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ARCHAEOLOGICAL ANIMAL REMAINS FROM NOVIODUNUM FORTRESS

Simina STANC[1], Aurel-Daniel STĂNICĂ[2], Luminița BEJENARU[1, 3,*], Mihaela DANU[1]

[1] "Alexandru Ioan Cuza" University of Iași, Faculty of Biology, Carol I Bd., 20A, 700505, Iași, Romania.
[2] "Gavrilă Simion" Institute of Eco-Museal Research, Museum of History and Archaeology, 14 Noiembrie, Str., 1bis, 820009, Tulcea, Romania
[3] "Olga Necrasov" Center of Anthropological Research, Romanian Academy – Iași Branch, T. Codrescu, Str. 2, 700479, Iași, Romania

Abstract

The paper analyses archaeozoological remains originating from the Noviodunum fortress in South-Eastern Romania, Tulcea County, where archaeological research indicates an extensive civil settlement with Roman and Medieval levels, but also few Getic discoveries. Animal remains are described in terms of their frequencies based on the number of identified specimens and on the minimum number of individuals. The archaeozoological data highlight a preference for domestic mammals (cattle, sheep/goat, pig), but also for wild mammals and fish. A summary of archaeozoological studies in different sites of Noviodunum fortress shows variation in the assemblages. The results of the Principal Component Analysis suggest that in the Roman period cattle was the preferred for consumption, and later, in Middle Ages, sheep/goat sheep was eaten more.

Keywords*: Archaeozoology; Taphonomy; Noviodunum; Antiquity; Middle Ages*

Introduction

The ruins of the Noviodunum fortress have been discovered since the end of the 19th century, being located near an important ford of the Danube, about 3 km east of the actual town of Isaccea (Tulcea County) (Fig. 1). The geographical position of this fortress had an important strategic role, especially from economic point of view, accentuated in the Roman and Medieval periods (Fig. 2).

Archaeological research, which began in 1953, indicates an extensive civil settlement with Roman and Medieval levels, delimited by three *vallum* of defence, to which are added necropolises and rural settlements, Ottoman fortifications, all forming a vast archaeological complex of about 500 hectares. The settlement of Noviodunum ceased at the end of the 14th century, it moving to the town of Isaccea.

Faunal remains have been much studied to understand the expansion of the Roman Empire as major event in the World history [1-4]. Archaeozoological studies, giving information on animal resources for food, husbandry strategies or consumption practices, can contribute to the knowledge of the common elements in the Roman world, but also of the geographic and cultural diversifications by regions. In this context, the present study can contribute with archaeozoological data regarding a peripheral settlement of the Roman world represented by the Noviodunum fortress evolving also later in the Middle Ages.

* Corresponding author: lumib@uaic.ro

Fig. 1. Location of Noviodunum fortress (https://www.google.ro/maps)

Fig. 2. Proximity of Noviodunum fortress

Archaeozoological research for Noviodunum fortress has already begun with economic and environmental evaluations [5-8]. Faunistic data for Noviodunum are also found in synthetic studies related to animal resources and their exploitation in different settlements from the Dobrogea area, during the first and second millennia AD [9-17].

The present work is focused on the animal skeletal remains found in different archaeological contexts of the Noviodumun fortress, with the aim to understand the processes of faunal accumulation in the sites, and also to reconstruct the economic and environmental contexts of the settlement. This study is based on a new set of archaeozoological data related to previous results.

Archaeological and paleoenvironmental context

During the 2014 preventive archeological research from Noviodunum, carried out in the sector of the Frontier Police (TPF), several Getic, Roman, Medieval complexes were discovered and investigated (Fig. 3) [18]. Only two archaeological complexes have been attributed to the Getic period (4^{th}-3^{rd} centuries BC), of which a pit contained faunal remains. The identified

Roman complexes (2nd-4th centuries AD) were of two types – funerary monuments and household pits, and the archaeozoological material has been discovered in the last ones.

