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PRELIMINARY STUDY OF THE FAUNAL MATERIAL DISCOVERED IN AN EARLY ENEOLITHIC FEATURE FROM THE ALEXANDRIA – *LIMONAGIUL* SETTLEMENT (TELEORMAN COUNTY). 2019–2021 CAMPAIGNS

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Keywords: *archaeozoology, neolithic, Gumelnița culture, mortality profiles, cut marks, palaeoeconomy*
Abstract: *The study presents the preliminary archaeozoological analysis of the faunal material discovered in an Early Eneolithic feature of the Gumelnița A1 culture from the settlement at Alexandria, Limonagiul site (Teleorman County), contributing to filling existing gaps in our understanding of the palaeoeconomy of this phase in southern Romania. The studied sample is rich in remains, with a total of 10,252, of which 3,800 (37.93%) could be taxonomically identified. The material shows an overwhelming majority of domestic animals (98.68%), with cattle clearly prevailing both in the number of remains (71.63%) and in total weight (92.05%). The mortality profiles of cattle (*Bos taurus*) and ovicaprines (*Capra hircus/Ovis aries*) suggest a mixed exploitation (for meat and secondary products such as milk), while pigs (Sus domesticus) were raised exclusively for meat, their abundance (second place by weight) indicating a possible sedentism of the community. Hunting played a minimal role (eight taxa, 1.32%). Overall, the data from Limonagiul confirm that the economy of this community was complex, integrating both types of domestic animal exploitation (primary and secondary), with a negligible involvement of hunting.*

Cuvinte-cheie: *arheozoologie, neolitic, cultura Gumelnița, curbe de mortalitate, urme antropice, paleoeconomie*
Rezumat: *Studiul prezintă analiza arheozoologică preliminară a materialului faunistic descoperit într-un complex eneolitic timpuriu al culturii Gumelnița A1 din așezarea de la Alexandria, punctul Limonagiul (jud. Teleorman), contribuind la completarea lacunelor privind paleoeconomia acestei faze din sudul României. Eșantionul studiat este bogat în resturi, cu 10,252, dintre care 3,800 (37,93%) au putut fi determinate taxonomic. Materialul prezintă un număr covârșitor de animale domestice (98,68%), dintre care bovinele domină categoric spectrul faunistic ca număr de resturi (71,63%) și greutate (92,05%). Analiza profilelor de mortalitate la bovine (*Bos taurus*) și ovicaprine (*Capra hircus/Ovis aries*) sugerează o exploatare mixtă (pentru carne și produse secundare, în special lapte), în timp ce porcul (Sus domesticus) era crescut exclusiv pentru carne, abundența sa (locul doi ca greutate) indică o posibilă sedentarizare a comunității. Importanța vânatului (opt taxoni) era minimă (1,32%). În ansamblu, datele de la Limonagiul confirmă că economia acestei comunități era complexă, integrând ambele tipuri de exploatare a animalelor domestice (primară și secundară), cu o implicare neglijabilă a vânătorii.*

INTRODUCTION

Preventive archaeological research was carried out between 2019 and 2021 in order to document and rescue an Early Eneolithic feature (Gumelnița culture, phase A1) from the settlement at Alexandria, site V.V. 07 – „Limonagiul" (Teleorman County)[1].

The settlement is located east of the town of Alexandria, on the high eastern terrace of the Vedea River, downstream from the former dam. It lies approximately 590 m southeast of National Road 6 (Alexandria–Bucharest) and the bridge crossing the Vedea River, and 560 m southwest of County Road 504 (Alexandria–Cernetu).

Within a radius of up to 6.6 km from the Limonagiul site, four other Gumelnița settlements are known. Two of them (Alexandria Gorgan and Ţigănești) lie upstream and downstream along the Vedea River, at distances of 3.1 km and 6.5 km from Limonagiul, respectively. Both sites are telling and archaeological investigation has shown that their occupation levels belong to phases A2 and B1 of the Gumelnița culture.

The other two sites are located in the valley of the Nanov River, a tributary of the Vedea. These are the tell at Izvorul Rece, located 6.7 km away, and the flat settlement at Izvorul Rece, 5.1 km from Limonagiul. Neither settlement has been excavated, but they are known from field surveys which indicate the presence of materials belonging to phases A2 and B1 of the Gumelnița culture (the flat settlement shows deposits from phase A2 only).

[1] For objective reasons, the archaeological research could not be continued in 2022–2023, with the completion date now scheduled for 2024 (Mirea, Torcică 2020; 2021; Torcică 2020, p. 6).

ARCHAEOZOOLOGICAL METHODOLOGY

For the taxonomic identification of the faunal remains, particularly mammal bones, the reference collection (comparative anatomy) of the Archaeozoology Laboratory of the "Vasile Pârvan" Institute of Archaeology, Romanian Academy, was used. In addition, the works of Schmid[2] and Barone[3] were also consulted for identification.

The distinction between sheep and goat was based primarily on the postcranial skeleton, using the works of Boessneck[4], Zeder and Lapham[5], Zeder and Pilaar[6], as well as Prummel and Frisch[7]. To establish mortality ages, several studies were consulted; the most frequently used was Schmid[8] (for tooth eruption sequences), while dental wear was assessed using Payne[9] and Helmer[10] (for caprines), Grant[11] and Ducos[12] (for cattle), and Horard-Herbin[13] (for pigs).

Correlation between dental/skeletal ages and biological ages was based on Udrescu *et alii*[14]. Measurements of faunal remains were taken with a caliper to a precision of 0.1 mm, following the recommendations of von den Driesch[15]. Height at the withers for sheep was calculated according to Teichert's[16] indices and for cattle according to Matolcsi's[17] indices.

It should be noted that, because the excavation was preventive, sampling was performed without sediment sieving, which accounts for the complete absence of small remains (fish or micromammals).

PRESENTATION OF THE OSTEOLOGICAL MATERIAL

The analysed faunal assemblage consists of 10,252 remains (169,679 g), of which 10,016 (97.70%) belong to mammals, while the remaining 236 (2.30%) belong to molluscs (Tab. 1).

The degree of taxonomic identification is relatively low: out of 10,016 mammal remains, only 3,800 (37.93%) were taxonomically identifiable, although these account for 146,871 grams (86.55%). These values reflect the very high degree of fragmentation observed in the assemblage. The list of identified species at this site is extensive, encompassing both domestic taxa – cattle (*Bos taurus*), sheep (*Ovis aries*), goat (*Capra hircus*), pig (*Sus domesticus*), and dog (*Canis familiaris*) – and wild taxa: aurochs (*Bos primigenius*), red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), horse (*Equus ferus*), fox (*Vulpes vulpes*), badger (*Meles meles*), hare (*Lepus europaeus*), and beaver (*Castor fiber*) (Tab. 1 and Appendix 4).

The faunal assemblage presents the characteristics of household waste, as indicated by the high number of undetermined remains (62.06% by NISP and 13.23% by weight), pronounced fragmentation, the presence of anthropogenic cut marks (disarticulation and defleshing), and the various tooth marks (from carnivores, rodents, and possibly pigs) observed on bone surfaces.

Out of the 3,800 determined remains, domestic mammals clearly dominate the analysed faunal assemblage with 3,750 remains (98.68%), while wild animals are poorly represented, with only 50 remains (1.32%) (Tab. 1 and Appendix 1). The total weight of domestic mammals is approximately 145,657 g (99.17%), whereas the weight of wild species amounts to only 1,214 g (0.83%) (Tab. 1 and Appendix 2). These data indicate that animal husbandry was the main economic activity of the community, while the contribution of wild species was very low (Tab. 1 and Fig. 1).

Domestic cattle (*Bos taurus*) are the most well-represented species among the determined remains, with 2,722 (71.63%), followed by caprines, with 490 remains (12.97%) and pigs with 374 remains (9.84%). Dogs are the least represented, with 161 remains (4.24%) (Tab. 1 and Fig. 1).

From the perspective of weight, cattle clearly remain in first place (92.05%), followed by pigs (3.93%) and then caprines (2.59%). Dogs remain last, with approximately 0.59% (Tab. 1 and Fig. 1).

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[2] Schmid 1972.
[3] Barone 1986.
[4] Boessneck 1969.
[5] Zeder, Lapham 2010.
[6] Zeder, Pilaar 2009.
[7] Prummel, Frisch 1986.
[8] Prummel, Frisch 1986.
[9] Payne 1973.
[10] Helmer 2000.
[11] Grant 1982.
[12] Ducos 1968.
[13] Horard-Herbin 1997.
[14] Udrescu *et alii* 1999.
[15] Von den Driesch 1976
[16] Udrescu *et alii* 1999, p. 97.
[17] Udrescu *et alii* 1999, p. 79.

Species	NR	%	W	%	MNI	%
Bos taurus	2722	71.63	135202	92.05	23	31.08
Ovis aries	17	0.45	282	0.19	4	5.41
Capra hircus	28	0.74	461	0.31	7	9.46
caprines	448	11.79	3066	2.09	9	12.16
Sus domesticus	374	9.84	5775	3.93	15	20.27
Canis familiaris	161	4.24	871	0.59	5	6.76
Total domestic	**3750**	**98.68**	**145657**	**99.17**	**63**	**85.14**
Bos primigenius	8	0.21	839	0.57	2	2.70
Cervus elaphus	6	0.16	165	0.11	1	1.35
Capreolus capreolus	2	0.05	8	0.01	1	1.35
Equus ferus	2	0.05	50	0.03	1	1.35
Vulpes vulpes	14	0.37	84	0.06	1	1.35
Meles meles	1	0.03	8	0.01	1	1.35
Lepus europaeus	13	0.34	40	0.03	3	4.05
Castor fiber	4	0.11	20	0.01	1	1.35
Total wild	**50**	**1.32**	**1214**	**0.83**	**11**	**14.86**
Total Identifiable	**3800**	**100.00**	**146871**	**100.00**	**74**	**100.00**
undetermined medium-sized	332		387			
undetermined large-sized	999		4835			
Unidentifiable	4885		17167			
Total Mammals	**10016**		**169260**			
Bivalvia	236		419			
Total Fauna	**10252**		**169679**			

Table 1. *Numerical and percentage distribution of faunal remains (NR), weight (W), and minimum number of individuals (MNI) discovered at Alexandria, Limonagiul site.*

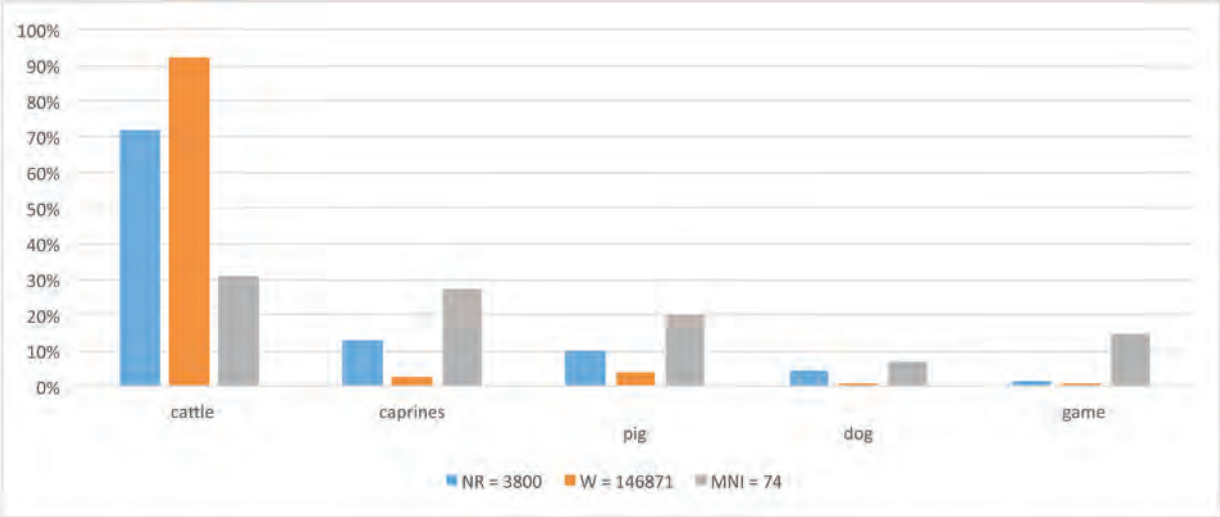

Figure 1. *Percentage distribution of mammalian faunal remains by number of remains (NR), weight (W in grams), and minimum number of individuals (MNI) from Alexandria, Limonagiul site.*

Game is poorly represented both in number of remains (1.32%) and in weight (0.83%). However, it is taxonomically diverse, including eight species: aurochs, red deer, roe deer, wild horse, fox, badger, hare and beaver.

