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edited by

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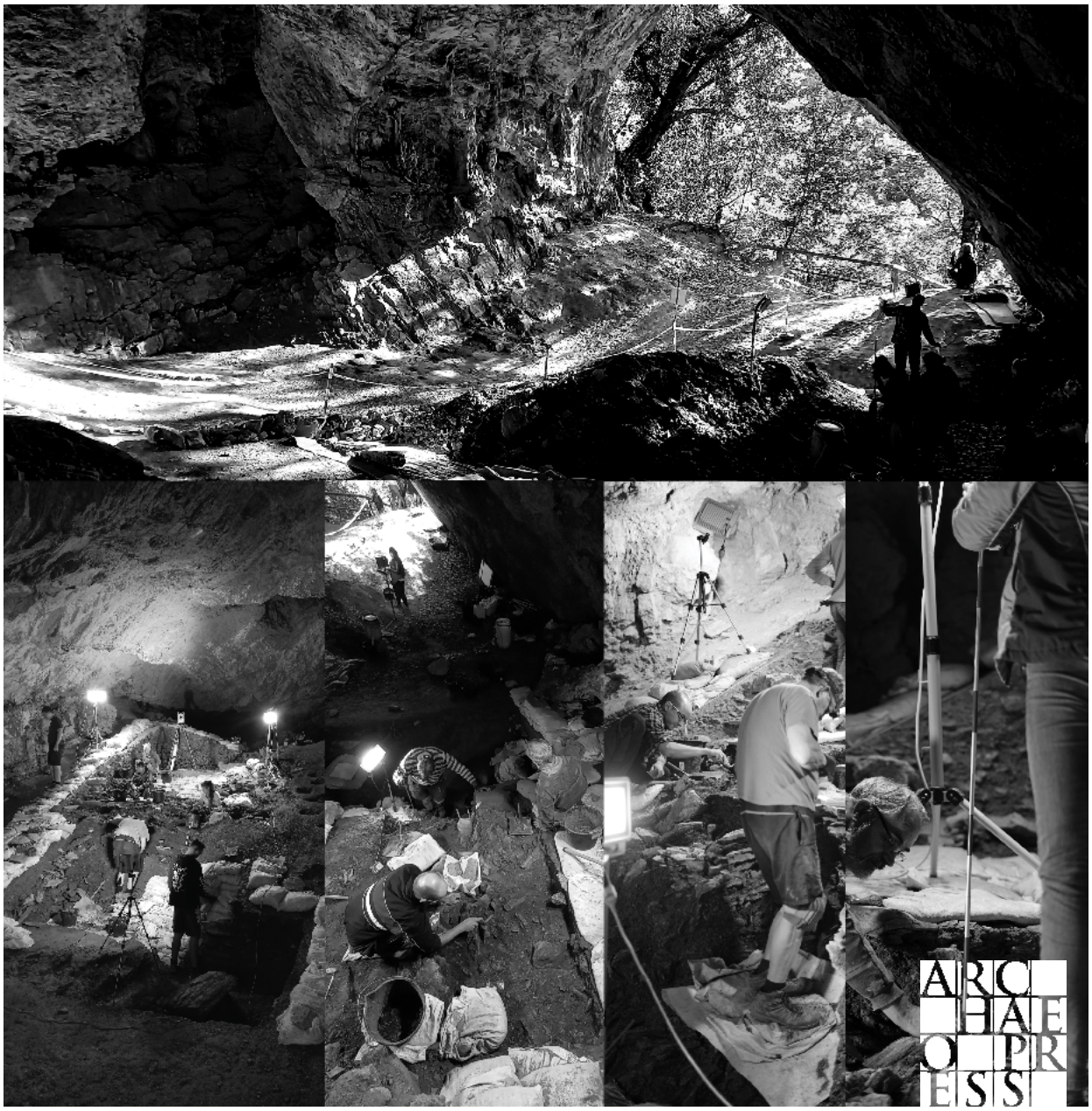

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Session XVII-4

Session XVII-6

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Session XVII-4. The Upper Palaeolithic research in Central and Eastern Europe
Session XVII-6. Lithic raw materials procurement during the upper Palaeolithic from Eurasia. Traditional approaches and contributions from the Archaeometry

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Part I

Session XVII-4

The Upper Palaeolithic research in Central and Eastern Europe

Zooarchaeological analyzes of the faunal remains of the upper layer of Climăuţi II (Republic of Moldova)

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Abstract

The upper layer of Climăuţi II, located in the Middle Dniester, delivered many archaeological remains relied to the first part of the upper Pleniglacial (between 20,500 and 20,000 BP). The lithic industry is rich, dominated by scrapers, burins and blades, and presents epi-Aurignacian characters. From our zooarchaeological analyzes we highlighted that this assembly was relatively quickly accumulated and little affected by sediment movements. The woolly mammoth is the main species, probably as important food resources, for ivory and as raw material to build structure. All the remains attest to various activities, as flint knapping, hunting and butchering activities, also as bone working. It corresponds to an important camp probably occupied several times during short-termed period. Compared to the rather contemporary sites of the Dniester valley, Climăuţi II is a unique site in the region with a clear and important status accorded to mammoth by Paleolithic human groups.

Keywords: Zooarchaeology; Dniester valley; Upper Palaeolithic; Mammoth exploitation; Moldova

Résumé

Le site de Climăuţi II/sup., située dans la vallée du Dniestr, a livré de nombreux vestiges archéologiques rattachés à la première partie du Pléniglacial supérieur (entre 20.500 et 20.000 BP). L'industrie lithique est riche, dominée par les grattoirs, les burins et les lames, et présente des caractères épi-aurignaciens. Les analyses archéozoologiques démontrent que cet assemblage a été accumulé assez rapidement et est peu remanié. Le mammouth est la principale espèce, exploitée en tant que ressource alimentaire, pour l'ivoire et comme matériaux de construction. Les vestiges archéologiques témoignent d'activités variées, telles que la chasse, la boucherie, le travail des matières lithiques et des matières dures d'origine animale. Il s'agit d'un campement important, probablement occupé à plusieurs reprises au cours d'une courte période. Comparé aux sites pseudo-contemporains de la vallée du Dniestr, Climăuţi II est un site unique dans la région, avec un statut particulier accordé au mammouth par les groupes humains.

Mots-clés : Archéozoologie ; vallée du Dniestr ; Paléolithique supérieur ; exploitation du mammouth ; Moldavie

1. Introduction

In The East European Plain, within the extra-Carpathian area the Prut and Dniester valleys were settled by Paleolithic human populations. The landscapes are characterized by middle mountains

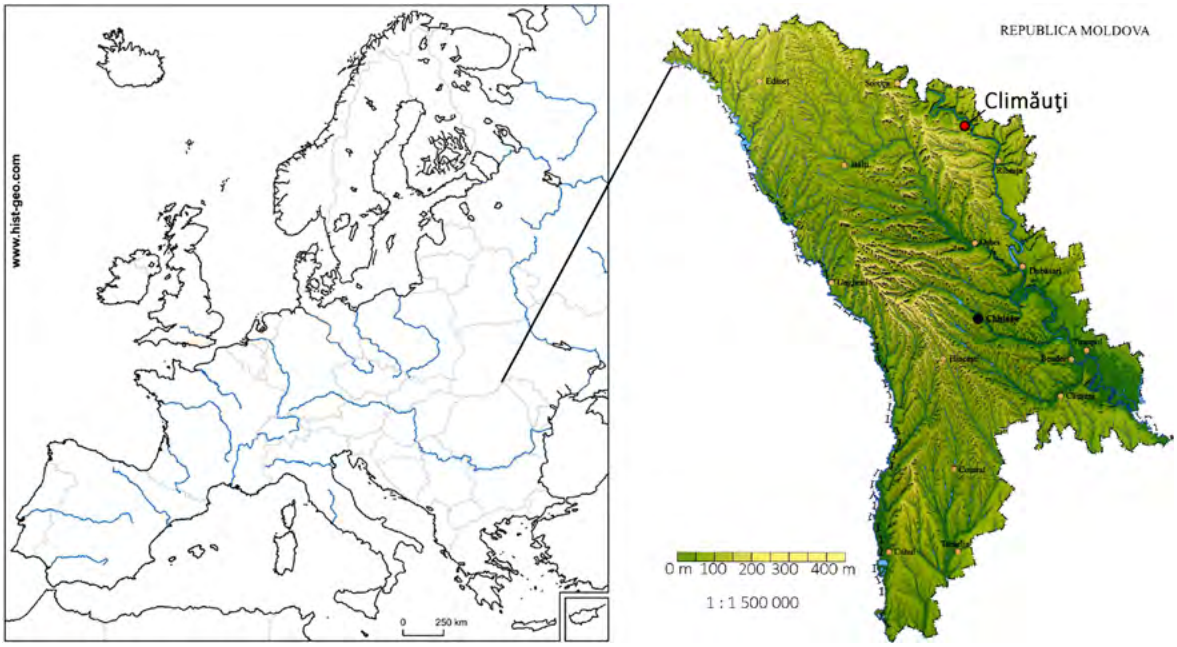

Figure 1. Localisation of the site of Climăuţi II in Republic of Moldova.

with hilly lands alternating with mountainous lands intersected by enclosed or meandering valleys. Molodova V, Mitoc-Malu-Galben, Korman IV, Cotu-Miculinţi, Cosăuţi and Dorochivtsy III provided important sedimentary and archaeological sequences which permitted to better define the chrono-cultural and palaeoenvironmental frameworks between 33,000 and 10,000 BP (Chernysh 1959; Kozarski 1980; Ivanova, Tzeitlin 1987; Otte *et al.* 1996; Damblon, Haesaerts 1997; Noiret 2007a; Haesaerts *et al.* 2007; Koulakovska, Usik and Haesaerts 2012; Chirica, Bodi 2014; Demay, Patou-Mathis and Koulakovska 2015). However there was little information about the Last Glacial Maximum (23,000-20,000 BP). We are particularly interested by this period wich correspond to the transition between the first part of Upper Pleniglacial (26,000-20,000 BP) to the second part of Upper Pleniglacial (20,000-14,000 BP) (according to Haesaerts *et al.* 2003) which relatively corresponds also to the transition from the Mid Upper Palaeolithic (29,000-24,000 BP) to the Late Upper Palaeolithic (23,000-10,000 BP). In this area an original culture was developed within the Gravettian called Molodovian or Eastern Gravettian and Epigravettian of Ukraine (Boriskovskyi 1953; Grigor'ev 1970; Chernysh 1954, 1973, 1985; Otte *et al.* 1996; Borziac 1998; Borziac and Koulakovska 1998; Borziac, Chirica 1999; Borziac, Haesaerts and Chirica 2005; Noiret 2004; 2007; Nuzhnyi 2009). We focus on the site of Climăuți II (Republic of Moldova) (Figure 1), to better determine the situation of this site, the human activities and its place in the chronocultural framework.

2. Site location and chronostratigraphy

The first discoveries in Climăuţi de Jos (District Soldăneşti, Republic of Moldova) were made by I. Borziac in 1971, with the site of Climăuţi I. In 1989, the building of a kindergarten in the village permitted to process to researches. On this occasion, T. Obadă found the site of Climăuţi II. Then rescue excavations have been carried out under the direction of I. Borziac. The site was excavated over 164 m². It is located on a promontory formed by river beds Dniester and Gârla, on the third terrace, 27-35 meters high above the Dniester, on the right bank (Figure 2A). The cultural remains were situated in loessic loams, which would correspond to the first part of Upper Pleniglacial (between 26,000 and 20,000 BP) (Borziac, David and Obadă 1992; Obadă, David and Borziac 1994). Two cultural layers were discovered. We present here the upper layer situated 1.50-2.20 meters deep from the zero point, 1.60-2.30 meters deep from the actual surface. In the northeastern part the layer was 0.25-0.30 meters thick and then to the southwest it increased gradually until reach 0.50-0.60 meters thick (Figure 2B).

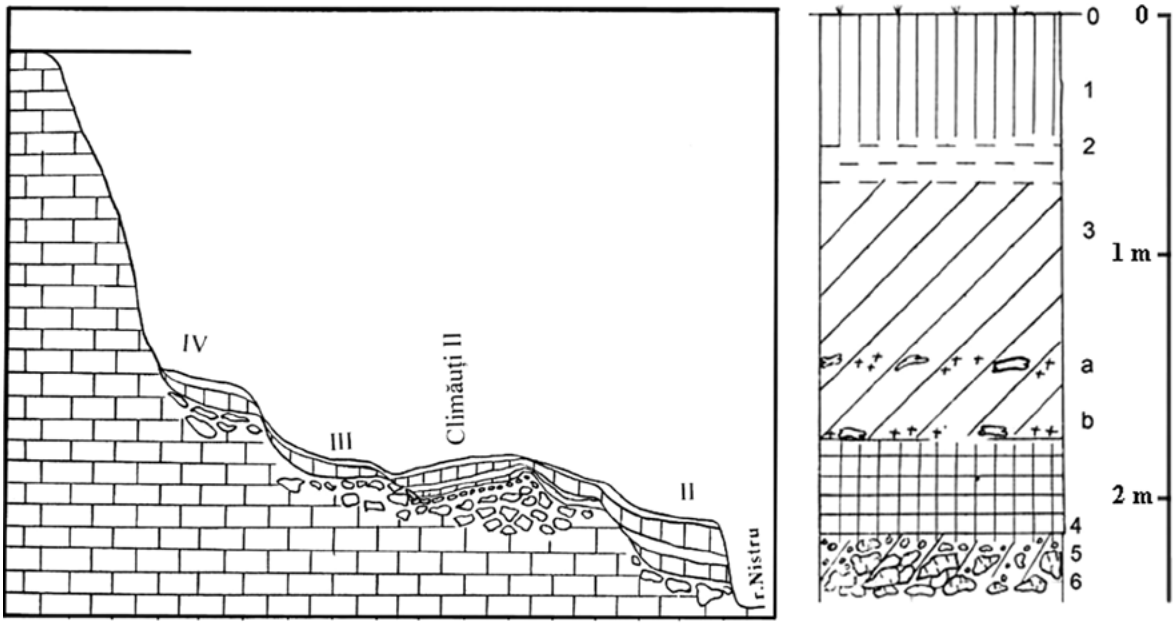

Figure 2. Geologic data of Climăuţi II, excavations 1989 A: location on the third terrace of the Dniester (Borziac, Chirica and David, 2007); B: stratigraphy (Borziac, David and Obadă, 1992); 1: chernozem; 2: horizon of transition between Holocene and Pleistocene; 3: loess level (clay with fine quartz sand); 4: fossil soil; 5: loess deposits, mixed with detritus and calcareous gravel; a: upper cultural layer; b: lower cultural layer.

