

DATA ABOUT HUNTING PRACTICES BY HALMYRIS (MURIGHIOL, TULCEA COUNTY) INHABITANTS IN THE 4TH – 7TH CENTURIES A.D.

Abstract: Articolul de față are în vedere analiza resturilor de faună aparținând mamiferelor sălbatice, colectate din fortificația romană târzie de la Murighiol (portul Halmyris în antichitate). Situl este plasat pe partea dreaptă a brațului Sfântu Gheorghe, în apropierea Deltei Dunării, pe un promontoriu stâncos, 5 metri deasupra nivelului mării. Au fost colectate ca 3553 oase de animale prin săpăturile executate între anii 2004-2007; dintre acestea, 3457 provin de la mamifere, 87 de la păsări și 9 resturi de la moluște, cf. datelor tabelului 1. Resturile de pește, bine reprezentate în eșantion nu au fost determinate și nici incluse în statisticile din text. Conform datelor preliminare, grupa mamiferelor domestice include 10 specii, reprezentate prin artiodactile, carnivore, rozătoare, fiind vorba per ansamblu de 605 fragmente însumând 21,42 %. Materialul a fost colectat din zona barăcilor, a presupusului Palat episcopal, terme, turnurile 2 și 12, cf datelor tabelului 2. În continuare se face o prezentare detaliată a caracteristicilor morfologice și dimensionale ale speciilor sălbatice, fiind vorba de: mistreț (cel mai bine reprezentat), cerb, căprior, bour, vulpe, vidră, jder, bursuc, castor și iepure. În final se face o paralelă (sub raport procentual) între fauna sălbatică de la Halmyris și cea din situri dateate între sec. IV-VII d. Chr., din Dobrogea cf datelor tabelului 3. Așadar vânătoarea era practică fie în scopuri economice: procurarea cărnii, a unor materii prime: corn de cervide, piei, blănuri, fie pentru necesitățile interne ori externe-comerț (blănuri), fie pentru agrement. Întrucât gruparea speciilor necesitănd un biotop ceva mai bine împădurit, mlăștinos (în primul rând mistrețul, chiar cerbul) este bine reprezentată, se apreciază că împrejurimile Halmyrisului erau destul de bine împădurite față de prezent. În schimb gruparea mamiferelor reclamând un biotop ceva mai stepizat (bour, iepure, chiar și căprior) este slab reprezentată confirmând ideea de mai sus.

Keywords: hunting, mammals, bones.

Murighiol locality (Halmyris town in Antiquity) is only 34 kilometers east from Tulcea, the city capital of the county, on the southern border of the Sfântu Gheorghe arm of the Danube. Referring to landscape that arm is the most spectacular and little affected by human activities. Murighiol locality is bordered like an amphitheatre to the south, west, and east by low hills (around 300 meters above sea level) without an abundance of vegetation at present. The zone climate is influenced by Danube vicinity, so the winters are gentle and the summer warmly enough. The landscape characterizes by a large variety of trees, plants, flowers and herbs specific to the Deltaic regions beside a rich fauna including fox, boar, rabbits, deer, wolf, falcons, wild geese, wild ducks, pelicans, pheasants and fish.

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The most important archaeological objective is the *Halmyris* fortress located on a rocky promontory five meters above the sea level. Since 1981, when were initiated the first investigations in the town of Halmyris, the yearly work has revealed step by step the chronology of the site, encompassing more than a millennium of life and the continuity of a civilization (fourth century BC to seventh century AD) (Zahariade, 1991: 311-317).

The assemblage under debate was collected during 2003-2007 excavations, from the following areas: barrack's block (no. 2, 3, 4) inhabited by the garrison soldiers, the assumed Episcopal Palace (domus no. 1), a structure closely related to the activities in the northern gate and towers, domus no. 2, the bathhouse, the towers no 2, a storage one with an apparent waterproof basin on its bottom for keeping fresh fish/meat products and tower no. 12. (Zahariade, Topoleanu, Ene, 2004; Zahariade et alii, 2006, Ibidem, 2007). Another faunal sample to anterior excavations was analysed by professor Haimovici, its results has not been published for now. Because the site archaeological research is not yet finished, for the present we considered a good opportunity to publish partial results about wild faunal analysis, that one representing a significant segment of the alimentary and utilitarian domain of Halmyris life. Approximately 3,553 bones were collected during excavations executed between 2004-2007, of which 3,457 originate in mammals, 87 in birds and 9 in mollusks, cf. Table 1. Fish remains, extremely numerous has not been determined and included in statistics up till now. According preliminary results, the wild mammal sample includes ten taxa remains, from artiodactyls, carnivorous and rodents, their bones accounting for 605 pieces (21.42 %). Talking about the wild mammals' distribution within the investigated areas (Table 2, Fig. 2) an unequal distribution of elements according taxa and body parts is obvious: so inside the barracks' perimeter were found few bones, just eight pieces, certainly from hygienic reasons the leavings were thrown elsewhere. Few bones were picked from the bathhouse (21 fragments) and domus no. 2 (41 remains). The richest samples originate in tower no. 12 (333 fragments) even tower no. 2 (88 fragments). Just the boar and deer remains were constantly found in all locations, the other taxa bones being aleatory dispersed. The Halmyris inhabitants practiced the hunting of a lot of big and medium sized-mammals as: wild boar, deer, roe deer, aurochs either to supplement the meat needful or to procure some raw materials as furs, hides, bones, antlers; small sized-aquatic and terrestrial animals as marten, otter, fox, beaver were also hunted, for the commerce with furs. Without doubt we can't negligee the amusement aspectual of hunting, practices by soldiers mostly. The hunted mammals in the Halmyris neighboring were included in four groupings in relating to their ecological requirements.