From the perspective of Minimum Number of Individuals (MNI), cattle occupy the first place with 31.08%; caprines follow with 27.03%; pigs rank third with 20.27%; while dogs complete the domestic spectrum with 6.76%. Game is relatively well represented, with 11 individuals (14.86%) (Tab. 1 and Fig. 1).

The taxa identified within the faunal spectrum are listed below.

Cattle (*Bos taurus*). A total of 23 individuals were identified, 22 of them based on dentition: one aged 6 months–1 year, five aged 1–2 years, six aged 2–4 years, four aged 4–6.5 years, three aged 6.5–9 years, one aged 9–11.5 years, and two over 11.5 years, to which a fetus/newborn individual was added, identified based on an unfused second phalanx (Tab. 1).

Sheep (*Ovis aries*). Sheep are represented by four individuals, attested by four distally fused humeri, one of which is 4–6 years old (based on lower dentition). A female was identified based on a horn core fragment.

Goat (*Capra hircus*). Goats are represented by seven individuals, determined exclusively by lower dentition: one aged 2–6 months, one aged 6–12 months, three aged 1–2 years, one aged 2–4 years, and one aged 4–6 years (Tab. 1). Two individuals were identified as males, based on two horn cores.

Caprines (*Ovis aries*/*Capra hircus*). In addition to the seven goats and four sheep, nine more caprine individuals were identified. Due to strong fragmentation, these individuals could not be assigned to a species, but lower dentition allowed the establishment of a MNI (Tab. 1): one aged 6–12 months, two aged 1–2 years, three aged 2–4 years, two aged 4–6 years, and one aged 6–8 years.

Pig (*Sus domesticus*). Pigs are represented by a minimum of 15 individuals, identified exclusively through lower dentition: two aged 2–4 months, two aged 6–8 months, one aged 8–10 months, one aged 10–12 months, one aged 12–14 months, three aged 16–18 months, one aged 18–20 months, three aged 22–24 months, and one aged 36–60 months. Two females and one male were identified based on upper canines, all from the right side.

Dog (*Canis familiaris*). The dog is represented by five subadult/adult individuals, identified by five lower left canines.

Aurochs (*Bos primigenius*). This is represented by two subadult/adult individuals determined based on two right calcanei; one is in the process of fusing and the other, fused, also shows cut marks suggesting skinning.

Red deer (*Cervus elaphus*). Represented by one subadult/adult individual identified based on a left metacarpal.

Roe deer (*Capreolus capreolus*). Represented by one subadult/adult individual based on a fused first phalanx.

Wild horse (*Equus ferus*). Represented by one subadult/adult individual based on a left coxal.

Fox (*Vulpes vulpes*). Represented by one subadult/adult individual based on a right mandible.

Badger (*Meles meles*). Represented by one subadult/adult individual based on a right scapula.

Hare (*Lepus europaeus*). Represented by three subadult/adult individuals, based on three fused left calcanei.

Beaver (*Castor fiber*). Represented by one juvenile/subadult, based on a proximally unfused left ulna.

EXPLOITATION OF DOMESTIC ANIMALS AT LIMONAGIUL

The analysis of mortality profiles for domestic cattle at Alexandria (Limonagiul site), based on the dentition, indicates a predominance of young animals; post-lactational slaughter is suggested by individuals with a dental age between 6 and 12 months[18]. Animals aged 1–2 and 2–4 years represent the largest proportion of individuals, reflecting meat consumption. Individuals aged 4–6.5 and 6.5–9 years are also well represented, and were likely kept primarily for secondary products, such as milk (Fig. 2). These results indicate mixed exploitation, primarily for meat and secondarily for milk and other dairy products.

[18] Bălășescu 2014, p. 154.

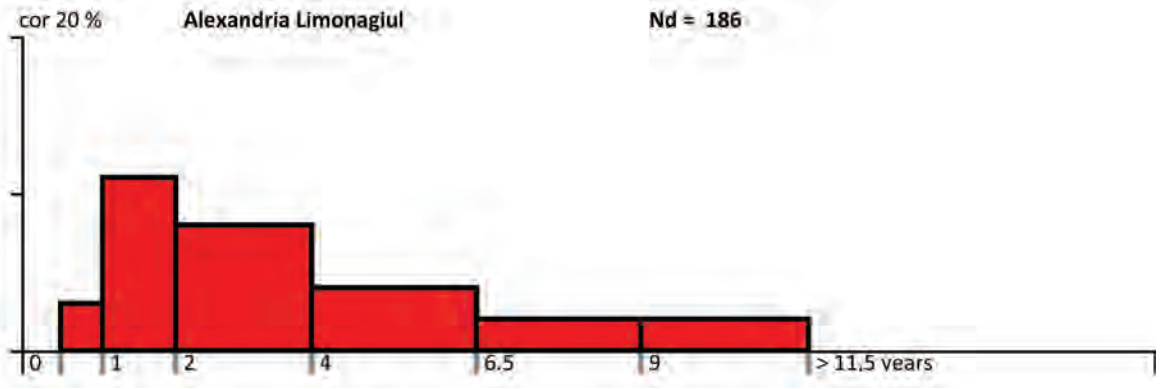

Figure 2. *Mortality profile of cattle discovered at the Alexandria site, Limonagiul. The age classes follow Ducos 1968*[19].

The mortality profiles of caprines (sheep and goats), analysed together, show individuals from class B (2–6 months) suggesting post-lactation slaughter, as well as classes C (6–12 months) and D (1–2 years), corresponding to meat production[20]. Although both categories provide meat, Class D has a higher proportion, indicating a preference for obtaining a larger quantity. Classes E–F (2–4 years) and G (4–6 years) suggest exploitation for secondary products, given the absence of individuals from Class A (0–2 months). A possible explanation for the absence of the youngest individuals is their use primarily for hair fibre production, but comparative data for caprines in the Teleorman Valley remain limited[21] (Fig. 3).

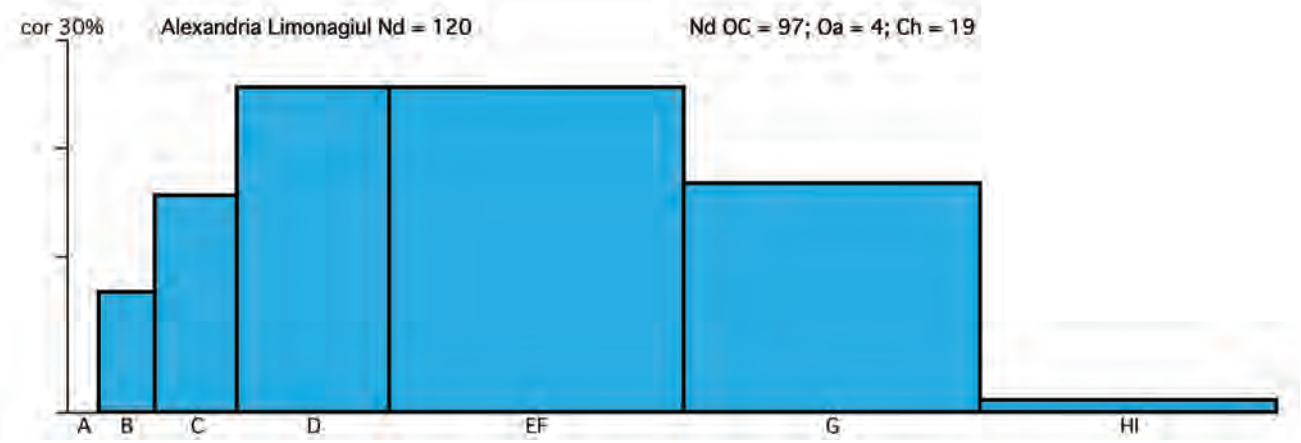

Figure 3. *Mortality profile of caprines discovered at the Alexandria site, Limonagiul. Legend: OC – Ovis aries/Capra hircus, Oa* – Ovis aries*, Ch* – Capra hircus*. The age classes follow Payne, 1973*[22].

For pigs, young animals under 14–16 months predominate, although these have not yet reached optimal body maturity (>18 months). This exploitation strategy is most likely related to seasonal variation, as pigs reproduce throughout the year, with farrowing periods especially in spring and autumn[23] (Fig. 4).

The analysis of the osteological material discovered at the Alexandria archaeological site highlighted the distribution of anatomical elements corresponding to the main domestic species. Anatomical elements were grouped into categories: head (neurocranium, viscerocranium, teeth, hyoid), axial skeleton (vertebrae and ribs), limbs (scapula, coxal, humerus, femur, radius, ulna, tibia, and fibula), and extremities (carpals, tarsals, metapodials, sesamoids, and phalanges).

[19] Ducos 1968.
[20] Bălășescu 2014, p. 157.
[21] Bălășescu 2014.
[22] Payne 1973.
[23] Bălășescu 2014, p. 162.

