Carpathian Journal of Earth and Environmental Sciences, November 2014, Vol. 9, No. 4, p. 121 - 128

MIDDLE HOLOCENE LANDSCAPE TO THE EAST OF CARPATHIANS: BIOARCHAEOLOGICAL CONSIDERATIONS ON THE CHALCOLITHIC SITE OF HOISEȘTI (IAȘI COUNTY, ROMANIA)

Luminiţa BEJENARU[1,2,*], George BODI[2,*], Simina STANC[1,*] & Mihaela DANU[1,*]

[1]Alexandru Ioan Cuza University, Faculty of Biology, Carol I Bd., 11, 700506, Iași, Romania, lumib@uaic.ro, danum2007@yahoo.com;

[2]Romanian Academy - Iași Branch, Institute of Archaeology, Lascar Catargi Str., 18, 700107, Iași, Romania, georgebodi@gmail.com; [*]All authors contributed equally to this work.

Abstract: Bioarchaeological (palynological and archaeozoological) and archaeological studies carried out in the site of Hoiseşti (Iași County, Romania), contributed to reconstruct the environmental context of the chalcolithic settlement. Evidences of diverse human activities in the area were also examined. This site of the phase *A* Cucuteni culture has been identified as a pottery production center and, unlike the vast majority of contemporary settlements, cereal cultivation is poorly represented and pig husbandry was preferred over cattle. Pollen analysis highlights the salinity of the soils from this area as well as significant anthropic influence of the landscape. The faunal remains from Hoiseşti present an important depreciation mainly because of precarious conservation due to water circulation and stagnation in sediment. Cultural factors were also involved in the bone fragmentation; we have identified marks of butchering, manufacturing, burning and probably trampling. The settlement of Hoiseşti has valorised a relative large faunal spectrum, 20 animal taxa being identified in the archaeozoological sample. The hunting almost equalizes the husbandry in importance, according to animal remains frequencies, and the forest species are dominant. Aquatic resources are also represented.

Keywords: landscape, Middle Holocene, Chalcolithic, Cucuteni, Hoiseşti-Romania, archaeology, palynology, archaeozoology

1. INTRODUCTION

The present paper concerns the prehistoric site from Hoiseşti, especially from palynological and archaeozoological perspective, but it also discusses the archaeological and pedological background. Our goal is to reconstruct the environmental context of the chalcolithic settlement, and also to contribute to the understanding of the site formation processes (e.g. accumulation of the faunal remains in the site, which have to be interpreted in terms of spatial local residence). For NE Romania, the Chalcolithic period evolves in the Middle Holocene (in the Altlantic paleoclimatic period) and is represented mainly by the Cucuteni culture (approx. 4525/4500-3350 cal. BC/5700-4900 B.P.) (Mantu, 1998). There are different types of settlements and Dunnell (1992) considers that a human group can occupy and use a settlement more or less continuously, according to a specific behavior: as sedentary agricultural villagers with significant effort for habitation, storage and rituals, or as foragers or small-scale agriculturalists for whom wild resources constitute a significant part of the diet. In this context, the taphonomical questions related to faunal assemblage (spatial distribution - location and quantity, morphology, and diversity of the remains) could clarify to which type of subsistence economy the settlement from Hoiseşti belongs. This work will correlate archaeozoological, palynological and archaeological results regarding the excavations at the Chalcolithic (Cucuteni *A* culture) site of Hoiseşti (Iași County, Romania), contributing to the reconstruction of the ancient landscape and to the definition of other economical characteristics of the settlements' community. This paper will also integrate interdisciplinary archaeological data in order to understand the

principal natural and cultural processes, which operated in the formation of the Chalcolithic settlement from Hoiseşti.

