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Studies on the Palaeolithic of Western Eurasia

edited by

György Lengyel, Jarosław Wilczyński,
Marta Sánchez de la Torre, Xavier Mangado,
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Session XVII-6. Lithic raw materials procurement during the upper Palaeolithic from Eurasia. Traditional approaches and contributions from the Archaeometry

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Foreword to the XVIII UISPP Congress Proceedings

UISPP has a long history, originating in 1865 in the International Congress of Prehistoric Anthropology and Archaeology (CIAAP). This organisation ran until 1931 when UISPP was founded in Bern. In 1955, UISPP became a member of the International Council of Philosophy and Human Sciences, a non-governmental organisation within UNESCO.

UISPP has a structure of more than thirty scientific commissions which form a very representative network of worldwide specialists in prehistory and protohistory. The commissions cover all archaeological specialisms: historiography; archaeological methods and theory; material culture by period (Palaeolithic, Neolithic, Bronze Age, Iron Age) and by continents (Europe, Asia, Africa, Pacific, America); palaeoenvironment and palaeoclimatology; archaeology in specific environments (mountain, desert, steppe, tropical); archaeometry; art and culture; technology and economy; biological anthropology; funerary archaeology; archaeology and society.

The UISPP XVIII World Congress of 2018 was hosted in Paris by the University Paris 1 Panthéon-Sorbonne with the strong support of all French institutions related to archaeology. It featured 122 sessions, and over 1800 papers were delivered by scientists from almost 60 countries and from all continents.

The proceedings published in this series, but also in issues of specialised scientific journals, will remain as the most important legacy of the congress.

L'UISPP a une longue histoire, à partir de 1865, avec le Congrès International d'Anthropologie et d'Archéologie Préhistorique (C.I.A.A.P.), jusqu'en 1931, date de la Fondation à Berne de l'UISPP. En 1955, l'UISPP est devenu membre du Conseil International de philosophie et de Sciences humaines, associée à l'UNESCO. L'UISPP repose sur plus de trente commissions scientifiques qui représentent un réseau représentatif des spécialistes mondiaux de la préhistoire et de la protohistoire, couvrant toutes les spécialités de l'archéologie : historiographie, théorie et méthodes de l'archéologie ; Culture matérielle par période (Paléolithique, néolithique, âge du bronze, âge du fer) et par continents (Europe, Asie, Afrique, Pacifique, Amérique), paléoenvironnement et paléoclimatologie ; Archéologie dans des environnements spécifiques (montagne, désert, steppes, zone tropicale), archéométrie ; Art et culture ; Technologie et économie ; anthropologie biologique ; archéologie funéraire ; archéologie et sociétés.

Le XVIII^e Congrès mondial de l'UISPP en 2018, accueilli à Paris en France par l'université Paris 1 Panthéon-Sorbonne et avec le soutien de toutes les institutions françaises liées à l'archéologie, comportait 122 sessions, plus de 1800 communications de scientifiques venus de près de 60 pays et de tous les continents.

Les actes du congrès, édités par l'UISPP comme dans des numéros spéciaux de revues scientifiques spécialisées, constitueront un des résultats les plus importants du Congrès.

Marta Azarello
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Zooarchaeological analyzes of the faunal remains of the upper layer of Climăuți II (Republic of Moldova)

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Abstract

The upper layer of Climăuți 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, Climăuți 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 Climăuți 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 mammoth 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, Climăuți II est un site unique dans la région, avec un statut particulier accordé au mammoth par les groupes humains.

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

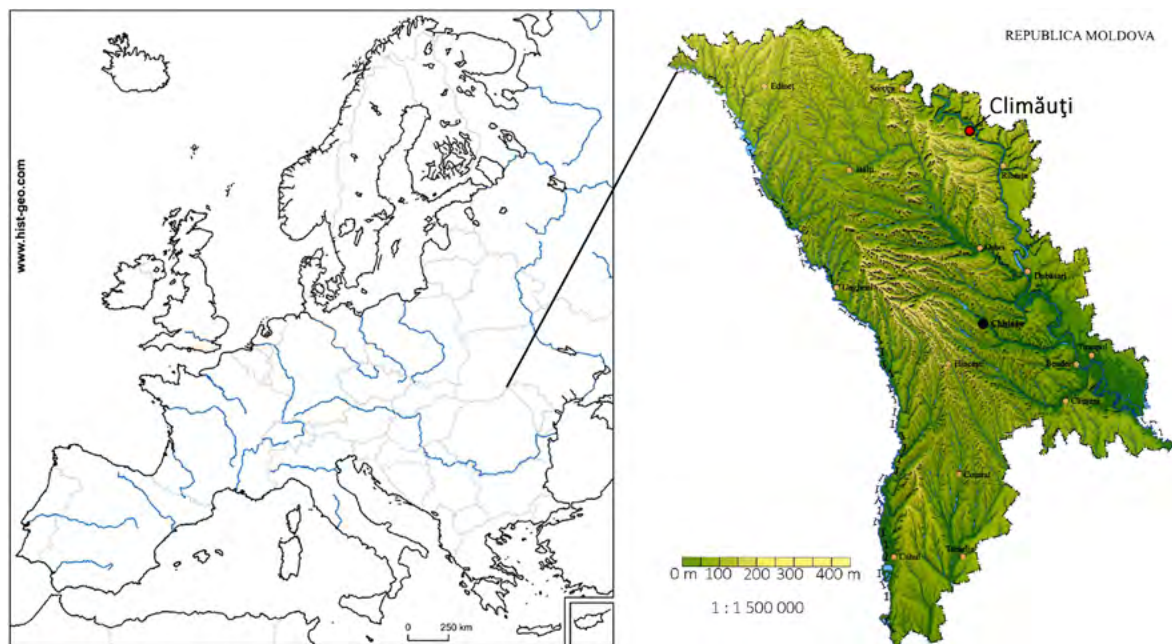


Figure 1. Localisation of the site of Climăuți II in Republic of Moldova.

with hilly lands alternating with mountainous lands intersected by enclosed or meandering valleys. Molodova V, Mitoc-Malu-Galben, Korman IV, Cotu-Miculiniți, Cosăuți 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 which corresponds 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 Climăuți de Jos (District Soldănești, Republic of Moldova) were made by I. Borziac in 1971, with the site of Climăuți 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 Climăuți 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).

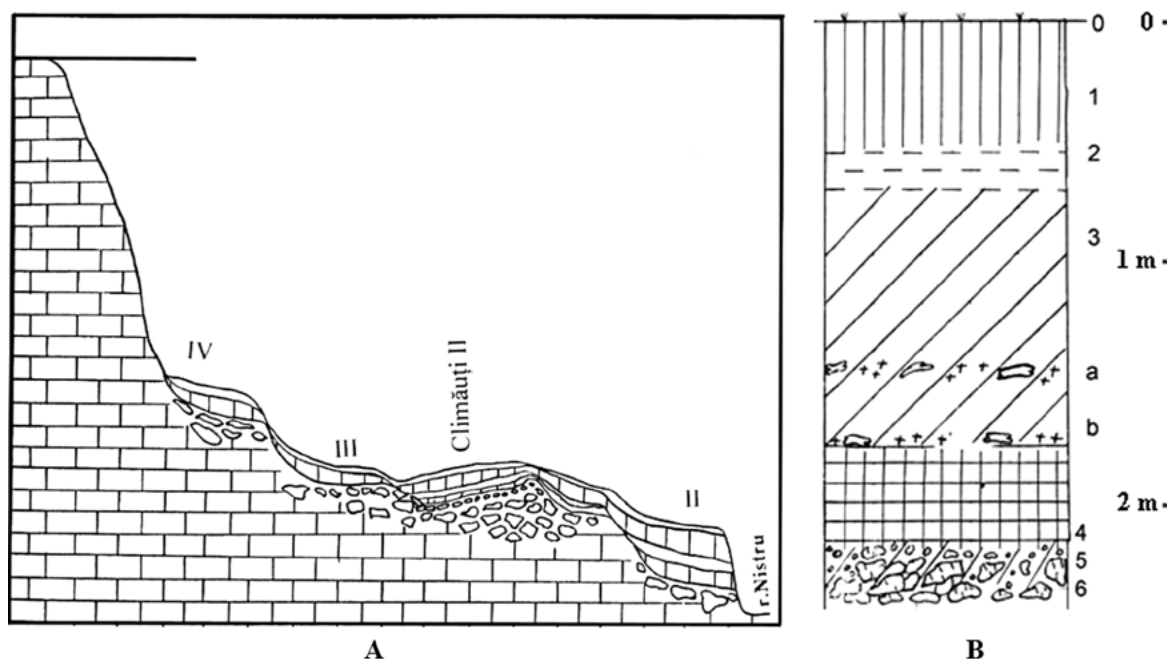


Figure 2. Geologic data of Climăuți II, excavations 1989 A: location on the third terrace of the Dniester (Borziac, Chirica and David, 2007); B: stratigraphy (Borziac, David and Obadă, 1992); 1: chernozem; 2: horizon of transition between Holocene and Pleistocene; 3: loess level (clay with fine quartz 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 $20,350 \pm 230$ BP (LU-2431; M.V. Lomonosov University of Saint-Petersburg) from a mammoth cheek teeth. The lower layer was dated from $24,840 \pm 230$ 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 characterized 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 Rașkov 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 Chișinău (Republic of Moldova).

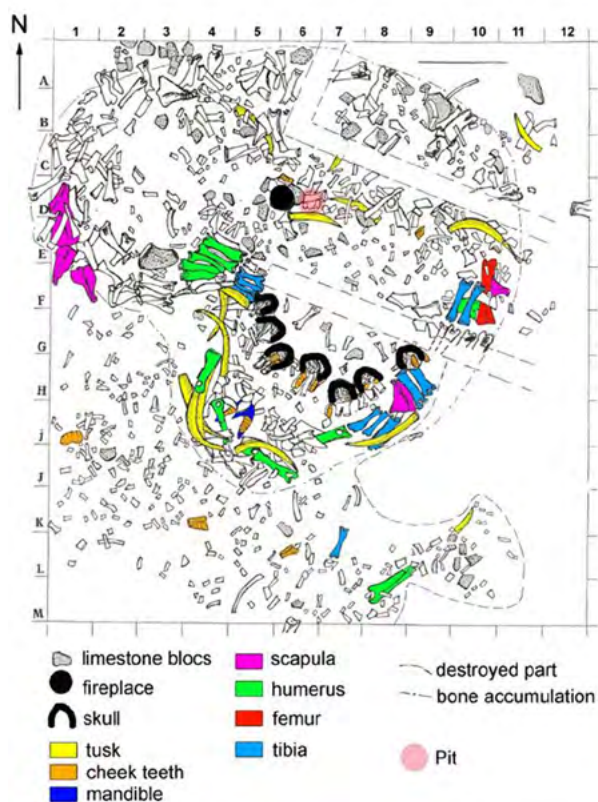


Figure 3. Planigraphy of elements and structures of Climăuți II/upper in 1989 (modified from Borziac, Chirica and David, 2007) and view on excavations (© A. Simanovschi).

