pig distal humerus fragment that also showed skinning marks and a horse distal tibia fragment which also showed signs of gnawing. Taking into account these taphonomic traces, it is possible that in some isolated cases, the horse was consumed by this population. It should be taken into account that this species was not bred for meat, its primary purpose being riding and carrying weights.



a.

An immature right-sided tibia fragment from a domestic pig showed cutting marks on the spine, most likely resulting from the detachment of the hide of the hind limb (**Fig. 6**). A left astragalus from a mature domestic cattle showed both gnawing and disarticulation marks. The cutting marks



b.

**Fig. 7.** Astragalus of *Bos taurus* with disarticulation marks: a. anterior view; b. medial view



Fig. 8. *Equus caballus* tibia with cut marks.

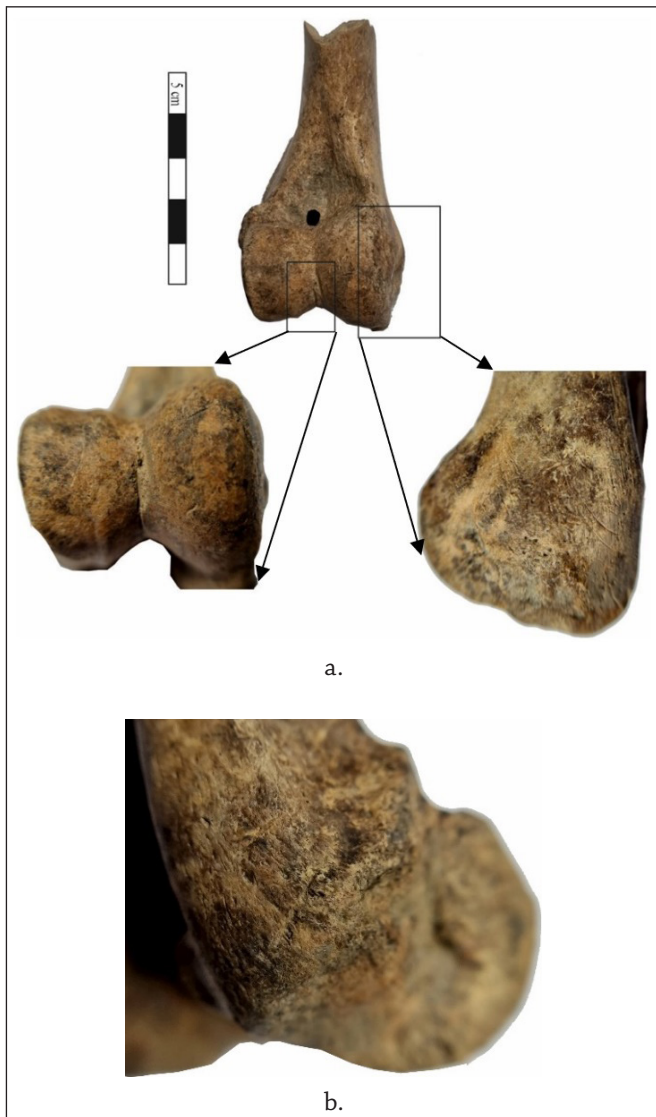


Fig. 9. *Sus domesticus* humerus with defleshing and tendon removal marks: a) cranial view; b) lateral view.

are located distally, on the anterior face, but also on the medial face (Fig. 7). A distal tibia fragment, discovered in the level I dwelling, from a mature horse specimen was gnawed distally, but also showed a cut mark (possibly butchered?), as it is possible that the identified specimen was consumed under certain conditions (starvation, siege, etc.) (Fig. 8). A humerus from the right side of a domestic pig that was butchered also showed traces of defleshing and tendon removal on the lateral epicondyle and on the medial epicondyle, as well as on the trochlea (Fig. 9). Another bovine astragalus (right-sided this time) showed, in addition to root marks, a blade mark located distally on the medial face from the disarticulation process (Fig. 10). A left side diaphyseal fragment of a domestic pig tibia showed on the medial face two blade marks from skinning. In addition to these traces, it was cut longitudinally, possibly for easier extraction of the bone marrow (Fig. 11).



Fig. 10. *Bos taurus* astragalus with disarticulation marks (dorsal and medial view).

Pathologies were identified only on an anterior proximal phalanx of *Bos taurus*. The phalanx presented lipping of the proximal articular surface and an enlargement of the distal epiphysis (exostosis). The lipping process tends to develop in response to excess pressure on limb bones<sup>9</sup>. Thus, these pathologies may come from the use of the animal as a traction force for fieldwork (Fig. 12).

It is possible for this community to have had a local bone industry, being identified a red deer antler representing processing waste (Fig. 13) and a boar canine with a perforation, being worn as a necklace (Fig. 14).

### CONCLUSION

The faunal remains are of domestic origin, most of them being left over from the diet of the studied community. The studied faunal remains presented butchering, burning, disarticulation, defleshing and tendons removal marks.

Only one phalanx presented pathologies that could be from the exploitation of cattle in the fieldwork. Therefore cattle were exploited not only for their primary products but for their secondary products too.

<sup>9</sup> BARTOSIEWICZ 2013, 108.



**Fig. 11.** *Sus domesticus* tibia fragment with skinning and cut marks.



**Fig. 12.** Phalanx I of *Bos taurus* with proximal lipping and distal exostosis.



**Fig. 14.** Pendant from a wild boar canine.



**Fig. 13.** Red deer antler with processing traces.

With a high percentage of domesticated taxa (about 90%), animal husbandry was the primary meat-producing activity for this community. Domestic cattle represented the most important species for this community, having proportions of 29% as NISP, 23% as MNI and 90% as meat yield. Similar situations have been observed also in the Late Iron Age hillforts from Stâncești and Cotu - Copălău, where domestic cattle represent 56,41% (NISP) and 45,42% (MNI), respectively 72.35% (NISP) and 51.51% (MNI)<sup>10</sup>.

The wild mammals that were identified in the sample were *Sus scrofa* (wild boar) and *Cervus elaphus*, representing about 8%, respectively 1.20% of the total specific identified remains and about 8% as MNI. As meat yield, the wild boar was the second species with a total of 4.61% offered meat. Considering all of this, hunting was not necessarily an important activity for this Late Iron Age community.

<sup>10</sup> BERZOVAN 2022, 217-219 with older bibliography.

The wild boar is a forest animal, which prefers the thickets impenetrable to humans but can also live in reeds, on grass or in the islands of the Danube Delta. Wild boar prefers large deciduous forests, which provide it with food (acorns and other forest fruits) and peace. The red deer prefers a similar biotope with large forests and mostly deciduous<sup>11</sup>. Correlating the wild mammals preferred habitat with the high proportion of domestic ruminants and the domestic pig, we can imagine a palaeoenvironment very similar to that of present day: the settlement surrounded by some open fields so the cattle, sheep and goats can graze but the deciduous forest was not too far from the settlement suggested by the presence of wild boar and red deer and, also, by the high proportion of the domestic pig which at that time were set loose in the forest so they can feed.

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## ILLUSTRATIONS

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**Fig. 13.** Red deer antler with processing traces.

**Fig. 14.** Pendant from a wild boar canine.

<sup>11</sup> BĂLĂȘESCU 2002.