2. LOCAL GEOMORPHOLOGY

The Cucuteni settlement of Hoiseşti (Dumeşti commune, Iaşi County) is located in NE Romania, within the Moldavian Plain (Fig. 1), to the left of the lower course of the Bahlui River. The geo-morphological structure of the Dumeşti area is that of a plain fragmented by hills and knolls, created through the processes of erosion and accumulation within the valley of the Bahlui River and of its tributaries, in the context of a tectonic platform regime. The settlement is located within the flood plain of the Bahlui River, at about 500 m of its southern limit with an inclination of about 10^0-20^0. The site is positioned on a prolluvial-colluvial glacis consisting mostly of sandy accumulations, with coarse granulation, and of finer colluvia of clay and sand washed down from the slopes. The slight elevation of the terrain, noticeable even today, explains why the Cucuteni community chose this location for its settlement (Bodi et al., 2010).

3. ARCHAEOLOGICAL CONTEXT

The Chalcolithic Cucuteni *A* settlement from Hoiseşti has been first recorded in 1988, as a result of the surface archaeological research made by I. Istrov. Later, in 1989-1991, D. Boghian and M. Istov investigated again this settlement and the archaeological results were published in 1997 (Boghian, 1997). In 2003-2004, two rescue archaeological campaigns have been conducted under the coordination of N. Ursulescu (Ursulescu et al., 2004; Ursulescu et al., 2005).

The archaeological investigations uncovered an area of approximately 1,000 square meters (Fig. 2). It was estimated that the settlement covered about 17,250 m^2, which is about 45% of the entire area encompassed by the meander of the river, and from which the construction site of a bridge over Bahlui River affected environ 2500m^2. The archaeological research has uncovered an area of about 1000 m^2, for the rest of 1500 m^2 being possible to carry out only observations on the already destroyed or damaged archaeological features (Bodi, 2010). During the investigations, there have been identified 14 dwellings from which six have been excavated. At present, the settlement appears to feature three habitation levels belonging to phase *A* of Cucuteni culture, but archaeologists also noticed the presence of pottery fragments belonging to phase *B* of the same culture. However, no inhabitation structures, refusal pit or midden deposits belonging to this latter phase have been identified in the excavation.

The tri-chrome painting of the pottery from Hoiseşti presents almost exclusively decorating motifs on white background, being thus characteristic for the Cucuteni A_3 phase. This observation, corroborated with the presence of the bi-chrome painting with brown or black on the pots' background, and the absence of the bi-chrome specie with synthetic decorative areas, places the Hoiseşti settlement on the same chronological level with the settlements from Hăbăşeşti, Truşeşti and Cucuteni, towards the ending of the Cucuteni A_{3a} phase. From the point of view of absolute chronology, the Cucuteni A_{3a} sub-phase is dated between 4350/4325-4050 B.C. (Mantu, 1998).

4. LOCAL SOILS

In order to better understand the relationship between the prehistoric inhabitation and its environment, an area of roughly 20 sq. kilometres has been taken under study. Given the results of previous research, which indicated that the Cucuteni site was oriented mainly towards pottery production (Bodi, 2010), we have paid special attention to the identification of local sources in the immediate vicinity of the site. The geological formation of the floodplain, presents at the bottom gravel and coarse-grained sand, and at the top fine sands and a layer of alluvial clay with sand pockets. The total thickness of the alluvial material ranges between eight and ten meters. Two distinct horizons have been identified: a sandy inferior one, with a depth of 3-5 meters, with frequent lenses of coarse sand and gravel, and a superior horizon, with a depth ranging from 5 to 8 meters, with much finer clayey-sandy or clayey alluvia with predominance of sand grains with a diameter 0.2-0.002 mm and fine clay grains with a diameter less than 0.002 mm. Given the dominant presence of clays, at the surface we find pockets of suspended groundwater and areas with marshes. In the area of our study we were able to observe the internal structure of the river banks: at the top, for about 1.5 meters, these consist of sand with intrusions of alluvial clay; underneath we find a buried gelyic soil (0.60 m thick), and even deeper alluvial clay.

