ARCHAEOZOOLOGICAL DATA ON THE ENEOLITHIC SETTLEMENT AT TOPOLIȚA (NEAMȚ COUNTY, ROMANIA)

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Abstract:
This paper presents the archaeozoological study of a sample recovered from the Early Eneolithic site of Precucuteni culture, at Topolița (Neamț County, Romania). The animal remains are described in terms of anatomical and taxonomic identifications, quantification, age and sex estimations, osteometry, and taphonomic evaluation. Domestic species dominate the assemblage (94.16%), including cattle, sheep/goat, pig, and dog, while wild mammals (4.79%) are less represented (e.g., wild horse, roe deer, red deer, wild boar, aurochs, brown bear). The archaeozoology data reflect a subsistence economy focused on animal husbandry, with limited hunting. Most animal individuals were slaughtered at immature stages. The nature and distribution of taphonomic traces indicate that the faunal remains represent household waste resulting from food processing and consumption activities. The results contribute with valuable insights into food economy and resource exploitation strategies in Eneolithic communities of eastern Subcarpathians.
Keywords: *animal skeletal remains; Eneolithic; Precucuteni Culture; Eastern Romania.*

I. INTRODUCTION

The Subcarpathian region of Eastern Romania is well known for its numerous archaeological sites attributed to the Eneolithic, particularly of Precucuteni and Cucuteni cultures. While the Cucuteni sites have consistently benefited from systematic investigations, the number of excavated Precucuteni settlements is limited. However, we mention a synthesis of archaeozoological studies[1] including data on several sites of Precucuteni culture – Andrieșeni[2],

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[1] BEJENARU, STANC 2013: 44-48.

[2] COROLIUC 2009.

Isaiia[3], Mândrișca[4], Târgu Frumos[5], Târpești[6], Traian-*Dealul Viei*[7]. In this context, the present study focuses on the analysis of the faunal assemblage recovered from the Precucuteni site at Topolița (Grumăzești Commune, Neamț County) (Fig. 1), during the 2019-2023 archaeological campaigns[8]. This study aims to reconstruct subsistence strategies, animal exploitation practices, and the ecological setting of the community, based on archaeozoology.

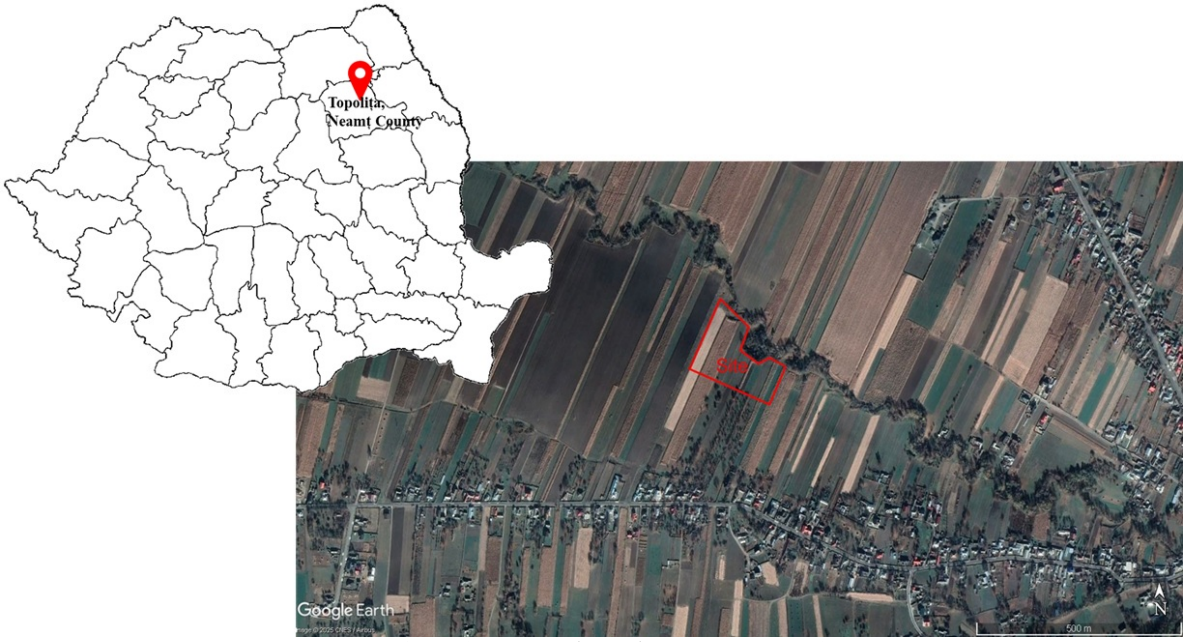


Fig. 1. Location of Topolița-*La Nord-Vest de Sat* archaeological site.