Fig. 3. Aspect of archaeological excavation in the TPF sector of Noviodunum

Several Medieval complexes of 13th century AD were investigated, represented by houses, pits, burial graves, hearths, and pottery kilns. Most of the faunal remains come from pits and houses. Archaeological investigations also led to the recovery of a sample of artifacts representing worked hard animal materials (i.e. bone and antler objects). According to previous research, large animal bones, and red deer antlers were processed [19].

There is no doubt that the actual landscape around the site is different from that of the Roman and Medieval periods. Aerial photographs show changes in the landscape around the fortress as a result of intensive agriculture since the 1950s [20]. The data regarding the ancient landscape are very few and punctual and did not allow the shaping of an image in this sense. Carpological remains from a level dated 527-538 AD highlight the presence of cereals (wheat, barley, rye), but also pulses [21] (Table 1). Yellow foxtail is also attested [21] and *Vitis* remains have been identified too [22]. The composition of the sample suggests that these vegetal remains come from two or even more fields [21]. This could mean that the territory in the immediate vicinity of the fortress could have been cultivated mainly with cereals.

Table 1. Identified carpological remains from Noviodunum fortress.

Plant group	Taxa*
Cereals	*Triticum aestivum* (common wheat)
	Triticum compactum (wheat)
	Triticum dicoccum (emmer wheat)
	Hordeum vulgare (barley)
	Secale cereale (rye)
Pulses	*Lens culinaris* (lentil)
	Vicia sp.
Other plants	*Setaria glauca* (yellow foxtail)
	Vitis sp. (grape)

*after [21], and [22]

Material and Methods

The archaeozoological assemblage analysed in the present paper is represented by skeletal remains of animals (bones, teeth, antlers and cornular processes, shells), collected in

2014 from the TPF sector of Noviodunum. The faunal remains were dated by archaeologists, they belong to the Getic (4th-3rd centuries BC), Roman (2nd-4th centuries AD) and Medieval (13th century AD) periods (Table 2). The faunal remains were hand-collected and not sieved, and this is an inconvenient in the frequency estimation of taxons by overrepresentation of large animals, and underrepresentation of smaller ones, such as fish, birds, and some carnivore mammals.

The study methods consisted of anatomical and taxonomical identifications, taphonomical evaluation, ageing and sexing, and quantification, according to standard procedure [23, 24]. The quantification of animal remains aimed at evaluating the relative frequencies of the different taxons, and it is based on the number of identified specimens (NISP) and the minimum number of individuals (MNI).

Table 2. Summary of the archaezoological assemblage collected in 2014 from the TPF sector of Noviodunum

Archaeological context	Sample size (number of remains)
Getic period (pit)	40
Roman period (2nd – 4th centuries) (pits)	1234
Middle Ages (13th century) (pits, houses, hearths, and kilns)	3803
Total	**5077**

Results and discussion

The analysed archaeozoological assemblage comprises 5077 remains, and the faunal remains belong to mammals (80.36%), birds (6.85), reptiles (0.02%), fish (12.72%) and molluscs (0.04%). Table 3 shows that in all archaeological contexts the remains of mammals predominate, followed by those of fish, then birds. Remains of reptiles (i.e. one dermal plaque from a chelonian carapace) and molluscs (i.e. two fragments of *Unio* sp. shell) are very rare and identified only in the medieval sample.

Table 3. Distribution of animal remains by taxonomic groups and archaeological contexts

Taxonomic group	Getic Period		Roman Period		Middle Ages		Total assemblage	
	NISP	%	NISP	%	NISP	%	NISP	%
Mollusca (Molluscs)	0	0	0	0	2	0.05	2	0.04
Pisces (Fish)	15	37.5	66	5.35	565	14.86	646	12.72
Reptilia (Reptiles)	0	0	0	0	1	0.03	1	0.02
Aves (Birds)	1	2.5	36	2.92	311	8.18	348	6.85
Mammalia (Mammals)	24	60	1132	91.73	2924	76.89	4080	80.36
Total	40	100	1234	100	3803	100	5077	100

The skeletal remains are broken up, so that about 30% of the mammal remains have been not identified until species level (Table 4). Culturally derived fractured bones are represented with prevalence in all three samples, and as factors that originated fragmentation, we identified the butchering and the manufacturing. The manufactured material is represented by a polished cattle radius (probably a skate), and seven antler fragments of red deer. We mention burn marks too, but also traces left by the teeth of other animals (dog most often).