As to the classification of the soils, we identified the presence of two types of soil that developed on alluvial deposits: gley mollic calcareous alluvial soils, moderately and strongly saline, and saline gleyic soils.

Figure 1**.** Location of Hoisești settlement.

In the Bahlui flood plain we can frequently find alluvial soils buried under the current soils. The hydro-halomorphic soils are common in the flood plains of rivers such as the Prut, the Jijia, and the Bahlui and along some slopes in the Moldavian Plain, where we find intersections of clay and saliferous marls. These soils are the product of the processes of gleyzation, salination and/or alkalization, being defined by a strongly alkaline pH (Băcăuanu, 1968).

On the surface they feature an ochric or mollic *A* horizon, followed by an intermediate horizon associated with the saline horizon over the first 50 cm.

These soils were formed in a steppe/forest steppe bioclimate where the evapotranspiration exceeds the total amount of precipitations for at least part of the year. Their permeability varies but it is usually low, they show a slight-moderate alkaline reaction and have a high concentration of salts. Granulometric analysis of the soils from the four sampling points situated in the immediate vicinity of the Chalcolithic settlement indicated a high percentage of fine clay (particle size<0.002 mm). In all the cases the soils' texture fits into the loamy clay category, and in the samples where the percentage of fine clay is situated over 61%, the soils belong to the medium clay category (Bodi et al., 2010; Bodi et al., 2013).

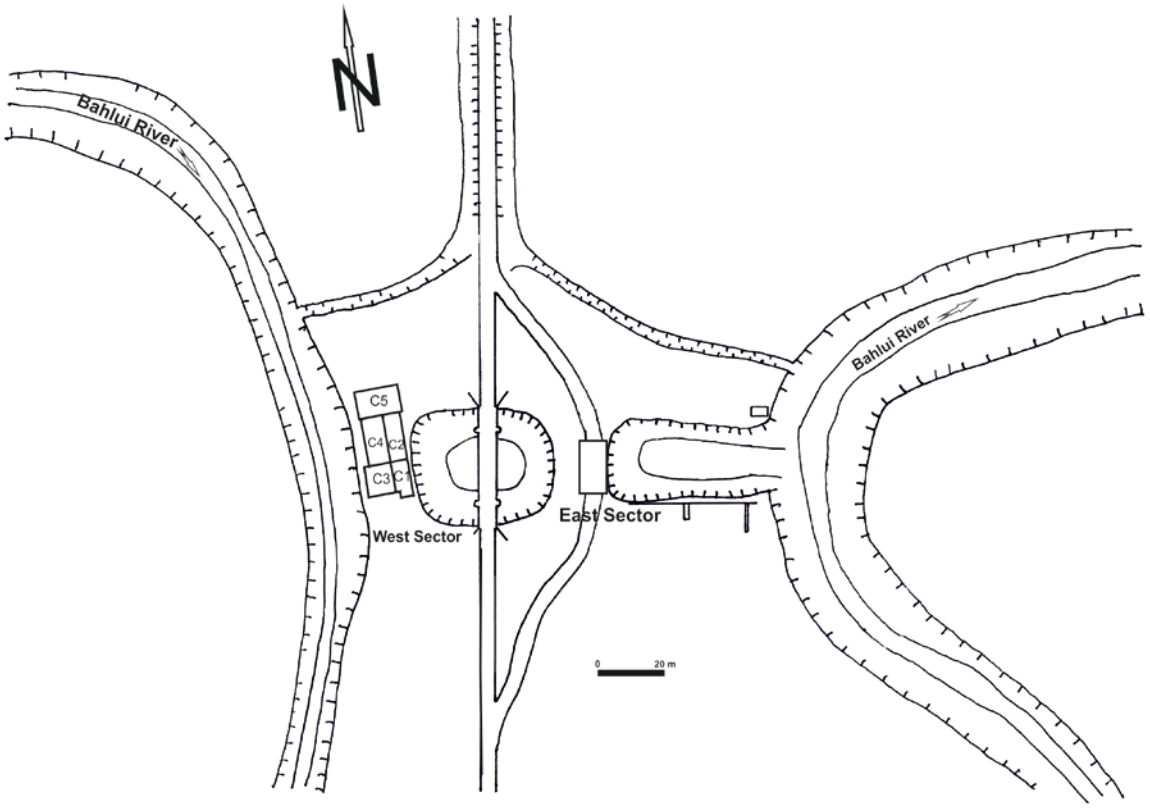

Figure 2. General plan of the Chalcolithic site of Hoiseşti: rescue archaeological campaigns (2003-2004).