II. Archaeological background

Situated on the interfluve between the Valea Seacă stream and the Topolița River, the archaeological site of Topolița-*La Nord-Vest de Sat* reveals multiple phases of occupation, from the Neolithic to the 4th century AD. The most substantial materials belong to the Precucuteni culture (5th millennium BC), being identified through geophysical surveys and systematic excavations. To date, the materials of seven Eneolithic and one Sântana de Mureș culture (4th century AD) dwellings have been investigated, along with a wide range of other features (e.g., pits, hearths).

From the Eneolithic levels of the site, a complex assemblage of artefacts has been recovered, including pottery, lithic tools, anthropomorphic and zoomorphic figurines, as well as faunal remains. The animal skeletal remains have been identified in the immediate vicinity of the dwellings, in certain cases occurring in dense concentrations of waste that could indicate refuse areas.

[3] HAIMOVICI, TENCARIU 2004: 301-316; COROLIUC 2009; CREȚU *et al.* 2021: 13-20.
[4] COROLIUC 2009.
[5] COROLIUC 2009.
[6] NECRASOV, ȘTIRBU 1981: 174-187.
[7] NECRASOV, BULAI-ȘTIRBU 1965: 19-28; NECRASOV, HAIMOVICI 1970: 59-66.
[8] DIACONU 2020: 392-297.

The Eneolithic settlement at Topolița is of significant scientific importance, as it provides key data for outlining the characteristics of these communities (phases II and III), their relationship with the surrounding environment, and their interactions with neighbouring contemporary populations. It is worth noting that only 6 km to the west lies the renowned site of Târpești, where large-scale excavations in the previous century uncovered substantial evidence of Precucuteni habitation, including archaeozoological ones[9].

The archaeozoological study of the faunal sample recovered in the archaeological site of Topoliţa-*La Nord-Vest de Sat* is part of a broader project aimed at a multidisciplinary approach to Eneolithic materials. So far, this project has also included pedological analyses[10] and investigations into ceramic technology[11].

III. Material and methods

The faunal remains analysed in this work (i.e., bone fragments, teeth, and horn cores) were recovered during the 2019-2023 archaeological campaigns in the Topoliţa-*La Nord-Vest de Sat* site. The analysed animal remains are dated according to archaeological artefacts to Eneolithic Precucuteni culture.

Archaezoological study was carried out at the Archaeozoology Laboratory of the Faculty of Biology, "Alexandru Ioan Cuza" University of Iași. Anatomical and taxonomic identifications were carried out using the reference comparative osteological collection and comparative anatomy atlases[12]. Quantification of remains was expressed by the number of identified specimens (NISP), and minimum number of individuals (MNI).

Estimation of slaughter ages was conducted mainly through dental analysis[13], considering both the timing of replacement of deciduous teeth by the permanent dentition and the degree of wear observed in the latter one[14]. This information was correlated with the stage of epiphyseal fusion in long bones, when such data were available, to obtain the most accurate possible age estimates[15]. Considering biological age (i.e. the age at which sexual maturity occurs), the limit between immature and mature for the main domestics was set to 2.5 years for cattle, 1.5 years for sheep/goat and 13 months for pig[16]. Due to the high degree of fragmentation of the skeletal material, the sex estimation was possible only for a single *Bos taurus* specimen, identified as female based on the horn morphology.

Several better-preserved specimens allowed for osteological measurements (in mm) following the guidelines of von den Driesch (1976)[17], which also allowed for the distinction between domestic and wild forms of some species (i.e., *Bos taurus*/*Bos primigenius*, and *Sus*

[9] NECRASOV, ȘTIRBU 1981: 174-187.
[10] PÎRNĂU *et al.* 2022: 1-14.
[11] ION *et al.* 2023: 488.
[12] GHEȚIE *et al.* 1954: 772.
[13] SCHMIDT 1972.
[14] UDRESCU, BEJENARU, HRIȘCU 1999: 59-62.
[15] BARONE 1976: 296.
[16] UDRESCU, BEJENARU, HRIȘCU 1999: 54.
[17] DRIESCH 1976.

domesticus/Sus scrofa). The poor state of preservation of the material prevented the estimation of withers height, as complete long bones required for standard osteometric formulas were absent.