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 Göhlich (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; Vaufray 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 curvilinear relation between the age and the height 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-Urbe 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 Kreuzer (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 |
|--------------------------------------|-----------------|-----|-----|-----|
| <i>Mammuthus primigenius</i> | Woolly mammoth | 311 | 243 | 17 |
| <i>Equus</i> sp. | Horse | 68 | 68 | 5 |
| <i>Bison</i> sp. | Bison | 19 | 17 | 4 |
| <i>R. tarandus</i> | Reindeer | 15 | 14 | 2 |
| <i>C. elaphus</i> | Red deer | 3 | 3 | 2 |
| <i>Canis lupus</i> | Wolf | 52 | 48 | 3 |
| <i>Vulpes</i> sp./ <i>A. lagopus</i> | Fox | 5 | 5 | 1 |
| <i>Lepus</i> 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 Climăuți II/upper in number of remains (NR), minimal number of element (MNE) and minimal number of individuals (MNI).

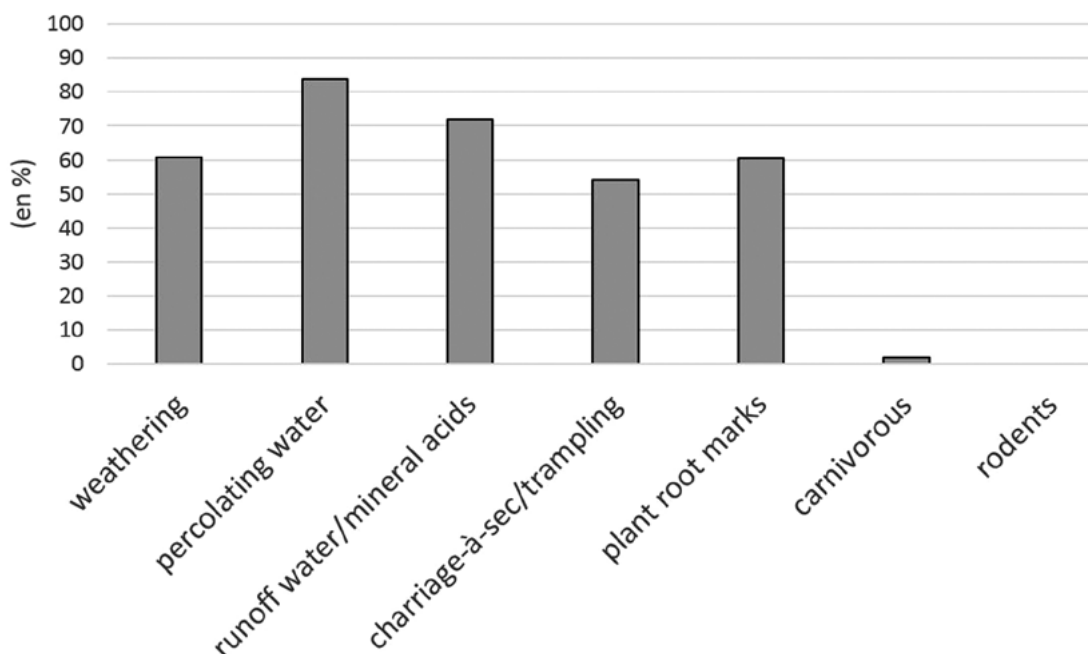


Figure 4. Alterations due to climato-edaphic and non-human biological agents in percentage of number of remains of Climăuți II/upper.

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;

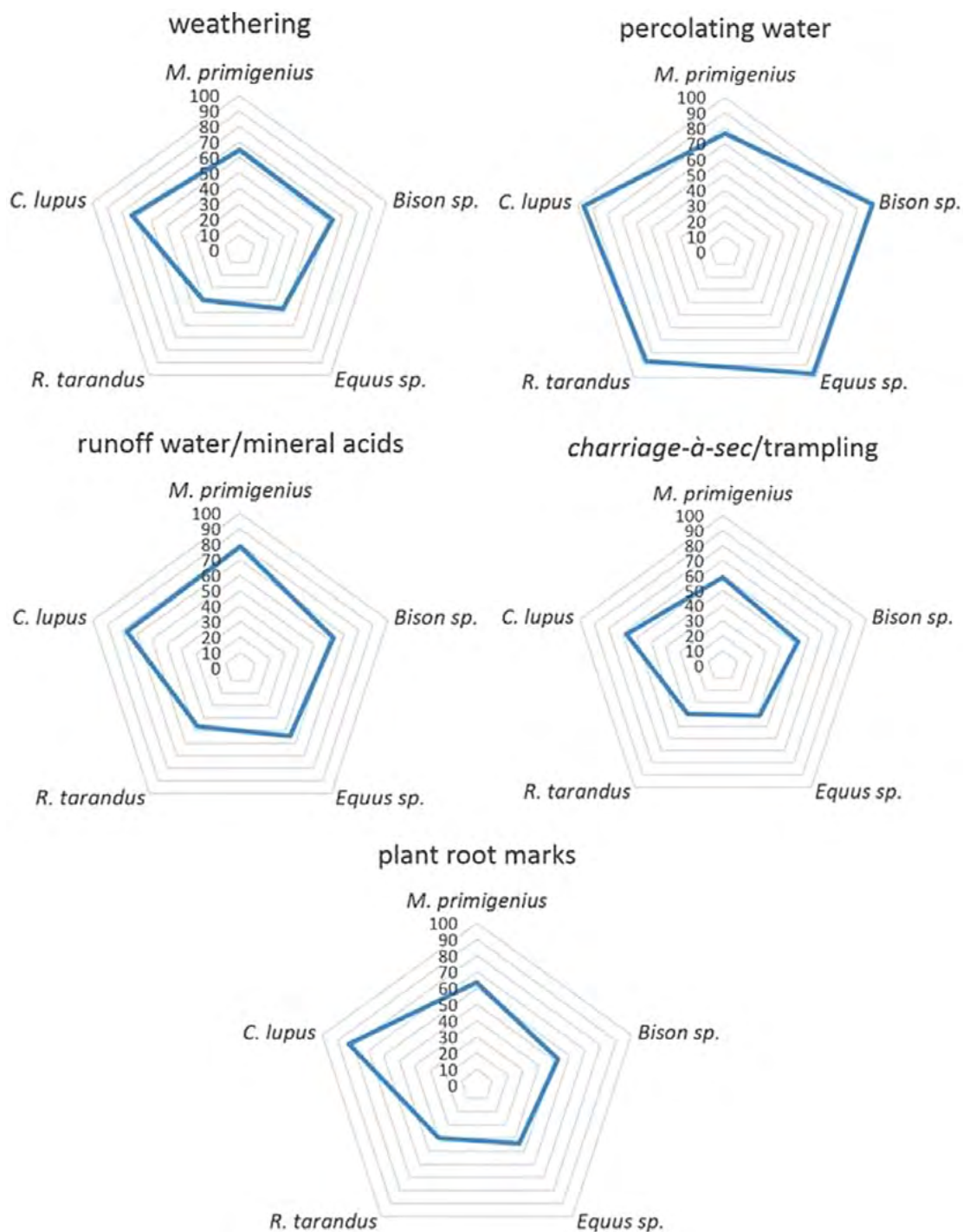


Figure 5. Alterations due to climato-edaphic and non-human biological agents in percentage of number of remains by species of Climăuți II/upper, (without species represented by ≤ 5 remains).

dental bones/postcranial bones) shows that the dental elements are overrepresented: $ICDNR = 84/182 = 0,46$; $ICDNE = 72/144 = 0,5$. 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).

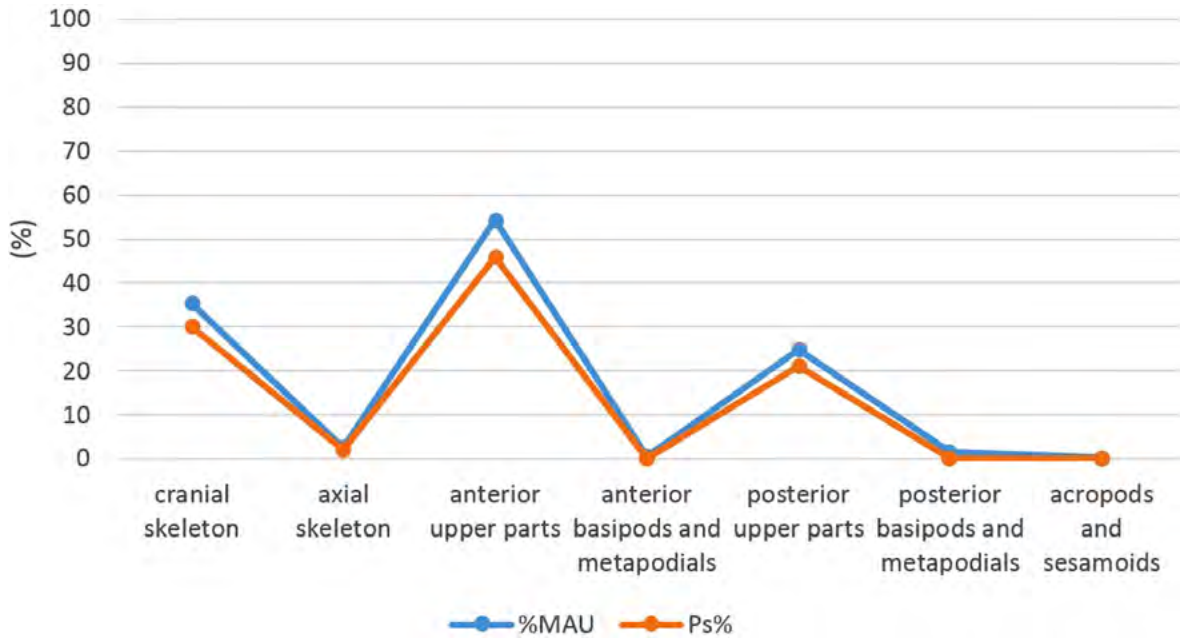


Figure 6. Skeletal preservation by anatomical parts in percentage of minimum animal unit (%MAU) and percentage survival (Ps%) of mammoth from Climăuți II/upper.