5. PALYNOLOGICAL EVIDENCE

Five sediment samples taken from Cucuteni cultural layer have been submitted to palynological analysis. A classical chemical protocol has been used to extract the pollen grains using HCL (10%), NaOH (10%), HF (40%) and acetolysis (8 minutes). Keys (Moore et al., 1991) and the reference collection have been used for determination.

Four samples turned out to be sterile. Only one sample taken from the cultural layer (97 cm depth level) has preserved a small number of pollen grains (112 grains). The main cause of poor pollen grains preservation in this case is the soil alkalinity. It is well known that a high pH level (>5.5) of the soil is not favorable for pollen preservation. Positive results can be obtained at times, but the pollen content will be low (Dimbleby, 1957). It is also the case of this sample where pedochemical analyses (Pîrnău, 2013) highlighted a mild alkaline reaction of the soil (pH = 8.1). Furthermore, the pollen analysis indicates a differenced preservation, most of the identified pollen grains resisting the action of different factors of degradation. The palynological information is scarce, but its importance is not to be neglected in default of any other data on the vegetal environment around the site.

Pollen analysis highlighted the presence of 11 pollen grains of trees and shrubs and the presence of 101 pollen grains of herbaceous plants.

Oak (*Quercus*), linden (*Tilia*), hazel (*Corylus*), pine (*Pinus*) and spruce (*Picea*) compose the tree and shrub spectrum. Oak, linden and hazel were surely present in the proximity of the site. The small number of pollen grains does not permit us to estimate the prevalence of each taxon in a possible forestry environment in the close proximity of the site. The presence of pine and spruce pollen is certainly explained by a long distance contribution.

Regarding the herbaceous plants, the spectrum of this sample records a very high percentage of Chenopodiaceae pollen (almost 90%). This layout perfectly correlates to the salinity of the soils from this area (Pîrnău, 2013). Considering the background of the sample, the probability that part of the pollen of this kind belongs to some ruderal species or even to some species that have alimentary value has to be taken into account.

The pollen spectrum of the herbaceous plants is completed by knotgrass (*Polygonum aviculare*) pollen, Rubiaceae and Asteraceae (Anthemideae and

Cichorioideae) pollen. These taxa imply an anthropic context. The pedochemical analysis of this sample also disclosed high amounts of resilient phosphorus (362 ppm) and potassium (434 ppm) content, rates that issue from a long human activity (Bodi et al., 2013). The herbaceous carpet composition also comprises Poaceae, Apiaceae and Caryophyllaceae.

We have to mention the absence of cereal pollen, indicating that the cucutenian community under study probably has not cultivated these plants in the immediate vicinity of the site, otherwise a rather common situation for other cucutenian sites (Monah & Monah, 2008; Danu & Bodi, 2010). This result correlates to the alkalinity of the soil area and to the increased inclination of the settlements' surrounding landscape, both inappropriate factors for cultivation of cereals.

6. ARCHAEOZOOLOGICAL EVIDENCE

A previous archaeozoological study has already addressed preliminary questions mainly related to subsistence practices such as animals present and/or consumed in the Chalcolithic site of Hoiseşti, and proportion of wild versus domestic fauna (Cavaleriu et al., 2006).

As it can be seen in Table 1, the quantity of the recovered animal remains varies considerably within the archaeological collection units, the sector east (Fig. 2) being better represented from this point of view. The west sector of the archaeological site was severely affected during the construction of the river course channel deviation.