Taphonomic analysis watched for various types of marks on the surfaces of skeletal elements (e.g., burning, butchery, manufacture), mainly to determinate the origin of faunal material.

IV. Results and discussion

The analysed archaeozoological sample comprises 931 faunal remains, all attributed to mammals. In the taphonomic analysis, various types of marks were recorded on the surfaces of the skeletal elements, representing both anthropogenic modifications (e.g., butchery, burning, and processing marks) and animal-related damage (e.g., carnivore tooth marks). Most skeletal fragments show cut marks (20.19% of the total sample), followed by traces of burning (10.53%), animal gnaw marks (2.36%), and, in smaller proportion, processing marks (0.21%) (Fig. 2). Such results indicate that the examined faunal material primarily originates from domestic refuse.

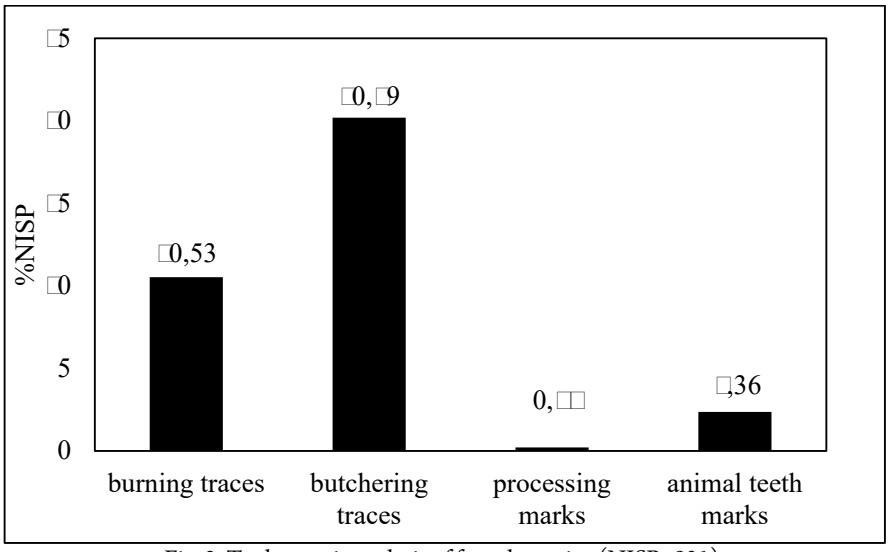


Fig. 2. Taphonomic analysis of faunal remains (NISP=931).

Due to the high degree of bone fragmentation, 28.24% remains of the total sample could not be identified to species level, but they were attributed to mammals. A proportion of 1.05% of the remains were assigned to *Sus* sp. (i.e., *S. scrofa/S. domesticus*), because they belonged to immature individuals, without the possibility to distinguish between the domestic and wild forms.

Domestic species dominate the assemblage (94.16% NISP), while wild mammals account for only 4.79%. Cattle (*Bos taurus*) remains are the most abundant, representing 82.34% of the sample, followed with much smaller proportions by sheep/goat (*Ovis aries/Capra hircus*, 7.19%), pig (*Sus domesticus*, 4.49%), and dog (*Canis familiaris*, 0.15%); for the latter one there are no evidence for its consuming (Table 1). The MNI frequencies indicate the same order of domestic species – cattle, followed at great distance by sheep/goat, pig, and dog. These data indicate that the settlement's economy relied primarily on animal husbandry, with domestic livestock constituting

the main source of food for the community, similar to other Precucuteni communities[18]. The frequency of domestic animal remains obtained for the Topoliţa site (94.16%) is very closed to that found for the large nearby Precucuteni settlement of Târpeşti (94.65%)[19]; the other Precucuteni sites analysed show lower frequencies of domestic animal remains, varying between about 72% at Andrieşeni[20] and 89% at Mândrişca[21]. Regarding the list of identified domestics, it is the same in all archaeozoologically analysed Precucuteni site, including only mammal species (i.e., cattle, sheep/goat, pig, and dog). There is also a similarity in the ratio between the main domestic species, with cattle predominating in all sites, followed at a great distance by sheep/goat and pig, whose frequencies are very close.