The recovered samples of animal remains have a domestic origin, mainly as food remains, and only eight fragments are artefacts with manufacturing marks (Table 5). The economic resources emphasized by the archaeozoological analysis are animal husbandry, hunting and harvesting. Since the remains of birds are mostly unidentified as species, in the following we will refer only to the husbandry and hunting of mammals (i.e. domestic and wild mammals, respectively).

Table 4. Distribution of mammal remains by taphonomy and archaeological contexts

Taphonomy	Getic Period	Roman Period	Middle Ages
Identified mammal remains	18	788	2008
Unidentified mammal remains	6	344	916
Remains with butchering traces	-	141	309
Remains with burn traces	-	77	107
Remains with animal teeth marks	1	95	249
Manufactured bones and antlers	-	-	8

Domestic mammals

The remains of domestic mammals predominate in the studied assemblage from the TPF sector and they belong to seven (7) species: *Bos taurus* (cattle), *Ovis aries* (sheep), *Capra hircus* (goat), *Sus domesticus* (pig), *Equus caballus* (horse), *Equus asinus* (donkey), *Canis familiaris* (dog) (Table 5). Most likely, due to the smaller size of some samples, dog is missing from the Getic one, and donkey from the Getic and the Roman ones.

We mention that, in addition to these seven species, there are two other domestic mammals identified in previous studies – *Felis domesticus* (cat) and *Camelus* sp. (camel) [6, 7].

Table 5. Quantification of mammal remains in the assemblage of the TPF sector

Taxon	Getic Period		Roman Period		Middle Ages	
	NISP	MNI	NISP	MNI	NISP	MNI
Bos taurus (cattle)	3	1	474	15	575	15
Ovis aries/*Capra hircus* (sheep/goat)	4	1	112	10	305+279*	12+63*
Sus domesticus (pig)	10	2	57	8	330	16
Equus caballus (horse)	1	1	56	3	74	5
Canis familiaris (dog)	-	-	5	1	73	5
Equus asinus (donkey)	-	-	-	-	2	1
Total domestic mammals	18	5	704	37	1638	54+63*
Cervus elaphus (red deer)	-	-	61	4	161	7
Sus scrofa (wild boar)	-	-	15	3	176	8
Capreolus capreolus (roe deer)	-	-	5	2	13	2
Bos primigenius (aurochs)	-	-	2	1	7	1
Lepus europaeus (hare)	-	-	1	1	12	2
Ursus arctos (bear)	-	-	-	-	1	1
Total wild mammals	-	-	84	11	370	21
Total identified mammals	18	5	788	48	2008	75+63*
Unidentified mammals	6	-	344	-	916	-
Total mammals	24	-	1132	-	2924	-

* In the pit number 15, an accumulation of 305 sheep/goat remains was found, coming mostly from the distal extremities of the limbs (95 phalanges and 207 metapodials), as well as 3 fragments of shoulder blade, mandible and horn (from mature individuals). Based on the metatarsals, 56 immature and 7 mature individuals were estimated; the bones have no anthropogenic or carnivorous traces on their surface.

Following the frequency of domestic mammals, relative to the total identified mammals, we notice some differences between the three samples (Fig. 4).

Cattle dominance in the Roman sample is noticeable, but later, in Middle Ages, the ratio between the main domestic species (cattle, sheep/goat and pig) appears more balanced. The horse has also a significant frequency (Fig. 4), higher in the Roman sample (about 7% NISP), being identified traces of cutting that indicate the consumption of meat from this species.