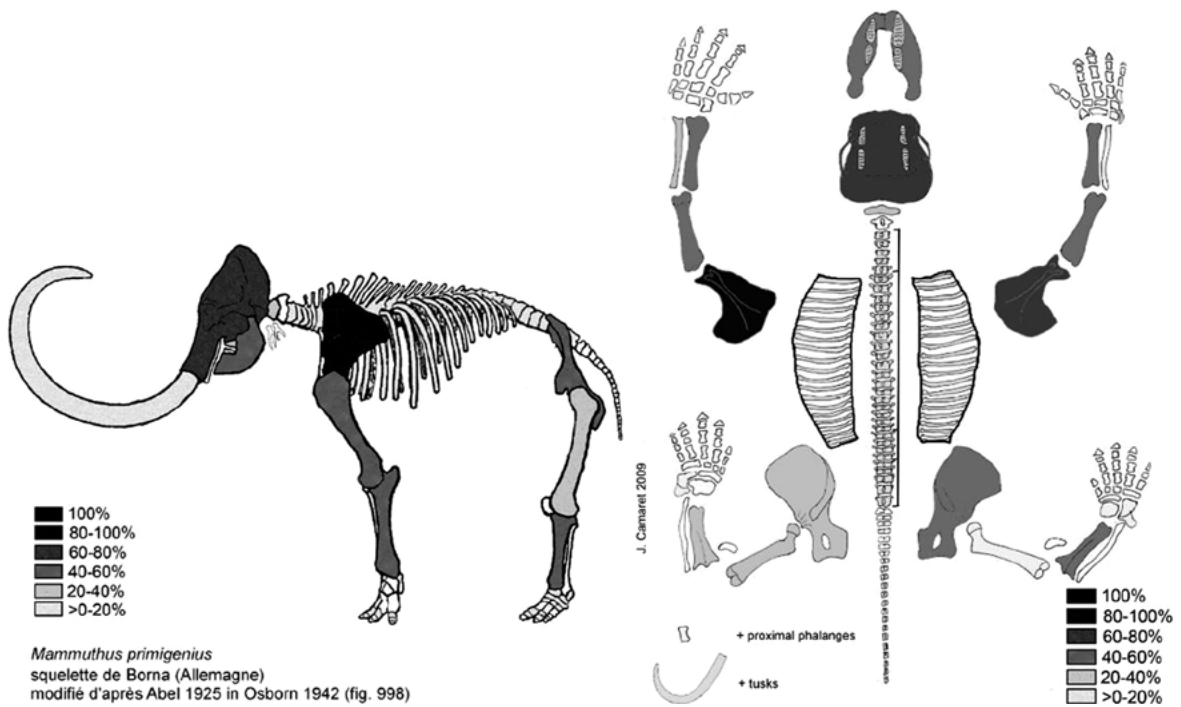


Figure 7. Skeletal preservation by elements and lateralized elements in percentage survival (Ps%) of mammoth from Climăuți II/upper.

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 Climăuți 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 <i>s.l.</i> | 2 |
| Total | 16 |

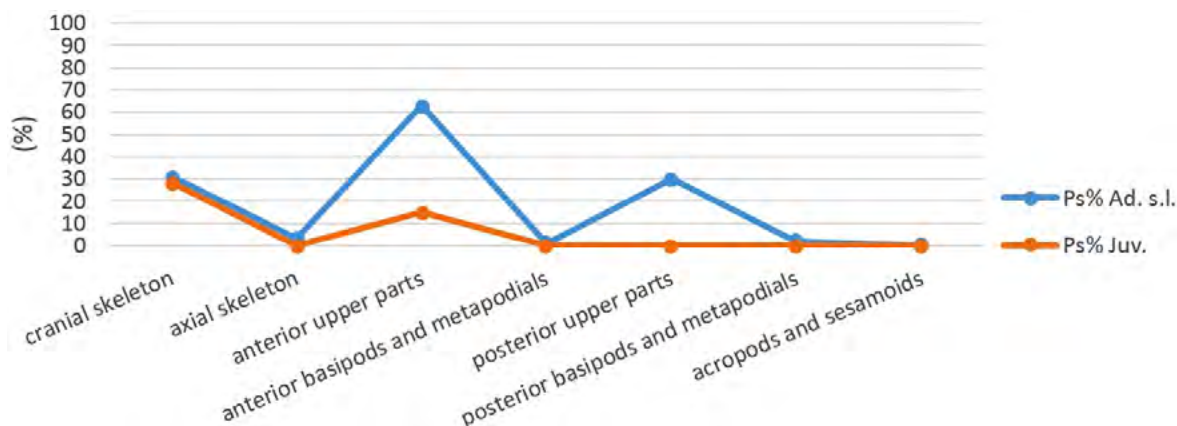


Figure 8. Skeletal preservation by anatomical parts in percentage survival (Ps%) of mammoth between adults s.l. and juveniles from Climăuți II/upper.

| 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 <i>s.l.</i> | > XVI | F | 2 |
| | VIII-XX | M | |
| Total | | | 17 |

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

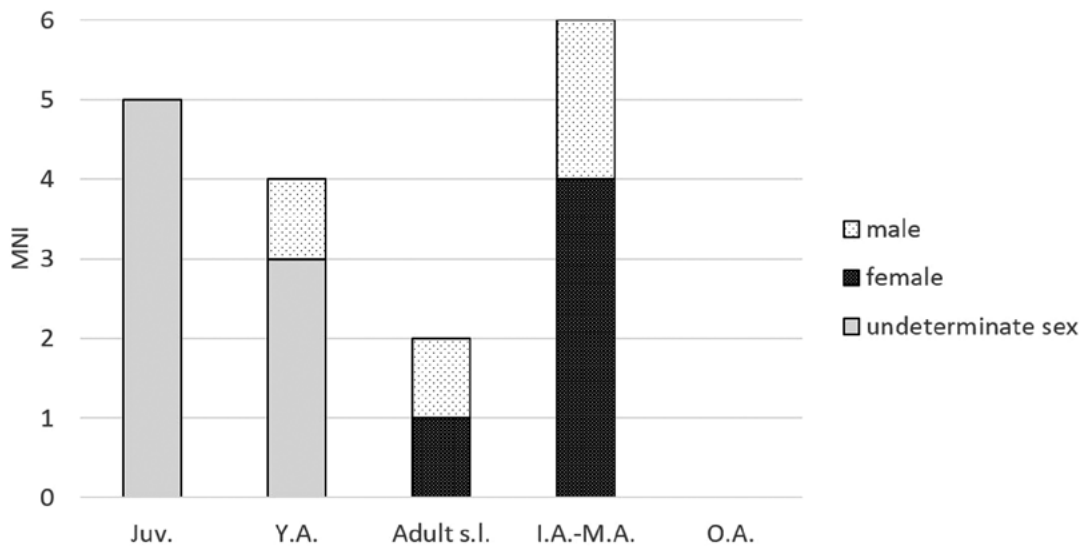


Figure 9. Minimum number of individuals by combination by age classes and gender of mammoth from Climăuți II/upper.

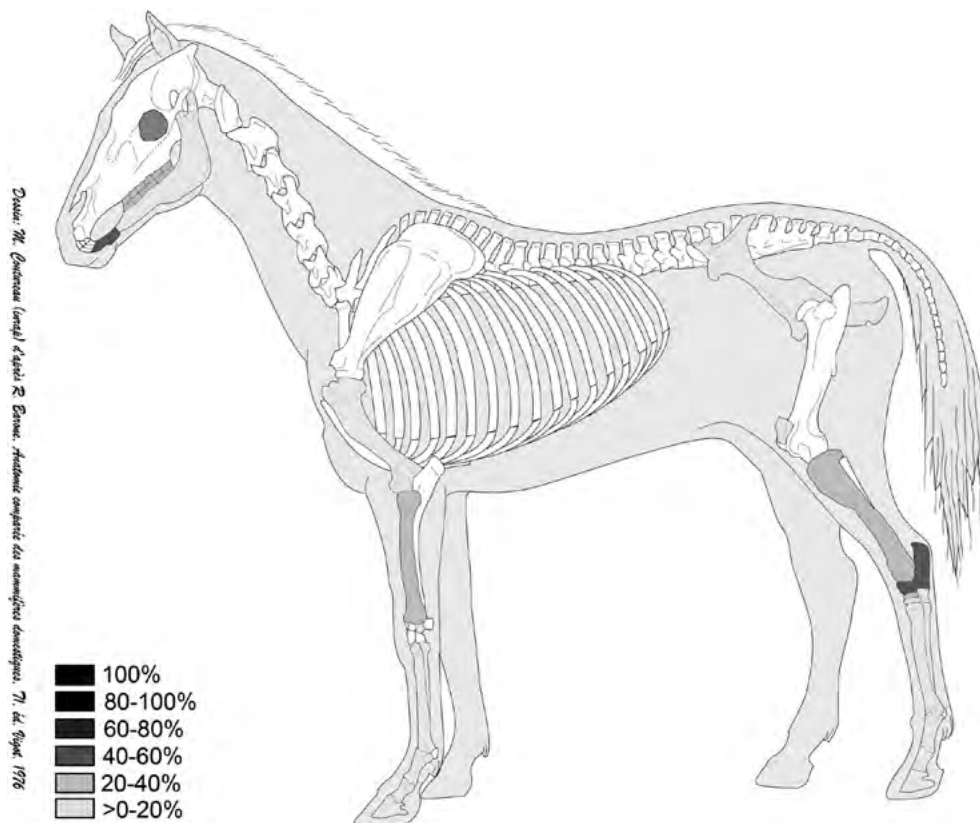


Figure 10. Skeletal preservation by elements in percentage survival (Ps%) of horse from Climăuți II/upper.

Considering the skeletal preservation by anatomical part in%MAU related to the density of bones ($R=0,14$; $p\text{-value}= 0,388899$ /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 Climăuți II/upper would correspond to *Equus latipes* (Figure 11).

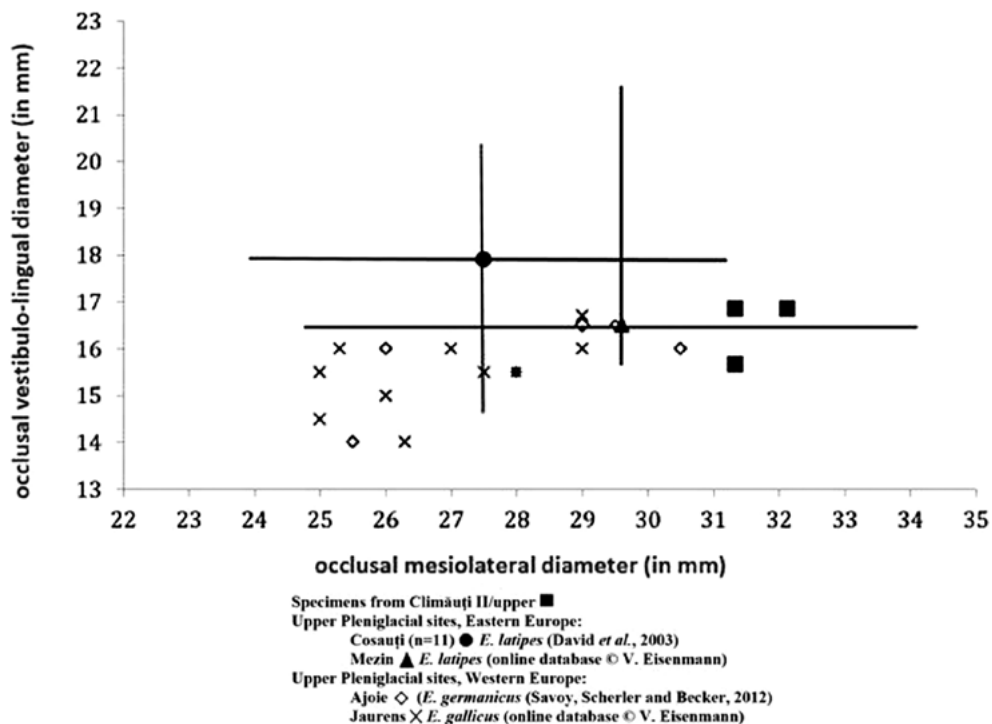


Figure 11. Osteometric comparisons of Equus sp. M1.