Taxon	NISP	%	MNI			
			mature	immature	total	%
Bos taurus (cattle)	550	82.34	6	16	22	52.38
Ovis aries/Capra hircus (sheep/goat)	48	7.19	2	4	6	14.29
Sus domesticus (pig)	30	4.49	0	3	3	7.14
Canis familiaris (dog)	1	0.15	1	0	1	2.38
Total domestic mammals	629	94.16	9	23	32	76.19
Equus ferus (horse)	16	2.40	3	0	3	7.14
Cervus elaphus (red deer)	7	1.05	1	0	1	2.38
Sus scrofa (wild boar)	6	0.90	1	1	2	4.76
Bos primigenius (aurochs)	1	0.15	1	0	1	2.38
Capreolus capreolus (roe deer)	1	0.15	1	0	1	2.38
Ursus arctos (brown bear)	1	0.15	1	0	1	2.38
Total wild mammals	32	4.79	8	1	9	21.43
Sus sp.	7	1.05	0	1	1	2.38
Total identified mammals	668	100	17	25	42	100
Total unidentified mammals	263					
Total sample	931					

Table 1. Quantification of faunal remains (NISP = number of identified specimens; MNI = minimum number of individuals).

As it is shown in Table 2, most cattle estimated individuals had at death an age of less than 2.5 years, although older individuals (even over 4 years) were also identified, indicating a mixed exploitation pattern and an efficient herd management strategy. A similar preference for slaughtering at an immature age (under 1.5 years) is evident in the sheep/goat group, while in pig (*Sus domesticus*), all three estimated individuals were slaughtered at mature biological age (over 13 months).

[18] BEJENARU, STANC 2013: 44-48.
[19] NECRASOV, ȘTIRBU 1981: 174-187.
[20] COROLIUC 2009.
[21] COROLIUC 2009.

Taxon	Slaughter age	MNI
Bos taurus	< 4 months	1
	6-12 months	3
	12-18 months	2
	18-24 months	8
	24-30 months	2
	30-48 months	3
	> 48 months	3
Ovis aries/Capra hircus	6-12 months	1
	12-18 months	3
	18-24 months	1
	24-36 months	1
Sus domesticus	13-18 months	1
	24-36 months	2

Table 2. Dental slaughter age for estimated individuals of *Bos taurus*, *Ovis aries/Capra hircus*, and *Sus domesticus* (MNI = minimum number of individuals).

Examining the distribution of remains by skeletal region for the main domestic mammal species (*Bos taurus, Ovis aries/Capra hircus*, and *Sus domesticus*), it was found that all body parts are represented (Fig. 3). This indicates that butchery, distribution, and consumption of the animals took place within the settlement.

The fragmentation of faunal material limited the number of measurements (Tables 3-5), and the withers height could not be estimated for any species. The resulting osteometric values fall within the limits of variation resulting from the analysis of other Precucuteni culture sites[22], and although they are isolated, they can be useful for synchronic and diachronic synthesis studies.