1. Grouping of species claiming a forested and swampy habitat includes wild boar and red deer, the most common taxa in our statistics. **The boar** dominates the wild mammals' segment by 330 bones (11.55 %). The distribution of skeletal parts emphasizes the prevalence of elements from upper fore- and hides limbs (61.2 %), the skull elements totaling no more than 26.7 %; also the ribs and

vertebra account for 17.8 %. About 76 % from long bones' sample originate in mature exemplars versus 24 % the rate of immature elements. Considering the teeth eruption and erosion the picture little changes: 22.5 % is

Table 1 – Species frequencies at Halmyris

Species/group	Frgm.	%
Sus domesticus (pig)	708	24.85
Bos taurus (cattle)	685	24.04
Ovis aries (sheep)	124	4.35
Capra hircus (goat)	84	2.95
Ovis/capra (sheep/goat)	434	15.23
Equus caballus (horse)	127	4.46
Equus asinus (donkey)	16	0.56
Canis familiaris (dog)	58	2.04
Felis domestica (cat)	8	0.28
Total domestic mammals	2,244	78.76
Sus s. ferrus (boar)	330	11.58
Cervus elaphus (red deer)	209	7.33
Capreolus c. (roe deer)	16	0.56
Vulpes vulpes (fox)	11	0.39
Lepus europaeus (hare)	10	0.35
Lutra lutra (Eurasian otter)	10	0.35
Martes m. (marten)	8	0.28
Meles meles (badger)	5	0.18
Castor fiber (beaver)	5	0.18
Bos primigenius (aurochs)	1	0.04
Total wild mammals	605	21.24
Total determined bones	2,849	100
Sus sp.	14	
Undetermined bones	594	
MAMMALS	3,457	
BIRDS	87	
MOLLUSCS	9	
TOTAL SAMPLE	3,553	

The percent of jaw bones with teeth in different stages of eruption and 77.5 % have a complete dentition, in different wear stages (adults, matures). Most part of individuals was killed between 4-8 years and over these limit just three males. Overall the aging according dentition harmonizes with the data on long bone

fusing. According maxillaries measurements the prevalence of males is clear, but the metric evaluations of the long bones indicate the predominance of females nevertheless. A tall variation of 84.8-109.9 cm (n=20), average - 92.3 cm was estimated. Closed values were established in case of some contemporaneous sites from Dobroudja as Telița-Amza - 93, 93,6, 112,2 cm (Haimovici 2001: 166), Dinogetia - 103,9 cm (Stanc 2005: 292) and Capidava - 96,9 cm (Haimovici, Căpuș, Căpuș 2006: 362). Overall, the metric evaluations suggest medium sized individuals, with some robust exemplars (probably males). We exemplify by the following averages: maxilla - lg. M3, 40.5 mm (38-43.2); mandible - lg. M3, 44.6 mm (41.2-55.5); humerus – breadth distal, 52.4 mm (47.6-59); tibia - breadth distal, 38.6 mm (35-42.5). Bones from half-breed individuals for sure exist in the sample, e.g. a complete tibia with the GL - 215 mm corresponds to a withers height of 84.2 cm, but its breadth distal is 35 mm only. Referring to variation of the length M^3/M_3 (Fig. 1) no gap between domestic and wild species values exists. For sure the pig rising in Deltaic conditions besides the increased density of the boar in neighboring favored the cross-breeding between both of mammals; as a result the increasing of the pig withers height and other body parameters. The phenomenon is well-known in the Danube Delta present-days.

The boar bones are constantly present in all samples from Dobroudja (4th-7th AD), regardless of sample size: at Dinogetia – 5.66 % (Haimovici, 1991, apud Stanc, 2005: 78), Slava Rusă – 1.51 % (Stanc, 2005: 59) and Histria – 0.56 % (Haimovici, 2007: 551) ranks the first, other times ranks the second after red deer as Capidava – 3.10 % (Haimovici, Căpuș, Căpuș, 2006: 359) or Adamclisi – 0.65 % (Stanc, 2005: 63).

Red deer was a very common element of the wildlife in some regions of Dobroudja. With 7.31 % corresponding to 209 fragments, the mammal was a preferred game for the inhabitants from Halmyris. Were identified bones from all body parts, their participation being disproportionate, 2/3 of them originating in upper fore- and hind limb parts. These represent 71.5 % versus 13.5 % the participation of ribs, vertebrae or 15 % the percent of cranial elements. Either we talk about a fortuitous distribution as a result of the present stage of site research or the hunted mammals were discarded elsewhere, just important body parts being carried into the fortress.

Table 2 – The distribution of bones within the excavated area

	Domus 1	Domus 2	Barrack 2	Barrack 3	Barrack 4	Bathhouse	Tower 2	Tower 12	Total
<i>Sus s. ferrus</i>	64	12		2	3	18	48	183	330
<i>Cervus elaphus</i>	44	24	2			2	29	108	209
<i>Capreolus c.</i>						1	9	6	16
<i>Vulpes vulpes</i>	5						2	4	11
<i>Lepus europaeus</i>								10	10
<i>Lutra lutra</i>		1						9	10
<i>Martes m.</i>		3						5	8

	Domus 1	Domus 2	Barrack 2	Barrack 3	Barrack 4	Bathhouse	Tower 2	Tower 12	Total
Meles meles		1						4	5
Castor fiber			1					4	5
Bos primigenius	1								1
Total wild species	114	41	3	2	3	21	88	333	605