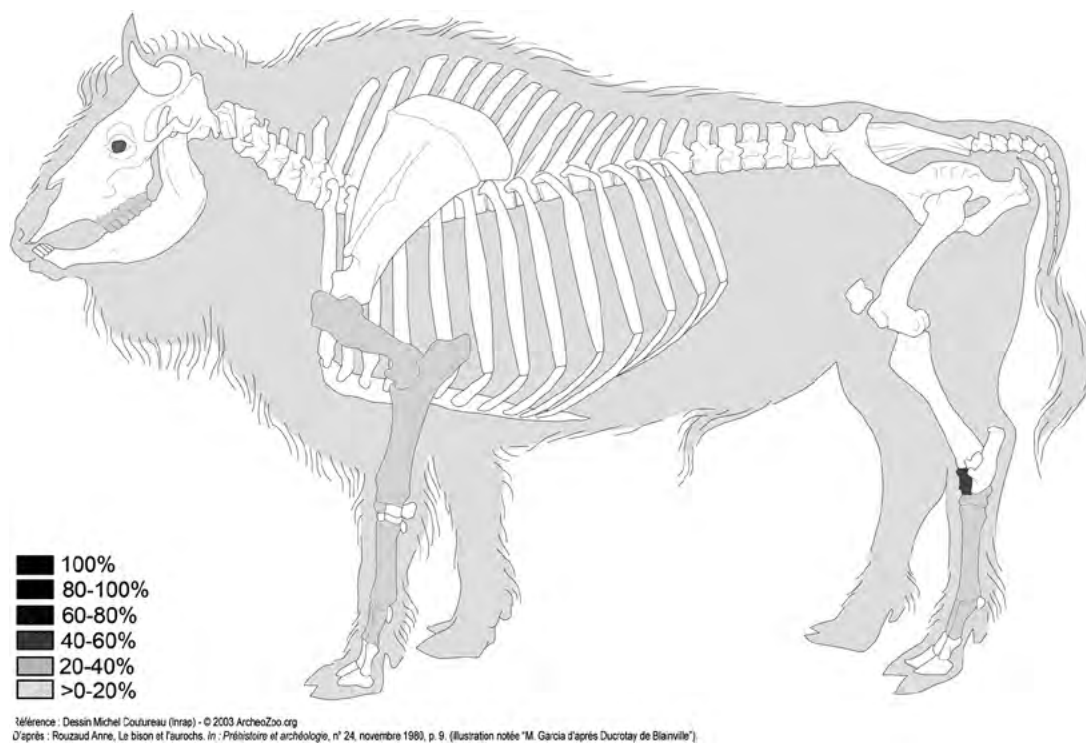


Figure 12. Skeletal preservation by elements in percentage survival (Ps%) of bison from Climăuți II/upper.

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 ($R=0,37$; $p\text{-value}= 0,052623$ / 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 | | | | |
|----------------------|----------|-------|-----------------------|------------------|----|-----------------|-----|
| | | | AGE _m | AGE _e | CH | CH _o | 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
AGE_m: potential ecological longevity; AGE_e: age of eruption for a tooth; CH: the crown height as measured at death; CH_o: the original unworn crown height.

According to bone refitting and pairings we identified 4 individuals. All of these individuals 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).

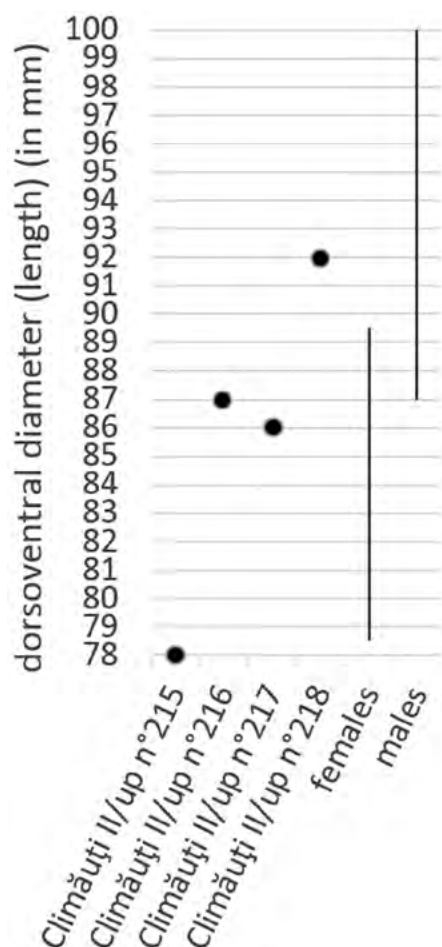


Figure 13. Osteometry of bison talus from Climăuți II/up and reference specimens (Prat *et al.* 2003).

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

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 example maybe to refined edges. It would be necessary to seek outside expertise to study the technical processes.

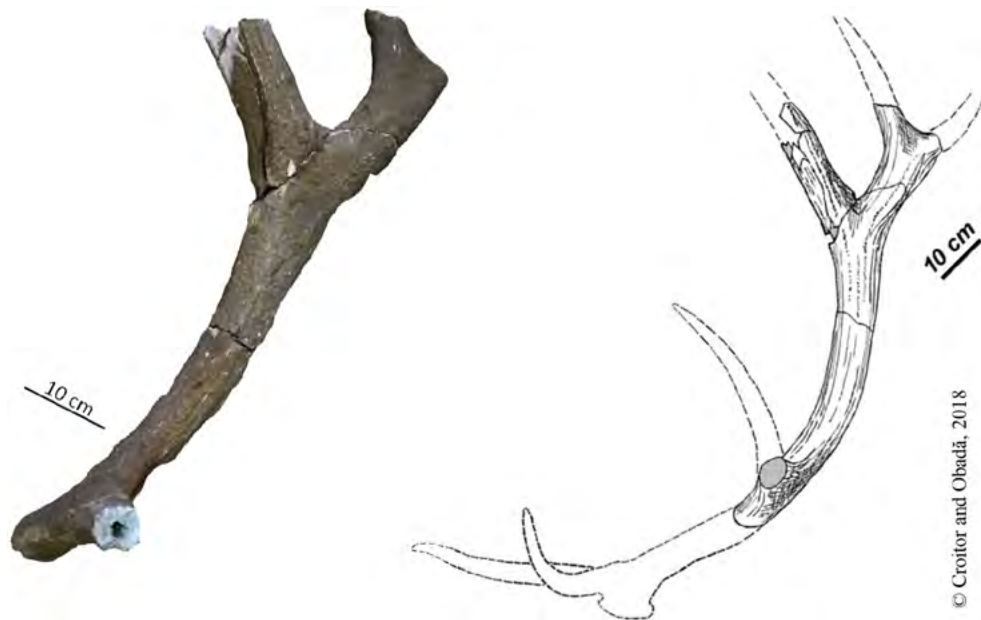


Figure 16.
Left antler of
red deer from
Climăuți II/up.

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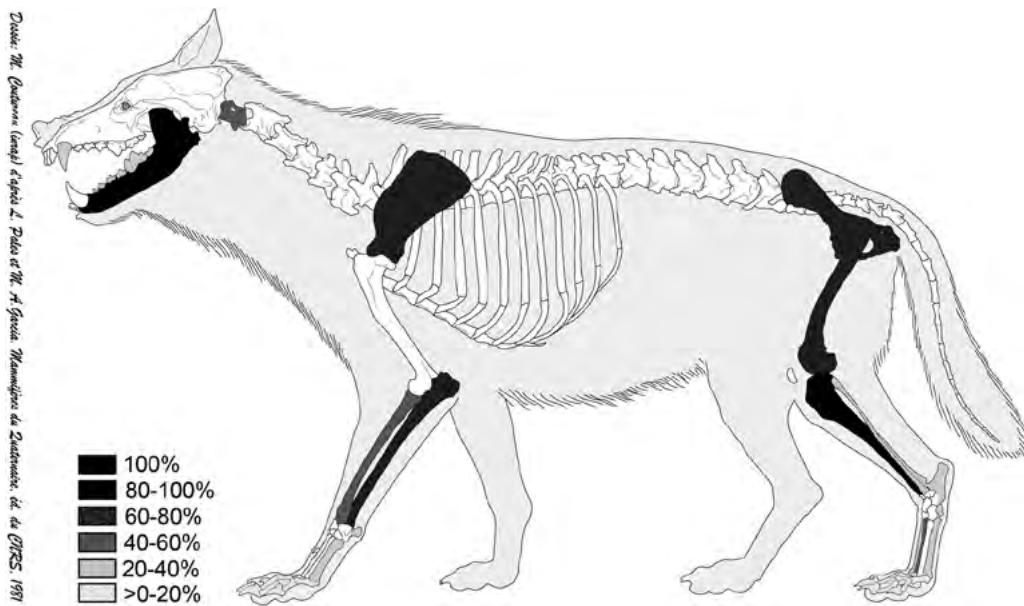


Figure 17. Skeletal preservation by elements in percentage survival (Ps%)
of wolf from Climăuți II/upper.

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.

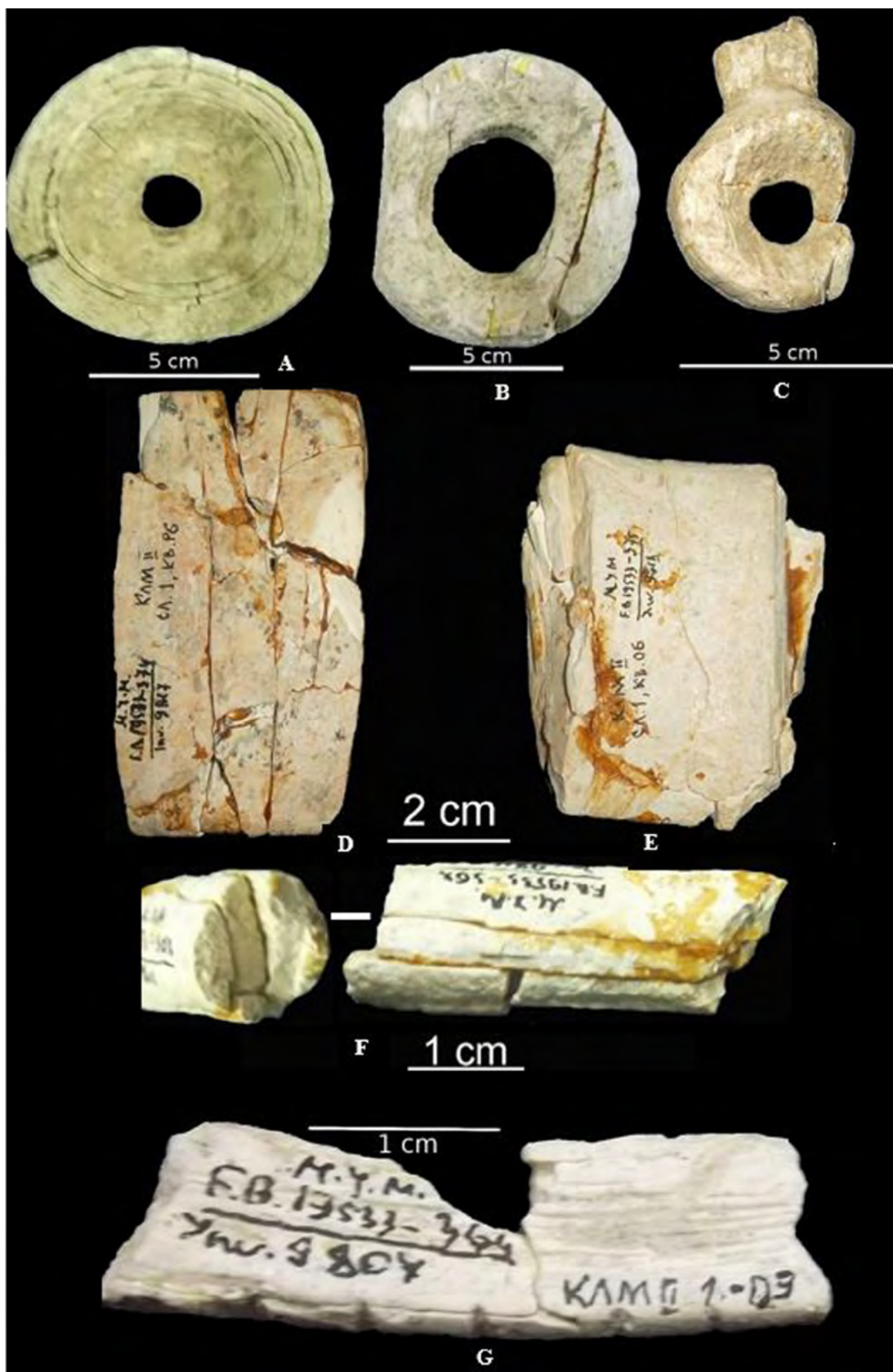


Figure 18. Shaped ivory pieces from Climăuți II/upper.
 A-B-C: ivory rings; D-E: fragments of «bracelets»; F: cone; G: plate.