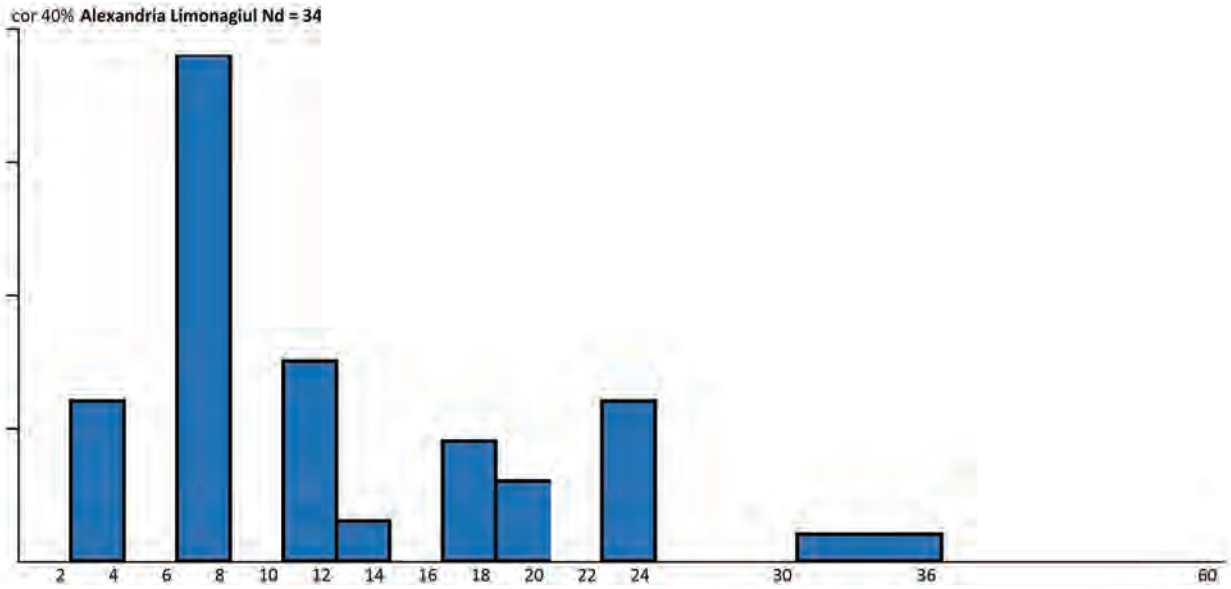

Figure 4. *Mortality profile of domestic suids discovered at the Alexandria site, Limonagiul. The age classes follow Horard-Herbin, 1997*[24].

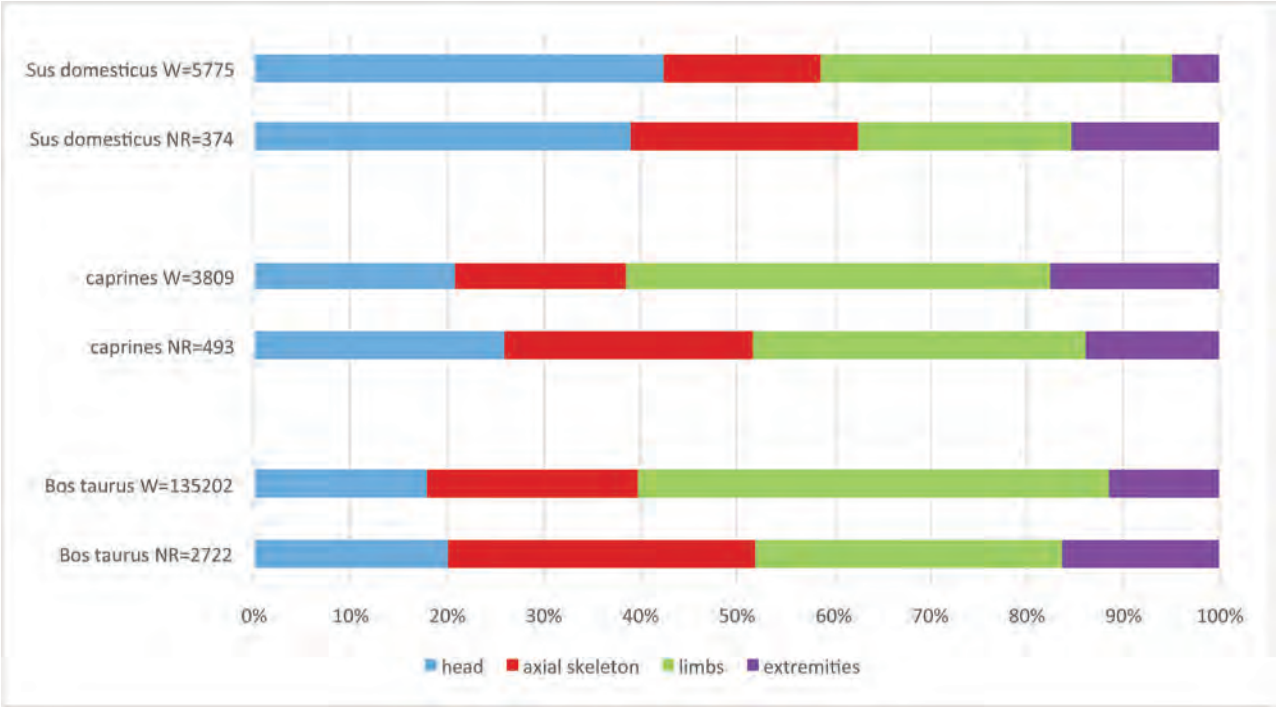

Figure 5*. Percentage distribution of the Number of Remains (NR) and Weight (W) by body part for the main domestic species studied at Alexandria.*

For large and small ruminants, limbs and the axial skeleton (63.45%; 60.2%) – areas rich in meat – are predominant compared to the head and extremities (36.65%; 39.8%), which are not considered meat-rich body parts and are poorly represented in the sample. For pigs, we observe that the parts lacking meat have a higher percentage (54.55%), compared to the limbs and axial skeleton (45.45%). These differences are especially visible when comparing the weight of the remains in ruminants, a parameter much more objective than the number of remains. For pigs, the situation changes, with the difference not being substantial between meat-rich parts (52.67%) and less meat-rich parts (47.24%).

[24] Horard-Herbin 1997.

ANTHROPIC TRACES

A primary argument that these household remains derive from the food consumption of the identified species is the pronounced fragmentation of the bones, as well as the visible anthropic traces on them. Numerous coarse cuts caused by heavy, axe-like tools were identified, allowing for the disarticulation and butchery of the animals, as well as fine cuts, probably made with flint blades, suggesting the defleshing of meat-rich bone pieces.

Since most anthropic traces were discovered on domestic animal bones (which are also the most numerous), we will briefly present them below.

Cattle (*Bos taurus*). Skinning marks are observed on the mandibular body and the coronoid process, and cuts were identified on the hyoid bone, which may suggest either the severing of blood vessels in the neck area (carotid and jugular) or the removal of the tongue. It is not possible to specify whether these marks were produced *ante-mortem* or *post-mortem* (Fig. 6).

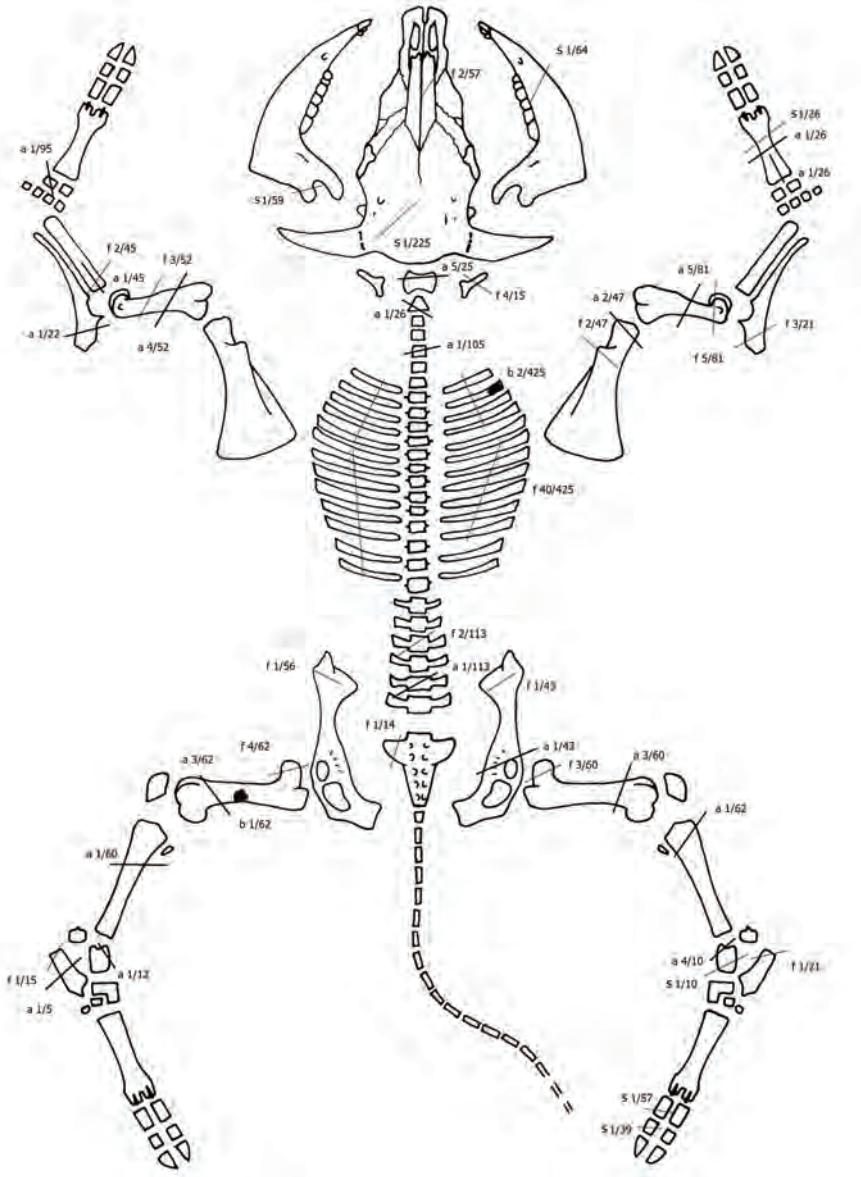

***Figure 6**. Anthropic traces related to food activity observed on cattle (Bos taurus) bones discovered at Alexandria (a – disarticulation, f – defleshing, b – burning, s – skinning). The figures indicate the ratio between anatomical elements with taphonomic traces and the total identified. Species descriptive sheet follows Helmer (1987)[25].*

[25] Helmer 1987.

Detachment of the skull from the trunk is suggested by numerous disarticulation marks identified on the atlas. Evisceration of the animal is indicated by fine blade marks observed on the internal surfaces of the ribs and vertebrae. Butchering marks also appear on the diaphyses of long bones (humerus, radius, ulna, femur, and tibia) (Photo 1), associated with sectioning the bones to facilitate both tissue separation and marrow recovery. Discrete defleshing marks are also observed, considering the tools used (Fig. 6).

On flat bones (scapula and coxal), both defleshing and disarticulation marks were identified, which were performed at the glenoid cavity (scapula) and the acetabular cavity (coxal) (Fig. 6). Defleshing and, especially, disarticulation marks are observed on the tarsals (calcaneus and astragalus), given the difficulty of separating the joint with the distal extremity of the tibia.

Caprines (*Ovis aries* and *Capra hircus*). Compared to cattle, fewer anthropic traces are observed in caprines: defleshing on the axial skeleton (vertebrae and ribs), an oblique defleshing mark on the ilium (coxal), as well as defleshing and butchering marks on the long bones (Fig. 7).