The Getic sample seems discordant, as pig remains dominate; but this finding is under the sign of reserve due to the small size of the sample. However, we emphasize the importance of this information since it is the first Getic sample associated to Noviodunum studied from archaeozoological point of view.

Estimating the age at slaughter, based on dentition (Fig. 5), show a higher number of immature individuals of pig in both periods and of sheep/goats especially in Middle Ages,

indicating that these species were bred mainly for their primary products obtained by slaughter (i.e. meat, skin, etc.). Cattle, for which mature individuals predominate in both periods, were raised especially for secondary products obtained during life (e.g. milk, traction force, etc.).

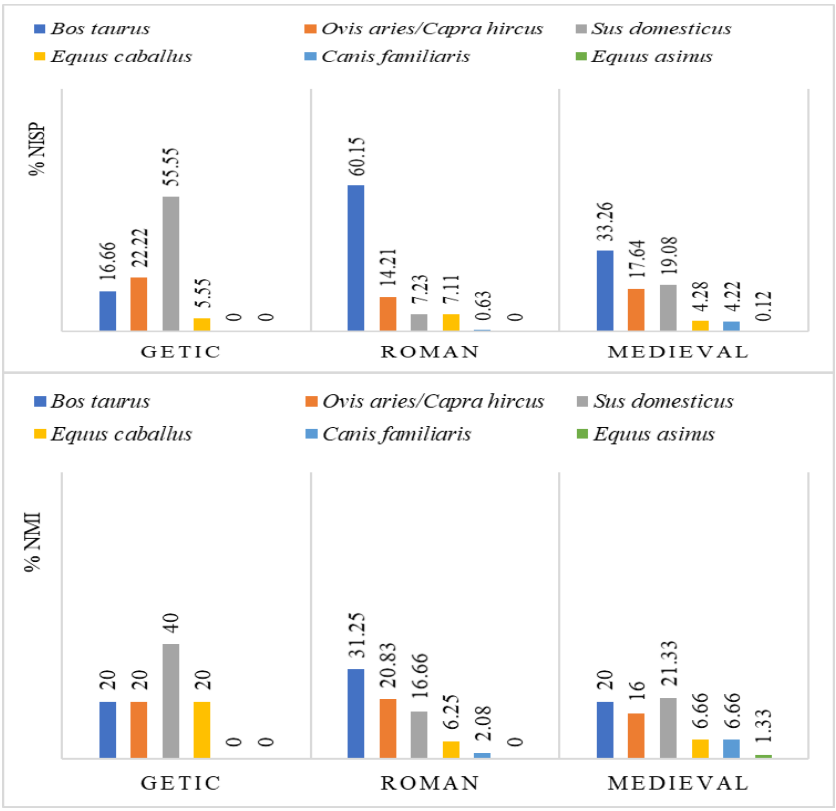

Fig. 4. Frequency of domestic mammal species (% NISP, and % MNI)

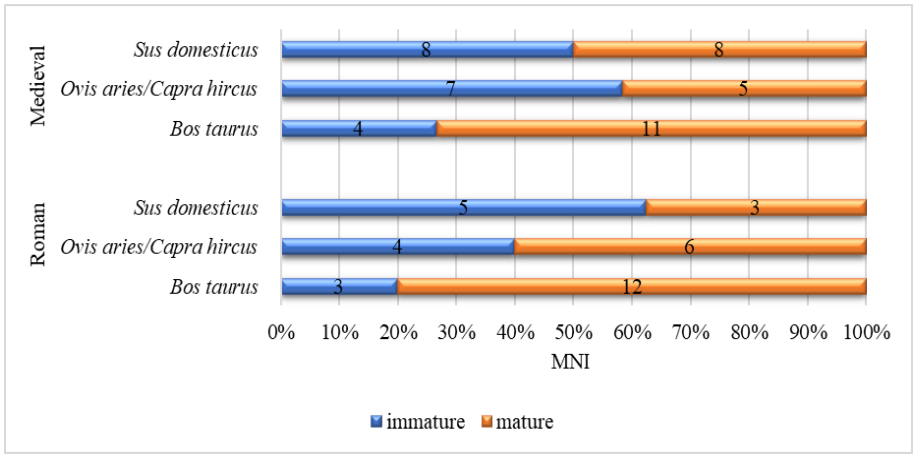

Fig. 5. Estimation of age at slaughter, based on dentition, at the main domestic mammals