Some shed antlers and splinters issued from antlers manufacturing were found too. Is the case of a frontal part with the shed anther, preserving the spindle with GL/diameter – 33.8/46 mm. The piece originates in a bulky male, ten years old. Were also identified two bases of shed antlers (maybe picked for manufacturing) as well as seven splinters, processing refuses. One of the shed antler base bear cut-off traces to remove some branches. The measurements emphasized both medium and big-sized exemplars and a visible sexual dimorphism. Among males were identified very robust exemplars, cu increased metric data like those of cattle e.g. M₃ - GL. 38.4 mm, versus 31-33 mm the mean variation; a distal humerus – breadth trochlea 66.4 mm; a proximal radius proximal – proximal breadth. 76.2 mm. A complete metatarsal of 303 mm estimated a tall of 121.5 cm, a female considering the slenderness of the bone. Referring to kill-off patterns one appreciates that most mandibles indicate two animals sub-adult and the others adult-matures, one exemplar having a much worn dentition (old one). The fusion data generally shows that 76 % of the bones come from adult or mature exemplars and just 24 % from bones originate in young and sub-adult animals. Two pieces bear butchery marks, is about two scapulae with deep cut marks applied above the articulation, to remove the upper part of the fore limb. That means either the method of butchery involved the use of a heavy tool such as cleaver or the person who executed the dismembering, were not “specialist” in butchering. Other cut marks (rather attempts) were observed on other bones too. Certainly the red deer bones found al Murighiol came from individuals hunted in the local woodland.

2. Grouping of species claiming an opened biotope, stepic one, including roe deer, aurochs, hare. There were 16 roe deer fragments identified accounting for 0.56 %; the majority of skeletal elements consist of limb bones. The few measurements indicate robust exemplars, hunted at an adult stage (at least). A single radius distal unepiphysed suggest an immature individual. The lower percentage of roe deer could be reflect a lower density of mammal in the Halmyris neighboring, maybe in relation to a lesser opened landscape.

The hare totals ten remains (0.35 %) originating in limb skeleton, from minimum 3-4 individuals; one of them is sub-adult, a distal radius not fused. It is probably that hare at Halmyris were hunted in the fields surrounding the harbour, occasionally, according its lower percent, 0.35 %. Indicator of opened areas with small wooden spots and a loamy-sandy soil (just so conditions offered by Dobroudja) it wasn't identified at Dinogetia, Histria, Ovidiu, Capidava, Jurilovca,

Adamclisi (Haimovici: 1991, 2006, 2007)¹, excepting Slava Rusă – 0.67 % (Stanc, 2005: 59). **Aurochs** is a rare element in the local fauna at the mid of the first mill. AD; a single scapula was in all probability assigned to species. We have some doubts for a certain assigning of fragment to aurochs because, cattle of that epoch had increased metric parameters, including numerous large individuals, very closed to wild species. The preliminary analysis of cattle sample from site gave us this impression, moreover confirmed by professor Haimovici when analysing the fauna from Telița-Amza (Haimovici, 2001: 160), Histria, Dinogetia, Capidava (Haimovici, 2006: 351-352). Aurochs remains are few or missing in the faunal samples collected from contemporary sites in Dobroudja; it was identified only at Histria (level of 6th century AD) – 0.38 % (Haimovici, 2007: 551), Capidava – 0.62 % (Haimovici, Cărpuș, Cărpuș, 2006: 359) and much later in the 9th-11th at Dinogetia (Haimovici, 1989: 53).

3. Grouping of aquatic species: carnivorous (Eurasian otter), rodents (beaver), claiming a biotope reach in lowland deciduous woody vegetation, streams with at least intermittent flow and lakes or ponds with standing waters. From **Eurasian otter** determined ten bones (0.35 %), consisting in complete bones from limb skeleton (two humeri, three radii, two ulnae, one tibia, one pelvis and a fragment from skull); they were collected from the filling of tower no. 12 and domus no. 2. We talk about a numerous enough sample confronted by materials from other sites located nearest the Danube whence is missing. Mammal well adapted to aquatic biotope, it was abundant in the Danube Delta area and implicit in the Halmyris neighbouring. The skull fragment is very probable to originate in a female exemplar as compared to similar material to Garvăn-Dinogetia (medieval levels) (Haimovici, 1989: 51). An obvious sexual dimorphism is ascertained on species bones, exemplified by the variation of radius proximal breadth, 11-12.7 mm. Though its remains are present in almost all prehistoric faunal samples from eastern Romania, the otter was not identified in the above mentioned sites from that chronological period. For sure its hunting was focused on the acquirement of a valuable fur, maybe exported. **The beaver** is quoted with 0.18 %, its sample including a mandible, two femora, a tibia and an ulna, from two (three) individuals. Semi-aquatic mammal, it preferred still watercourses or lakes with a vegetation including poplar, willow, birch, alder, elements common to Danube Delta in the Ist mill AD. Unfortunately it was identified excepting Murighiol at Dinogetia - 0.94 %. It was captured for fur and flesh (?) (Lynwood, 1990:151). Also the „castoreum” oil, a glandular secretion, was used in the medicine, according to physicians’ writings from the 4th-5th centuries AD, Oribasius and Antyllus (Ramoutsakis ET alii, 2002). The taxon from the Late Roman epoch reduced its size, such as the faunal samples from Dobroudja of the Ist mill AD prove it (Haimovici, 1991, apud Stanc, 2005: 78). Extinct from Romania the beaver was introduced into local fauna after 1995.

¹ The small samples’ size would be an explanation.