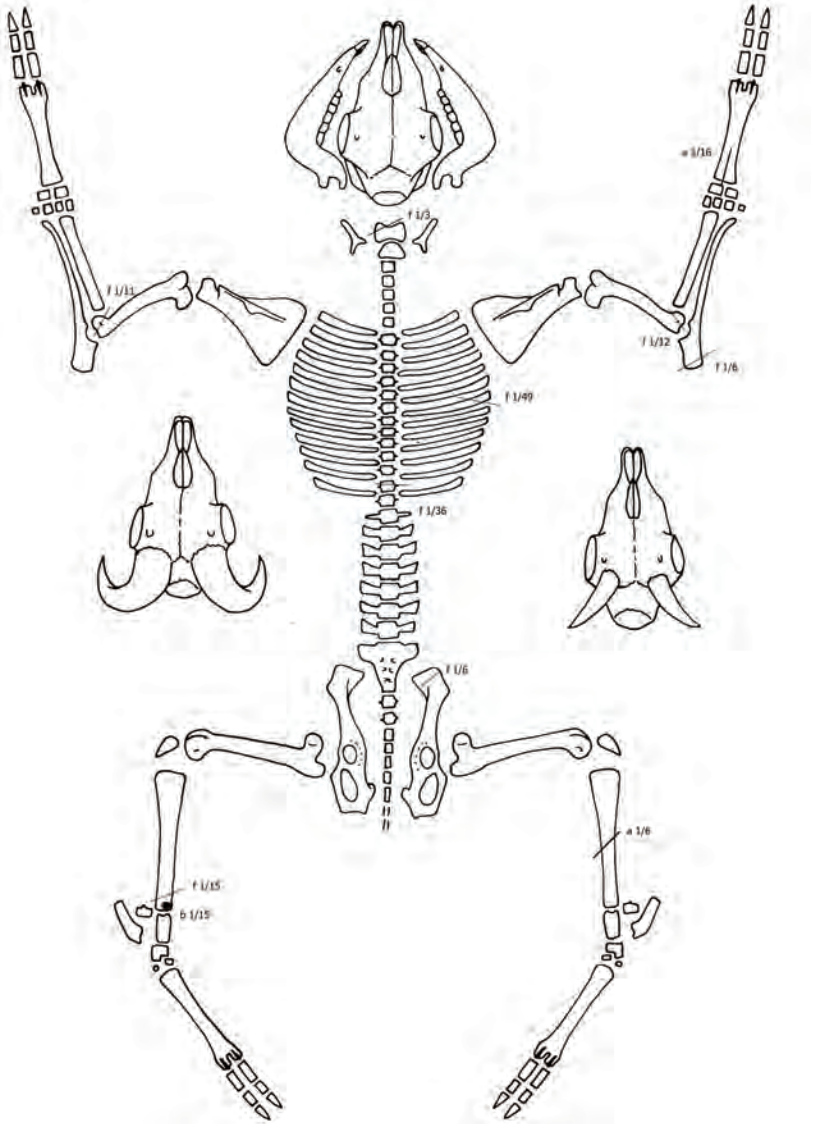

Figure 7. *Anthropic traces related to food activity observed on caprines bones (Ovis aries and Capra hircus) discovered at Alexandria (a – disarticulation, f – defleshing, b – burning, c – skinning). The figures indicate the ratio between anatomical elements with taphonomic traces and the total identified. Species descriptive sheet follows Helmer (1987)*[26].

[26] Helmer 1987.

Pig (*Sus domesticus*). Similar to caprines, there are only a few taphonomic traces. Skinning marks were identified on the mandible, defleshing and butchering marks on the axial skeleton, defleshing marks around the glenoid cavity of the scapula, and disarticulation marks on the acetabular cavity of the coxal. Also, observed were defleshing and disarticulation marks on the diaphyses and distal extremities of long bones (humerus and tibia). Fine cut marks attesting to skinning were noted on the astragalus and first phalanx (Fig. 8).

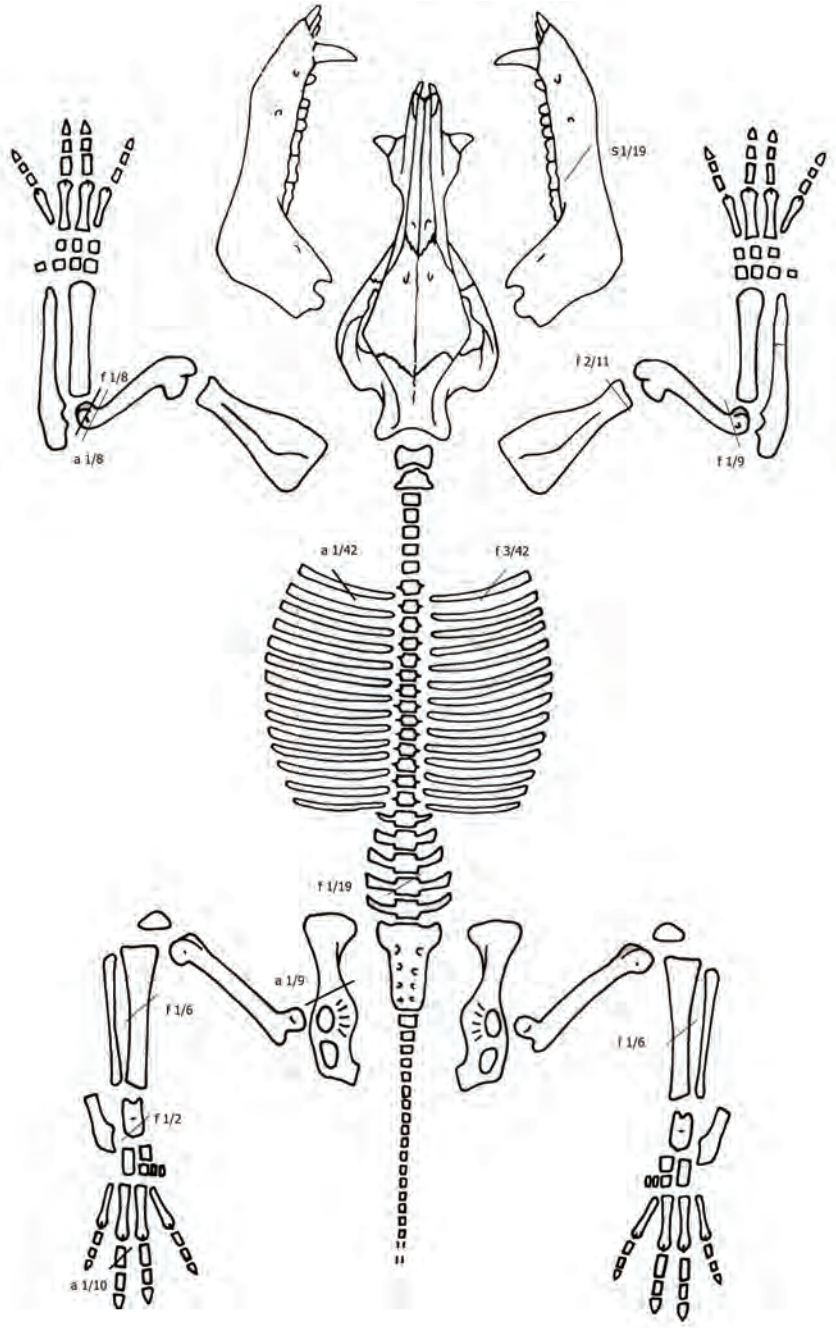

Figure 8. *Anthropic traces related to food activity observed on pig (Sus domesticus) bones discovered at Alexandria (a – disarticulation, f – defleshing, b – burning, s – skinning). The figures indicate the ratio between anatomical elements with taphonomic traces and the total identified. Species descriptive sheet follows Helmer (1987)*[27].

[27] Helmer 1987.

Dog (*Canis familiaris*). Only two taphonomic traces were identified on the dog: a disarticulation mark on the proximal extremity of a humerus and a defleshing mark above the acetabular cavity on a coxal bone, near the ilium, both meat-rich bones (Fig. 9). The consumption and slaughter of dogs for food were practiced in the Gumelnița culture[28].

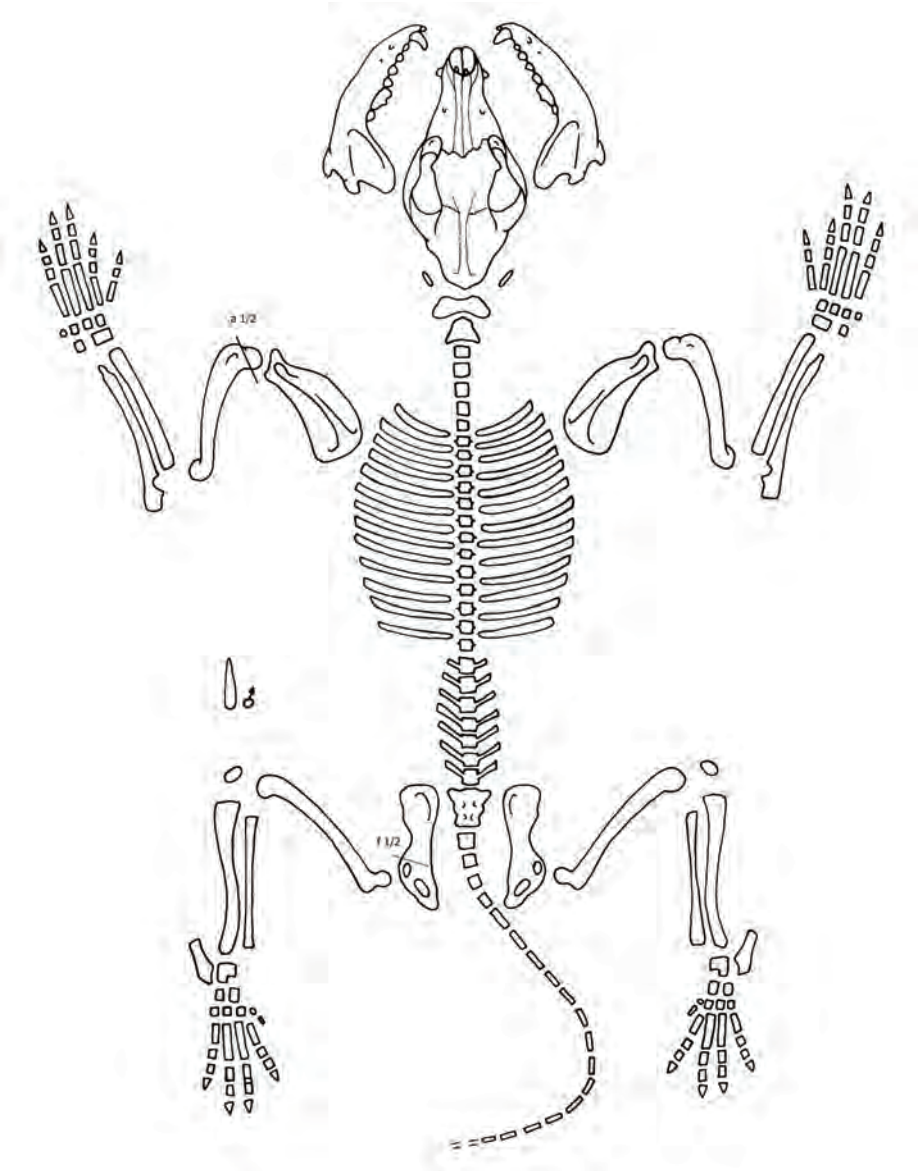

Figure 9. *Anthropic traces related to food activity observed on dog (*Canis familiaris*) bones discovered at Alexandria (a – disarticulation, f – defleshing, b – burning, c – skinning). The figures indicate the ratio between anatomical elements with taphonomic traces and the total identified. Species descriptive sheet follows Helmer (1987)[29].*

ARCHAEOZOOLOGICAL COMPARISONS WITH OTHER GUMELNIȚA A1 SITES

The Gumelnița A1 cultural phase has benefited from a few archaeozoological analyses to date, with only the sites of Vlădiceasca[30] (475 mammalian remains) and Palazu Mare (1,004 remains) being mentioned[31] (Fig. 10). Although Palazu Mare lies in a geographically and climatically different region from Muntenia, on the shore of a lake (Siutghiol) and near the Black Sea, it is still useful to compare these relatively contemporary sites.