Wild mammals

The remains of wild mammals have a frequency of about 11% in the Roman sample and about 21% in the medieval one, indicating an important hunting rate. Six species have been identified: *Cervus elaphus* (red deer), *Sus scrofa* (wild boar), *Capreolus capreolus* (roe deer), *Bos primigenius* (aurochs), *Lepus europaeus* (hare), *Ursus arctos* (bear). The most common wild species is red deer in the Roman sample and wild boar in the Medieval one (Table 5).

In addition to these species, there are four other wild mammals identified in previous studies [6-8]: *Lutra lutra* (otter), *Castor fiber* (beaver), *Vulpes vulpes* (fox), *Martes* sp. (marten).

Estimated ages in wild mammals indicate that mature specimens were predominantly slaughtered; few immatures were identified only in red deer and wild boar.

Fish

Considering the fortress location on the Danube bank and the relatively small number of fish remains, we consider that fishing is underestimated due to the method of collection by hand and not by sieving sediments. However, following table 3, we find a difference between periods in the frequency of fish remains: lower in the Roman period and higher in the pre- and post-Roman periods. The identified fish species are varied, as it is shown in table 6.

Table 6. Fish species identified in TPF sector of Noviodunum

	Getic Period	Roman Period	Middle Ages
Taxon	**NISP**	**NISP**	**NISP**
Acipenser sp. (sturgeon)	0	4	9
Aspius aspius (asp)	0	0	1
Cyprinus carpio (carp)	3	12	118
Esox lucius (pike)	0	3	24
Perca fluviatilis (perch)	0	0	2
Silurus glanis (catfish)	1	8	74
Sander lucioperca (zander)	0	3	4
Total unidentified Teleostei	11	36	333
Total Fish	**15**	**66**	**565**

Summary considerations

To have an overview on the differentiated use of animal resources (i.e. relationships between periods and animal taxa), we have cumulated the quantification data for the representative periods of Noviodunum fortress (i.e. Roman and Medieval periods), those presented above in this study with those taken from previous publications [6-8]. We excluded from the analysis the species with an extremely small number of remains (i.e. donkey, cat, camel, bear, otter, beaver, fox, and marten), and also the dog that was not consumed. In order to solve the problem of differences in sample size, we used statistical Principal Component Analysis (PCA) based on NISP of the animal taxa from the archaeozoological samples. The result is projected on the first two principal axes which accounted for 99.86% of the overall variance (the first axis 97.23% and the second axis 2.64%). Contributions in % of variables and observations for the two principle axes are presented in table 7, and Figure 6 shows how the taxon points plot in relation to the period points to reveal the association between them. Considering the first factor axis (horizontal), most points are located on the right side of the plot, with the majority of the wild taxa, including fish and birds, and also with horse and pig. The second axis (vertical) contrasts by cattle and sheep/goat. Cattle played an important role in the economy of the Roman period, and sheep/goat in Middle Ages. We can also notice a close association between fish and the Medieval period of the fortress. The wild mammals are not plotted separately by periods, which would indicate that their hunting is rather correlated with the environment around the fortress relatively unchanged in the analyzed periods. We mention

the presence of forest wild species (i.e. red deer, wild boar), as well as those of forest-edge and open field (i.e. roe deer, hare, aurochs).