Two radiocarbon dates were realized. The upper layer furnished a result of 20,350 ± 230 BP (LU-2431; M.V. Lomonosov University of Saint-Petersburg) from a mammoth cheek teeth. The lower layer was dated from 24,840 ± 230 BP (LU- 2351; Institute of Geography of the Academy of Sciences of Moldova) from humus.

We will can do new datings about the material from an archaeological survey realized in 2017 (Covalenco, Obadă and Demay 2018).

3. Palaeoenvironmental and archaeological data

3.1. Palynology

According to the palynological data (Medeanik and Borziac in Borziac, Chirica and David 2007), the upper layer presents species from periglacial cold steppe associated with bushes and conifers. This ecosystem was adequate for the development of large mammalian fauna.

3.2. Malacofauna

Within the upper layer, some terrestrial molluscs were discovered. Four species were identified by Prepelitsa (in Borziac, Chirica and David 2007): Vallonia tenuilabris, Pupilla muscorum (Moss Chrysalis Snail), Vallonia pulchella (Smooth Grass Snail), Trichia cf. Hispida terrena = Trochulus hispidus (Hairy Snail). It corresponds to cold and arid climates slightly mild in bound with cold steppe associated to bushes and conifers, near water.

3.3. Fauna

According to the identified fauna (David, Obada in Borziac, Chirica and David 2007), the faunal spectrum is typical of the 'Mammoth steppe', characterized by a cold open landscape. The presence of red deer could testify of the proximity of an arboreal area near water.

3.4. Lithic industry

The upper layer furnished 4514 lithic pieces. They were realized from local flint, granite and quartzite and from imported schist and volcanic tuff. They are represented by untouched flint nodules and pebbles (0.4%), fragments of quartzite nodules and pebbles (1.2%), prenucleus (0.4%), nucleus (3.3%), fragments of nucleus (1.4%), bladelets (0.7%), crested pieces (0.3%), tools (5.6%) and dominated by blades (11.9%), splinters (11.8%) and flakes (63%). Among the nucleus, some of them were complete and others are characterized a maximum exploitation of the raw material. There are 254 tools: retouched flakes (6.7%), notched retouched pieces (2.7%), nucleiform tools (2.4%), scaled pieces (3.2%), scrapers (1.6%) dominated by end scrapers (13%), burins (36.6%) and retouched blades (33.4%) (Borziac, David, et Obadă 1992; Borziac, Chirica and David 2007). This industry is characterize by epi-aurignacian characters corresponding to the Epigravettian aurignacoid or Epi-Aurignacian (Borziac, Chirica and David 2007; Noiret 2009).

The Epi-aurignacian corresponds to the resurgence of techniques used in the Aurignacian. This phenomenon has been observed in several sites (notably Raşkov VII in the Dniester Valley), without any direct cultural affiliation between them (Covalenco 2003-2004; Zwyns 2004; Noiret 2007b; Chirica and Valeanu 2007).

Moreover a sandstone plate with engraving was discovered (Borziac, Chirica and David 2007).

3.5. Ochre

Several pieces of animal origin were covered by red ochre (Borziac, Chirica and David 2007).

3.6. Mobiliary bone supports

The upper layer furnished a rich series of objects modified (points, hoe, lissoirs, retouchers, handles, ivory rings/bracelets, and metapod and long bone diaphysis cylinders with sawing marks and perpendicular incisions) or collected from animal resources: bone, antler, ivory, shells and echinoderm (Abramova 1995; Chirica, Borziac 1995; Borziac, Chirica and David 2007; Noiret 2009). 60 seashells (Tritia reticulata: Netted Dog Whelk and Cerithium vulgatum: Common Cerithe) were scattered in the layer. 24 of them were perforated, probably used as pendants. Among them 15 were also covered by red ochre. These seashells could have been imported or extracted from sarmatian limestones of the Dniester valley. A fossil sea urchin was discovered characterized by anthropogenic notches and deposits of ochre. It could also be from sarmatian limestones.

3.7. Anthropogenic structures

The southern part of the excavation underwent reworking when the kindergarten was started. In the square D-5/6 a rubefied soil with ashes was excavated. It reaches 30 x 35 centimeters in diameter and 5-6 centimeters deep. It could correspond to a fireplace. Nearby was a pit 34 x 37 centimeters in diameter and 40-45 centimeters deep. It was filled with grayish sediments (Figure 3). Several limestone blocks were scattered in the area. They fell from the upper part of the terrace. Some of them could have been used as support by human. A circular accumulation of mammoth bones was observed. The bones were gathered and stacked by types of elements (Figure 3). Moreover, according to Borziac, Chirica and David (2007), seven long bones (4 humerus and 3 undetermined) of mammoth were characterized by anthropogenic perforations (from 5 to 12 centimeters in diameter). According to the authors they were used to elaborate a structure with ropes.

4. Material and methodology

We proceeded to the zooarchaeological analyzes of the faunal remains of the excavations from 1989. This material is kept in the Institute of Zoology of Academy of Sciences in Chişinău (Republic of Moldova).

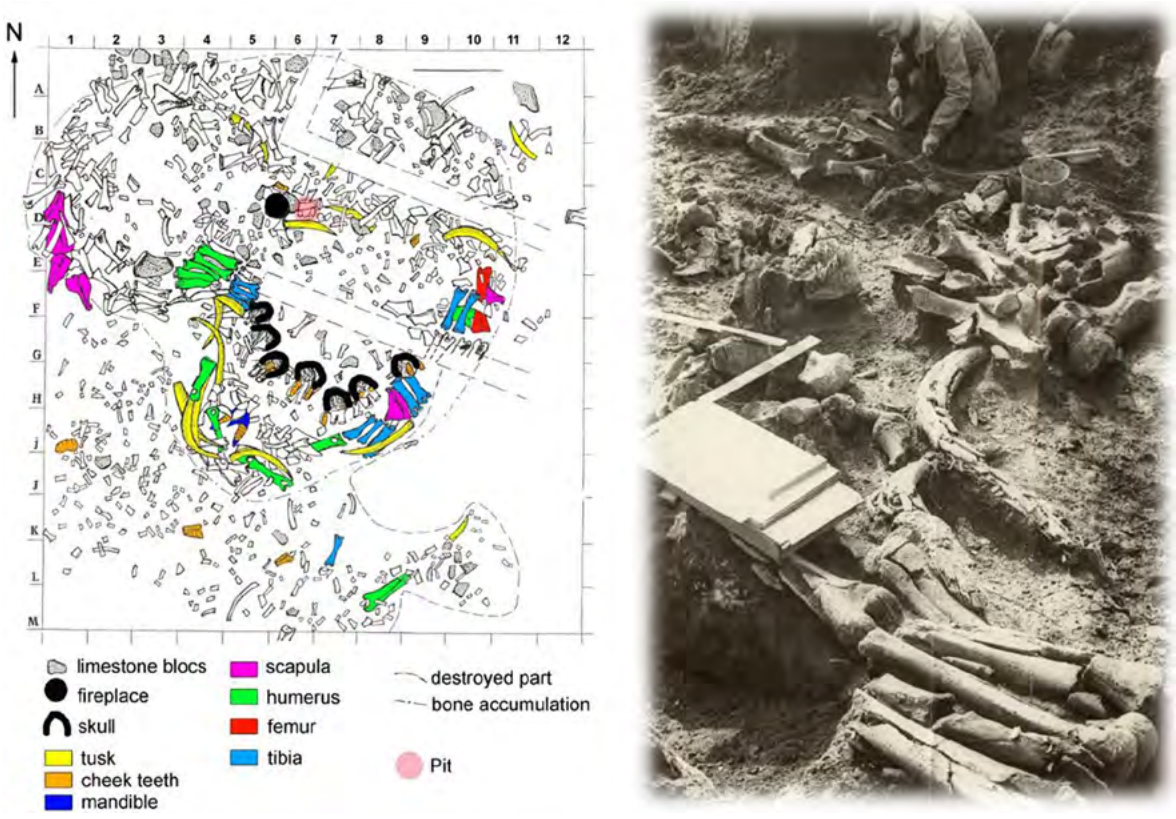

Figure 3. Planigraphy of elements and structures of Climăuţi II/upper in 1989 (modified from Borziac, Chirica and David, 2007) and view on excavations (© A. Simanovschi).

The study includes paleontological analyzes, the biology and ethology of the species, by means of actual comparisons. In addition, the description and quantitative analysis of the anatomical elements associated with taphonomy (climate and edaphic factors and non-human biological agents) will make it possible to identify the conditions that make up the fossil assemblage. The combination of these analyzes in relation to the stigmas that may have been left by humans, will lead to a better understanding of the anthropogenic impact on this assemblage (Poplin 1976; Binford 1979; Behrensmeyer 1978; 1990; Lyman 1994; Denys, Patou-Mathis 2014; Fernández-Jalvo, Andrews 2016). Taxonomic references and systematics are based on the zoological nomenclature code (1999). The vernacular anatomical terms are used according to the criteria of Barone (1986) taking into account the current nomenclatures. Here we adopt the quantization units defined by Poplin (1976), and Lyman (2008). The skull (cranium and face) is considered an element. The frontal appendages can also be considered as a separate element. The hemi-mandible is counted as an element, except for the mammoth whose mandible is a complete element. A tooth, whether isolated or in place, is considered as an element. To estimate the Minimal Number of Individuals (MNI) we proceeded to reassembling, pairing, associations, according to the criteria of age and sex.

Osteometric measurements follow the procedures of von den Driesch (1976), and concerning mammoth, of Agenbroad (1994), Lister (1996) and Göhlish (1998).

For the identification of mammoths (Mammuthus primigenius), age determination is based on epiphyseal stages of long bones and eruption and eruption/wear sequence of the cheek teeth (Osborn 1942; Vaufrey 1955; Coppens 1965; Laws 1966; Krumrey, Buss 1968; Roth 1984; Roth, Shoshani 1988; Haynes 1991). The identification of sex is based on the morphometry of the bones (Averianov 1996; Shoshani, Tassy 1996; Lister 1999). For the age identification of horses (Equus sp.) (Barone 1966; Guadelli 1998), bison (Bison sp.) (Koch 1932 in Duffield 1973; Koch 1935; Grant 1982),

reindeer (Rangifer tarandus) (Bouchud 1953, 1966; Miller 1972, 1974; Hufthammer 1995; Enloe 1997; Weinstock 2000), wolf (Canis lupus) (Barone 1976), we used the same methods. For bison, we used the Klein-Spinage formula which permits to describe the curvilenar relation between the age and the hight of crown (Spinage 1973; Klein *et al.* 1981, 1983). Here, for the original unworn crown height we used data from Brugal and David (1993).

Seasonality can be estimated in relation with biological cycles of bison (Walde 2006) and reindeer (Murray 1993; Kuntz 2011).

Patterns in the age at death (mortality profiles) of animals are used to infer the origins of assemblages (Klein, Cruz-Uribe 1984; Haynes 1987; Stiner 1990; Magniez 2010). Moreover a model of ternary diagram was put in place to compare the mortality profiles to highlight the origins of death (Stiner 1990, 1991; Costamagno 1999; Discamps, Costamagno 2015). We have developed theoretical diagram for mammoth.

The skeletal preservation on%MAU by anatomical segments related with bones density (from Lam *et al.* 1998; Lam, Pearson 2003) is based on Lam *et al.* (1999) for horse and Kreutzer (1992) for bison.

The nutritional strategies are estimated (Binford 1978, 1987; Metcalfe 1988; Jones, Metcalfe 1988; Lyman 1994; Faith, Gordon 2007), from Outram, Rowley-Conwy (1998) and Morin (2012) for horse and from Emerson (1990, 1993) for bison.

The intensity of the occupations according to weight of meat and the available calories is based on Rozoy (1978) and Noiret (2009) who synthesized the data of Klein (1973), Chernych (1977), Soffer (1985), Delluc, Delluc and Roques (1995), and López Bayón, Gautier (2007).

5. Zooarchaeological analyses

5.1. Faunal spectrum

The fauna is dominated by proboscideans (M. primigenius), then artiodactyls (Bison sp., R. tarandus, C. elaphus), then perissodactyls (Equus sp.) and carnivorous (C. lupus, Vulpinae) and finally rodents (Lepus sp.) (Table 1).