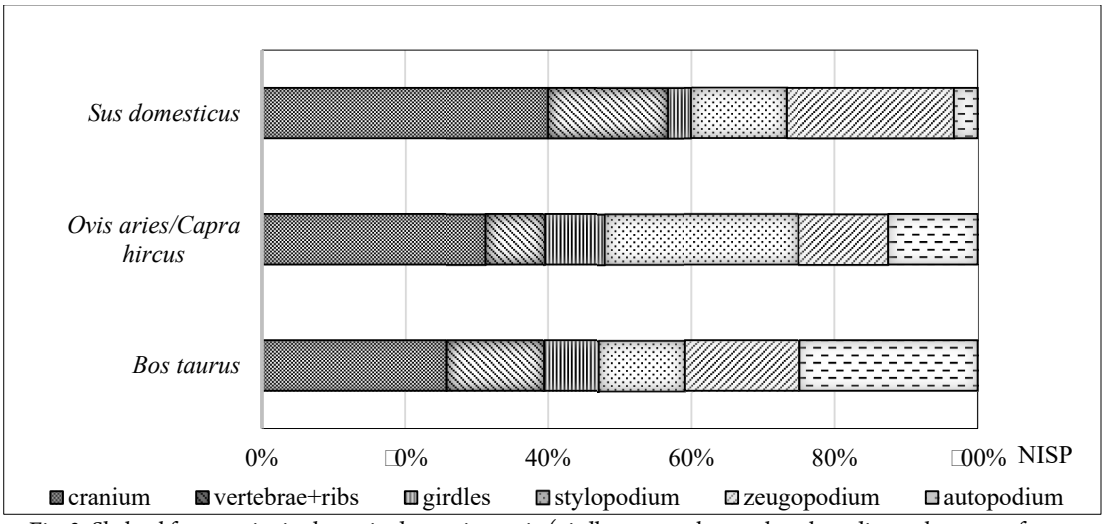


Fig. 3. Skeletal frequencies in the main domestic specie (girdles = scapula, coxal; stylopodium = humerus, femur; zeugopodium = radius, ulna, tibia, fibula; autopodium = carp, tars, metapodium, phalanges).

[22] BEJENARU, STANC 2013: 44-48.

Taxon	Anatomical element	GL	GLl	GLm	Bp	BFp	Bd	BT	SD
Bos taurus	humerus	-	-	-	-		95.5	90.5	-
Bos taurus	humerus	-	-	-	-	-	77	72	-
Bos taurus	humerus	-	-	-	-	-	84	75	-
Bos taurus	radius	-	-	-	-	-	87	-	-
Bos taurus	radius	-	-	-	83	74	-	-	-
Bos taurus	tibia	-	-	-	-	-	64.5	-	-
Bos taurus	tibia	-	-	-	-	-	67	-	-
Bos taurus	tibia	-	-	-	-	-	55	-	-
Bos taurus	tibia	-	-	-	-	-	61	-	-
Bos taurus	tibia	-	-	-	-	-	55	-	-
Bos taurus	tibia	-	-	-	-	-	60	-	-
Bos taurus	astragalus	-	-	66	-	-	44	-	-
Bos taurus	astragalus	-	-	62	-	-	-	-	-
Bos taurus	astragalus	-	68.5	(65)	-	-	-	-	-
Bos taurus	astragalus	-	65	61	-	-	41	-	-
Bos taurus	astragalus	-	69	65	-	-	41.5	-	-
Bos taurus	astragalus	-	69	-	-	-	41	-	-
Bos taurus	astragalus	-	74	-	-	-	45	-	-
Bos taurus	metacarpal	-	-	-	53	-	-	-	-
Bos taurus	metacarpal	-	-	-	59	-	-	-	-
Bos taurus	metacarpal	-	-	-	54	-	-	-	-
Bos taurus	metacarpal	-	-	-	-	-	71	-	-
Bos taurus	metacarpal	-	-	-	50	-	-	-	-
Bos taurus	metacarpal	-	-	-	56	-	-	-	-
Bos taurus	metacarpal	-	-	-	60	-	-	-	-
Bos taurus	metacarpal	-	-	-	65	-	-	-	-
Bos taurus	metacarpal	-	-	-	-	-	54	-	-
Bos taurus	metacarpal	-	-	-	-	-	58	-	-
Bos taurus	metacarpal	-	-	-	52	-	-	-	-
Bos taurus	metacarpal	-	-	-	47.5	-	-	-	-
Bos taurus	phalanx I	-	-	-	27	-	-	-	-
Bos taurus	phalanx I	-	-	-	27	-	-	-	-
Bos taurus	phalanx I	-	-	-	23.5	-	-	-	-
Bos taurus	phalanx I	56	-	-	29.5	-	27	-	26
Bos taurus	phalanx I	58	-	-	32	-	28.5	-	25
Bos taurus	phalanx I	-	-	-	27	-	-	-	-
Bos taurus	phalanx I	61	-	-	32	-	30	-	29.5
Bos taurus	phalanx I	55	-	-	30	-	29	-	26.5
Bos taurus	phalanx I	64	-	-	32	-	29	-	27
Bos taurus	phalanx II	39	-	-	-	-	25.5	-	-
Bos taurus	phalanx II	39	-	-	-	-	-	-	-
Bos taurus	phalanx II	39	-	-	-	-	-	-	-
Bos taurus	phalanx II	41	-	-	31	-	27	-	-
Bos taurus	phalanx II	35	-	-	26	-	21	-	-