4. Grouping of species without special requirements of habitat including fox, badger, marten. The fox has the highest frequency within the carnivorous, the eleven fragments totalling 0.38 %, from at least five adult exemplars. Inside the Episcopal palace were collected five remains from minimum two foxes, the other six bones coming from the filling of tower no. 12. By entrance of tower no. 12 was collected an almost complete skull with the zygomatic arches damaged. The value of the canine length – 7.1 mm falls within the size range variation common for males and females (Szuma, 200: 120, Table 2), but the value of the basal length of 136 mm should suggest a mature female (closed skull sutures); for males the value of basal length oscillates around 150 mm. It was established a fluctuation of 15-16.3 mm for the length of carnassials (M_1). The other measurements fall within the medium range variation, without discrepancies confronted by values registered in prehistoric sites from the eastern regions of Romania (Haimovici, 1991: 155; Bălăşescu, 2003: 458). Adapted to variety of habitat the fox was a common element to Dobroudja landscape. Its hunting was done exclusively for fur and to eliminate the predator effect for fowls. Its remains sporadically appear in contemporary sites from Dobroudja, being identified only at Slava Rusă/Ibida (3rd-7th AD), with an insignificant participation, 0.42 % (Stanc, 2005: 56). **The badger** is quoted with 0.18 %, its sample including five skull fragments, from minimum three (four) exemplars. A fluctuation of 15.8-17.5 mm was registered on the length of M_1 , the values belonging to small and medium size range comparatively to similar material (Haimovici, 1989: 51; Bălăşescu, Radu, 2003: 379). Adapted to all habitats from lowland forests to uplands ones, nevertheless he prefers the wooden areas in the vicinity of cultivated fields. For sure the surroundings of Halmyris offered good conditions of living at those times, but its hunting was occasionally practiced. Eight complete bones (0.28 %) preserved from **marten**; a radius, a tibia and six mandibles suggest minimum two young and two adult individuals. On the length of M_1 established a variation of 11.5-14.6 mm, an average – 13.06 mm. It seems the carnivore was frequent enough in the Dobroudja milieu, its hunting was done for fur, much more valuable than that of otter.

Therefore the inhabitants of Halmyris practiced the hunting of a lot of big and medium sized-mammals as: wild boar, deer, roe deer, aurochs either to supplement the meat needful or to procure some raw materials as furs, hides, bones, antlers; small sized-aquatic and terrestrial animals as marten, otter, fox, beaver were also hunted, for the commerce with furs. Without doubt we can't neglect the amusement aspectual of hunting, practices by soldiers mostly. Generally the hunting would have had a selective character, adult and matures exemplars being preferred. About 2/3 of bones originate in these exemplars. According to above mentioned data, of the four mammals grouping the first one (including the boar and deer) dominates the statistics, it comes to that the surroundings of Halmyris were quite different than present: extensive forests, containing thermophilic mixed oak developed throughout, inclusively nearby the waters, today they were extinct. Due to these woods the environment of the fortress was not as arid as present. So the surroundings consisted in waters and forests low or higher zone forest. The recent

paleogeographic data referring to Danube Delta in Holocene emphasized that, at the beginning of the IST mill AD, the southern arm of the Danube was split into two main distributaries, Dunavăț and St. George. Dunavăț started to build its marshy delta into Halmyris lagoon, at present transformed into Razim-Sinoie complex (Giosan, ET alii, 2006: 759). By that branch was a communication with the salted waters of the Black Sea. Self-evident, a shell of *Cardium*, marine species was found in our sample. The archaeological data talk about the harbor Halmyris at the Danube too (Zahariade, 1989: 311-317).

By and large, talking about the hunting practiced in the 4th-7th centuries AD in Dobroudja we refer to several faunal samples, quantitatively unequal, most part of them counting below one thousand fragments. A comparison between them suggests the following aspects: 1. taking into account the wild/domestic ratio the sites in question sort in two main classes. (Fig. 3):

- Sites with an important percent of wild remains, that one counting for 10-20 %: Murighiol - 21.24 %, Slava Rusă – 14.25 % (Stanc, 2005: 59), Capidava – 11.79 % (Haimovici, Corpus, Cărbuş, 2006: 359), Dinogetia – 9.43 % (Haimovici, 1991 apud Stanc, 2005: 78). Broadly we talk about settlements placed in the central or N-NW part of Dobroudja, in a various biotope, with more forested areas than present. We refer to Murighiol and Măcin Hills, or Babadag Plateau, or near by the Danube floodplain. Fauna is rather diversified, predominating over the “sylvan” mammal group (red deer, wild swine);

Table 3 - Distribution of wild mammalian bones in sites from Dobroudja (4th-7th AD)

Species	Murighiol	Slava Rusă	Adamclisi 1*	Adamclisi 2*	Dinogetia	Histria	Ovidiu	Capidava 4 th -6 th
Dating	4 th -7 th	4 th -6 th	5 th -7 th	6 th	6 th	6 th	4 th -6 th	4 th -6 th
<i>Sus s. ferrus</i>	11.58	3.02	0.65	2.22	5.66	0.56	4.8	3.1
<i>Cervus elaphus</i>	7.33	6.08	3.25	2.22	2.83	1.5	1.2	8.07
<i>Capreolus capreolus</i>	0.56	3.9	0.65			0.18		
<i>Vulpes vulpes</i>	0.39	0.42						
<i>Lepus europaeus</i>	0.35	0.67						
<i>Lutra lutra</i>	0.35							
<i>Martes martes</i>	0.28							
<i>Meles meles</i>	0.18							
<i>Castor fiber</i>	0.18				0.94			
<i>Bos primigenius</i>	0.04					0.38		0.62
<i>Ursus arctos</i>		0.08						
<i>Canis lupus</i>		0.08						
<i>Phocaena relicta</i> ?						0.18		

Species	Murighiol	Slava Rusă	Adamclisi 1*	Adamclisi 2*	Dinogetia	Histria	Ovidiu	Capidava
Wild mammals	21.24	14.25	4.55	4.44	9.43	2.8	6	11.79
Domestic mammals	78.76	85.75	95.45	95.56	90.57	97.2	94	88.21

1* - sample determined by S. Stanc, 2005; 2* - sample determined by S. Haimovici, 1991

- Sites with a reduced wild mammal bones, below 6 %, Adamclisi – 4.5 % (Stanc, 2005: 63), Histria – 2.8 % (Haimovici, 2007: 551), Ovidiu – 6 % (Haimovici, 2007: 561). The deer and wild boar bones are present in samples, but they have reduced percentages. For sure, in the lowlands (the plain), the species, mostly red deer would have had reduced densities in Antiquity, as compare to Dobroudja uplands or Danube riversides.