Species	Vernacular name	NR	MNE	MNI
Mammuthus primigenius	Woolly mammoth	311	243	17
Equus sp.	Horse	68	68	5
Bison sp.	Bison	19	17	4
R. tarandus	Reindeer	15	14	2
C. elaphus	Red deer	3	3	2
Canis lupus	Wolf	52	48	3
Vulpes sp./*A. lagopus*	Fox	5	5	1
Lepus sp.	Hare	2	2	1
Number of identified specimens		475	400	35
cervid		1		
large-sized mammal		1		
large-sized herbivores		5	4	
large or medium-sized mammal		5		
medium-sized mammal		10	9	
medium or small-sized mammal		6		
TOTAL		503	413	35

Table 1. Counting of faunal remains of Climăuţi II/upper in number of remains (NR), minimal number of element (MNE) and minimal number of individuals (MNI).

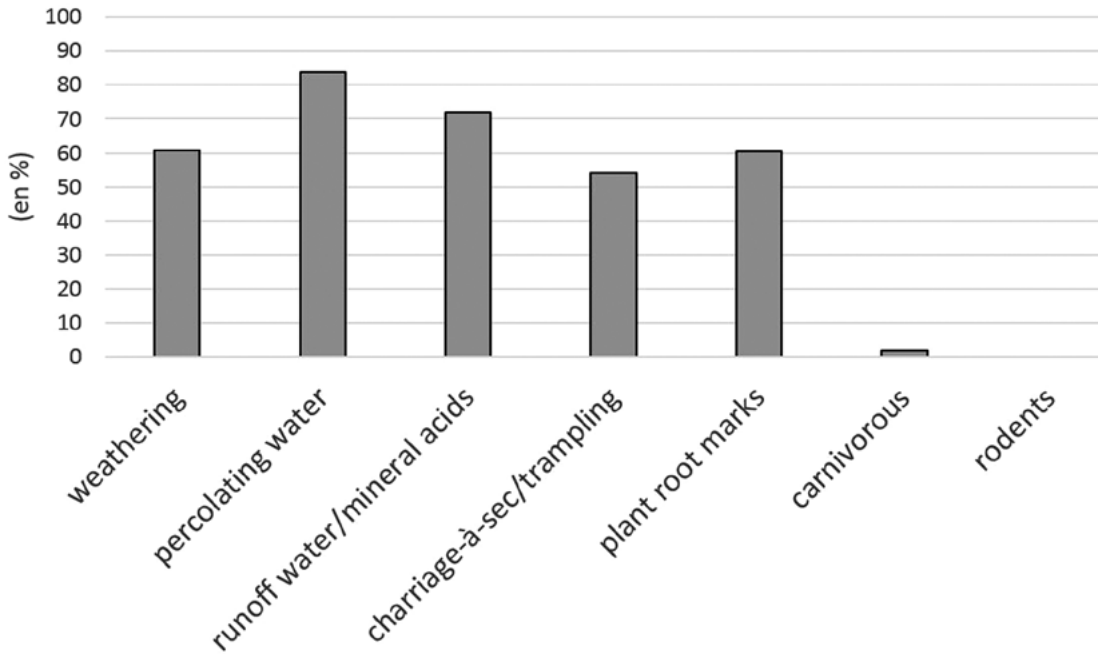

Figure 4. Alterations due to climato-edaphic and non-human biological agents in percentage of number of remains of Climăuți II/upper.

5.2. Preservation of bones and taphonomy

Splinters were not kept, so we have mainly quasi-complete and identifiable bones. Bone surfaces are well preserved. They are characterized by fresh and dry fracturations. Several vertebrae of mammoth were still in anatomical connection.

Surfaces are damaged by relatively short-time weathering (stages 1-2 [Berhensmeyer 1990]), water effects, some marks of charriage-à-sec and plant root marks. We have only few marks of carnivorous (Figure 4). We did not observe differences of preservation between the different species (Figure 5).

5.3. Paleontology and skeletal preservation

5.3.1. Mammoth

Mammoth is the most abundant taxon. It is represented by 311 remains corresponding to at least 243 elements belonging to 17 individuals. Different teeth are missing, so we could have initially two other individuals. Cranial skeleton, particularly teeth, and limb bones are the most represented. Bones are a little bit fragmented, most for skull and tusks which are naturally more fragile.

All anatomical parts are represented except caudal vertebrae and metapodials. As we said, splinters are absent. So we have few fragmented bones. However we can observe fragmentation of skull and tusks which are naturally more fragile in terms of their morphology and structure.

According to the skeletal conservation indices, cranial and limb bones are the most represented (Figures 6 and 7).

It could be relied to natural preservation or anthropogenic selection.

Comparing skeletal preservation by lateralized elements we have a similar representation between left and right sides. The general index of skeletal conservation (IGCS; cranial bones/postcranial bones) shows that the cranial skeleton is overrepresented (theoretical indexes are respectively 0,07 and 0,05): IGCSNR= 114/182=0,62 ; IGCSNME= 92/144=0,64. The dental preservation index (ICD;

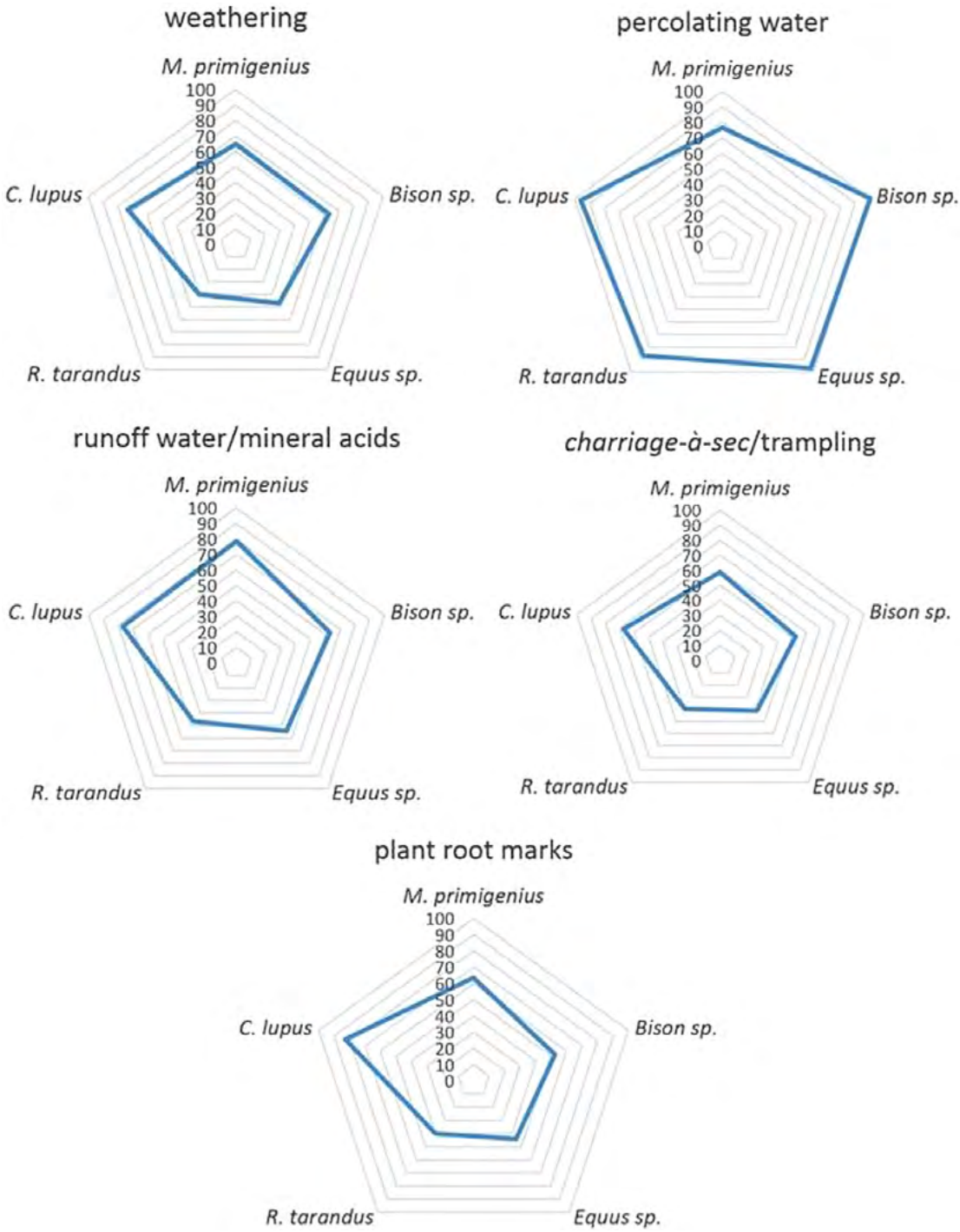

Figure 5. Alterations due to climato-edaphic and non-human biological agents in percentage of number of remains by species of Climăuţi II/upper, (without species represented by ≤ 5 remains).

dental bones/postcranial bones) shows that the dental elements are overrepresented: ICDNR= 84/182=0,46; ICDNME= 72/144=0,5. It would not correspond to a natural dispersion phenomenon.

We proceeded to the refitting of mammoth bones and to the determination of age classes and genders. One individual presents a pathology, fused left radius and ulna.

According to teeth we determined at least 15 individuals and to other bones there is 16 individuals (Table 2).

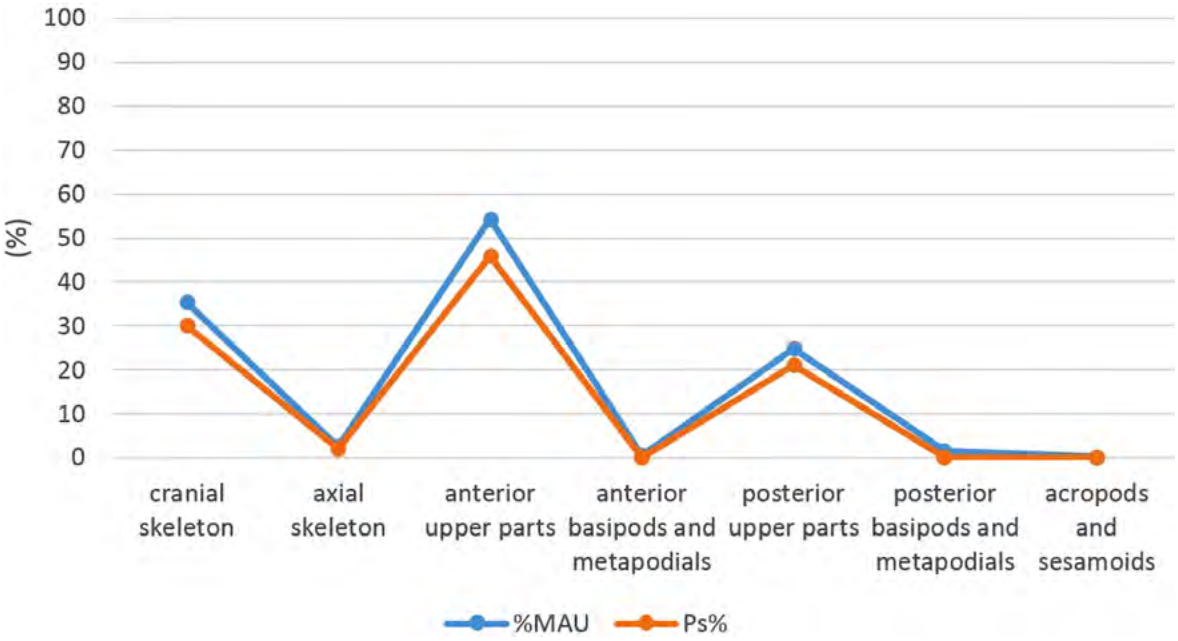

Figure 6. Skeletal preservation by anatomical parts in percentage of minimum animal unit (%MAU) and percentage survival (Ps%) of mammoth from Climăuţi II/upper.

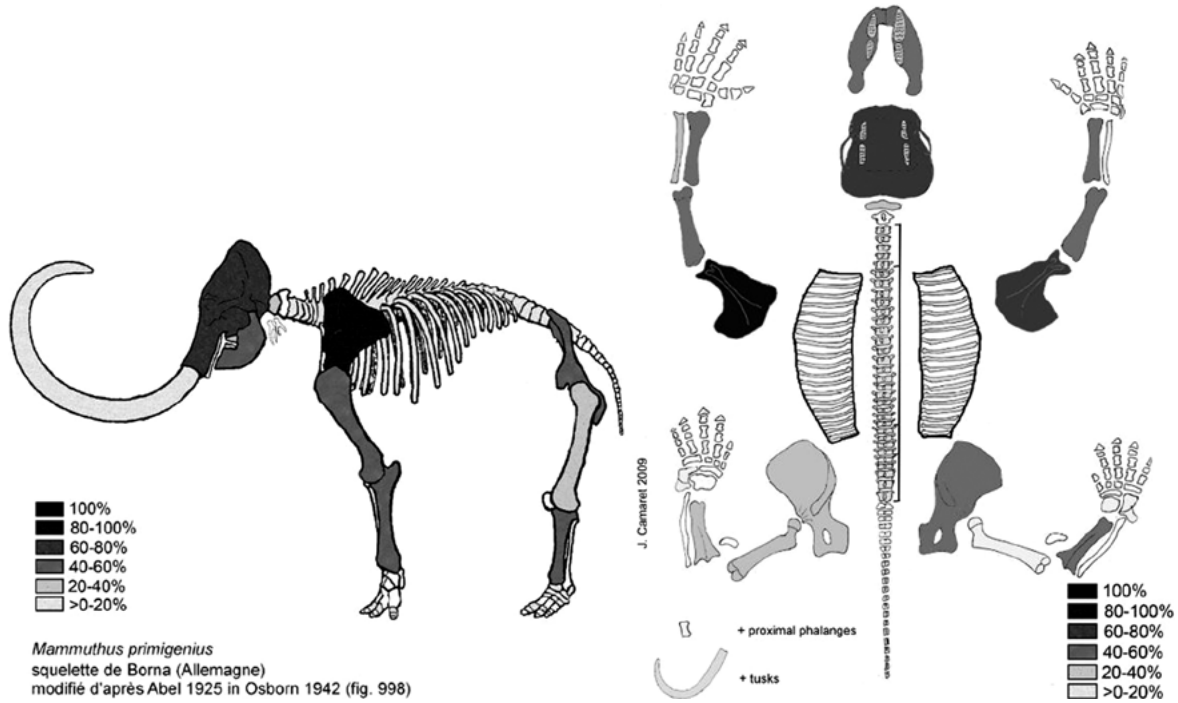

Figure 7. Skeletal preservation by elements and lateralized elements in percentage survival (Ps%) of mammoth from Climăuţi II/upper.