The animal remains are strongly broken up, so that only 1557 (52.55%) mammal remains have been identified until species level. A number of 32 fragments have been identified as *Sus* sp., 10 as large Ruminantia (*Bos*, *Bison*, *Cervus*), and 1364 as unidentified mammals.

Both naturally and culturally derived fractured bone assemblages may be represented in the site of Hoiseşti. The precarious circumstances of the animal remains conservation, with water circulation and stagnation in sediment, and with the contribution of the freezing temperatures in the very cold winters have probably contributed to skeletal brittleness and consequently to an important breaking up. Skeletal elements were also affected by tissue diagenesis especially through water and temperature regimes: the sedimentary matrix, in which animal remains were buried, affected the outer surface of many fragments so that they acquired an external cement encrustment. We can add as natural fracture agent, the feeding carnivores, whereas 5.75% remains of faunal sample keep gnawing marks.

As cultural factors that favored the bone fragmentation, we suppose that, besides the butchering and manufacturing, the burning and trampling are also involved. People can break skeletal elements to extract resources from carcasses. In the analyzed assemblage, cut marks have been identified on about 0.63% of the total animals remains, and manufacturing modifications on the about 2.33% of the sample. Burning evidences from excessive heat that affected the bones are presented on 3.25% of the total faunal remains.

The trampling by humans, but also by animals, can be correlated with the spatial displacement of animal remains (55% remains of all sample have been dispersed and discovered in the *stratum*, and only 45% in archaeological units such as houses and pits), and with the excessive fracturing of bones. Extent of fragmentation (proportion of the whole/broken bones), and its variation on skeletal elements are shown in the figure 3.

Table 1. Counts of animal remains (NR) recovered from archaeological collection units.

Archaeological sector	Archaeological Level	Archaeological collection unit	Recovered animal remains (NR)
Sector East	Level 1 (0.65-0.90/0.95 m)	House L. 1	9
		House L. 2	255
Sector West	Level 1 (0.65-0.90/0.95 m)	House L. 3	377
		Residual Pit Gr. 2	793
		Residual Pit Gr. 2A	24
	Level 2 (0.85/0.90-1.10/1.20 m)	House L. 8A	32
		House L. 11	66
Stratum (0.65-1.80 m)			1919
Total sample			3475