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).

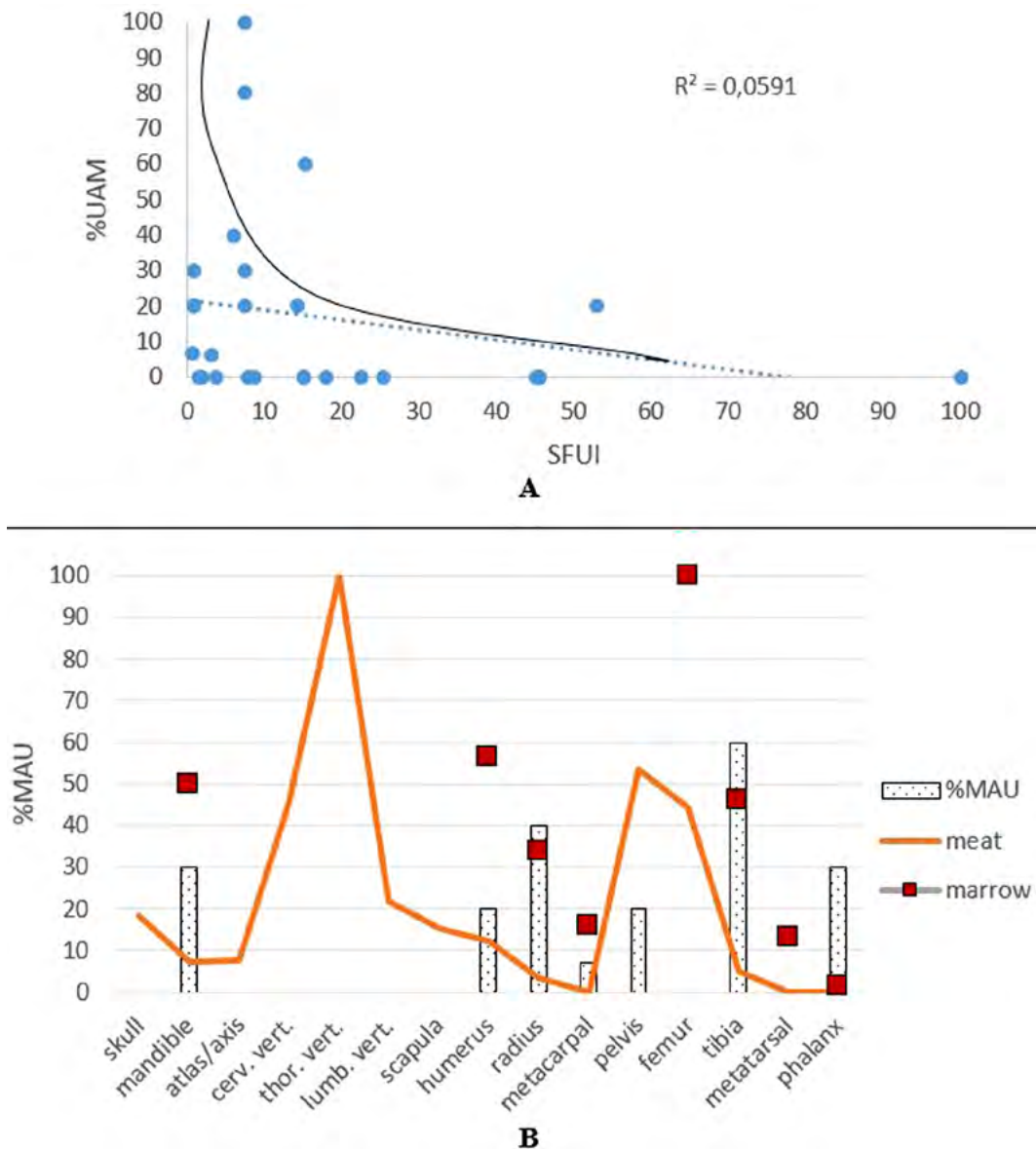


Figure 19. Skeletal preservation of horses related to nutritional values (Outram and Rowley Conwy, 1998; Morin, 2012), from Climăuți II/upper. A: nutritional values by anatomical segments; B: in%MAU by anatomical elements, related to the indexes meat and marrow.

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

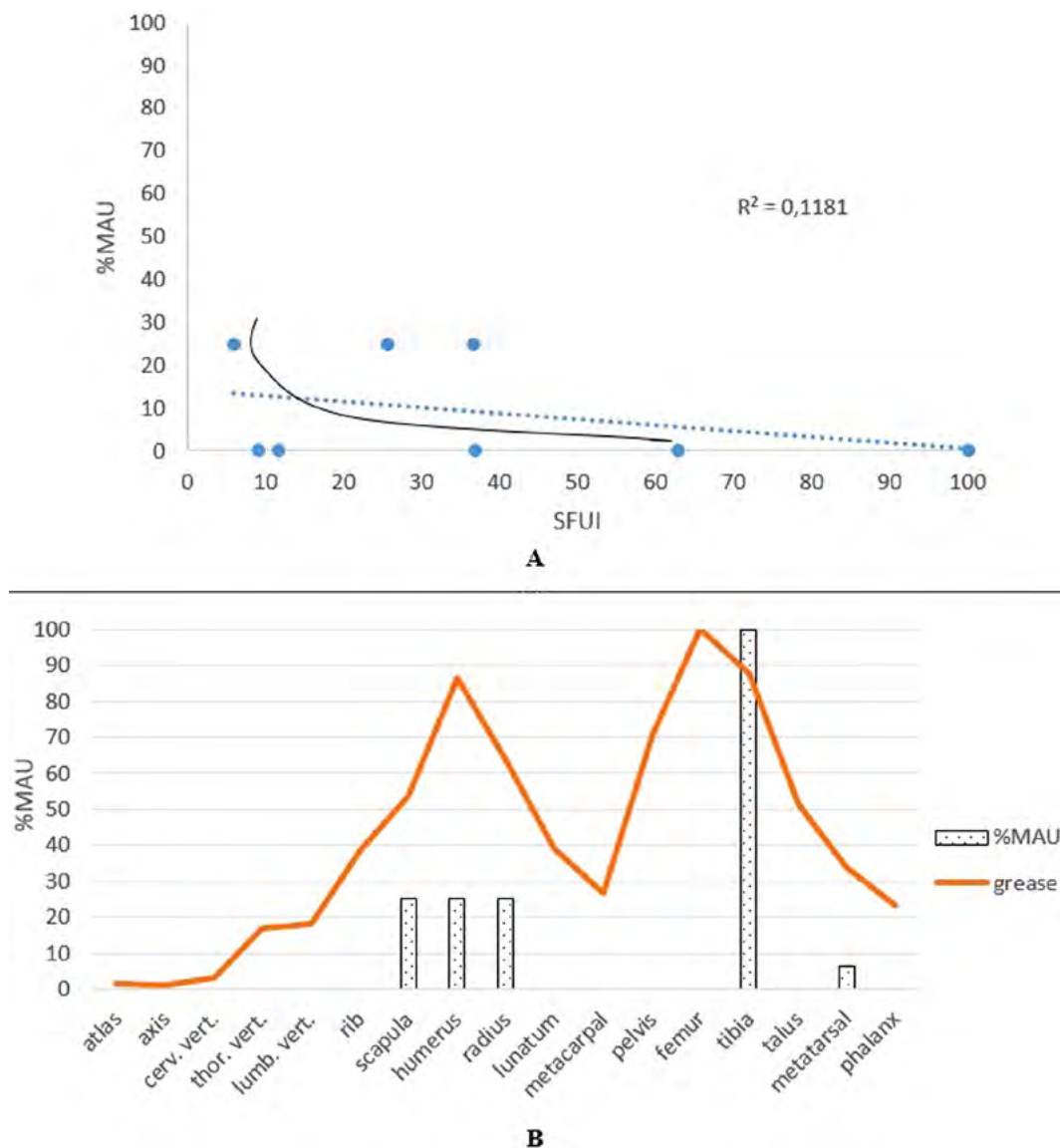


Figure 20. Skeletal preservation of bisons, related to nutritional values (Emerson, 1990), from Climăuți II/upper. A: nutritional values by elements; B: in%MAU by anatomical elements, related to the indice grease.

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





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

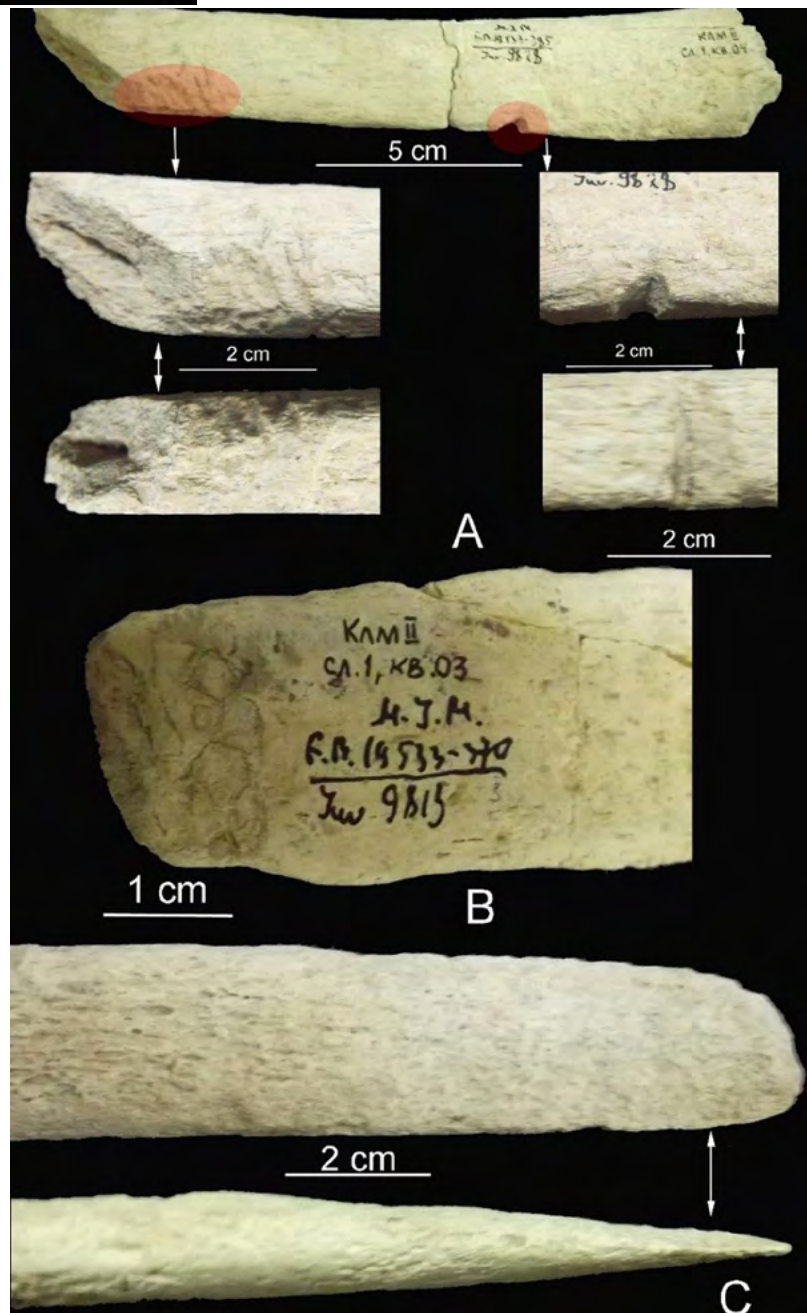


Figure 23. Modified ribs of large or medium-sized mammal from Climăuți II/upper.