2. Referring to the richness in taxons and the interspecies rapports, despite of sample size, in all cases, the wild swine and red deer constantly were identified in samples. The wild boar has a maximum value at Murighiol (11.5 %) (is not astonishing, having in view the Delta proximity, lesser values were recorded at Dinogetia (6 %), Capidava, Slava Rusă (3 %). The red deer counts for 6-8 % at Capidava, Murighiol, and Slava Rusă and below 3 % in the other sites. Occasionally, bear (element of a forested habitat) is found only at Slava Rusă (0.08 %). The mammals adapted to an opened biotope are present in almost all cases, especially in those from the central and southern part of Dobroudja. The terrestrial and aquatic carnivorous have few fragments, they appear sporadically in settlements.

Because the investigation of the site goes on the coming years the existing information have a preliminary character, we expect new faunal samples to complete the present data.

BIBLIOGRAPHY

- Bălăşescu A., 2003:** L'étude de la faune des mammifères découverts à Luncavița, *Peuce*, XIV, p. 453-458.
- Bălăşescu A., Radu V., 2003:** Studiul materialului faunistic descoperit în tell-ul de la Vitănești (jud. teleorman): Nivelul Gumelnița B1, *Cercetări Arheologice*, XII, p. 363-391.
- Giosan L., Donnelly P. J., Constantinescu S., Filip Fl., Ovejanu I., Vespremeanu-Stroe A., Vespremeanu E., Geoff Duller A.T. 2006:** Young Danube delta documents stable Black Sea level since the middle Holocene: Morphodynamic, paleogeographic, and archaeological implications, *Geology*, vol 34, no. 9, p. 757-760 (PDF).
- Haimovici S. 1989:** Les caractéristiques des mammifères sauvages découverts dans le matériel archéozoologique provenu de la cité Byzantine de Dinogetia (IX – XI siècle de n. e.), *An. Șt. ale Univ. "Al. I. Cuza" Iași*, T. XXXV, s. II, Biologie, p. 51 – 53.

- Haimovici S., 1991:** Materialul faunistic de la Gârbovăț. Studiu Arheozoologic, *Arheologia Moldovei*, 14, p. 153-166.
- Haimovici S., 2001:** Les caractéristiques de l'élevage de la période romaine du nord de la Dobroudja (IIe-IIIe s. ap. J-C) dans un lot de paléofaune du site de Telița-Amza, *Studia Antiqua et Archaeologica*, VIII, p. 153-174.
- Haimovici S., Cărbuș L., Cărbuș C., 2006:** Studiul arheozoologic al unui lot de faună provenit din situl romano-bizantin de la Capidava-sec. IV-VI p. Chr., *Pontica*, XXXIX, p. 355-363.
- Haimovici S.:** Ameliorarea rasială a animalelor domestice evaluată prin specia taurine (*Bos taurus*), făcută de către romani, după venirea lor în antichitate, în actuala Dobroge, *Pontica*, XXXIX, p. 349-353.
- Haimovici S., 2007:** Studiul arheozoologic al unor resturi faunistice descoperite în nivelul aparținând sec. al VI-lea P. Chr. Al cetății Histria, *Pontica*, XL, p. 541-562.
- Haimovici S., 2007:** Studiul unui mic lot de paleofaună din fortăreața romano-bizantină de la Ovidiu (sec. IV – VI p. Chr.), *Pontica*, XL, p. 559-563.
- Linhart B. S., 1968:** Dentition and Pelage in the Juvenile Red Fox (*Vulpes vulpes*), *Journal of Mammalogy*, Vol. 49, No. 3 (Aug., 1968), pp. 526-528 apud Szuma E., 2000, Variation and correlation patterns in the dentition of the red fox from Poland, *Annales Zoologici Fennici*, 37(2), p. 113-127.
- Lynwood A. Fiedler., 1990:** Rodents as a food source, *Proceedings of the Fourteenth Vertebrate Pest Conference 1990*, University of Nebraska – Lincoln, p. 149-155, versiune PDF (<http://digitalcommons.unl.edu/vpc14/30>).
- Ramoutsaki I. A., Papadakis C. E., Helidonis E. S., 2002:** Therapeutic Methods used for otolaryngological problems during the Byzantine period, *Annales Otol Rhinol Laryngol*, 111, p. 553-557, rezumat, PDF.
- Stanc S., 2005:** *Cercetări arheozoologice pentru secolele IV-X d. Chr. din zonele extracarpătice de est și de sud ale României*, Teză de doctorat (versiune PDF).
- Zahariade M., 1989:** An Early and Late Roman Fort on the Lower Danube: Halmyris, Tulcea County, Romania, *Roman Frontier Studies 1989. Proceedings of the XVth International Congress of Roman Frontier Studies*, University of Exeter Press 1991, 311–317.
- Zahariade M., Topoleanu Fl., Ene D., 2004:** *Cercetărilor Arheologice din România, Campania 2003*.
- Zahariade M., Mărgineanu Cârstoiu M., Topoleanu Fl., Bounegru O., Dvorski T., Madgearu A., 2006:** *Cercetărilor Arheologice din România, Campania 2005*.
- Zahariade M., Mărgineanu Cârstoiu M., Topoleanu Fl., Bounegru O., Dvorski T., Madgearu A., 2007:** *Cercetărilor Arheologice din România, Campania 2006*.