Comparing adult s.l. and juveniles, juveniles are mainly represented by cranial skeleton (Figure 8). According to osteometric data we determined 4 males and 5 females adult s.l.. We proceeded to the refitting of mammoth bones and teeth and to the determination of age classes and genders by combination we identified at least 17 individuals (Table 3; Figure 9).

5.3.2. Other herbivorous mammals

Horse is represented by 68 remains corresponding to 68 elements, mainly cranial and limb elements (Figure 10).

Table 2. Determination of mammoth age classes according to teeth and other bones from Climăuţi II/upper.

TEETH	
Classes	**Number of individuals**
juvenile	5
young adult	4
intermediate adult	1
intermediate or mature adult	3
mature adult	2
old adult	0
Total	**15**
BONES	
Classes	**Number of individuals**
juvenile	4
young adult	4
intermediate adult	1
intermediate or mature adult	3
mature adult	2
old adult	0
adult *s.l.*	2
Total	**16**

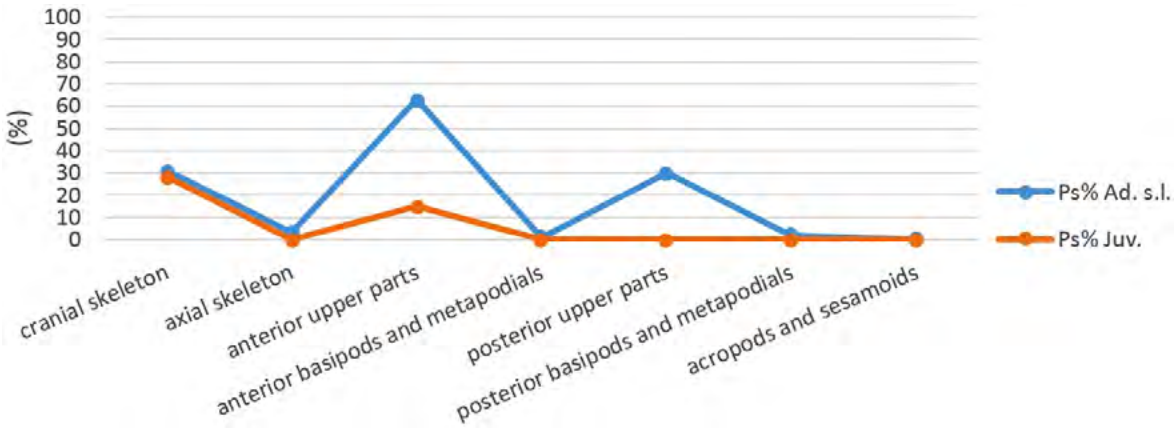

Figure 8. Skeletal preservation by anatomical parts in percentage survival (Ps%) of mammoth between adults s.l. and juveniles from Climăuţi II/upper.

Classes	Stages	Gender or type	Number of individuals
juvenile	IX	/	5
	V	/	
	VIII	/	
	VIII-IX	/	
	V-VII	/	
young adult	IX-X	/	4
	XIV	M	
	IX-X	/	
	XV-XVI	F or Y.A.	
intermediate adult	XVI-XVIII	F	1
intermediate or mature adult	XVII-XX	F	3
	XVII-XIX	M	
	XVII-XIX	F	
mature adult	XXI-XXII	M	2
	XXI-XXIII	F	
old adult			0
adult *s.l.*	> XVI	F	2
	VIII-XX	M	
Total			**17**

Table 3. Determination of minimum number of individuals by mammoth age classes and gender from Climăuţi II/upper.

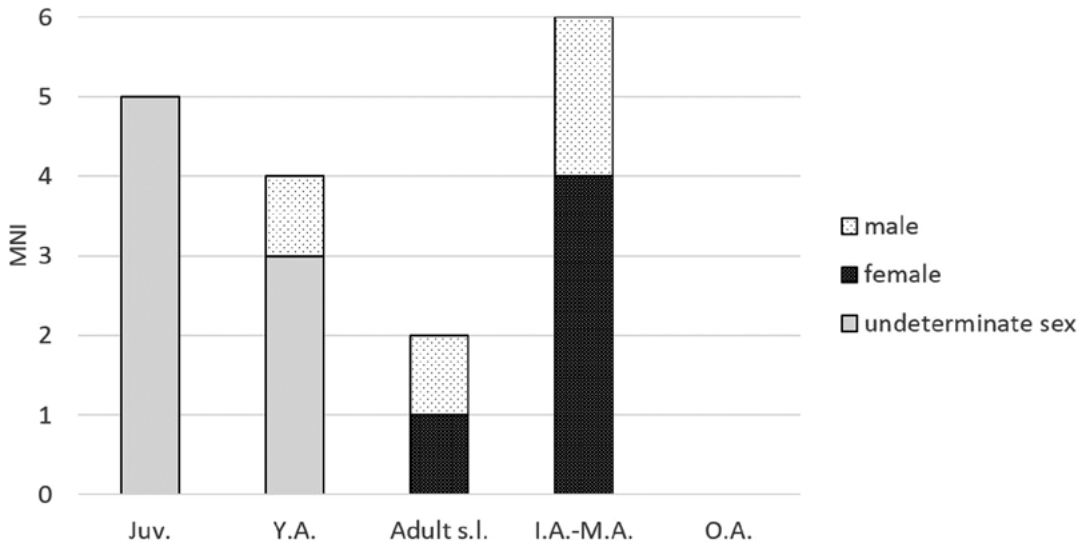

Figure 9. Minimum number of individuals by combination by age classes and gender of mammoth from Climăuţi II/upper.

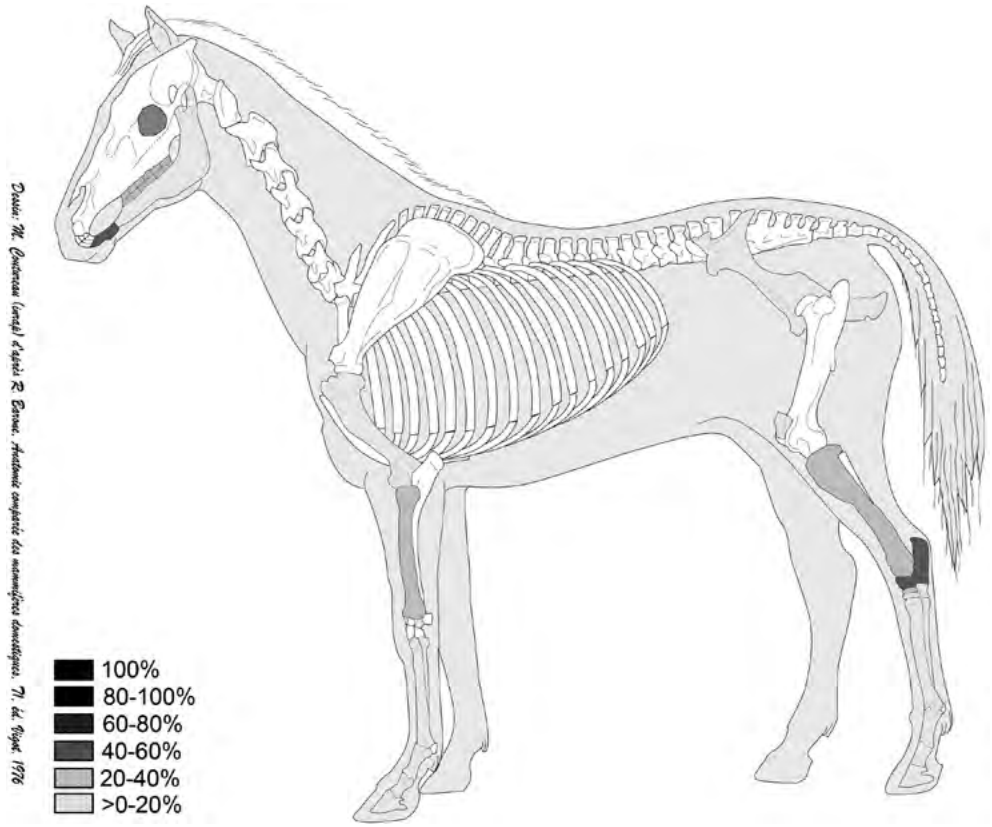

Figure 10. Skeletal preservation by elements in percentage survival (Ps%) of horse from Climăuţi II/upper.

Considering the skeletal preservation by anatomical part in%MAU related to the density of bones (R=0,14; p-value= 0,388899/not significant at $p < 0.10$ and at $p < 0.01$), this type of preservation is not due to natural processes of dispersion.

We identified at least 5 individuals, a juvenile and four adults s.l. whose at least two mature adults. It would correspond to mixt herd(s).

Comparing the size of teeth with those from different species, the specimens of Climăuţi II/upper would correspond to Equus latipes (Figure 11).

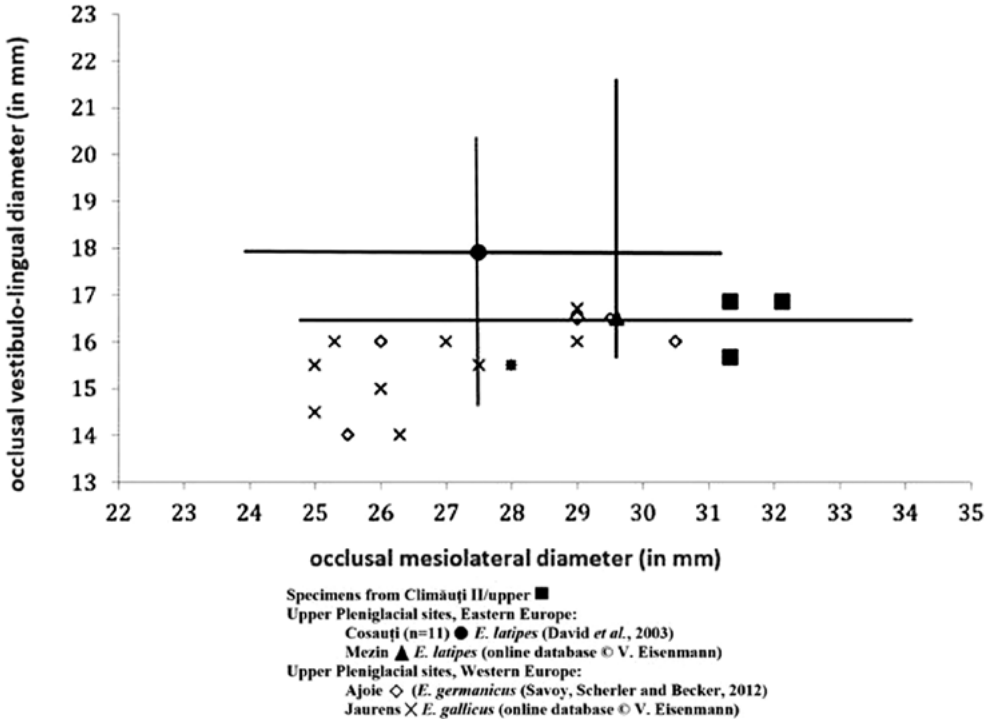

Figure 11. Osteometric comparisons of Equus sp. M1.

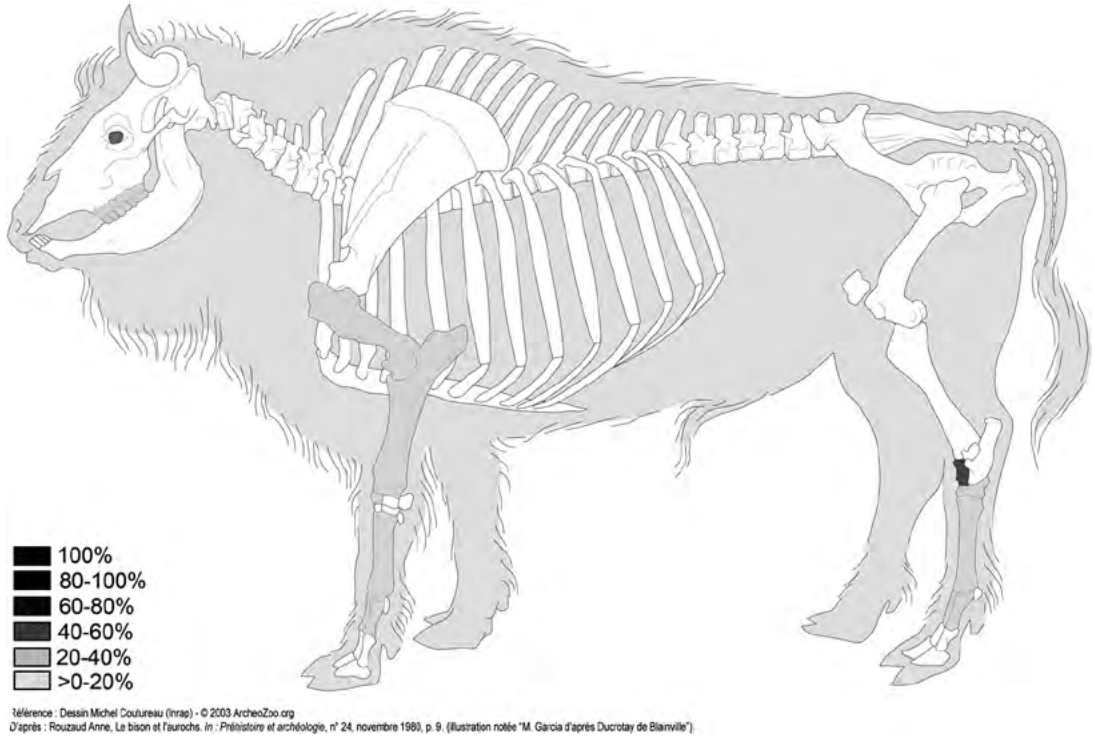

Figure 12. Skeletal preservation by elements in percentage survival (Ps%) of bison from Climăuţi II/upper.