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 related 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 related 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 Climăuți 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 Climăuți II/upper.

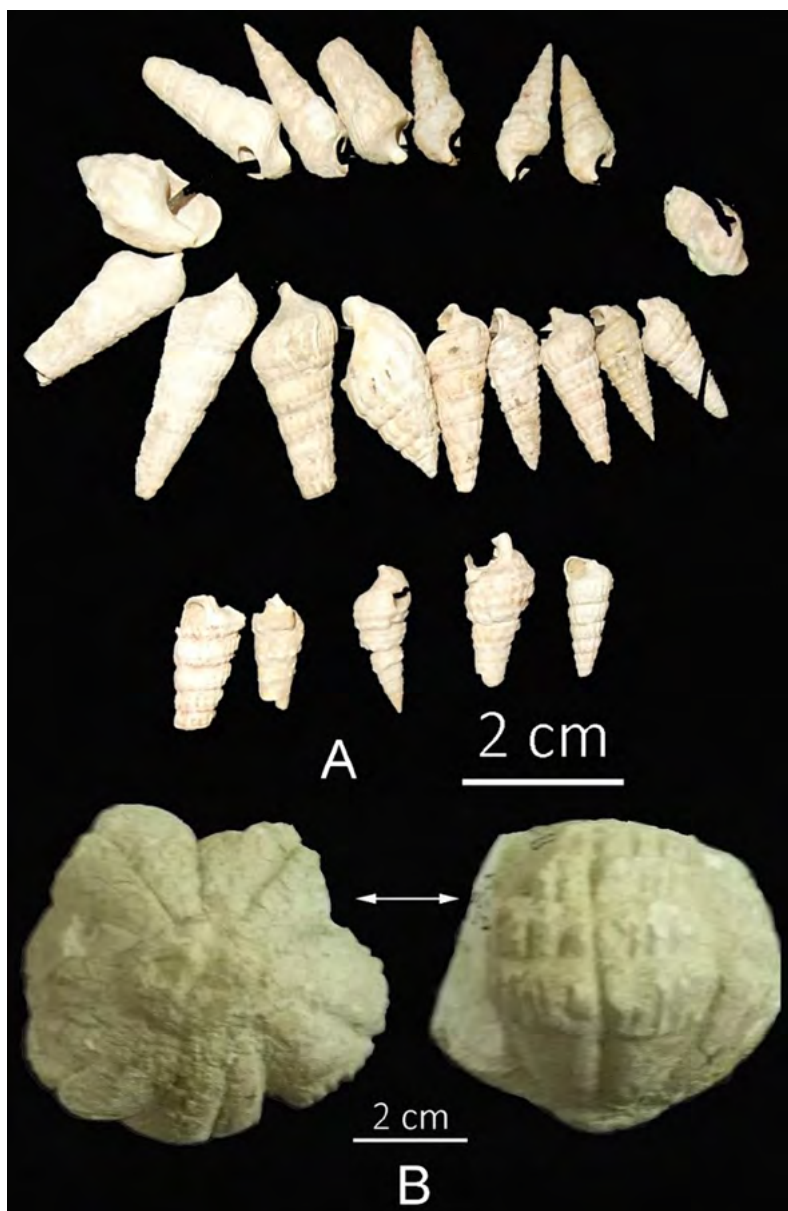


Figure 25. Shells and echinoderm from Climăuți II/upper.

| 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.

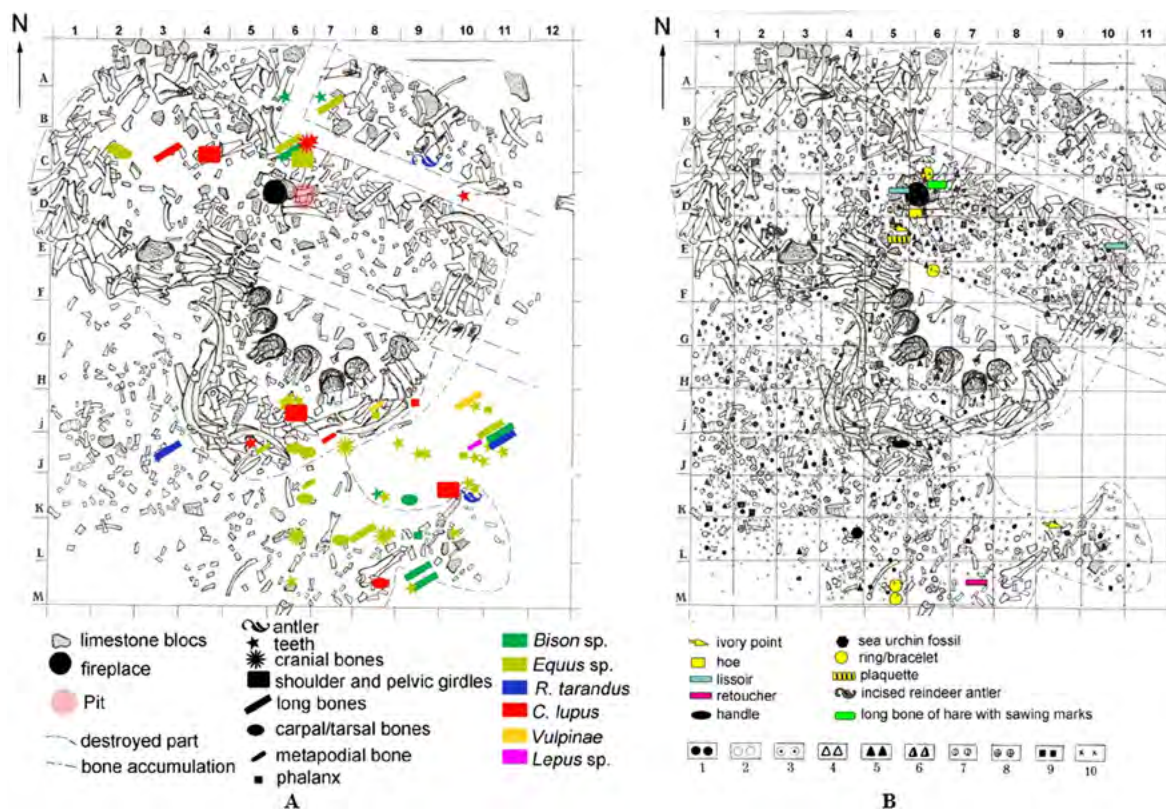


Figure 26. Spatial distribution from Climăuți II/upper, excavations 1989. A: by type of elements and species (others than mammoth); B: of 'ornaments', boneous and lithic industries; Lithic tools: 1-2: end scrapers; 3: fragments of end scrapers; 4: angle burin; 5: lateral burins on retouched truncation;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

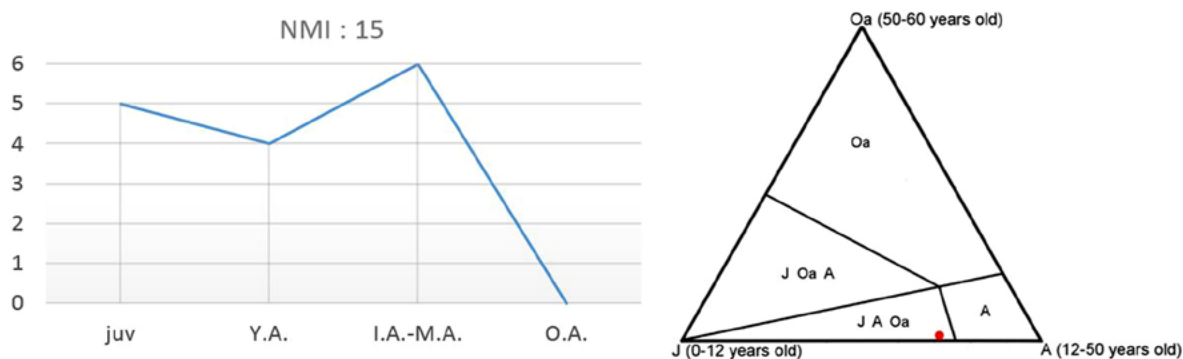


Figure 27. Mortality profile and ternary diagram from the precisely determined age of mammoths from Climăuți II/upper.

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 Climăuți 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 Climăuți 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, such 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 Climăuți 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

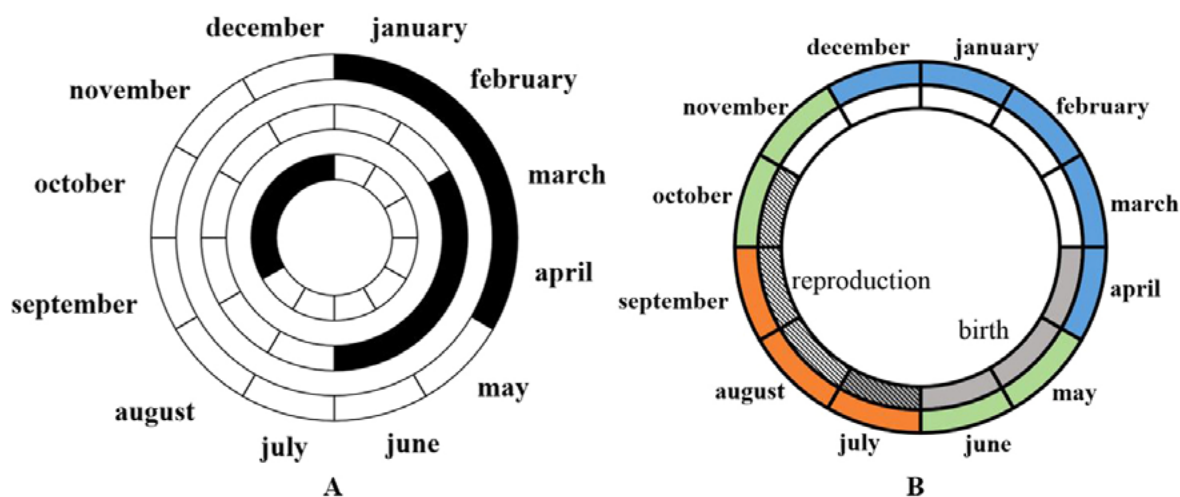


Figure 28. Seasonality of bisons. A: estimation of seasons from individuals from Climăuți II; B: biological annual cycle of bisons.