MEASUREMENTS

Skulls			Maxilla			
dorsal	fox	badger	M1-M3	P1-M3	M3/P4	Species
Total length	139		78,5		39,2	boar
Upper neurocranium length	70,5		81,2		38,9	boar
Facial length	43,4				38,4	boar
Snout length	59,4				39,3	boar
Euryon-Euryon	43,8	44,6			41	boar
Least breadth of skull	21,1				42	boar
Frontal breadth	32				42,8	boar
Entorbitale-Entorbitale	27				43	boar
Height of orbit	24,5			31,9	10,9	otter
Skull height	37,9			36,7 (alv.)	16	badger
Skull height without the sagittal crest	36,3					
Otion-Otion	45,2	59				
Breath of the occ. condyles	25,6	30,8		Ulna		
Breadth of foramen magnum	16,7	13,6		GL	71,1	otter
Height of foramen magnum	12,7	17,6				
Akrocranium-Basion	31	33,6				
Median palatal length	74,9					
Diam. of auditory bulla	19,5	21,6				
Breadth al canine alveoli	21,8					
P1-M2	55,4					
M1-M2	15,4					
P1-P4 (at alveola)	40,8	Axis				
Lg. P4	13,6	BFcr	SBV	LCDe	H	
Greatest palatal breadth	40,8	54,7	35,7	67,6	68,4	deer
Diam. canine (at alveola)	7,1	61,5				boar

Mandible						
P1/P2-M2/M3	M1-M3	P1-P4	M3/M1	Condylbasal length	Species	
	86,7		38,4		deer	
127	78,8		31,8		deer	
			32,6		deer	
			32,7		deer	
135,7	91		46,5		boar	
			43,5		boar	
			49		boar	
			43		boar	
	95,8		55,5		boar	
	82,5		41,8		boar	
			45,5		boar	
			45		boar	
			42		boar	
	82,5		41,9		boar	
			42,1		boar	
			43,7		boar	
			43,4		boar	
	81,8		41,2		boar	
58,7	26,7	32,3	16		fox	
	23,9		15		fox	
			16,3		fox	
			11,5		marten	
33,1			12,6		marten	
			13,1		marten	
			13,5		marten	
			14,6		marten	
39	21,5	17,5	15,8	81,5	badger	
40,1			16,2		badger	
37,6			17,5		badger	
29,8					beaver	
Atlas			Scapula			
BFcr	BFcd	Species	Ld	SLC	GLP	Species
60,4	64,9	boar	39,9			deer

62,4		boar	43,2	63,1	49,3	deer	
66	64,5	boar	43,5	66	50,7	deer	
66,5		boar	43,6	65,7	52,7	deer	
67,1	63,6	boar		67,3	54	deer	
67,4		boar		56,6	52	deer	
72		boar	29,7	44	37,8	boar	
			29,7			boar	
			31,7	48,8	38,1	boar	
			32,1			boar	
			33,5		36,4	boar	
			34,8			boar	
				43,4	35,8	boar	
			68,6	90,5	75,3	aurochs	
			15,4		15,1	fox	
Humerus							
GL	Bp	Dp	Sd	BT	Bd	Dd	Sp.
				53,4	60,4	60,1	deer
				56	64,8	61,9	deer
				57,2	64,2		deer
				57,5	63	64,2	deer
				58,8	66,2		deer
				66,4			deer
	84,6						deer
						43,5	boar
					54,6		boar
				37,2	48,5	46,1	boar
				37	49,8	49,5	boar
				38,5	51		boar
				38	47,6	47,7	boar
				39,4	49,8	49,7	boar
				39,6	52,1	55,6	boar
				39	53,7	50,1	boar
				39	51,2		boar
				40,1	51,8	55,2	boar
				40,6	52,3	51,8	boar
				40,9	54,7	51,5	boar

				41,3	50,4	50,9	boar
				41,3	52,8	50,3	boar
				41,8	59	54,6	boar
				42	53,8		boar
				45,5	53,3	53	boar
					56,8		boar
	88,4						boar
					30,2		roe deer
					21,6	17,8	fox
					22,3		fox
					13,5	10,4	hare
					13,2	9,8	hare
94,4			7,6		28,8	12,2	otter
					27,6	11,6	otter
Radius							
GL	BFp	Bp	Dp	Sd	Bd	Dd	Spe cies
	53,7	58,7	31,6				deer
	58,4	64,3	33,5				deer
	58,7	65,5	35,3				deer
	60,5	64,2	36				deer
		76,2					deer
					48,4	39,4	deer
					55,8	39,4	deer
		36,8	36,4				boar
		37	25,9				boar
		37,1	27,4				boar
		38	25,4				boar
		39,4	27,5				boar
		39,6	24,4				boar
		42	26,8				boar
					40,1	31	boar
					46,4	35,2	boar
					49	34	boar
					41,6	31	boar
58,1		26,7	16,3				roe

							deer
		11	8,2	5,8	13,2	9,1	otter
64,1		12,3	8,5				otter
		12,7	9,4	6,4	13,7	11,5	otter
Metacarpus							
Bp	Dp	Bd	Spec ies	Mt. III-GL	Spe cies		
43,7	30,1		deer	104,1	boar		
43,7	32,3		deer	116,1	boar		
45,2	32,8		deer				
46,2			deer	Mc. IV-GL	Spe cies		
46,3	31,6		deer	103	boar		
48,9	34,2		deer	Mc. III-GL	Spe cies		
		45	deer	102,6	boar		
Talus				Femur			
GLI	GL m	Bd	Spec ies	Bp	Bd	Species	
54,6	50,1	38,9	deer	84,5		deer	
61,1	57,5	36,2	deer		60,1	boar	
61,5	56,5	37,9	deer		61	boar	
55,9	45,9	34,4	boar		61,2	boar	
54,9	46,8	28,2	boar		62,5	boar	
51,6	47,3	33,5	boar		63,4	boar	
52,4	47,6	34,2	boar		64	boar	
49,7	46,1	30,4	boar		64,1	boar	
52,3	46,7	30,9	boar	73,3		boar	
56,4	47	35,8	boar		21,4	fox	
53,2	49,1	33,2	boar	29,2		hare	
54,1	49,5	36,2	boar	20,1		hare	
49,5	44,3	31,2	boar				
26,8		17,9	fox				