Table 7. Contributions of variables and observations for the two principal axes

Contribution of the variables (%):		
	F1	F2
Roman Fortress	32.638	60.360
Medieval Fortress	33.236	37.129
Medieval *Extramuros*	34.126	2.511
Contribution of the observations (%):		
	F1	F2
Bos taurus	74.554	11.391
Ovis aries / Capra hircus	6.724	34.801
Sus domesticus	0.002	0.041
Equus caballus	2.212	9.936
Sus scrofa	1.966	0.195
Cervus elaphus	1.151	2.915
Capreolus capreolus	3.948	2.187
Lepus europaeus	4.093	1.724
Bos primigenius	4.102	1.734
Aves	1.244	0.015
Fish	0.006	35.061

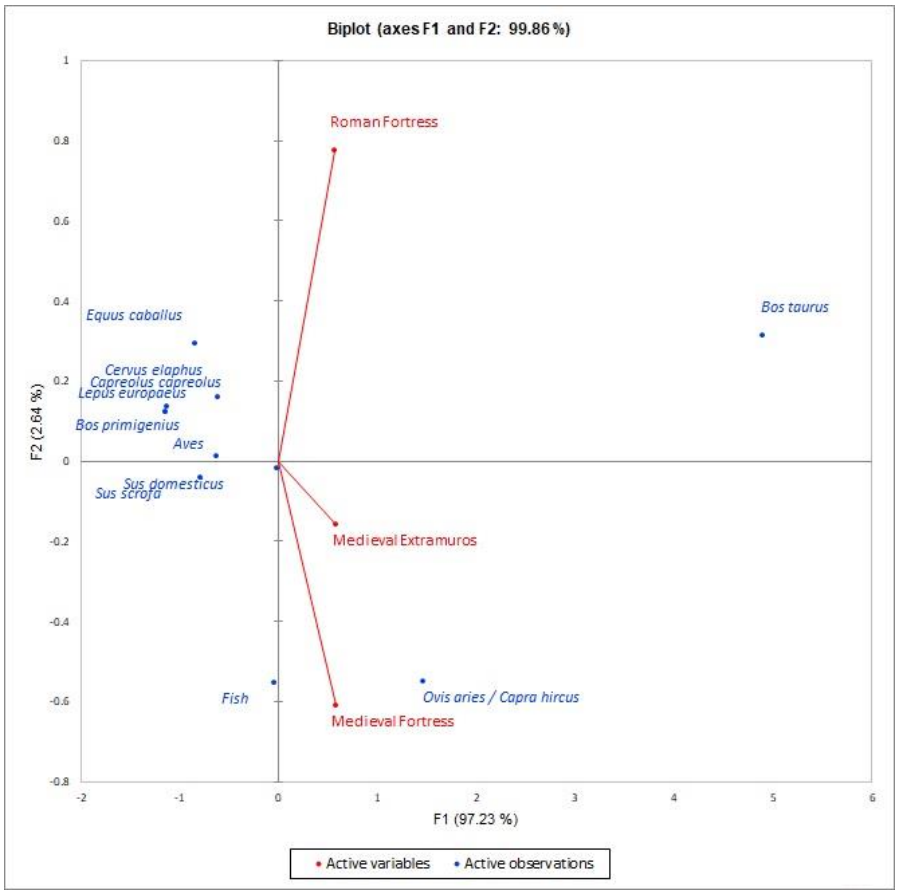

Fig. 6. Plot of the correspondence analysis (bi-dimensional representation)

Conclusions

This paper provides archaeozoological evidence for economic and environmental conditions at Noviodunum fortress during Roman period, and also in pre- and post-Roman ones.

The evolution of the Noviodunum fortress involved not only a general stability in the subsistence strategy but also changes described in terms of animal components of diet. Generally, the settlement economy was based on domestic animals (e.g. cattle, sheep/goat and pig) and, probably, on cultivated cereals (e.g. wheat, barley and rye).

Considering the three periods, Getic, Roman and Medieval, variability among the frequency of domestic species has been found. The indigenous dietary pattern in the Getic period is one of high pig percentages, and after the Roman Conquest, the relative percentage of cattle increases. Later, in Middle Ages, there is another change marked by a high frequency of sheep/goat.

Regarding the hunting and the preference for forest and forest-edge wild species, no significant differences were identified between the three periods. We could consider that the landscape around the fortress, with wooded large areas, has remained unchanged during these periods.

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