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; Pañnescu 1999; Cârciumar, Cosac and Nițu 2004-2005), Rașkov 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 Climăuți II 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 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 Climăuți 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, bison and reindeer, 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 Climăuți II attest to a variety of activities, as flint knapping, hunting and butchering activities, also as bone work. So Climăuți 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 suppose 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, Climăuți 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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References

- Abramova, Z.A. 1995. *L'art paléolithique d'Europe orientale et de Sibérie*, collection 'L'Homme des Origines'. Grenoble: Jérôme Million.
- Agenbroad, L.D. 1994. Taxonomy of North American Mammuthus and biometrics of the Hot Springs mammoths. In L.D. Agenbroad, J.I. Mead, (eds.), *The Hot Springs Mammoth Site*. Rapid City: Fenske Printing: 158-207.
- Audouze, F., Cahen, D., Keeley, L.H., Schmider, B. 1981. Le site Magdalénien du Buisson Campin à Verberie (Oise). *Gallia Préhistoire*, 24(1): 99-143.
- Averianov, A. 1996. Sexual dimorphism in the mammoth skull, teeth, and long bones. In J. Shoshani, P. Tassy, (eds.), *The Proboscidea*, Oxford: Oxford University Press: 280-288.
- Barone, R. 1966. *Anatomie comparée des mammifères domestiques, Tome 1 : Ostéologie*. Lyon: École nationale vétérinaire.
- Barone, R. 1976. *Anatomie comparée des animaux domestiques, Tome 1 : Ostéologie*. Paris: Vigot Frères.
- Behrensmeyer, A.K. 1978. Taphonomic and ecologic information from bone weathering. *Paleobiology*, 4(2): 150-162.
- Behrensmeyer, A.K. 1990. Transport/Hydrodynamics of Bones. In D.E.G. Briggs, P.R. Crowther, eds., *Palaeobiology: A Synthesis*. Oxford: Blackwell Scientific Publications: 232-235.
- Belan, N.G. 1985. Late Pleistocene Equus latipes from Desna Basin. *Trudy Zoologicheskogo Instituta, AN SSSR*, 131: 50-83. (in Russian).
- Binford, L.R. 1978. *Nunamiut Ethnoarchaeology*. New York: Academic Press.
- Binford, L.R. 1979. Organization and Formation Processes: Looking at Curated Technologies. *Journal of Anthropological Research*, 35: 255-273.

- Binford, L.R. 1987. Data, relativism and archaeological science. *Man*, 22 (3): 391-404.
- Bon, F. 2005. Little big tool. Enquête autour du succès de la lamelle. In F. Le Brun-Ricalens, J.-G. Bordes, F. Bon, (ed.), *Productions lamellaires attribuées à l'Aurignacien : chaînes opératoires et perspectives technoculturelles*, Actes du XVe congrès de l'Union Internationale des Sciences Pré-et Protohistoriques de Liège (2-8 septembre 2001), ArchéoLogiques, 1. Luxembourg: Musée national d'Histoire et d'Art: 479-484.
- Boriskovskyi, P.I. 1953. *Paleolit Ukrainy*. Moscow-Leningrad: Istoriko-arkheologicheskiye ocherki. (in Russian).
- Borziac, I.A., David, A., Obadă, T. 1992. Climăuți II. Un site du Paléolithique supérieur avec faune de mammoths dans la région du Dniestr. *Anuarul Muzeului Național de Istorie a Moldovei*, 1: 75-94. (in Russian).
- Borziac, I.A., Allsworth-Jones, P., French, C., Medyanik, S.I., Rink, W.J., Lee, H.K. 1997. The Upper Palaeolithic Site of Ciuntu on the Middle Pruth, Moldova: a multidisciplinary study and reinterpretation. *Proceedings of the Prehistoric Society*, 63: 285-301.
- Borziac, I.A. 1998. Le Gravettien de la région du Dniestr et ses liens avec le complexe Willendorf-Pavlov-Kostenki. In H.A. Amirkahnov (ed.), *The Eastern Gravettian*, Actes du Colloque de Moscou-Zaraysk, 1-7 septembre 1997. Moscow: Institute of Archaeology, Russian Academy of Sciences: 135-141. (in Russian).
- Borziac, I.A., Kulakovska, L.V. 1998. Gravet podnistrovie. Zagalnij ogljad. *Arkeologie*, 5: 55-64. (in Ukrainian).
- Borziac, I.A., Obada, T.F. 1999. Mammoth in the Palaeolithic of the Carpathian- Dniester Region. It is Time to Collect Stones. *Stratum Plus*, 1: 287-311. (in Russian).
- Borziac, I., Chirica, V. 1999. Considérations concernant le Gravettien de l'espace compris entre le Dniestr et les Carpates. *Préhistoire Européenne*, 14: 67-78.
- Borziac, I., Haesaerts, P., Chirica, V. 2005. Cadrul cronostratigrafical Paleoliticului superior cuprins între Carpații Orientali și Nistru. *Revista Arheologică, Serie Nouă*, 1(2): 164-198.
- Borziac, I., Chirica, V., David, A., eds, 2007. *L'aurignacien moyen et tardif de l'espace carpatique-dniestreen : le gisement Climăuți II*. Académie roumaine – Filiale de Iasi/ Institut d'Archéologie – Iasi : Bibliotheca Archaeologica Moldaviae.
- Bouchud, J. 1953. Signification climatologique des faunes paléolithiques. *Bulletin de la Société Préhistorique Française*, 50: 431-435.
- Bouchud, J. 1954. Dents de Rennes, bois de Rennes et migrations. *Bulletin de la Société Préhistorique Française*, 51: 340-345.
- Bouchud, J. 1966. *Essai sur le Renne et climatologie du Paléolithique moyen et supérieur*. Périgueux: Imprimerie Magne.
- Brudiu, M. 1980. Descoperiri paleolitice la Crasnaleuca (com.Cotusca, jud. Botosani). *Studii si cercetari de istorie veche si arheologie* (Études et recherches d'histoire ancienne et d'archéologie), 31 (3): 425-443.
- Brugal, J.-P., David, F. 1993. Usure dentaire, courbe de mortalité et 'saisonnalité' : les gisements du Paléolithique moyen à grands bovidés. In J. Desse, F. Audoin-Rouzeau, (eds.), *Exploitation des Animaux Sauvages à Travers le Temps*, VIe Colloque international de l'Homme et l'Animal, Société de Recherche interdisciplinaire. Juan-les-Pins: Éditions APDCA: 63-77.
- Cârciumaru, M., Cosac, M., Nițu, E.-C. 2004-2005. Les datations C-14 et la succession culturelle du Paléolithique, Epipaléolithique de la Roumanie. *Annales d'Université 'Valahia' Targoviste - Section d'Archéologie et d'Histoire*, 6-7: 7-43.
- Cherkassov, A.A. 2012. *Notes of an East Siberian Hunter*. Authorhouse.
- Chernysh, A.P. 1959. *Pozdnii paleolit Srednego Pridnestrov'ya*. In V.I. Gromov, A.I. Okladnikov, eds., *Paleolit Srednego Pridnestrov'ya*. Moscow: Izdate'lstvo Akademii nayk SSSR, Trudy Komissii po izucheniyu chetvertichnogo perioda, 15, pp. 5-214. (in Russian).
- Chernysh, A.P. 1973. *Paleolit i mezolit Pridnestrov'ya (karty i katalog mestonakhozheniy)*. Moscow: Nauka. (in Russian).
- Chernysh, A.P. 1954. *Karta paleolita SSSR. Nauchnyye zapiski Instituta Obshchestvennykh*. Kyiv: Nauka: 67-152. (in Russian).
- Chernysh, A.P. 1977. *Mnogosloynaya paleoliticheskaya stoyanka Korman' IV i yeyo mesto v paleolite*. In G.I. Goretzky, S.M. Zeitlin, (eds.), *Mnogosloinaia paleoliticheskaiya stoyanka Korman IV*

- na srednem Dniestr* (A multistratified site Korman IV on Middle Dniester). Moscow: Nauka: 7-77. (in Russian).
- Chernysh, A.P. 1985. Verkhniy paleolit. *Arkeologii ukraini*, 1: 43-63. (in Russian).
- Chirica, V., Borziac, I. 1995. Les ivoires du sud-est de l'Europe: Bulgarie, Grèce, Yougoslavie et Roumanie jusqu'au Dniestr. In J. Hahn, M. Menu, Y. Taborin, Ph. Walter, F. Widemann, (eds.), *Le travail et l'usage de l'ivoire au Paléolithique supérieur*, Actes de la Table ronde de Ravello, 29-31 mai 1992, Rome. Rome: Istituto poligrafico e zecca della Stato: 199-210.
- Chirica, V., Văleanu, M.-C., eds., 2007. Établissements et habitations préhistoriques. Structure, organisation, symbole. Actes du colloque de Iași, 10-12 Décembre 2007. Iași: Pim: 159-158.
- Chirica, V.-C., Bodi, G. 2014. La chasse du renne et du cerf par les communautés humaines gravettiennes, épigravettiennes et mésolithiques de l'espace carpatique-dniestréen. *Arheologia Moldovei*, 37: 21-62.
- Coppens, Y. 1965. Les éléphants du Quaternaire français: dentition, systématique, signification et préhistoire. *Actes du XVIe Congrès Préhistorique de France*, 28 août-5 septembre 1959, Monaco. Paris: Société préhistorique française: 403-431.
- Costamagno, S. 1999. Coudoulous II : Taphonomie d'un aven-piège – Contribution des accumulations d'origine naturelle à l'interprétation des Archéofaunes du Paléolithique moyen. *Anthropozoologica*, 29: 13-32.
- Covalenco, S.I. 2003-2004. A Contribution to the Problem of the Dniester Epi-Aurignacien. *Stratum Plus*, 1: 301-306. (in Russian)
- Covalenco S., Obadă, T., Demay, L. 2018. Results of the study of 'residential structures' on the Upper Palaeolithic site of Climăuți II in the Middle Dniester region. *Revista Arheologică*, XIV(1): 5-12. (in Russian).
- Croitor, R., Covalenco, S. 2011. Mammal fauna from Upper Paleolithic site of Rașcov-8 (Moldova). Oltenia. *Studiile și comunicările. Științele naturii*, 27(1): 231-238.
- Croitor, R., Obadă, T. 2018. On the presence of Late Pleistocene wapiti, *Cervus canadensis* Erxleben, 1777 (Cervidae, Mammalia) in the Palaeolithic site Climăuți II (Moldova). *Contributions to Zoology*, 87(1): 1-10.
- Damblon, F., Haesaerts, P. 1997. Radiocarbon chronology of representative Upper Palaeolithic sites in the Central European Plain: a contribution to the Sc-004 project. *Préhistoire Européenne*, 11: 255-276.
- David, A.I. 1980. *Teriofauna pleistočena Moldavii*. Chișinău: Știința.
- David, A., Nadachowski, A., Pascaru, V., Wojtal, P., Borziac, A.I. 2003. Late Pleistocene fauna from the Late Palaeolithic butchering site Cosăuți I. *Acta Zoologica*, 46 (1): 85-96.
- Delluc, G., Delluc, B., Roques, M. 1995. *La Nutrition Préhistorique*. Périgueux: Pilote 24.
- Demay, L., Patou-Mathis, M., Kulakovska, L.V. 2015. Zooarchaeology of the layers from Dorochivtsy III (Ukraine). *Quaternary International*, 359-360: 384-405.
- Demay, L., Patou-Mathis, M., Klopachev, G.A., Sablin, M.V., Vercoûtère, C. 2019. L'exploitation de la faune par les groupes humains au Pléniglaciaire supérieur à Eliseevichi 1 (Russie). *L'Anthropologie*, 123(2) : 345-402
- Demay, L., Obadă, T. 2018. 'Large mammals from Upper Paleolithic site of Valea Morilor (Republic of Moldova)'. In Lazarovici C.M., Berzovan A. (Eds.), *Studia in Honorem Professoris Vasile Chirica, Quaestiones Praehistoricae*, Honoraria 14, Academiei Române/Istros, București – Brăila: 111-144.
- Demay, L., Obadă, T., Péan, S. (submitted). Utilization of mammoth resources and occupation of the Dniester basin territory: the Upper Paleolithic site of Valea Morilor (Republic of Moldova). *Quaternary Science Reviews*.
- Denys, C., Patou-Mathis, M., (dir.) 2014. *Manuel de Taphonomie*. Collection Archéologiques, Paris: Éditions Errance.
- Discamps, E., Costamagno, S. 2015. Improving mortality profile analysis in zooarchaeology: a revised zoning for ternary diagrams. *Journal of Archaeological Science*, 58: 62-76.
- Driesch, A. von den. 1976. *A guide to the Measurement of Animal Bones from Archaeological Sites*. Peabody Museum of Archaeology and Ethnology 1, Cambridge: Harvard University.
- Duffield, L.F. 1973. Aging and Sexing of the Post-Cranial Skeleton of Bison. *Plains Anthropologist*, 18: 132-139.