[28] Bălășescu 2014, p. 139.
[29] Helmer 1987.
[30] Bălășescu *et alii* 2005.
[31] Voinea *et alii* 2023.

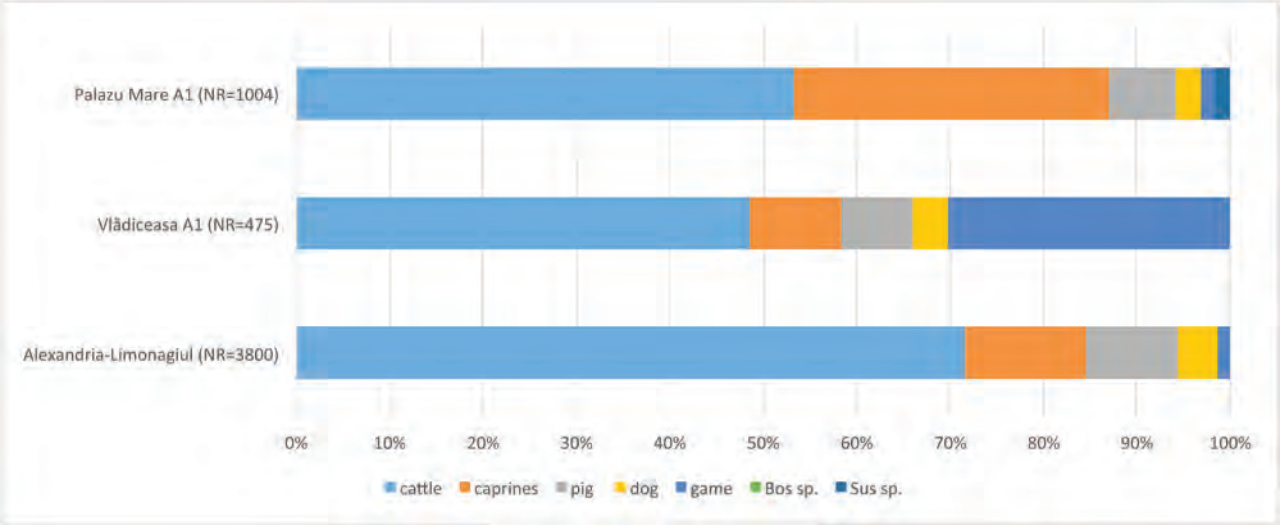

Figure 10. *Numerical and percentage distribution of faunal remains (NR) from Gumelnița A1 sites in Romania.*

Differences are noted between the Alexandria – *Limonagiul* site and those at Vlădiceasca and Palazu Mare. The proportion of domestic animals is high in all cases: varying between 98.66% (Alexandria) and 69.68% (Vlădiceasca). The most intensively exploited species are cattle, which vary between 71.64% at Alexandria and 48.63% at Vlădiceasca. Caprines occupy second place: from 33.67% at Palazu Mare to 9.68% at Vlădiceasca.

What stands out in the comparison between the Muntenia sites (Alexandria and Vlădiceasca) and Dobrogea (Palazu Mare) is the relatively increased proportion of caprines in Dobrogea, which appears to be a characteristic of the area, observed throughout the entire chronological sequence of the Dobrogean Neo-Eneolithic. Pigs rank third: between 9.84% at Alexandria and 7.17% at Palazu Mare. Dogs have low proportions everywhere, between 4.21% at Alexandria and 2.79% at Palazu Mare.

In the Alexandria and Palazu Mare sites, game has an almost negligible proportion (1.34% and 1.63% respectively) unlike Vlădiceasca, where it reaches 30.32%. The list of wild taxa is relatively rich, comprising nine species: aurochs, red deer, roe deer, wild boar, horse, wolf, fox, mustelids, and hare. The fewest taxa were identified at Palazu Mare (five), followed by Alexandria (eight) and Vlădiceasca (nine) (Tab. 1).

EVOLUTION OF ANIMAL PALAEOECONOMY IN THE VEDEA AND TELEORMAN VALLEYS

Since the Vedea Valley is extremely close to the Teleorman Valley (7.5 km), a comparison was made with the latter. In the already studied sites in the Teleorman Valley[32], a predominance of domestic species is observed, especially in the first part of the Neolithic (Fig. 11). The Alexandria site stands out with the highest percentage of domestic animals (98.68%) compared with the other settlements.

Given the relatively low number of remains from each site attributed to the Boian–Spanțov culture (TELEOR 001, TELEOR 008, TELEOR 009, and CLA 002), it was appropriate to combine them into a single sample to obtain a more consistent analytical basis.

Different strategies regarding species exploitation across cultural phases are observed. In the early Neolithic, cattle predominated: 54.92% in the Precriș culture, 45.68% in Starčevo-Criș, and approximately 70% in the Dudești and Vădastra cultures. The percentage then drops to 29.20% in Boian–Giulești, only to increase again to about 76.32% in Boian–Spanțov[33]. At the beginning of the Gumelnița culture (phase A1), cattle categorically dominate the faunal spectrum (71.69% at Alexandria), but in phase A2, they drop sharply to 11.61%, and later rise to 23.02% in phase B1 at Vitănești (Fig. 12).

[32] Bălășescu 2014.
[33] Bălășescu 2014.

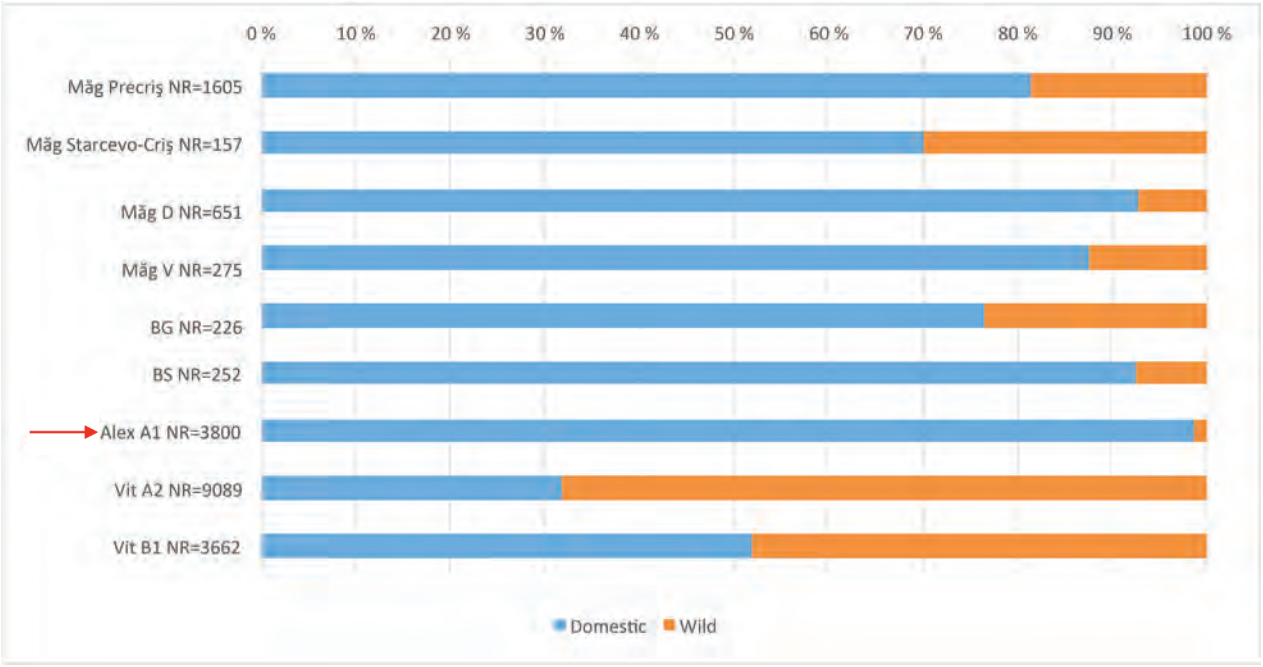

Figure 11. *Percentage distribution by mammal categories discovered in the Teleorman Valley by cultures (NR = number of remains corresponding to each site); Legend: Măg Precriș = Măgura Boldul lui Moș Ivănuș (Precriș culture); Măg Starčevo-Criș = Măgura Buduiasca (Starčevo-Criș culture); Măg D = Măgura Buduiasca (Dudești culture); Măg V = Măgura Buduiasca (Vădastra culture); BG = Boian-Giulești culture; BS = Boian-Spanțov culture; Alex A1 = Alexandria, Limonagiul site (Gumelnița phase A1); Vit A2 = Vitănești (Gumelnița phase A2); Vit B1 = Vitănești (Gumelnița phase B1).*

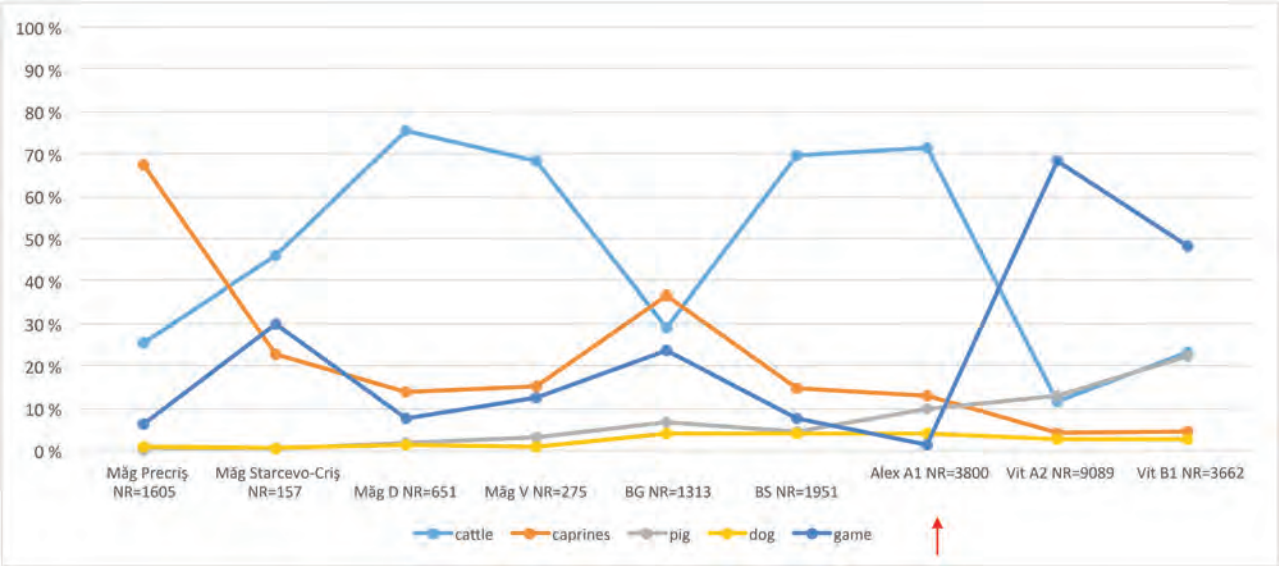

Figure 12. *Percentage distribution of the number of remains (NR) of domestic mammals in the Teleorman Valley across different Neo-Eneolithic cultures. Legend – Figure 11.*

Caprines show the opposite evolution to cattle. In early cultures (Precriș), they reach high percentages (up to 67%), then decline in Dudești (13.67%) and Vădastra (15.27%). In Boian–Giulești, they rise to approximately 37%, but subsequently drop again: about 13% at Alexandria and only 4% in both cultural phases at Vitănești (A2 and B1) (Fig. 12).