Bison is represented by 19 remains corresponding to at least 17 elements, mainly cranial and limb elements (Figure 12).

Considering the skeletal preservation by anatomical part in%MAU related to the density of bones (R=0,37; p-value= 0,052623/ significant at $p < 0.10$ and not at $p < 0.05$), this type of preservation is not due to natural processes of dispersion.

element	eruption	wear	Klein-Spinage formula				
			AGEm	AGEe	CH	CHo	age
M_2 n°352	>43-45	f: 54	240	44	58	65,67	48
M_1 n°353	>21-25	g: 66	240	23	43	54,25	34
M_2 n°354	>43-45	h: 78	240	44	52	65,67	54

Table 4. Identification of age (in months) from teeth of bison from Climăuți II/upper
AGEm: potential ecological longevity; AGEe: age of eruption for a tooth; CH: the crown height as measured at death; CHo: the original unworn crown height.

According to bone refitting and pairings we identified 4 individuals. All of these indivuals are young adults (Table 4).

We identified a younger individual and probably two females and a male (Figure 13). Reindeer is represented by 15 remains corresponding to at least 14 elements, mainly cranial and limb elements (Figure 14).

According to the bone refits and the identification of age we identified at least 2 individuals, an adult s.l. and a mature adult. A non-shed antler permitted to determine a large-sized male (Figure 15).

Red deer is represented by 3 remains corresponding to 3 elements, only antlers, belonging to 2 matured males (Figure 16).

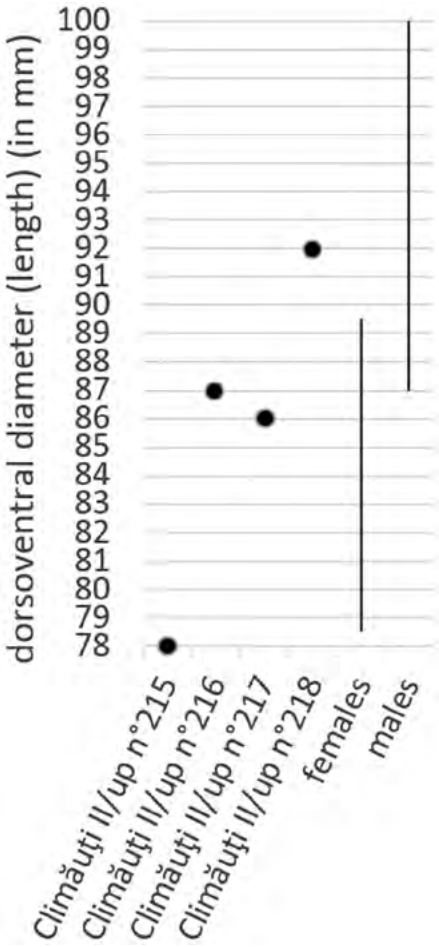

Figure 13. Osteometry of bison talus from Climăuți II/up and reference specimens (Prat *et al.* 2003).

Hare is represented by 2 remains corresponding to 2 elements (two metapodials) belonging to at least 1 individual.v

5.3.3. Carnivores

Wolves are represented by 52 remains corresponding to 48 elements: cranial bones, vertebrae, shoulder and pelvic girdles and limb bones (Figure 17).

We identified at least 3 individuals, a juvenile and 2 adults s.l..

Fox is represented by 5 remains corresponding to 5 elements (two canines, a pelvis, a fragment of long bone and a fragment of a metapodial) belonging to at least 1 individual.

5.4. Animal resources and human activities

5.4.1. Mammoth

Among mammoth remains, 8 fragments of ivory were shaped (Figure 18). Four pieces are finished workpieces: fragments of «bracelets » (D-E), cone (F) and plate (G). The piece (A) was being shaped. Concerning the other ivory rings (B-C), they could be finished or the process was under way, for exemple maybe to refined edges. It would be necessary to seek outside expertise to study the technical processes.

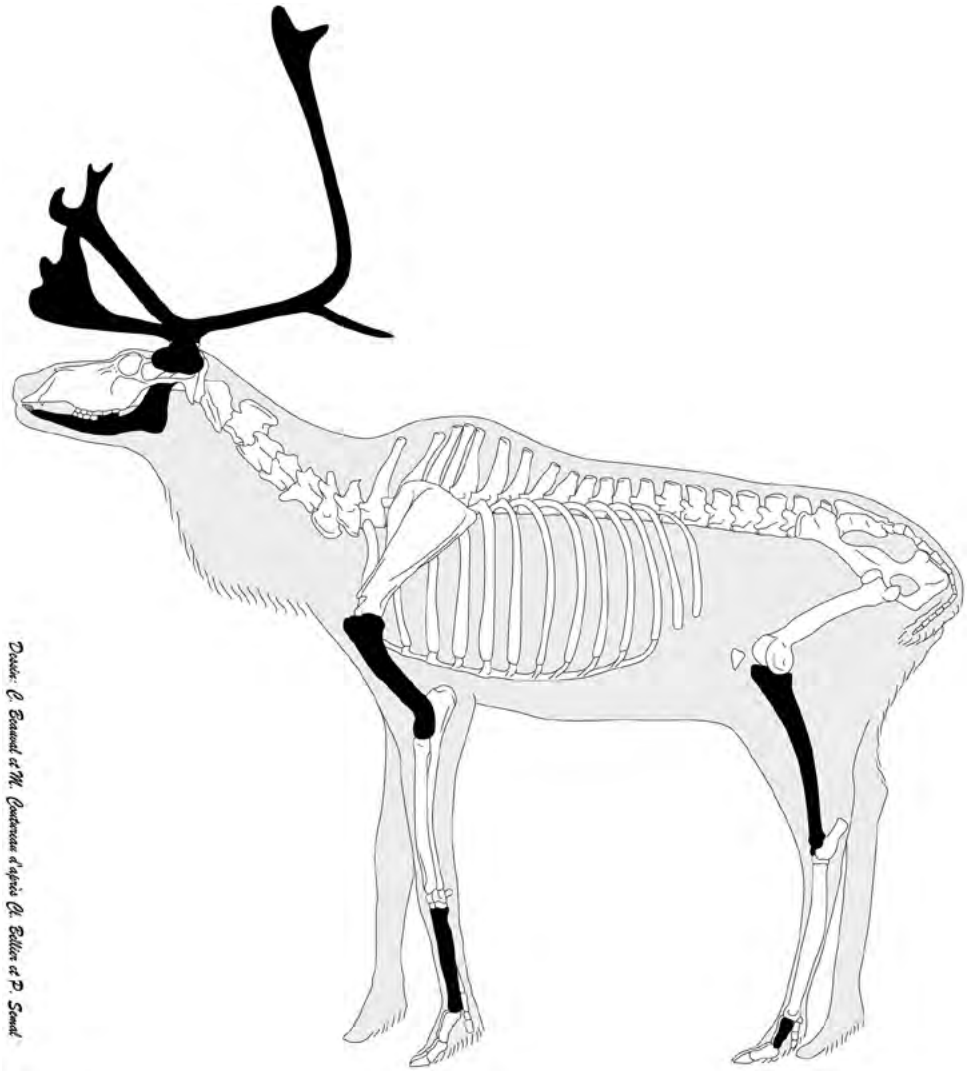

Figure 14. Skeletal preservation of reindeer from Climăuţi II/upper.

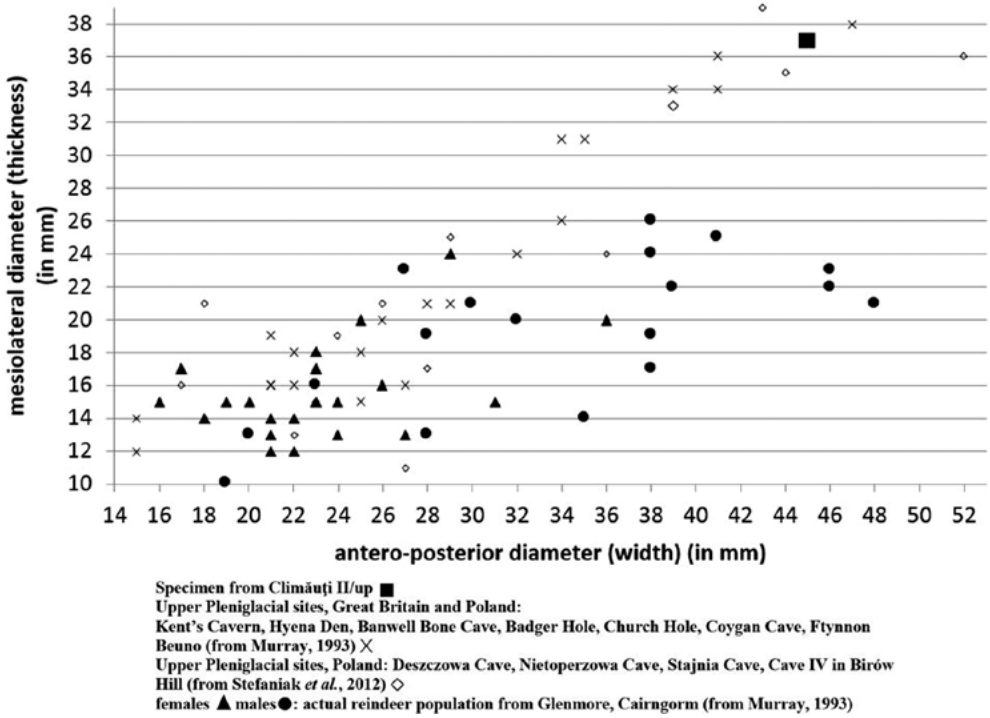

Figure 15. Osteometry of antler basis of reindeer from Climăuţi II/up and specimens of references.

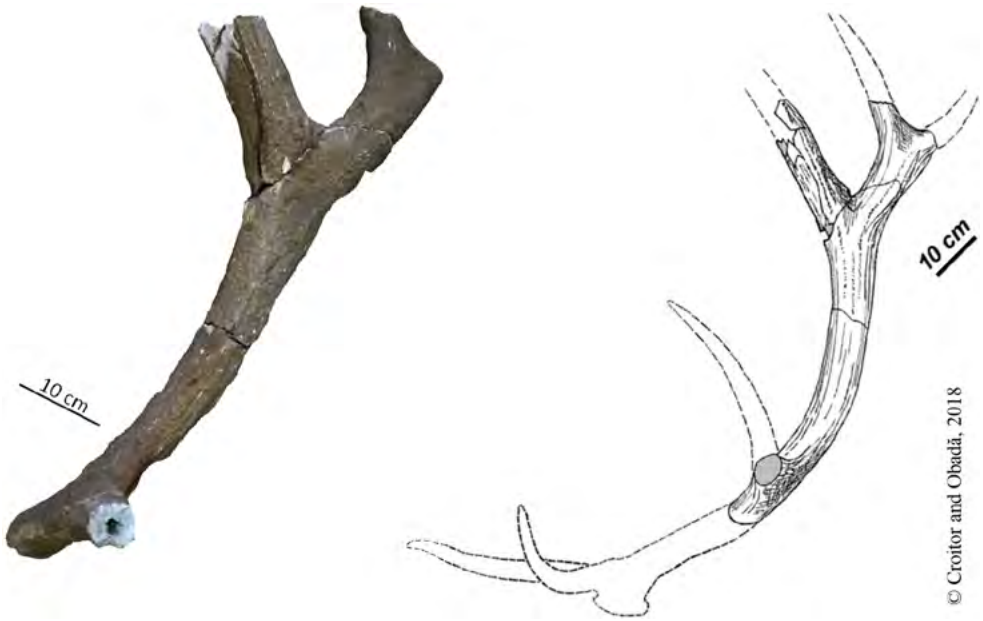

Figure 16. Left antler of red deer from Climăuți II/up.