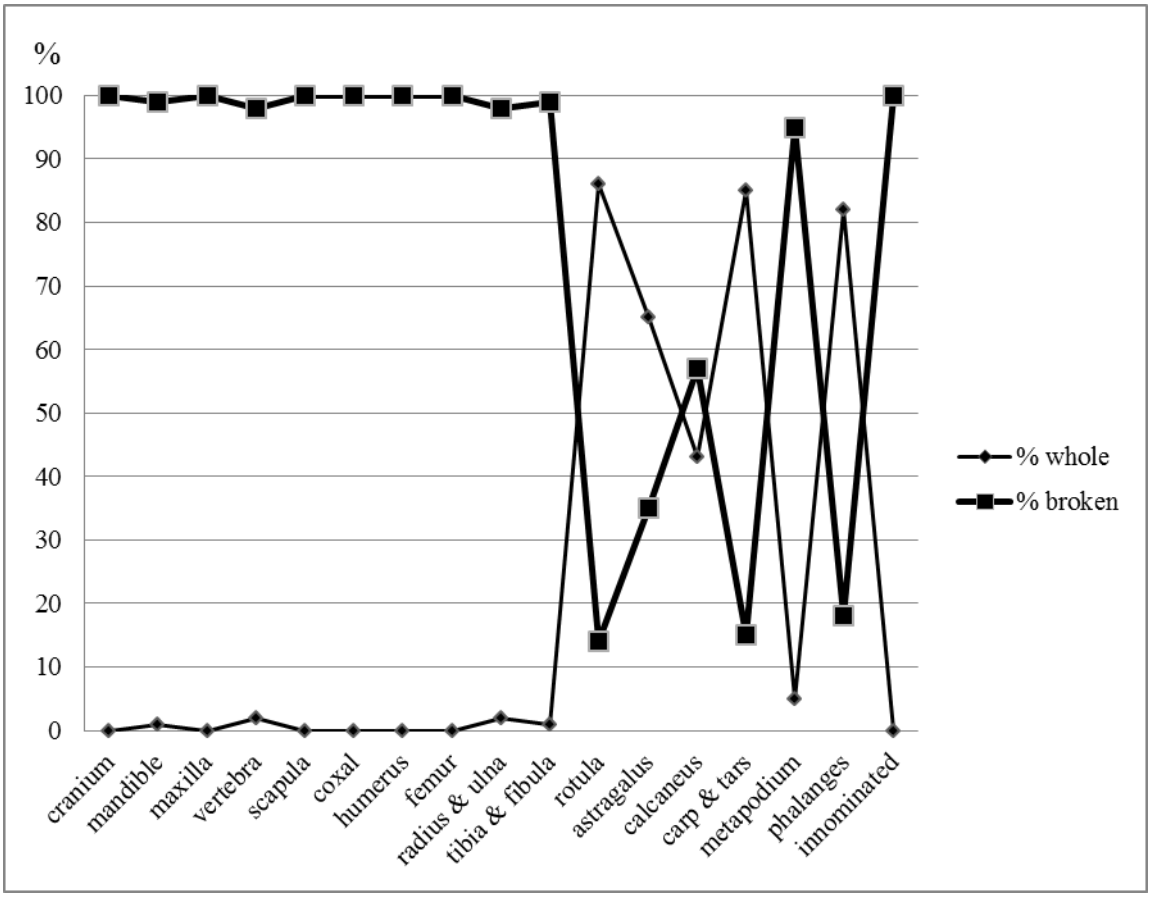

Figure 3. Variation in the proportion of whole/broken skeletal elements identified as mammal remains.

In the archaeozoological assemblage of Hoiseşti, we have identified a total of 3475 remains, these being distributed as follows: 509 of molluscs (1 snail and 508 bivalve remains), 3 of birds and 2963 of mammals. The majority of the faunal remains recovered have a domestic origin, mainly as food remains, and others 81 fragments are artefacts with manufacturing marks. In most of the cases, the raw material of wild animals (*Cervus elaphus, Capreolus capreolus, Sus scrofa*) has been used, but artefacts made of bones and teeth of domestic animals (*Ovis aries/Capra hircus, Sus domesticus*) have also been found. The artefacts, occurring in different states of manufacture, respectively use wear, have been analyzed in a previous publication (Cavaleriu & Bejenaru, 2009).

Domestic mammals in the Hoiseşti assemblage present a proportion of 59.22% remains, showing the animal husbandry as an important occupation. The pig remains (*Sus domesticus*) are dominant with 29.03%, while cattle (*Bos taurus*) and sheep/goat (*Ovis aries/Capra hircus*) come on the second place – each with 14.26% remains. The pig prevalence is a specific feature of the Hoiseşti assemblage while the predominance of cattle is a general pattern specific for the Cucuteni *A* sites (Haimovici, 1987).

Wild mammals have a high proportion as number of remains – 40.78%. As game species, wild boar (*Sus scrofa*) is dominant with 21.07% remains. Red deer (*Cervus elaphus*) is on the second place as number of remains (10.15%) because of the increased number of antler fragments, but as minimal number of individuals red deer (4.48%) is surpassed by roe deer (*Capreolus capreolus*) with 8.96%. We have to mention that, in other Cucuteni *A* assemblages, red deer is the most frequent game species (Haimovici, 1987). The high proportion of the wild boar could be correlated with an afforested Neolithic landscape, in this case steppe forests as indicated by the soil analyses, probably with oak groves.