Pigs show a gradual increase from the beginning of the Neolithic until nearly the end of the Gumelnița culture. In early phases (Precriș and Starčevo-Criș), they have very low values (approximately 1%), but in the Gumelnița

culture, a process of sedentism is observed, with percentages of 10% at Alexandria, 13% in phase A2, and up to 22% in phase B1 (Fig. 12).

The dog is constantly present in the palaeoeconomy, but with low percentages: 1%–2% in the Precriș, Dudești, and Vădastra cultures, about 4% in Gumelnița A1 and 2% in phases A2 and B1.

The most interesting aspect of the comparison is the significant increase in the proportion of hunting. While in previous cultures (Starčevo-Criș and Boian–Giulești) it did not exceed 30%, in the Vitănești A2 phase it abruptly rises to 68.34%. The number of taxa increases proportionally to the community's interest in this food resource. Thus, up to five wild species are present in the Boian culture; seven in Dudești; eight in Starčevo-Criș and Vădastra; nine at Alexandria, and between 14 and 17 species in Gumelnița A2 and B1. It is notable that, although the number of taxa at Alexandria is high, their economic importance is much lower than at Vitănești (Fig. 12).

The Alexandria settlement resembles the Boian-Spanțov sites more than the Gumelnița sites in the Teleorman Valley in terms of animal exploitation. Until recently, archaeozoological data for the Gumelnița A1 phase in Teleorman County were non-existent; this analysis now allows a new image of faunal resource management strategies to be outlined.

BIOMETRIC DATA

From a biometric perspective, only a small number of osteological remains were analysed (Annex 3). To contextualise these results, the widths of several anatomical segments belonging to different species that provided a sufficient number of remains were compared. These were measured against other values from various Neolithic settlements to establish correspondences and differences with the material discovered at Alexandria, Limonagiul site.

Cattle

Based on a metatarsus, a height at the withers (Matolcsi's indices)[34] of 126.77 cm was estimated for a female (Annex 3). The obtained value is higher than the average value of female specimens from other Neolithic cultures[35]. However, given the singular nature of this determination, the value cannot be interpreted as indicating an upward trend in cattle size. Overall, compared to other available biometric data, this female bovine from Alexandria, at the Limonagiul site, exhibits a more gracile morphology than specimens from the beginning of the Neolithic, being similar to those from the Dudești and Hamangia cultures. At the same time, it is more robust than the specimens from Boian and Gumelnița and more gracile than those from Cernavodă[36].

The other bone-width values fall within the known ranges for the Gumelnița culture. The only notable difference is represented by the distal width of the radius (Bd), where the mean values from Alexandria exceed all previously determined means, but this fact can also be attributed to sexual dimorphism, which is relatively pronounced in this species. In this case, these larger values can be interpreted as belonging to males.

Sheep

The discovery of two whole osteological pieces allowed for the estimation of the height at the withers for sheep (Teichert's indices)[37]: one metacarpus provided a height of 50.98 cm, and an astragalus – 56.65 cm (Annex 3). Compared to other Gumelnița culture data, both heights are below the average values known in this culture[38]. Regarding the other biometric data, especially the distal width of the tibia, the values obtained at Alexandria are also below the averages recorded in other Neo-Eneolithic sites, suggesting a more gracile character of the specimens identified in this context.

Pigs

For pigs, the distal width of the humerus (Bd), the proximal width of the radius (Bp), and the acetabular length were analysed and compared with values reported for Vitănești[39], Borduşani – *Popină*[40], and Hârşova – *tell*[41]. The values obtained at Alexandria exceed the means recorded in the three settlements. These results may suggest a slight local morphological variation of the pig specimens, possibly linked to ecological factors.

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[34] Udrescu *et alii* 1999, p. 79.
[35] Bălăşescu *et alii* 2005, p. 123.
[36] Bălăşescu *et alii* 2005, p. 129–130.
[37] Udrescu *et alii* 1999, p. 79.
[38] Bălăşescu *et alii* 2005, p. 115.
[39] Bălăşescu, Radu 2003.
[40] Bălăşescu *et alii* 2005, p. 101.
[41] Bălăşescu *et alii* 2005, p. 138.

CONCLUSIONS

The Gumelnița culture is well-documented for most of its phases; however, paradoxically, phase A1 has benefited from a few archaeozoological studies to date, only those at Palazu Mare and Vlădicească being notable.

The palaeoeconomy of the Alexandria site is characterised by an overwhelming proportion of domestic animals (98.68%). Among these, cattle categorically dominate by the number of remains, followed by caprines and pigs. In terms of weight, the same situation persists, with pigs taking second place. In the material, mixed slaughtering patterns are observed for both types of ruminants, suggesting that this community used them both for the primary product (meat) and for secondary products, especially milk production and possibly for the reproduction of animal herds. Pigs were raised exclusively for meat, and the high number of remains analysed in this community suggests that the population was sedentary.

Hunting does not play a significant role in the palaeoeconomy of this culture (1.32%), although the number of wild taxa is relatively high (eight).

Overall, the study contributes to filling the knowledge gaps concerning the Gumelnița A1 phase in Southern Romania, providing solid data on faunal exploitation strategies and the dynamics of the human-animal relationship. The Limonagiul site in Alexandria confirms that, even from this early stage, the Gumelnița economy was a complex one, integrating primary and secondary production into a structured system, with minimal involvement of hunting.

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Annex 1. Distribution by anatomical elements of mammalian remains discovered at Alexandria, Limonagiul site.

ANATOMICAL ELEMENTS	*Bos taurus*	*Ovis aries*	*Capra hircus*	caprines	*Sus domesticus*	*Equus ferus*	*Canis familiaris*	*Bos primigenius*	*Cervus elaphus*	*Capreolus capreolus*	*Vulpes vulpes*	*Meles meles*	*Lepus europaeus*	Castor fiber
Antlers									2					
Cranium				1	1									
Neurocranium	214	1	6	4	54		8							
Viscerocranium	114			8	24		8		1					
Upper Teeth	71			47	20		13							1
Mandible	94		2	20	32		12				1		1	1
Lower Teeth	44	1	5	35	14		16							1
Teeth	10				1									
Atlas (C1 vertebra)	25			3	3		1							
Axis (C2 vertebra)	26			3	3		2				1			
Hyoid	15													
Cervical Vertebrae	108			15	12		7				1			
Thoracic Vertebrae	106			36	9		4				1			
Lumbar Vertebrae	115			20	19		10	1			2			
Sacral Vertebrae	38						1							
Caudal Vertebrae	9													
Ribs	425			49	42		27	2			2			
Scapula	63			29	16		1	1				1	1	
Humerus	147	5	4	14	17		7						1	
Radius	98	2	1	31	4		4							
Ulna	43			7	4		4	1					1	1
Radio–Ulna	4	1	1	3										
Carpals	95													
Metacarpus	46	5	2	18	4		12	1	1		2		1	
Pelvis	117			11	21	1	5							
Femur	140			14	8		5			1	1		3	
Patella	13													
Tibie	248			21	12		4				2			
Fibula					5									
Astragalus	22	1	1	3	2									
Calcaneus	36		3	6	1		1	2					4	
Tarsals	7			3					1					
Metatarsus	53	1	1	20	12		4							
Metapodials	18			6	15		4				1			
Phalanx 1	71		2	13	9	1	1			1			1	
Phalanx 2	53			5	6									
Phalanx 3	34			3	2				1					
Lateral Phalanx					2									
TOTAL	**2722**	**17**	**28**	**448**	**374**	**2**	**161**	**8**	**6**	**2**	**14**	**1**	**13**	**4**

Annex 2. Distribution by weight of mammalian remains discovered at Alexandria, Limonagiul site.

ANATOMICAL ELEMENTS	*Bos taurus*	*Ovis aries*	*Capra hircus*	caprines	*Sus domesticus*	*Equus ferus*	*Canis familiaris*	*Bos primigenius*	*Cervus elaphus*	*Capreolus capreolus*	*Vulpes vulpes*	*Meles meles*	*Lepus europaeus*	Castor fiber
Antlers									88					
Cranium	1191			14	5									
Neurocranium	8505	18	200	32	880		42							
Viscerocranium	8153			101	532		106		20					
Upper Teeth	1253			247	76		28							3
Mandible	6572		28	285	907		151				7		3	5
Lower Teeth	589	12	22	119	44		38							3
Teeth					2									
Atlas (C1 vertebra)	2986			58	82		4							
Axis (C2 vertebra)	2146			62	48		21				10			
Hyoid	126													
Cervical Vertebrae	6665			119	115		48				5			
Thoracic Vertebrae	3280			146	96		15				1			
Lumbar Vertebrae	5418			103	369		76	57			6			
Sacral Vertebrae	2171						2							
Caudal Vertebrae	161													
Ribs	5992			120	227		60	39			3			
Scapula	4084			252	382		3	214				8	3	
Humerus	15224	113	94	139	594		70						2	
Radius	8564	32	3	249	76		24							
Ulna	1378			28	66		29	34					4	9
Radio–Ulna	502	14	41	73										
Carpals	2143													
Metacarpus	2658	70	30	117	22		33	172	23		7		1	
Pelvis	7992			105	482	38	29							
Femur	15162			130	209		35			5	8		14	
Patella	410													
Tibie	11520			240	296		30				35			
Fibula					23									
Astragalus	1188		4	11	32									
Calcaneus	2759		28	31	12		4	323					11	
Tarsals	119	5		12					31					
Metatarsus	2998	18	6	193	93		13							
Metapodials	276			20	39		9				2			
Phalanx 1	1741		5	41	39	12	1			3			2	
Phalanx 2	821			12	20									
Phalanx 3	455			7	6				3					
Lateral Phalanx					1									
TOTAL	**135202**	**282**	**461**	**3066**	**5775**	**50**	**871**	**839**	**165**	**8**	**84**	**8**	**40**	**20**

Annex 3 – Biometrics – measurements are in millimeters and their codes follow von den Driesch.