Pelvis		Pelvis		Calcaneus		
LA	Species	LA	Species	GL	Species	
40	boar	44,1	boar	95,6	boar	
40,3	boar	56,4	deer	98,8	boar	
40,6	boar	57,4	deer	106	boar	
42,1	boar	61,1	deer	107,4	boar	
42,1	boar	53,2	deer	109,3	boar	
42,7	boar	55,9	deer			
43	boar	15,5	otter			
44,1	boar					
Metatarsus						
GL	Bp	Dp	Sd	Bd	Dd	Species
303	37,8	40,2	23,4	40,7	30,7	deer
	37,3	44,2				deer
	38,7	42,7				deer
				40,9	26,7	deer
				48	33,4	deer
					31	deer
Tibia						
GL	Bp	Dp	SD	Bd	Dd	Species
				50,2	37,7	deer
				51,7	37,6	deer
				51,8	41,9	deer
				53,2		deer
				55,4	43,6	deer
				57,2	43,2	deer
				58,1	46,4	deer
	69,3					boar
	81,2					boar
				35		boar
				35,1	32,3	boar
				36,8	32,7	boar
				37	33	boar
				38,2	33,6	boar

				38	35,1	boar
				40,3	36,6	boar
				40,4	34,6	boar
				40,4	40,7	boar
				41,3	36,3	boar
				42,5	36,6	boar
90,1	12,7	9,4	7,3	14,3	10,9	otter
	10,4					marten

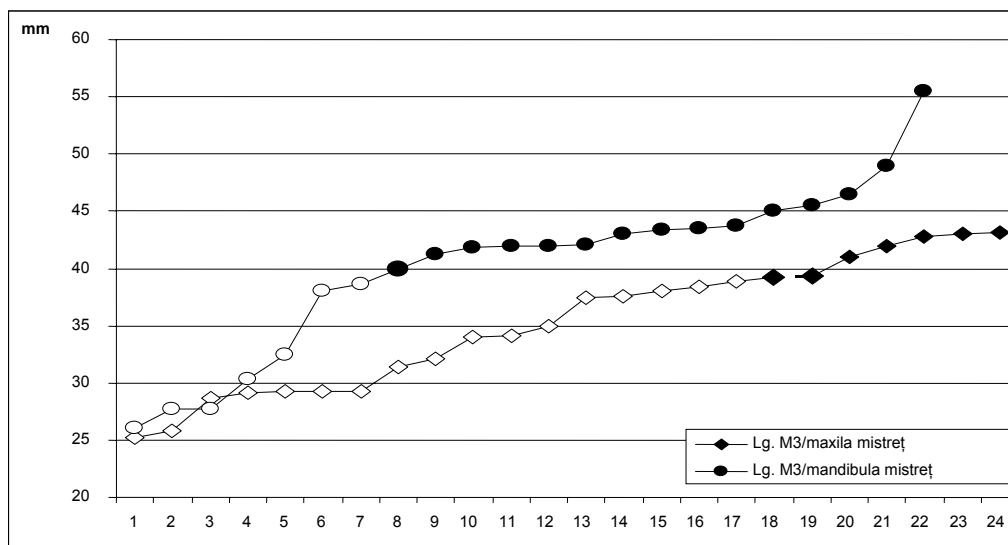


Fig. 1: Scatter diagram of Lg. M³/M₃: fill circle, rhombus-boar; empty circle, rhombus-pig.

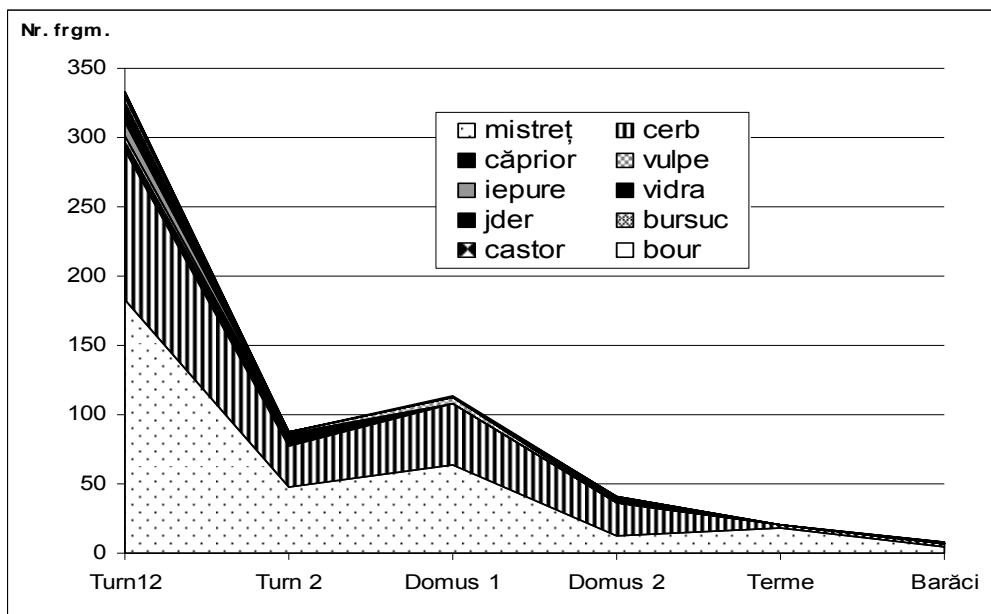


Fig. 2: Distribution of wild species bones at Halmyris.