Bos taurus	phalanx II	-	-	-	37	-	-	-	-
Bos taurus	phalanx II	42.5	-	-	29	-	23	-	-
Bos taurus	phalanx II	42	-	-	25	-	20	-	-
Bos taurus	phalanx II	36	-	-	27.5	-	22	-	-
Bos taurus	phalanx II	42	-	-	31	-	27	-	-
Bos taurus	phalanx II	44	-	-	32	-	26	-	-
Bos taurus	phalanx II	39	-	-	29	-	23	-	-
Ovis aries/Capra hircus	metacarpal	-	-	-	-	-	22	-	12
Sus domesticus	radius	-	-	-	24	-	-	-	-
Equus ferus	phalanx I	82	-	-	-	-	-	-	-

Table 3. Measurements of long and short bones (in mm): GL – greatest length; GLI – greatest lateral length; GLm – greatest medial length; Bp – breadth of the proximal end; BFp – breadth of the proximal articular surface; Bd – breadth of the distal end; SD – minimum diaphyseal breadth; BT – breadth of the trochlea; GB – greatest breadth.

Taxon	Anatomical element	GLP	LG	BG	SLC	LA
Bos taurus	coxal	-	-	-	-	65
Bos taurus	scapula	68.5	56	50	-	-
Ovis aries/ Capra hircus	scapula	32.5	25.5	20.5	19	-

Table 4. Measurements of scapula and coxal bones (in mm): GLP – greatest length of the processus articularis; LG – length of the glenoid cavity; BG – breadth of the glenoid cavity; SLC – shortest length of the scapular neck; LA – length of the acetabulum.

Taxon	Anatomical element	Tooth	L	B
Bos taurus	maxilla	M3	29	17.5
		M3	32	20
		M3	31	23
	mandible	M3	38	16

Table 5. Measurements of dentition (in mm): L – length of the tooth; B – breadth of the tooth.

Hunting appears to have been an occasional practice for this community, yet the list of wild taxa is relatively diverse including six mammal species (Table 1), but lower than those for the sites of Isaiia[23], Târgu Frumos[24], Târpești[25] and Traian-*Dealul Viei*[26], where the analysed samples were much larger.

The wild horse appears in all the sites of the Precucuteni culture archaeozoologically analysed, but at Topolita-*La Nord-Vest de Sat* the frequency of its skeletal remains is the highest (Table 1). Red deer and wild boar follow as frequency (Table 1), species that predominate as wild animals in the other Precucuteni sites[27]. Other identified wild mammals (i.e., aurochs, roe deer, and brown bear) are represented by very few remains (Table 1). As concerning the estimated death age,

[23] HAIMOVICI, TENCARIU 2004: 301-316; COROLIUC 2009; CREȚU *et al*. 2021: 13-20.

[24] COROLIUC 2009.

[25] NECRASOV, ȘTIRBU 1981: 174-187.

[26] NECRASOV, BULAI-ȘTIRBU 1965: 19-28; NECRASOV, HAIMOVICI 1970: 59-66.

[27] BEJENARU, STANC 2013: 44-48.

each wild species is represented by one adult individual, except for the wild boar, which is represented by one adult and one immature individual.

Considering the identified animal species and their ecological preferences, the archaeozoological data suggest the presence of large open spaces for cattle husbandry, but also for wild horse. Besides that, a forest habitat in the neighbourhood of the settlement as well as an ecotone of forest-edge areas are proven by the remains of red deer, wild boar, brown bear, and respectively of roe deer, aurochs.

V. Conclusions

The archaeozoological material examined in this study is of domestic refuse origin and consists entirely of mammal skeletal remains. According to archaeozoological results, animal husbandry was an important subsistence activity in Precucuteni settlement at Topolița, being focused more on cattle, and less on sheep/goat group and pig.

Hunting was practiced occasionally, probably to supplement the animal protein intake in the community food. Most remains of wild species belong to wild horse, followed by red deer and wild boar, which are large-bodied species.

In terms of palaeoeconomy, the settlement at Topolița-*La Nord-Vest de Sat* is similar to others of Precucuteni sites, especially to the large neighbouring one at Târpești, where the cattle husbandry represented the main subsistence activity.

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