Bos taurus

Cornual process

45	46
29.11	47.41
39.9	45.39
31.09	59.53

Cranium

21
85.39
88.51
79.53

Mandible

L M3	B M3
37.57	14.36

Atlas

GL	BFcr	BFcd	GLF	H
106.6	89.35	76.71	106.79	85.46
111.66	89.06	81.14	47.27	
102.11			91.33	
			110.63	

Axis

LCDe	LAPa	BFcr	BPacd	BPtr	SBV	BFcd	H
94.18	72.55	82.65	57.03	85.26	52.16	42.85	112.06
	82.19	91.66	64.12		53.98		

Scapula

SLC	GLP	LG	BG
57.91	69.39	61.37	55.01
53.39	62		46.87
69.09	80.87		60.44
61.32	77.7		57.92
	70.72	60.07	50.34
	65.98	59.04	43.7
		55.18	49.15

Humerus

Bp	Bd	BT
100.64		
94.03		
	79.34	94.52
	81.98	77.64
	75.96	69.12
	83.96	78.84
	87.71	79.63
	100.09	88

Ulna

BPC
42.87
45.03
44.12

Radius			
Bp	BFp	Bd	BFd
81.38	74.04		
84.83	77.85		
85.06	76.42		
95.74	85.03		
95.71	86.57		
79.12	71.47		
79.94	71.77		
79.04	74.55		
79.14	72.75		
83.21	76.26		
	78.1		
	71.22		
	69.95		
		86.72	
		81.96	52.62

Metacarpus		
Bp	Bd	
59.31		
	74.71	
	56.42	
	73.92	

Coxal	
LA	
58.79	
72.17	
58.66	
65.92	

Femur		
DC	Bd	
49.14		
42.11		
42.51		
45.34		
49.66		
51.34		
42.8		
	99.03	
	96.16	

Tibia		
Bp	Bd	Dd
107.61		
92.01		
89.46		
	61.59	40.21
	60.2	41.63
	58.28	42.88
	70.98	49.69
	62.71	45.05
	60.8	45.14
	54.73	40.99
	59.19	44.31

Centrotarsal

BG
57.17
50.98
54.91
65.39
53.5

Astragalus

GLl	GLm	Dl	Dm	Bd
68.47	62.05	36.92	36.88	46.02
62.28	58.26	36	27.65	38.12
67.36	61.71	36.17	34.12	41.66
58.09	53.74	30.18	29.48	36.55
72.11	65.52	39.92	36.44	47.24
65.17	58.74	32.6	36.76	41.32
71.4	65.78		41.38	46.4

Calcaneus

GL	GB
130.49	40.29
148.74	48.86
133.84	45.94
143.08	41.21

Metatarsus

GL	Bp	SD	CD	DD	Bd	I2	I3
237.84	50.87	26.13	31.33	26.63	58.53	21.39	10.99
	62.92			29.07			
				28.67	55.21		
				24.45	50.48		
					60.35		

Phalanx I

GLpe	Bp	SD	Bd
64.36	32.47	30.32	31.08
62.11	34.1	30.18	31.71
53.72	27.84	23.92	26.56
59.5	30.36	25.96	26.31
56.4	28.78	25.6	27.12
57.84	29.71	26.57	27.34
60.08	28.74	25	28.91
59.76	30.66	25.08	28.57
64.07	29.93	25.7	29.99
62.24	29.55	26.41	29.13
60.85	34.11	30.25	32.97
59.36	27.9	24.58	26.21
57.38	27.72	24.39	26.66
62.5	28.96	25.19	29.14
61.9	26.25	22.53	25.05
61.07	35.07	28.87	31.72
57.96	29.92	27.12	27.46
60.95	34.99	29.87	33.22
61.38	25.67	22.22	24.64
64.71	30.06	26.14	28.08
59.42	29.83	26.18	27.55
60.76	31.82	26.31	

Phalanx II

GL	Bp	SD	Bd
45.44	32.4	26.33	26.55
39.68	29.3	25.41	24.5
38.83	28.9	24.14	22.55
38.23	32.04	27	28.04
36.65	27.63	23.45	24.5
30.83	31.81	26.1	26.16
39.94	31.01	26.23	25.44
41.64	32.34	28.38	29.07
43.54	32.96	27.5	28.43
41.9	33.29	28.48	28.85
42.57	33.72	28.64	27.5
39.15	27.36	22.36	22.64
40.02	30.25	25.12	24.84
39.96	35.03	30.46	29.63
35.4	26.61	20.14	22.16
43.67	32.84	26.34	27.16
38.86	34.15	28.64	28.61
	30.98		
	29.83		24.97

Phalanx III

DLS	Ld	MBS
58.48	49.83	20.43
67.96	57.42	22.38
74.42	56.67	24.19
75.68	56.68	22.12
67.34	54.57	23.94
63.86	54.58	24.38
73.27	58.41	25.03

Ovis aries

Radius

BFp
31.63

Metacarpus

GL	Bp	SD	CD	DD	Bd
104.26	24.69	15.98	10.36	9.25	27.58
				9.67	20.31

Tibia

Dd	Bd
24.09	17.78

Astragalus

GLl	GLm	Dl	Dm	Bd
24.98	26.16	15.84	15.27	18.77

Capra hircus

Metacarpus	
Bp	SD
27.63	12.21
Tibia	
Bd	Dd
24.85	19.35
23.5	18.21

Sus domesticus

Scapula
SLC
21.22
24.63

Humerus
Bd
40.5

Radius
Bp
30.57

Coxal
LA
36.05

Femur	
Bp	DC
60.03	25.23

Phalanx I			
Glpe	Bp	SD	Bd
34.65	15.92	12.54	14.47
34.64	15.53	12.08	14.76

Canis familiaris

Cranium
16
14.56

Cranium	
L P4	B P4
11.97	5.37

Mandible	
L M2	B M2
7.69	5.99

Mandible				
9	10	12	L M1	B M1
66.57	31.97	35.21	16.47	6.06

Metacarpus III

GL	Bd
49.16	5.69
54.45	5.81

Metacarpus IV

GL	Bd
50.27	6.07

Tibia

SD	CD	Bd	Dd
11.39	9.81	18.72	13.55

Metatarsus III

GL	Bd
45.32	6.26

Lepus europaeus

Calcaneus

GL	GB
36.61	12.91
37.14	13.05
36.19	13.17

Metacarpus II

GL	Bd
38.96	4.75

Photo 1. *Cattle (*Bos taurus*) humerus, left side with disarticulation marks.*

Photo 2. *Goat (*Capra hircus*) cornual process.*

Photo 3. *Pig (*Sus domesticus*) scapula, right side.*

Photo 4. *Dog (*Canis familiaris*) mandible, left side.*

Photo 5. *Red deer (*Cervus elaphus*) metacarpal, left side.*

Photo 6. *Wild horse (*Equus ferus*) phalanx.*

Photo 7. *Fox (*Vulpes vulpes*) mandible, right side.*

Photo 8. *Hare (*Lepus europaeus*) mandible, right side.*

Photo 9. *Beaver (Castor fiber) ulna, left side.*

ABREVIERI / ABRÉVIATIONS / ABBREVIATIONS

AA – Archäologischer Anzeiger. Deutsches Archäologisches Institut, Darmstadt, München, Tübingen–Berlin
(A)ARMSI – Analele Academiei Române. Memoriile Secțiunii Istorice, București
ACD – Acta Classica Universitatis Scientiarum Debrecenensis, Debrecen
ActaArchHung – Acta Archaeologica Academiae Scientiarum Hungaricae, Budapest
ActaHistArt – Acta historiae artium Academiae scientiarum Hungaricae, Akadémiai Kiadó, Budapesta
ActaMN – Acta Musei Napocensis, Cluj-Napoca
ActaMP – Acta Musei Porolissensis, Zalău
AÉ – L'Année épigraphique, Paris.
AIIA Iași – Anuarul Institutului de Istorie și Arheologie „A. D. Xenopol", Iași
AIIC – Anuarul Institutului de Istorie „George Barițiu", Cluj
AJBA – American Journal of Biological Anthropology
AJPA – American Journal of Physical Anthropology
AK – Archaeologiai Közlemények, Pest
AnSt – Anatolian Studies, British Institute of Ankara
AnUCDC – Analele Universității Creștine „Dimitrie Cantemir"
AnUVT – Annales d'Université « Valahia » Târgoviște, Section d'Archéologie et d'Histoire
AO – Arhivele Olteniei, Craiova
ArchBulg – Archaeologia Bulgarica, Sofia
ArchÉrt – Archaeológiai Értesítő, Budapest
Argesis – Argesis. Muzeul Județean Argeș. Pitești
ArhMed – Arheologia Medievală
ArhMold – Arheologia Moldovei, Iași
AȘUI – Analele Științifice ale Universității „Alexandru Ioan Cuza", Iași
Az Érem – Az Érem kiadványai, Budapest
Banatica – Banatica. Muzeul Banatului Montan, Reșița
BARBrSer – British Archaeological Reports. British Series, Oxford
BARIntSer – British Archaeological Reports. International Series, Oxford
BCMI – Buletinul Comisiunii Monumentelor Istorice
BerRGK – Bericht der Romisch-Germanische Kommission des Deutschen Archaeologischen Instituts, Frankfurt am Main
BiblIstroPontica-P – Biblioteca Istro-Pontica. Seria Patrimoniu, Tulcea
BJ – Bonner Jahrbücher – Bonner Jahrbücher des Rheinischen Landesmuseums in Bonn, Bonn
BMC – *Coins of the Roman Empire in the British Museum*, Londra: 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).
BMI – Buletinul Monumentelor Istorice, București
BMJT – Buletinul Muzeului Județean Teleorman, Alexandria
BSNR – Buletinul Societății Numismatice Române, București
Buridava – Buridava. Studii și materiale, Muzeul Județean „Aurelian Sacerdoțeanu", Râmnicu Vâlcea
CA – Cercetări Arheologice. Muzeul Național de Istorie a României, București
Caiete ARA – Caiete ARA. Asociația Arhitectură, restaurare, arheologie, București
Carpica – Carpica. Complexul Muzeal „Iulian Antonescu" Bacău
CCA – Cronica Cercetărilor Arheologice din România
CEpR – Cronica Epigrafică a României
CercIst – Cercetări Istorice, Iași
CICSA – Centrul de Istorie Comparată a Societăților Antice, Facultatea de Istorie, Universitatea din București
CIL – *Corpus Inscriptionum Latinarum*, I-XVII, Berlin
CN – Cercetări Numismatice. Muzeul Național de Istorie a României, București
CNM, V.1 – *Corpus Nummorum Moldaviae*, vol. V.1, Chișinău
CRAI – Académie des inscriptions et belles-lettres. Comptes rendus des séances de l'année ...
Crisia – Crisia. Muzeul Țării Crișurilor, Oradea