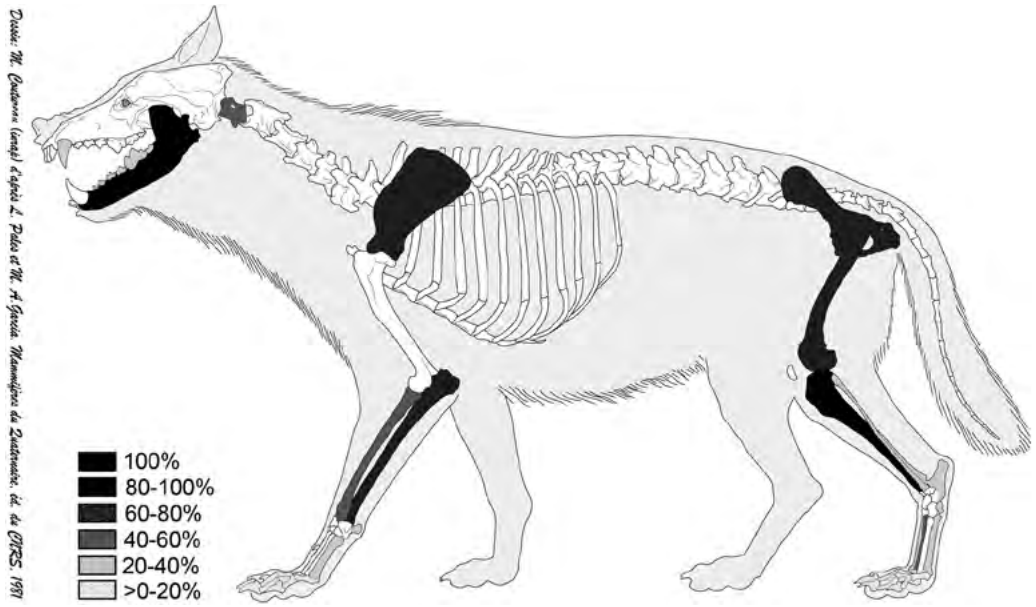

Figure 17. Skeletal preservation by elements in percentage survival (Ps%) of wolf from Climăuți II/upper.

5.4.2. Horse

Looking at the nutritional values it corresponds to the reverse bulk strategy, the less nutritive parts, more related to marrow consumption (Figure 19).

5.4.3. Bison

Concerning bison we have few elements, but we can purpose tendencies. Looking at the nutritional values it corresponds to the reverse bulk strategy, the less nutritive parts, more related to marrow consumption (Figure 20).

5.4.4. Cervids

Concerning cervids, we have few remains.

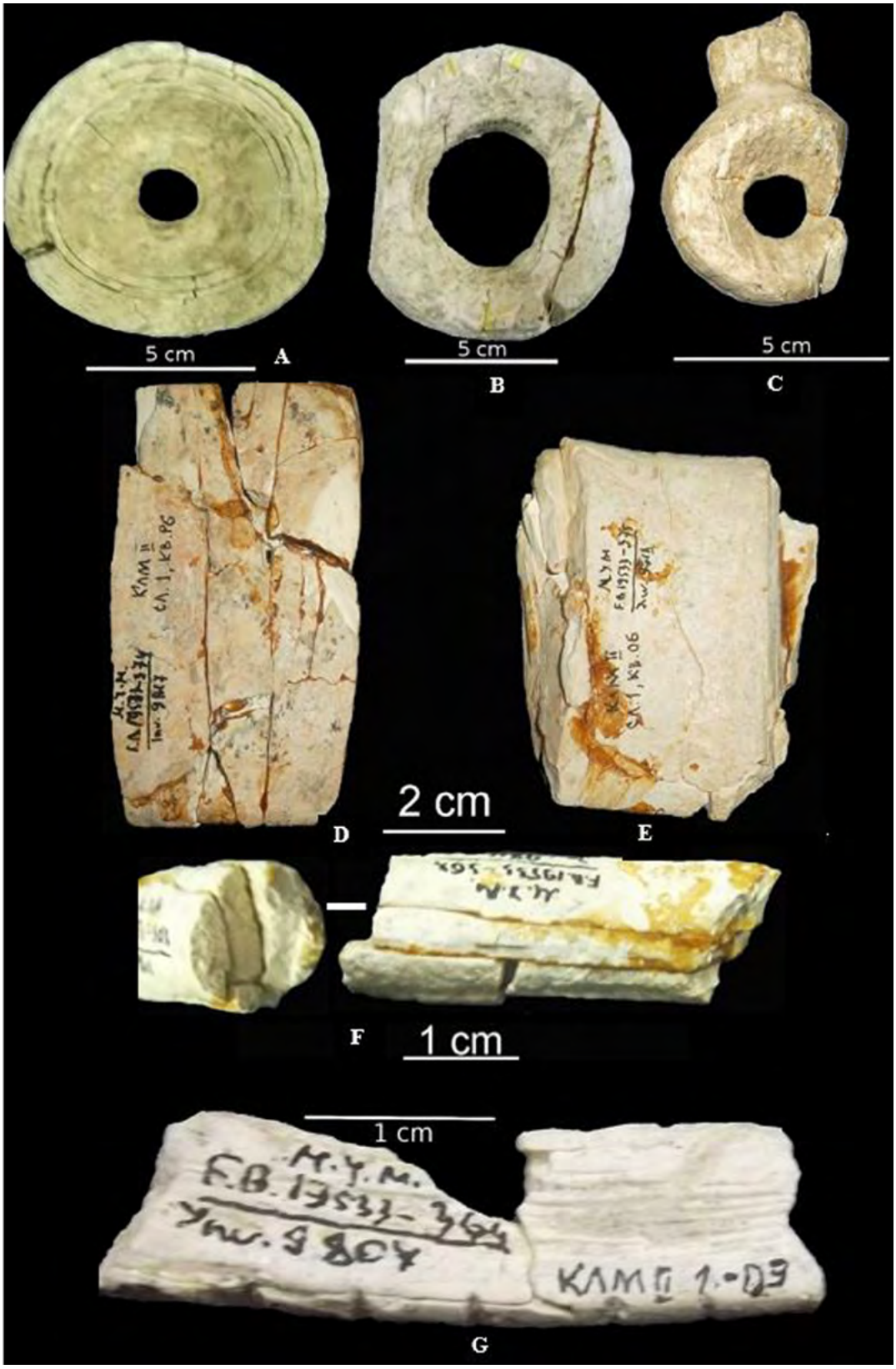

Figure 18. Shaped ivory pieces from Climăuţi II/upper.
A-B-C: ivory rings; D-E: fragments of «bracelets »; F: cone; G: plate.

The surfaces of antlers of red deers are characterized by more plant root marks and ferric and manganese deposits. So they were probably imported on the site. A fragment of antler was shaped: hollowed spongiosa and a circular furrow all around the stem (Figure 21A).

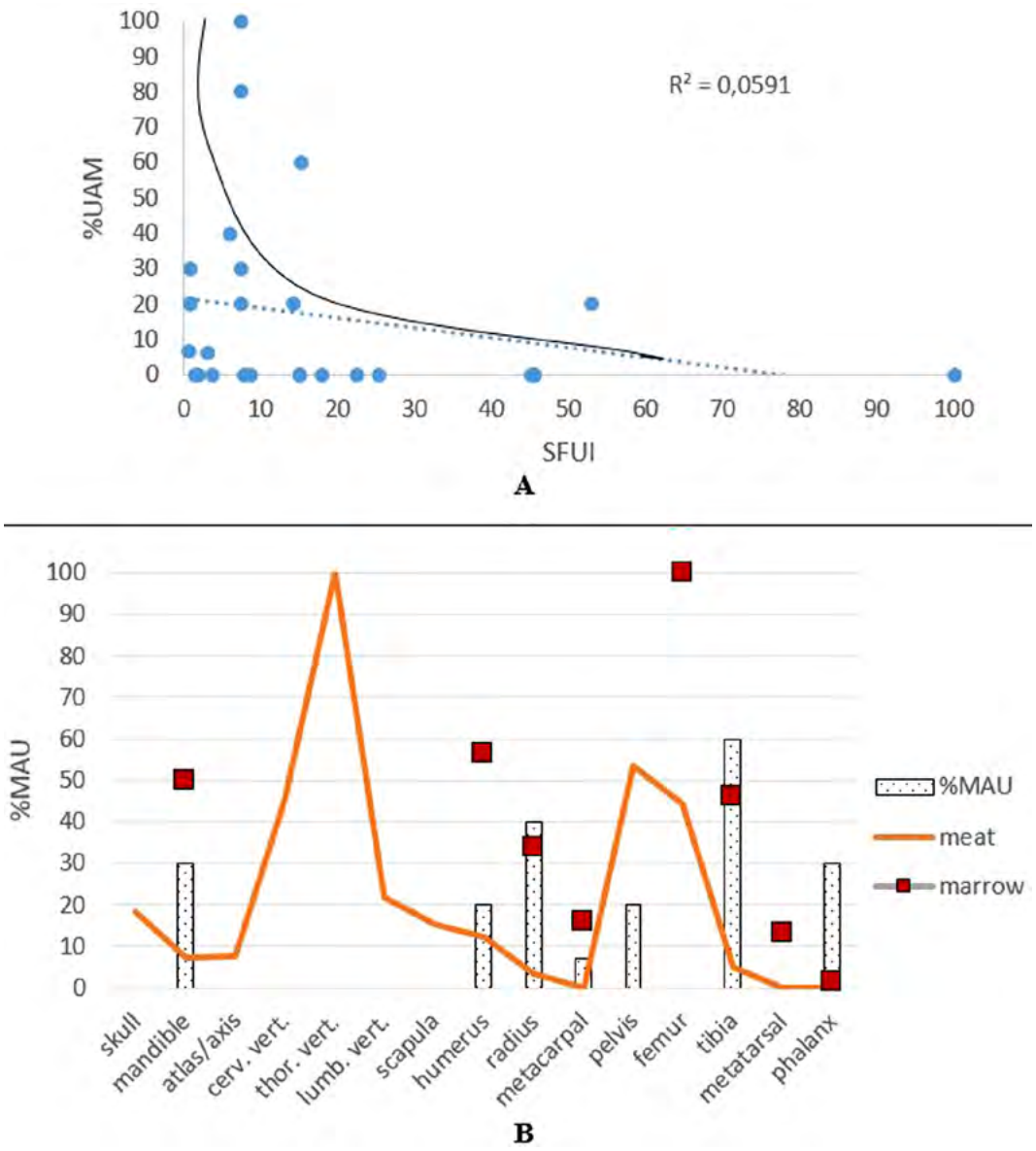

Figure 19. Skeletal preservation of horses related to nutritional values (Outram and Rowley Conwy, 1998; Morin, 2012), from Climăuți II/upper. A: nutritional values by anatomical segments; B: in%MAU by anatomical elements, related to the indexes meat and marrow.

Another fragment of antler is characterized by series of parallel transversal grooves Figure 21B).

5.4.5. Canids

Two bones of wolf were shaped: a sawn and abraded metapodial and a sawn metapodial with grooves Figure 22).

5.4.6. Large or medium-sized mammal

Three fragments of ribs of large or medium-sized mammal are characterized by modifications (Figure 23). We have to raise that lead pencil marks are present on bones.

The first object (A) is characterized by different modifications. These marks are localized on latero-posterior surface. The first one consists of the presence of a diagonal fracture and a series of notches and grooves. These marks could result from carnivore or anthropogenic activities. Grooves are

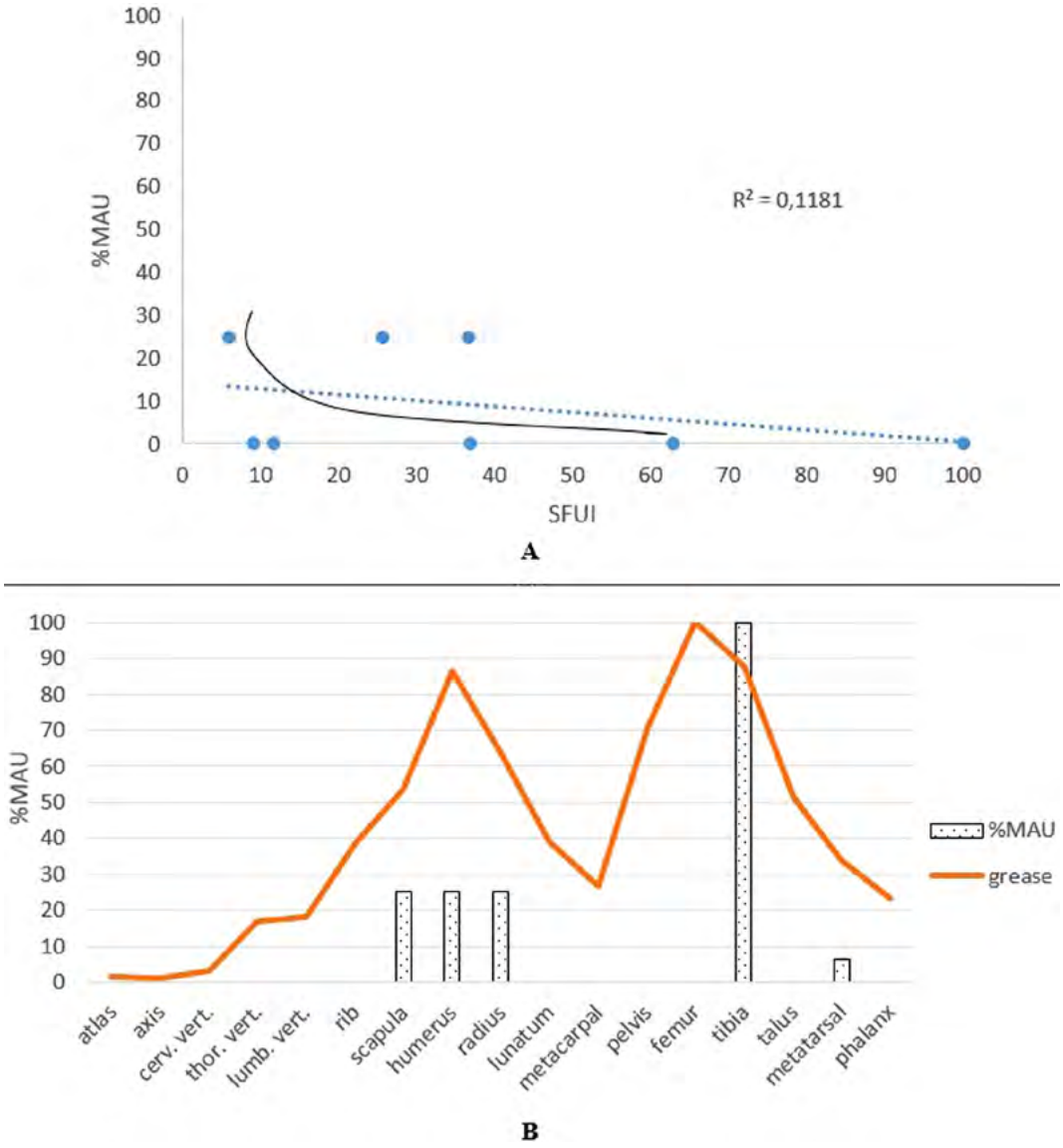

Figure 20. Skeletal preservation of bisons, related to nutritional values (Emerson, 1990), from Climăuţi II/upper. A: nutritional values by elements; B: in%MAU by anatomical elements, related to the indexe grease.