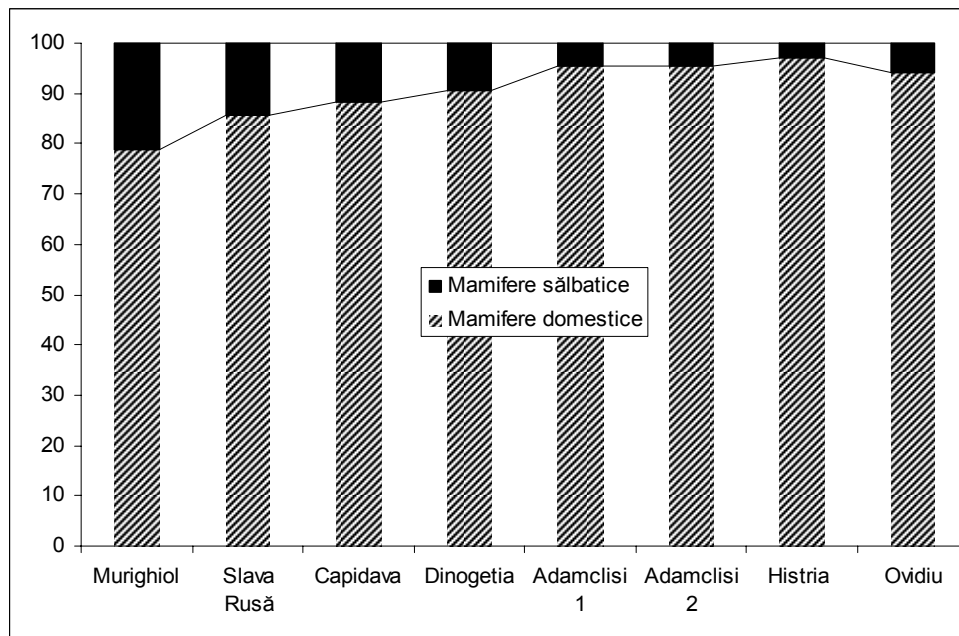


Fig. 3: Domestic/ wild ratio at Halmyris.

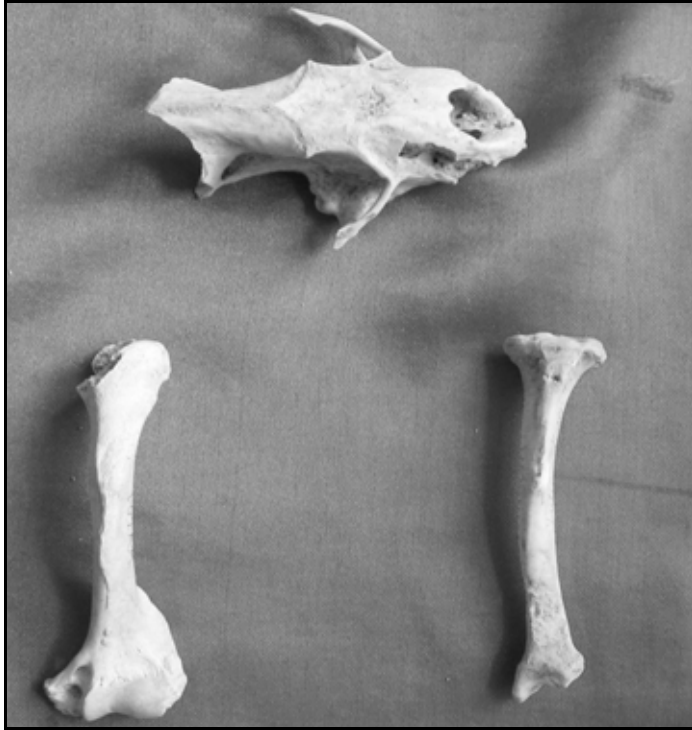


Fig. 4: Bones of Eurasian otter.

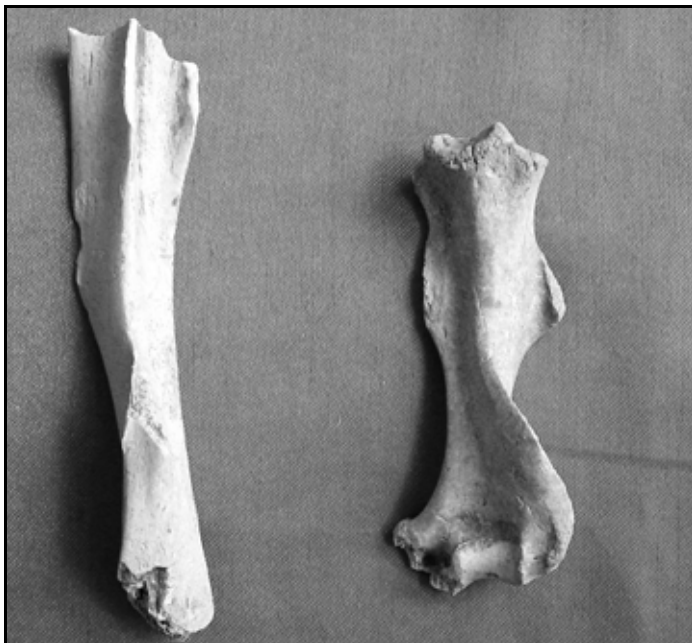


Fig. 5: Bones of beaver.