In this idea, identified wild mammals were grouped corresponding to ecological characteristics in: forest species (*Cervus elaphus, Sus scrofa, Ursus arctos, Felis sylvestris, Sciurus vulgaris and Castor fiber*), skirt - transitional zone between forest and steppe - species (*Capreolus capreolus, Lepus europaeus* and *Bos primigenius*) and eurytopic species (*Vulpes vulpes*). Forest species are dominant, both as number of remains (77.44%) and as minimal number of individuals (63.34%).

Aquatic resources were also exploited in the Hoiseşti settlement, according to the

archaeozoological study. We have identified a number of 508 bivalve remains, all of them representing the *Unio* genus. Two shell species are in the sample – *Unio crassus* and *Unio pictorum*, and the first is dominant with 60.83% remains. We have to remark the similarity with the nowadays frequency of this shell species in the fauna of northern and eastern regions of Romania (Grossu, 1962). The shell remains identified in the Hoiseşti assemblage are more or less broken up and originate from culinary activities. None of them presents manufacturing marks.

7. CONCLUSIONS

The main results converge to conclude that chalcolithic settlement from Hoiseşti was situated in a forested, humid and fragmented area, with alkaline soil, inappropriate for cereal cultivation. An important emphasis was placed on the exploitation of the resources offered by the environment.

Pollen analysis highlights the salinity of the soils from this area. Cereal pollen is absent but the presence of certain ruderal taxa indicates an anthropic context. Pollen of deciduous trees taxa is also present and suggests the proximity of the forest.

The archaezoological assemblage from Cucuteni *A* site of Hoiseşti presents an important depreciation caused by both natural and cultural factors. Considering the natural factors, the high rate of fragmentation suggests that the bones were pre- and post-depositional exposed to extreme conditions of humidity and also of temperature. Skeletal elements were also affected by tissue diagenesis and carnivore gnawing. As cultural factors that favored the bone fragmentation, we assume the presence of butchering and manufacturing practices, associated with burning and trampling.

The wild resources constitute a significant part of the diet, so we consider the Chalcolithic community from Hoiseşti as a group of small-scale agriculturalists. The hunting almost equalizes the husbandry in importance, according to animal remains frequencies, and the gathering of mollusks is also important. The Cucuteni *A* settlement of Hoiseşti has valorized a relative large faunal spectrum, 20 animal taxa being identified in the archaeozoological sample.

The remains of pig (*Sus domesticus*) and wild boar (*Sus scrofa*) are the most frequent in the mammal category; this sample feature could be correlated with the presence of steppe forests with oak groves in the proximity of the site, as it is indicated by the palynological data.

ACKNOWLEDGEMENTS

This work was supported by grants of the Romanian National Authority for Scientific Research, CNCS – UEFISCDI: project PN-II-RU-TE-2011-3-0146; project PN-II-ID-PCE-2011-3-0885.

REFERENCES

Băcăuanu, V., 1968. *Moldova Plain. Geomorphological study*. Romanian Academy Publishing House: Bucureşti, 221 p. (In Romanian).

Bodi, G., 2010. *Hoiseşti-La Pod. A Cucutenian settlement in the floodplain of Bahlui River*. Pim Publishing House: Iaşi, 297 p. (In Romanian).

Bodi, G., Cavaleriu, R., Danu, M. & Pîrnău, R., 2010. *Preliminary Considerations Regarding the Paleoenvironment in the Hinterland of the Neolithic Habitation-Sites at Isaiia– Balta Popii and Hoiseşti–La Pod*. In: Bajenaru, R., Bodi, G., Opreanu, C. & Zirra V.V. (Eds.), Transylvanian Review, XIX, Supplement No. 5: 1 - Recent Studies on Past and Present. I. Human Heritage and Community: Archaeology in the Carpathians and Lower Danube Area from Prehistory to the Early Medieval Age. Color Print: Zalău, 31-48.