Figure 21. Shaped antlers of cervids from Climăuţi II/upper. A: fragment of shaped red deer antler; B: fragment of cervid antler with grooves.

Figure 22. Shaped bones of wolves from Climăuţi II/upper. A: sawn and abraded metatarsal V; B: sawn metapodial with grooves.

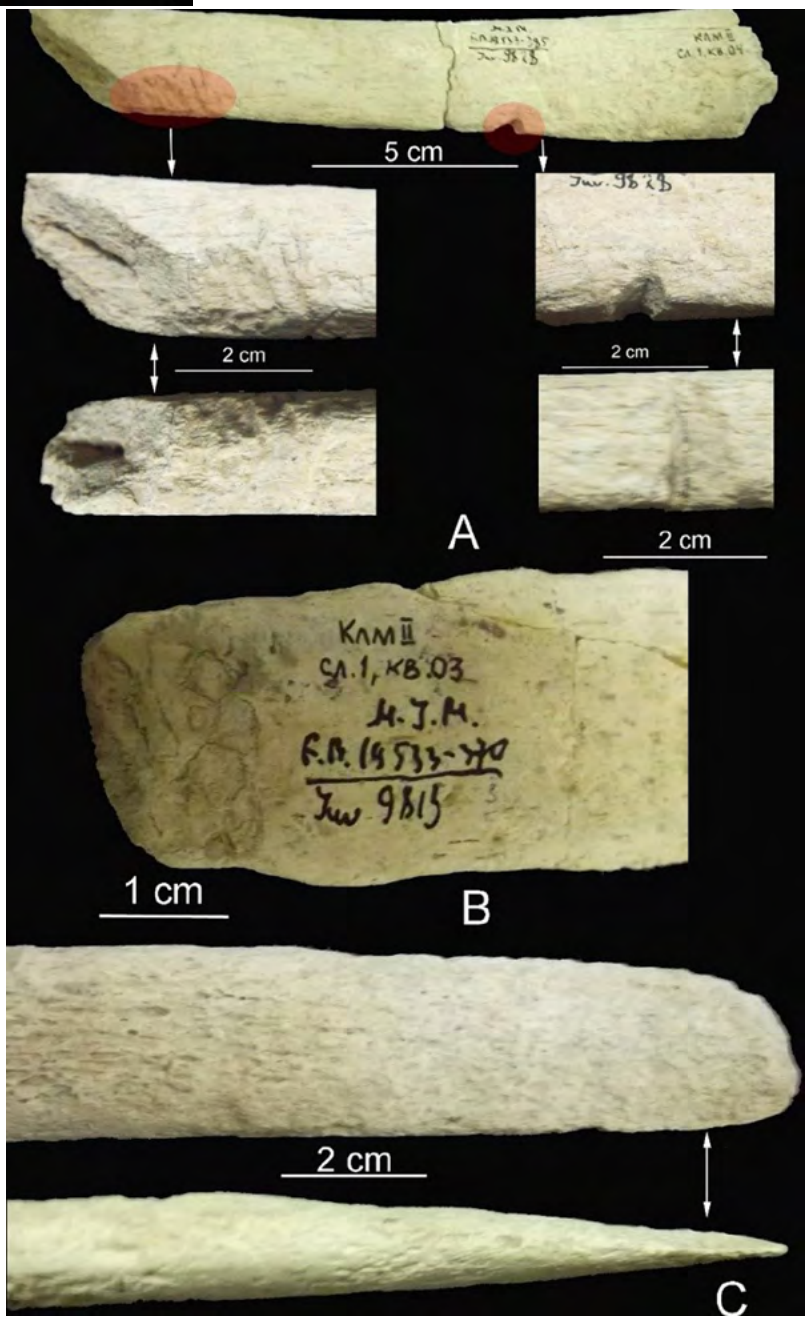

Figure 23. Modified ribs of large or medium-sized mammal from Climăuţi II/upper.

asymmetric, localized on the edge and only on one side of the rib. Notches are of variable sizes and depths. So these stigmas do not seem to be related to the chewing of a carnivore. In addition, the slices of the grooves are more marked than those generally made by carnivores. It looks like lithic tool impact on relatively grease bone. The second mark is a puncture wound (6 mm width). It does not look like recent damage. This kind of stigmata is not really common on ribs. This is also could result from carnivore or anthropogenic activities on grease bone. Carnivores can make this kind of puncture by gnawing. But generally a unique puncture results from the gnawing on long bone which were fractured and dispersed, not on rib. By addressing the anthropogenic causes, it could result from food or non-food activities, or during slaughtering of the prey. It could be a technical work, as sawing type. However it looks like an immediate damage. Indeed we did not observe any repeated gesture neither abrasion. It could be relied to butchering activities of the carcass. The mark is 'V' shaped but wide, deep and not symmetric, so not similar to a cutmark. From similar cases and experimentations (Churchill *et al.* 2009; Fernández-Jalvo and Andrews 2016; Pomeroy *et al.* 2017) it could be a penetrating lesion, due to object such as stab or projectile. The lack of secondary damages such as radiating fracture lines or crushes tends to show that this lesion was caused by relatively low kinetic energy.

The second object (B) bears notches and the edges were abraded. It is not due to water effect, neither carnivore. It is relied to anthropogenic abrasion and impacts.

The third object (C) was clearly abraded. We can identify it as a lissoir.

5.4.7. Medium or small sized-mammal

Six diaphysis cylinders and fragments of cylinders were sawn and polished, sometimes with grooves (Figure 24). It could be pearls.

5.4.8. Shells and echinoderm

In association with mammal bones we saw the perforated shells and the urchin with grooves (Figure 25).

5.5. Durations of occupation

According to the weight of meat of herbivores and the energy values potentially exploited, the upper level of Climăuţi II is rich (Table 5). It may be the slaughtering of several individuals or, more likely, several hunts that have taken place over a number of years by a relatively large human group.

Figure 24. Diaphysis cylinders and fragments of cylinders of medium or small sized-mammal from Climăuţi II/upper.

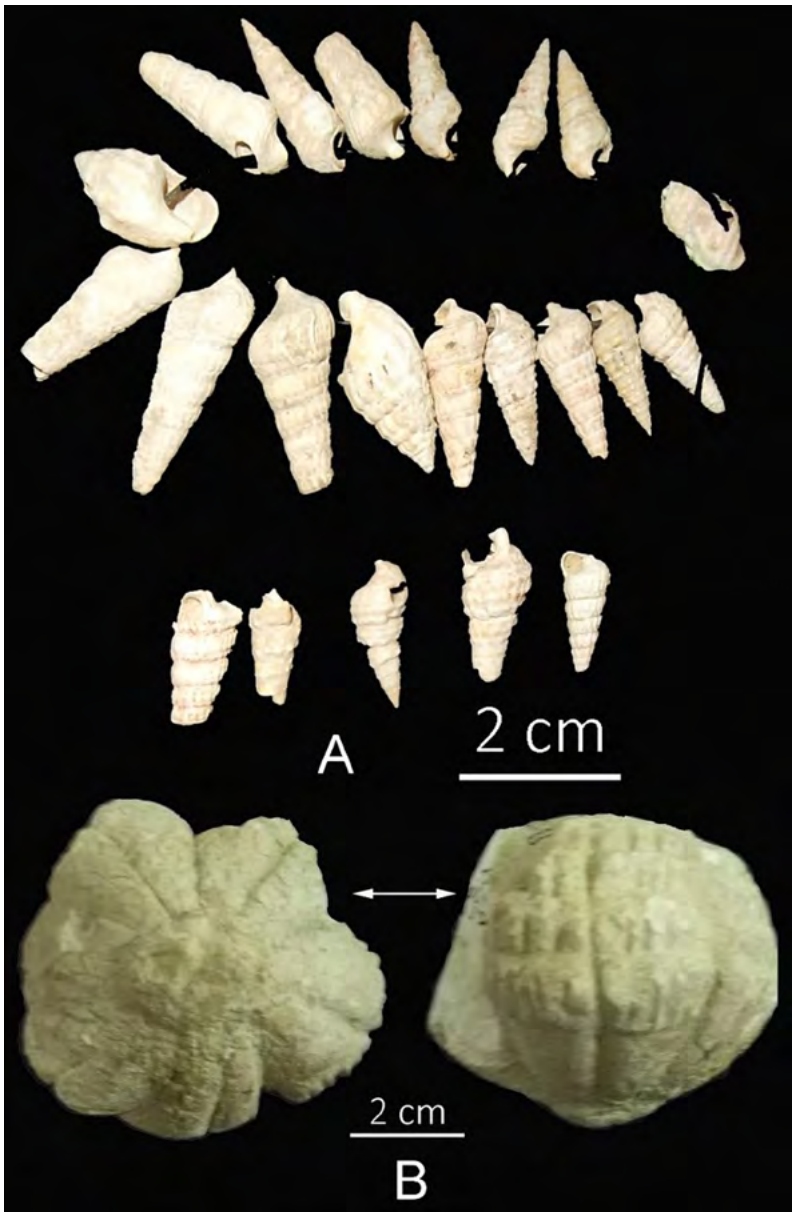

Figure 25. Shells and echinoderm from Climăuți II/ upper.

weight of meat (kg)					
reindeer	horse	bison	TOTAL	mammoth	TOTAL with mammoth
120	950	1920	**2990**	31110	**34100**
estimation of durations of occupation					
number of days for 1 person		number of months for 10 persons		with mammoth	
				days for 1 person	months for 10 persons
4271		**14**		**48714**	**162**
energetic values (Kcal)					
reindeer	horse	bison	TOTAL	mammoth	TOTAL with mammoth
152400	1045000	2016000	**3213400**	62220000	**65433400**
estimation of durations of occupation					
number of days for 1 person		number of months for 10 persons		with mammoth	
				days for 1 person	months for 10 persons
3060		**10**		**62317**	**207**

Table 5. Estimation of weight of meat and energetic values related to durations of occupation, from Climăuți II/upper.

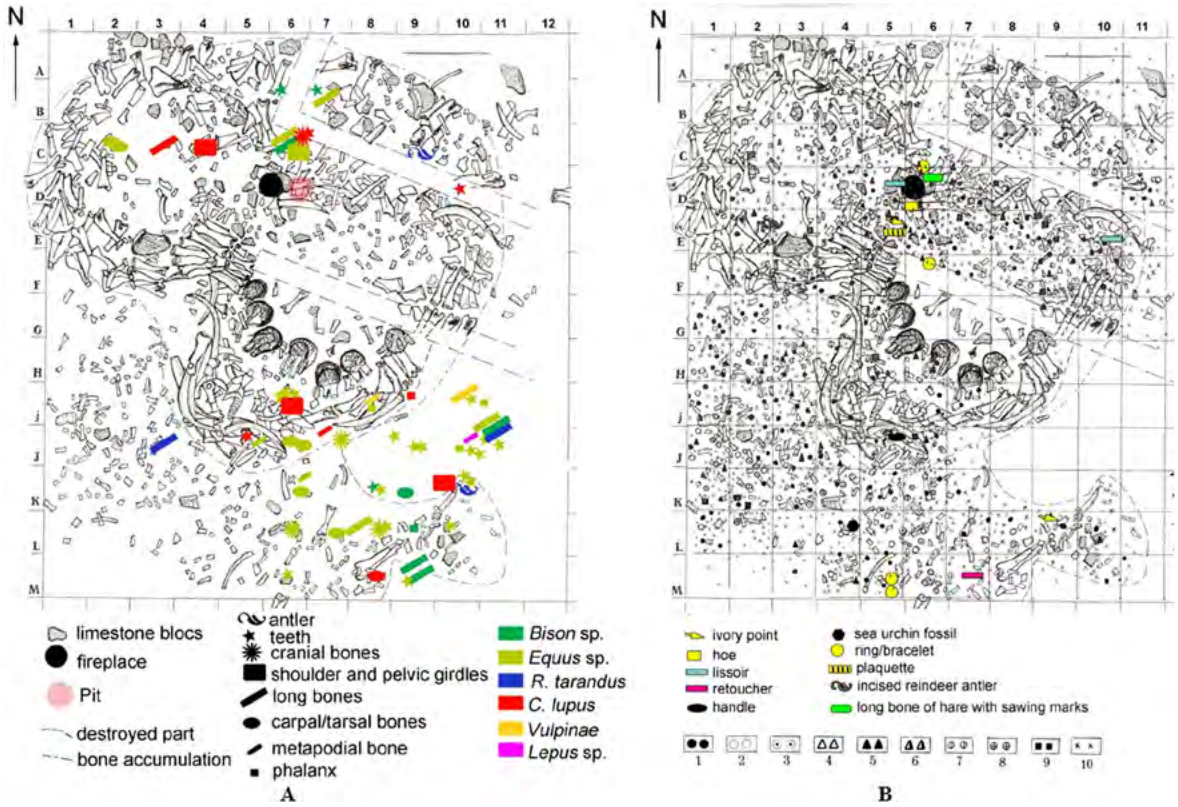

Figure 26. Spatial distribution from Climăuţi II/upper, excavations 1989. A: by type of elements and species (others than mammoth); B: of 'ornaments', boneous and lithic industries; Lithic tools: 1-2: end scrapers; 3: fragments of end scrapers; 4: angle burin; 5: lateral burins on retouched truncation; 6: burins from break; 7: retouched blades; 8: scrapers; 9: nucleus; 10: splinters.