Dacia – Dacia / Dacia Nouvelle Série. Revue d'archéologie et d'histoire ancienne. Académie Roumaine. Institut d'archéologie « V. Pârvan », Bucarest
Danubius – Danubius. Revista Muzeului de Istorie Galați
DHA – Dialogues d'histoire ancienne, Institut des Sciences et Techniques de l'Antiquité
Documenta Praehistorica – Documenta Praehistorica, University of Ljubljana, Faculty of Arts, Department of Archaeology, Ljubljana
EphemDac – Ephemeris Dacoromana, Roma
EphemNap – Ephemeris Napocensis, Cluj-Napoca
ERSIR – *Enciclopedia reprezentanților scrisului istoric românesc*, I – V, V. Spinei, D. N. Rusu (coord.), Suceava, 2021
FolArch – Folia Archaeologica. A Magyar Nemzeti Múzeum Évkönyve. Annales Musei Nationalis Hungarici, Budapest
Fontes I – *Fontes Historiae Daco-Romanae – Izvoarele istoriei României*, I, București, 1964
Fontes II – *Fontes Historiae Daco-Romanae – Izvoarele istoriei României*, II, București, 1970
FSI – Forensic Science International
Glasnik– Glasnik. Srpsko Arheološko Društvo (Journal of the Serbian Archaeological Society), Belgrad
Hierasus – Hierasus. Muzeul Județean Buzău
HOMO – HOMO. Journal of Comparative Human Biology, Stuttgart
Ialomița – Ialomița. Studii de cercetări de arheologie, istorie, etnografie și muzeologie, Slobozia
IDRE – C. C. Petolescu, *Inscriptiones Daciae Romanae. Inscriptiones externae – Inscriptions externes concernant l'histoire de la Dacie*, I-II, București, 1996-2000
IGB – G. Mihailov, *Inscriptiones grecae in Bulgaria repertae*, vol. I-V, Sofia, 1956-1970
IGLR – E. Popescu, *Inscripțiile grecești și latine din secolele IV–XIII descoperite în România*, București, 1976
IGRR – *Inscriptiones Graecae ad Res Romanas pertinentes*, publiées par R. Cagnat, J. Toutain, G. Lafaye, Paris, 1906-1927
IJP – International Journal of Paleopathology
ISM – *Inscriptiones Daciae et Scythiae Minoris antiquae*. *Series altera: Inscriptiones Scythiae Minoris Graecae et Latinae – Inscripțiile din Sythia Minor*: I. *Inscriptiones Histriae et vicinia – Histria și împrejurimile* (Dionisie M. Pippidi), București, 1983; II. *Tomis et territorium – Tomis și teritoriul său* (Iorgu Stoian), București, 1987; III. *Callatis et territorium – Callatis et son territoire* (Alexandru Avram), București – Paris, 1999; IV. *Tropaeum – Durostorum – Axiopolis* (Emilian Popescu), București – Paris, 2015 ; V. *Capidava – Troesmis – Noviodunum* (Emilia Doruțiu-Boilă), București, 1980; VI.2. *Supplementa 2. Tomis et territorium – Tomis et son territoire* (Alexandru Avram, Maria Bărbulescu, Livia Buzoianu), București – Paris, 2018
Istros – Istros. Muzeul Brăilei „Ferdinand I", Brăila
IzvestijaVarna – Izvestija na Narodnija Muzej (Izvestija na Varnenskoto Arheologičesko Družestvo), Varna
JAHA – Journal of Ancient History and Archaeology, Cluj-Napoca
JAS – Journal of Archaeological Science, Amsterdam
JAT – Journal of Ancient Topography
JFS – Journal of Forensic Studies
JITE – Journal of Institutional and Theoretical Economics
JHE – Journal of Human Evolution
LRBC – *Late Roman Bronze Coinage A.D. 394-498*, Londra, 1965: I, *The Bronze Coinage of the House of Constantine A.D. 324–346* (P. V. Hill, J. P. C. Kent); II, *Bronze Roman Imperial Coinage of the Later Empire A.D. 346–498* (R. A. G. Carson, J. P. C. Kent).
MarNero – Il Mar Nero. Annali di archeologia e storia, Roma
MemAnt – Memoria Antiquitatis, Piatra Neamț
Marmatia – Marmatia. Muzeul Județean de Istorie și Arheologie Maramureș, Baia Mare
MCA – Materiale și Cercetări Arheologice, București
MCSEE – Monedă și comerț în Sud-Estul Europei, Sibiu
MEFRM – Mélanges de l'Ecole française de Rome. Moyen Âge, Rome
MER – *Catalogue des monnaies de l'Empire romain*. II. J.-B. Giard, *De Tibère à Néron*, Paris, 1988 ; III. J.-B. Giard, *Du soulèvement de 68 après J.-C. à Nerva*, Paris-Strasbourg, 1998
MFMÉ-SA – A Móra Ferenc Múzeum Évkönyve – Studia Archaeologica, Szeged
MIR – *Moneta Imperii Romani*. 14. B. Woytek, *Die Reichsprägung des Kaisers Traianus (98–117)*, I–II, Wien, 2010; 18. W. Szaivert, *Die Münzprägung der Kaiser Marcus Aurelius, Lucius Verus und Commodus (161–192)*, Wien, 1986.
Mousaios – Mousaios. Buletinul Științific al Muzeului Județean Buzău
MuzNaț – Muzeul Național, Muzeul Național de Istorie a României, București
Numizmatičar – Numizmatičar. Casopis za anticki i stari jugoslovenski novac, Belgrad

Numizmatikai Közlöny – Numizmatikai Közlöny. A Magyar Numizmatikai Társulat, Akadémiai Kladó, Budapest
NZ – Numismatische Zeitschrift, Viena
Oltenia – Oltenia. Studii și Comunicări, Craiova
Paléorient – Paléorient: revue interdisciplinaire de préhistoire et de protohistoire du sud-ouest et de l'Asie centrale, Paris
PBF – Prähistorische Bronze Funde, München – Stuttgart
Peuce – Peuce. Studii și cercetări de istorie și arheologie, Institutul de Cercetări Eco-Muzeale „Gavrilă Simion", Tulcea
PME – H. Devijver, *Prosopographia militiarum equestrium quae fuerunt ab Augusto ad Gallienum*, Leuven, I (A–I, 1976), II (I–V, 1977), III (1980; indici)
Pontica – Pontica. Studii și materiale de istorie, arheologie și muzeografie, Muzeul de Istorie Națională și Arheologie, Constanța
Przeglad Archaeologzny – Przeglad Archaeologzny, Institut Archeologii i Etnologii Polskiej Akademii Nauk, Wroclaw
PZ – Prähistorische Zeitschrift, Institut fur Prähistorische Archäologie, Berlin
RAASI – Revista de Arheologie, Antropologie și Studii Interdisciplinare, Institutul de Cercetări Bioarheologice și Etnoculturale, Republica Moldova
RAN – Repertoriul Arheologic Național / National Archaeological Repository
RCAN – Revista de Cercetări Arheologice și Numismatice, București
RESEE – Revue des Études Sud-Est Européennes. Academia Română. Institutul de Studii Sud-Est Europeene, București
RevArh – Revista Arheologică, Chișinău
RGZM – Barbara Pferdehirt, *Römische Militärdiplome und Entlassungsurkunden in der Sammlung des Römisch-Germanischen Zentralmuseums*, Mainz, I-II, 2004
RI – Revista Istorică. Institutul de Istorie „Nicolae Iorga", București
RIC – *The Roman Imperial Coinage*, Londra: I^2, *From 31 BC to AD 69*, 1984 (C. H. V. Sutherland); II, *Vespasian to Hadrian*, 1926 (H. Mattingly, E.A. Sydenham); II.1, *From AD 69–96. Vespasian to Domitian*, 2007 (I. A. Carradice, T.V. Buttrey); II.3, *From AD 117–138. Hadrian*, 2019 (R.A. Abdy, P.F. Mittag); III, *Antoninus Pius to Commodus*, 1930; IV.1, *Pertinax to Geta*, 1968 (H. Mattingly, E.A. Sydenham); IV.2, *Macrinus to Pupienus*, 1938; IV.3, *Gordian III – Uranius Antoninus*, 1949 (H. Mattingly, E. A. Sydenham, C. H. V. Sutherland); V.1, 1927 (reimprimat 1968; P. H. Webb); VII, *Constantine and Licinius A.D. 313–-337*, 1966 (P.M. Bruun); VIII, *The Family of Constantine I A.D. 337–364*, 1981; X, *The Divided Empire and the Fall of the Western Parts A.D. 395–491*, 1994 (J.P.C. Kent)
RMD – Margaret M. Roxan, *Roman Military Diplomas*, London: I. *Roman Military Diplomas 1954–1977*, 1978; II. *Roman Military Diplomas 1978–1984*, 1985; III. *Roman Military Diplomas 1985–1993*, 1994; Margaret M. Roxan, P. Holder, *Roman Military Diplomas* IV, 2003; P. Holder, *Roman Military Diplomas* V, 2006
RMM-MIA – Revista Muzeelor și Monumentelor – Monumente Istorice și de Artă, București
Romanoslavica – Romanoslavica. Asociația Slaviștilor din România, București
RPC – *Roman Provincial Coinage*, Oxford (https://rpc.ashmus.ox.ac.uk/search/map?volume_id=)
RPC, VII.2 – *Roman Provincial Coinage.* VII.2. *From Gordian I to Gordian III (AD 238–244): all provinces except Asia, Londra/ Paris, 2022 (*J. Mairat, M. Spoerri Butcher, cu contribuția M. Amandry, R. Bland, K. Butcher, J. Nurpetlian, U. Peter).
RRH – Revue Roumaine d'Histoire, Bucarest
SAA – Studia Antiqua et Archaeologica, Iași
SCIA.AP – Studii și Cercetări de Istoria Artei. Seria Artă Plastică
SCIV(A) – Studii și Cercetări de Istorie Veche (și Arheologie), București
SCN – Studii și Cercetări de Numismatică, București
SHA – *Scriptores Historiae Augustae*, Teubner, Leipzig, 1965
Simpozion Chișinău 2003 – *Simpozion de numismatică dedicat Centenarului Societății Numismatice Române (1903–2003), Chișinău, 26–28 noiembrie 2003*, București, 2005.
SMIM – Studii și Materiale de Istorie Medie. Institutul de Istorie „Nicolae Iorga", București
SMMIM – Studii și Materiale de Muzeografie și Istorie Militară, București
SNGCop 2 – *Sylloge Nummorum Graecorum. The Royal Collection of Coins and Medals, Danish Royal National Museum*, Copenhaga, 1942–1969 (serie reeditată); II, *Thrace and Macedonia*, West Milford, 1982.
SP – Studii de Preistorie, București
StCl – Studii Clasice, București
StratumPlus – Stratum Plus, Școala Superioară de Antropologie, Chișinău, St Petersburg, București
Suceava – Suceava. Anuarul Muzeului Național al Bucovinei, Suceava
SympThrac – Symposia Thracologica, București
Syria – Syria. Archéologie, art et histoire. Institut Français du Proche-Orient
TdE – Trabajos de Egiptología. Papers on Ancient Egypt, Universidad de La Laguna, Tenerife, Spania

Th-D – Thraco-Dacica, București
Tyragetia – Tyragetia. Anuarul Muzeului Național de Istorie a Moldovei, Chișinău
VAH – Varia Archaeologica Hungarica V. Redigit Csanád Bálint. Publicationes Instituti Archaeologici Academiae Scientiarum Hungaricae, Budapest
Valachica – Valachica. Studii și cercetări de istorie și istoria culturii, Complexul Muzeal Național „Curtea Domnească”, Târgoviște
ZPE – Zeitschrift für Papyrologie und Epigraphik, Bonn
ZRVI – Zbornik radova Vizantološkog instituta. The Institute for Byzantine Studies. Serbian Academy of Sciences and Arts, Belgrad