Bodi, G., Pîrnău, R., Danu, M. & Cavaleriu, R., 2013. *Interdisciplinary researches in the Neolithic and Chalcolithic of North-East Romania*. "Alexandru Ioan Cuza" University Publishing House: Iaşi, 181 p. (In Romanian).

Boghian, D., 1997. *Nouvelles découvertes des vases cucuténienes de culte dans le département de Jassy*. Studia Antiqua et Archaeologica, III-IV, 63-74.

Cavaleriu, R. & Bejenaru, L., 2009. *Archaeozoological researches on Cucuteni Culture, phase A.* "Alexandru Ioan Cuza" University Publishing House: Iaşi, 256 p. (In Romanian).

Cavaleriu, R., Bejenaru, L. & Bodi, G., 2006. *Archaeozoological inventory of the faunal remains discovered in the Chalcolithic Cucuteni A Culture site from Hoiseşti (Iaşi County, Romania).* Analele Ştiinţifice ale Universităţii „Alexandru Ioan Cuza" Iaşi, s. Biologie animală, LII, 269-272.

Danu, M. & Bodi, G., 2010. *Palynological research on Poduri-Dealul Ghindaru settlement (Bacău County).* Transylvanian Review, XIX, Supplement 2, Worlds in Change II. Transforming East-Central Europe, 59-65.

Dimbleby, G.W., 1957. *Pollen analysis of terrestrial soils.* The New Phytologist, Oxford, 56, 1-132.

Dunnell, R.C., 1992. *Archaeology and evolutionary science.* In: Wandsnider, L. (Ed.), Quandaries and quests: visions of archaeology's future. Southern Illinois University Center for Archaeological Investigations Occasional Paper No. 20, Carbondale, 209-224.

Grossu, Al.V., 1962. *Fauna of Romanian Popular Republic, Molusca, III/3: Bivalvia*. Romanian Academy Publishing House: Bucureşti, p. 131-163 (In Romanian).

Haimovici, S., 1987. *Quelques problèmes d'archeozoologie concernant la culture de Cucuteni*. In: La civilisation de Cucuteni en contexte européen. BAI, I, Université „ Alexandru Ioan Cuza" Iaşi, 157-166.

Mantu, C.-M., 1998. *Cucuteni Culture. Evolution, chronology, synchronisms.* Museum of History: Piatra-Neamţ, p. 94-132 (In Romanian).

Monah F. & Monah D., 2008, *Archaeobotanical researches in the Chalcolithic tell from Poduri-Dealul Ghindaru*. "Constantin Matasă" Publishing House: Piatra Neamţ, 212 p. (In Romanian).

Moore, P.D., Webb, J.S. & Collinson, M.E., 1991. *Pollen analysis*. Blackwell Scientific Publications, London, 216 p.

Pîrnău, R., 2013. *Physico-geographical setting and pedological context.* In: Bodi, G., Pîrnău, R., Danu, M. & Cavaleriu, R., *Interdisciplinary researches in the Neolithic and Chalcolithic of North-East Romania*. "Alexandru Ioan Cuza" University Publishing House: Iaşi, 70-79 (In Romanian).

Ursulescu, N., Cotiuga, V., Bodi, G., Chirila, L., Boghian, D., Turcanu, S., Valeanu, M. & Garvan, D., 2004. *Hoiseşti, Dumeşti commune, Iaşi county.* In: Archaeological Excavations in Romania. Campaign 2003. Institute of Cultural Memory, Bucureşti, 139-142 (In Romanian).

Ursulescu, N., Cotiuga, V., Tencariu, F., Bodi, G., Chirila, L., Kogalniceanu, R. & Garvan, D., 2005. *Hoiseşti, Dumeşti commune, Iaşi county.* In: Archaeological Excavations in Romania. Campaign 2004. Institute of Cultural Memory, Bucureşti, 177-178 (In Romanian).

Received at: 19. 02. 2014
Revised at: 28. 08. 2014
Accepted for publication at: 06. 09. 2014
Published online at: 11. 09. 2014