5.6. Spatial distribution

Concerning the spatial distribution of mammoth bones, we have clusters of anatomical elements: skulls, tusks, humerus, tibias, scapulas, femurs (Figure 3), which form a circular accumulation. It is clearly not due to natural processes. So we have an intentional anthropogenic selection and disposition of mammoth bones.

As to other species, some bones are localized in the mammoth bone accumulation and the majority is outside (Figure 26A), probably relied to the treatment of marrow. The osseous industry pieces are located around the fireplace. Lithic nucleus and tools are distributed in this area and to the south of accumulation with more burins in the first and endscrappers in the second, which could reflect different stages of activities, particularly the final manufacturing processes (Figure 26B).

6. Discussion

6.1. Preservation of the assemblage

According to the taphonomic analyses this assemblage was relatively quickly buried, in subsurface with the presence of vegetation, then altered by humidity in relation to active layer of permafrost, mollisol. The whole material seemed to have been accumulated in a relatively short time span.

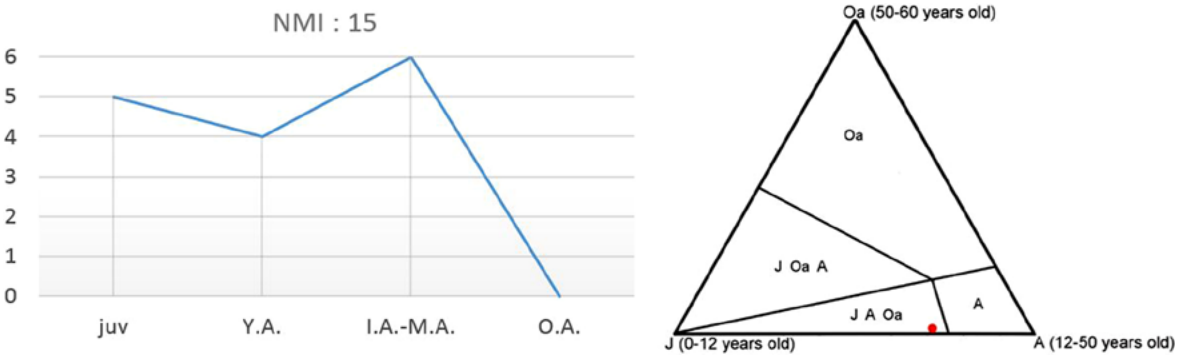

Figure 27. Mortality profile and ternary diagram from the precisely determined age of mammoths from Climăuţi II/upper.

6.2. Acquisition and exploitation of fauna

6.2.1. Mammoth

Although there are less represented, small bones are present. So because we have quite complete skeletons of mammoth, these mammoths died nearby the site. According to the profile of mortality (Figure 27), we have a high representation of adults s.l., with juveniles. Comparing with actualistic data, it could correspond to repeat selective slaughtering. We also identified a young adult male, a mature adults males and females. Knowing that among current populations of elephants three types of social behavior are adopted by elephants (female herds with juveniles, herds of males and solitary adult males) it is unlikely that mammoth of Climăuţi II were in the same place at the same time. So it could correspond to different die-offs.

6.2.2. Large-sized herbivores

Mixt herd(s) of horses were probably hunted. From our study we have a selection of anatomical quarters corresponding to a secondary butchering treatment. This is also the case for bisons.

6.2.3. Cervids

From the skeletal preservation of reindeers, they could have been submitted to the same treatment that for horse and bison.

The surfaces of antlers of red deers are characterized by more plant root marks and ferric and manganese deposits. So they were probably imported on the site.

6.2.4. Wolf

The skeletal preservation of wolves shows that complete carcasses have been bringing back on the site. So they were submitted to different treatment that for herbivores. The presence of a juvenile could correspond to a pack. They could be acquired by active hunting or could be trapped (enclosure) or snared. The tracks taken by the pack can be taking into account. Moreover when in a pack the dominant individuals can be trapped, the rest of the pack remaining in the area and can be hunted. Fur can be used. It has high isothermal capacities and is nonetheless thick and durable. The consumption of meat creates a risk of intestinal parasites. This meat must be cooked for a long time. We know that even it is not common and in high quantity, meat of wolf was sometimes eaten by humans (Lopez 1978; Cherkassov 2012; Steffánson 2004). Bones were used as mobilar support maybe as ornaments or needle cases. Use of wolf bones is rare. It is known in szeletian layer from Buran-Kaya III/C in Crimea (Laroulandie, d'Errico 2004)

and the epigravettian site of Eliseevichi 1 (Polikarpovich 1968; Abramova 1995; Demay *et al.* in press) in the Desna valley. Finally, domestication and tame could be possible during this period (Germonpré *et al.* 2015).

6.2.5. Small-sized mammals

Few remains of fox and hare were discovered. These species could have been acquired more occasionally.

6.2.6. Shells and echinoderm

Shells and an urchin were gathered, to be used as ornament and probably for their esthetic characteristics.

6.2.7. Activities of human groups and function of occupations

The archaeological remains from Climăuţi II attest to a variety of activities.

Flint knapping is a major activity, as demonstrated by the local flint exploitation and on-site importation of exogenous materials, the large number of lithic remains and the number of shaped tools. The presence of all the categories of lithic pieces shows that the different steps of the chaîne opératoire were realized on the site.

Then important hunting activities took place. We have highlighted the exploitation of the woolly mammoth that may have been hunted. The different species (mammoth, horse, reindeer, bison) could have been consumed after carcass treatment. Then bones and ivory were used and worked. Ivory work shows an important know-how of this material, with particular techniques.

Lithic tools can be relied to different tasks. Pebbles can be used as hammer for shaping objects. Blades can be used in their raw state or be retouched, to be used in hunting or/and butchering or to make other tools. Retouched flakes can be used for wood, skin, meat and bones works. Scrapers are used to perfect surface aspect. It is also generally agreed that endscrapers were used in the treatment of soft material, such as animal fur. They can also be used by cast percussion on perishables, sush as vegetal or animal origins. Scaled pieces are multi-faceted tools used for plants and any animal material (Bon 2005; Patou-Mathis *et al.* 2005). Burins can be used for grooving, engraving and also to perforate (Audouze *et al.* 1981). Moreover some osseous pieces were identified as *lissoirs*, which could be relied to tanning.

In the excavated area we have only relatively final stages of ivory cutting, lithic works and butchering treatment, so the first stages of the different chaînes opératoires were probably made nearby.

So Climăuţi II/upper could correspond to a base camp probably occupied several times during relatively short time span.

Furthermore this location is a strategic and protected place between river and cliffs near water to hunt mammals.

6.3. Seasonality

We do not have clear data concerning seasonality but we can purpose hypotheses.

According to the birth season and from age of bison teeth determined by Klein-Spinage method we can purpose that these individuals were killed between autumn and spring (Figure 28). So it could

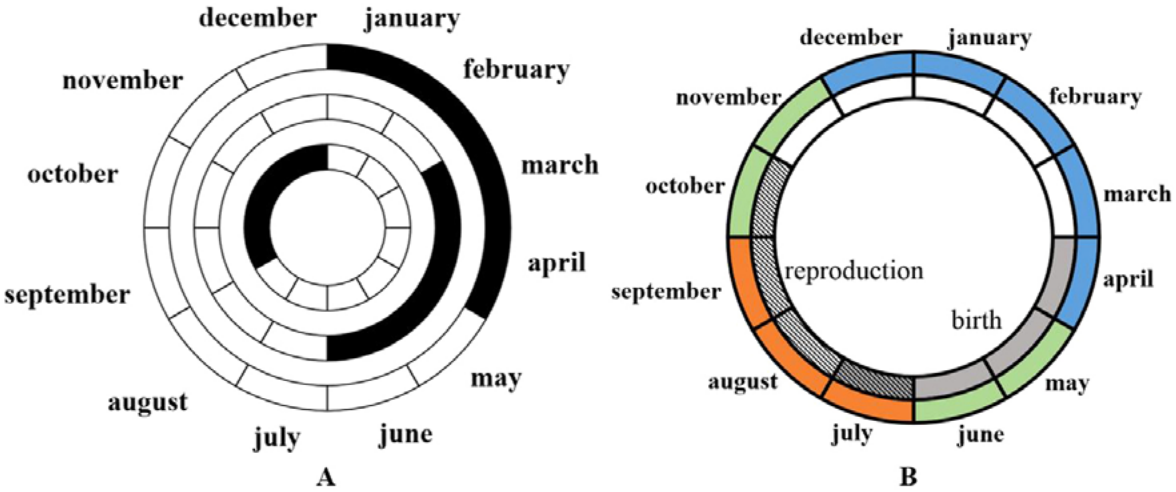

Figure 28. Seasonality of bisons. A: estimation of seasons from individuals from Climăuţi II; B: biological annual cycle of bisons.

correspond, mainly to slaughtering of isolated bison herds, but also to birth season or grouping during the reproduction period. It could also result from different hunts.

From the male non-shed antler of reindeer, we can say he was killed between April and December. So it could correspond to the migrations, to the dispersal or gathering of herds by sex.

6.4. Chronocultural position of the site in the region

Focusing on the Dniester valley sites of the first part of Upper Pleniglacial, we have four open air sites and a rockshelter:

- open air pluristratified sites: Dorochivtsy III (Ukraine) (Kulakovska *et al.* 2008; *et al.* 2015; Demay, Patou-Mathis and Koulakovska 2015), Crasnaleuca-Staniște/VII (Romania) (Brudiu 1980; Paŭnescu 1999; Cârciumaru, Cosac and Nițu 2004-2005), Raşkov VIII (Republic of Moldova) (Croitor, Covalenco 2011);
- one archaeological layer rockshelter: Ciuntu (Republic of Moldova) (David 1980; Borziac *et al.* 1997; Noiret 2009);
- one archaeological layer open air site: Valea Morilor (Republic of Moldova) (Obadă, Van der Plicht 2010; Obadă *et al.* 2012; Demay, Obadă 2018; Demay *et al.* submitted).

They are generally dominated by relatively short-term occupations, related to local lithic raw material for hunting activities. Reindeer is generally the main game, associated with horse and bison, with few exploitation of Canids. However we don't know if mammoth was included in the diet. But ivory was used as tool and artistic support. It is the case in Dorochivtsy III. Moreover bones of mammoth were used as combustible, as in Valea Morilor. So Climăuţi II is a unique site inthe region with a clear and important status accorded to mammoth by Paleolithic human groups. This could correspond to specific activities of the same human population or to a totally different culture.

7. Conclusions

The zooarchaeological study of bone material permitted to better understand the burial conditions and the human activities in Climăuţi II. We found that this assembly was little affected by sediment movements and have been accumulated in a relatively short time span. The identification of the anatomical representation and the population profiles of mammoths permitted to identify repeated selective slaughtering nearby the site. The woolly mammoth is the main species, probably

as important food resources, for ivory and as raw material to build structure. From our study concerning the secondary games, horses, bisons and reindeers, we have a selection of anatomical quarters corresponding to a secondary butchering treatment. Concerning wolves, bones were used as mobile support, which is in fact very rare. Eventually, fox and hare were acquired more occasionally also as red deer antlers were gathered.

The archaeological remains from Climăuţi II attest to a variety of activities, as flint knapping, hunting and butchering activities, also as bone work. So Climăuţi II/upper could correspond to a base camp probably occupied several times during relatively short-termed period. We do not have numerous data concerning seasonality but we can purpose that these occupations took place at least between autumn and spring.

According to the comparisons of the Dniester valley sites of the first part of Upper Pleniglacial, Climăuţi II/upper is a unique site in the region with a clear and important status accorded to mammoth by paleolithic human groups. This could correspond to specific activities of the same human population in the area or to a different culture. This point needs to be further developed in the future by new zooarchaeological analyses of regional sites and comparisons with Eastern European Plain and Central Europe occupations.

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Studies on the Palaeolithic of Western Eurasia presents the papers from Sessions XVII-4 and XVII-6 of the 18th UISPP World congress (Paris, June 2018). The geographic areas discussed in the Session 4, Central and Eastern Europe, are prehistorically strongly articulated, their cultural successions are highly similar, and they share several common archaeological issues for investigation. The papers disseminate a wealth of archaeological data from Bavaria to the Russian Plain, and discuss Aurignacian, Gravettian, Epigravettian, and Magdalenian perspectives on lithic tool kits and animal remains. The papers of Session 6 are concerned with lithic raw material procurement in the Caucasus and in three areas of the Iberian peninsula.

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