- Emerson, A.M. 1990. *Archaeological Implications of Variability in the Economic Anatomy of Bison bison*. Unpublished Ph.D. dissertation, Washington State University.
- Emerson, A. 1993. The role of body part utility in small-scale hunting under two strategies of carcass recovery. In J. Hudson, (ed.), *From bones to behavior: Ethnoarchaeological and experimental contributions to the interpretation of faunal remains*, Occasional Paper, 21, Southern Illinois: University Center for Archaeological Investigations: 138-155.
- Enloe, J.G. 1997. Seasonality and age structure in remains of Rangifer tarandus: Magdalenian hunting strategy at Verberie. *Anthropozoologica*, 25-26: 95-102.
- Faith, J.T., Gordon, A.D. 2007. Skeletal element abundances in archaeofaunal assemblages: economic utility, sample size, and assessment of carcass transport strategies. *Journal of Archaeological Science*, 34: 872-882.
- Fernández-Jalvo, Y., Andrews, P., eds., 2016. *Atlas of taphonomic identifications: 1001+ images of fossil and recent mammal bone modification*. Collection « Vertebrate Paleobiology and Paleoanthropology », Dordrecht: Springer Netherlands.
- Germonpré, M., Sablin, M.V., Lázničková-Galetová, M., Després, V., Stevens, R.E., Stiller, M., Hofreiter, M. 2015. Palaeolithic dogs and Pleistocene wolves revisited: a reply to Morey (2014). *Journal of Archaeological Science*, 54: 210-216.
- Göhlich, U. 1998. Elephantoidea (Proboscidea, Mammalia) aus dem Mittel- und Obermiozän der oberen Süßwassermolasse Süddeutschlands: Odontologie und Osteologie. *Münchner Geowissenschaftliche Abhandlungen*, (A)36: 1-245.
- Grant, A. 1982. The Use of Tooth Wear as a Guide to the Age of Domestic Ungulates. In B. Wilson, C. Grigson, S. Payne, (eds.), *Ageing and sexing animal bones from archaeological sites*, British Archaeological Reports International Series, 109: 91-108.
- Grigoriev, G.P. 1970. *Verchnij paleolit. Kamennyi vek na territorii SSSR*. Moscow: Nauka: 43-63. (in Russian).
- Guadelli, J.-L. 1998. Détermination des classes d'âge des chevaux. *Paleo*, 10: 87-93.
- Haesaerts, P., Borziak, I., Chirica, V., Damblon, F., Koulakovska, L.V., van der Plicht, J. 2003. The east Carpathian loess record: a reference for Middle and Late Pleniglacial stratigraphy in Central Europe. *Quaternaire*, 14 (3): 163-188.
- Haesaerts, P., Borziac, I., Chirica, V., Damblon, F., Koulakovska, L.V. 2007. Cadre stratigraphique et chronologique du Gravettien en Europe centrale ». Spéciale table ronde (1ère partie) : Le Gravettien : entités régionales d'une paléoculture européenne, Les Eyzies, juillet 2004. *Paleo*, 19: 31-52.
- Haynes, G. 1987. Proboscidean die-offs and die-outs: Age profiles in fossil collections. *Journal of Archaeological Science*, 14(6): 659-668.
- Haynes, G. 1991. *Mammoths, Mastodons and Elephants, Biology, behavior and the Fossil record*. Cambridge: Cambridge Press.
- Hufthammer, A.K. 1995. Age determination of Reindeer (Rangifer tarandus L.). *Archaeozoologia*, 7(2): 33-42.
- Ivanova, I.K., Tzeitlin, S.M., eds., 1987. *Mnogosloinaia paleoliticheskaia stoianka Molodova V. Liudi kamennogo veka i okruzhaiushchaia sreda*. Moscow: Nauka. (in Russian).
- Jones, K., Metcalfe, D. 1988. Bare Bones Archaeology: Bone Marrow Indices and Efficiency. *Journal of Archaeological Science*, 15: 415-423.
- Klein, R.G. 1973. *Ice-Age Hunters of the Ukraine*. Chicago: The University of Chicago Press.
- Klein, R.G., Wolf, C., Freeman, L.G., Allwarden, K. 1981. The use of dental crown height for constructing age profiles of red deer and similar species in archaeological samples. *Journal of Archaeological Science*, 8: 1-31.
- Klein, R.G., Cruz-Uribe, K. 1983. The computation of ungulates of ungulate age (mortality) profiles from dental crown heights. *Paleobiology*, 9(1): 70-78.
- Klein, R.G., Cruz-Uribe, K. 1984. *The Analysis of Animal Bones from Archaeological Sites*. Chicago and London: The University of Chicago Press.
- Koch, W. 1932. Über Wachstums und Altersveränderungen am skelet des Wisents. *Abhandlungen der Mathematisch-naturwissenschaftlichen Abteilung der Bayerische Akademie der Wissenschaften*, 15, Bayern: Bayerische Akademie der Wissenschaften.

- Koch, W. 1935. The Age Order of Epiphyseal Union in the Skeleton of the European Bison (*Bos bonasus* L). *The Anatomical Record*, 61: 371-376.
- Koulakovska, L.V., Usik, V.I., Haesaerts, P. 2012. Dorochivtsy III- Gravettian site in the Dniester valley (Ukraine). *Stratum Plus*, 1: 131-150.
- Koulakovska, L.V., Usik, V.I., Haesaerts, P., Ridush, B., Uthmeier T., Hauck, T.C. 2015. Upper Paleolithic of Middle Dniester: Doroshivtsi III site. *Quaternary International*, 359-360: 347-361.
- Kozarski, S. 1980. An outline of the Vistulian stratigraphy and chronology of the Great Poland Lowland. In S.Z. Rozycki, ed., *Quaternary Studies in Poland, Vistulian Stratigraphy Poland* 79, 2(1), Varsovie-Poznan: Polish Academy of Sciences: 21-35.
- Kreutzer, L.A.A. 1992. Bison and Deer Bone Mineral Densities: Comparisons and Implications for the Interpretation of Archaeological Faunas. *Journal of Archaeological Science*, 19: 271-294.
- Krumrey, W.A., Buss, I.O. 1968. Age estimation, growth, and relationships between body dimensions of the female elephant. *Journal of Mammalogy*, 49(1): 22-31.
- Kulakovska, L.V., Usik, V.I., Rydush, B., Péan, S. 2008. Paleolitina stojanka Dorochivtsy III v Cerednoumu Podnistrov'i (Pooeredne novidomlennja). *Materiali mijnarodnoi naukovoi konferenchii Padomisle ta jogo istorija*, 3-4: 51-52.
- Kuntz, D. 2011. *Ostéométrie et migration(s) du renne (Rangifer tarandus) dans le sud-ouest de la France au cours du dernier Pléni-glaciaire et du Tardiglaciaire (21.500-13,000 cal. BP)*. Thèse de Doctorat, Université de Toulouse II.
- Lam, Y.M., Chen, X., Marean, C.W., Frey, C. 1998. Bone density and long bone representation in archaeological faunas: comparing results from CT and photon densitometry. *Journal of Archaeological Science*, 25: 559-570.
- Lam, Y.M. Chen, X., Pearson, O.M. 1999. Intertaxonomic variability in patterns of bone density and the differential representation of bovid, cervid, and equid elements in the archaeological record. *American Antiquity*, 64: 343-362.
- Lam, Y.M., Pearson, O.M. 2003. Bone density studies and the interpretation if the faunal record. *Evolutionary Anthropology*, 14: 99-108.
- Laroulandie, V., d'Errico, F. 2004. Worked bones from Buran-Kaya III level C and their taphonomic context. In V. Chabai, K. Monigal, A. Marks, eds., *The Paleolithic of Crimea, III. The Middle Paleolithic and Early Upper Paleolithic of Eastern Crimea, Études et recherches archéologiques de l'Université de Liège*, 104: 83-94.
- Laws, R.M. 1966. Age criteria for the African elephant *Loxodonta a. Africana*. *East African Wildlife Journal*, 4: 1-37.
- Lister, A.M. 1996. Sexual dimorphism in the mammoth pelvis: an aid to gender determination. In J. Shoshani, P. Tassy, eds., *The Proboscidea*. Oxford: Oxford University Press: 254-259.
- Lopez, B.H. 1978. *Of wolves and men*. London: Charles Scribner's Sons.
- López Bayón, I., Gautier, A. 2007. Mitoc-Malu Galben, analyse archéozoologique des ateliers de taille ». In M. Otte, V. Chirica, (dir.), *Mitoc-Malu Galben, Études et recherches archéologiques de l'Université de Liège*, 72, pp 145-166.
- Lyman, R.L. 1994. *Vertebrate taphonomy*. Cambridge: Cambridge University Press.
- Lyman, R.L. 2008. *Quantitative Paleozoology*. New-York: Cambridge University Press.
- Magniez, P. 2010. *Etude paléontologique des Artiodactyles de la grotte Tournal (Bize-Minervois, Aude, France). Etude taphonomique, archéozoologique et paléoécologique des grands Mammifères dans leur cadre biostratigraphique et paléoenvironnemental*. Thèse de Doctorat, Université de Perpignan Via Domitia.
- Metcalf, D., Jones, K. 1988. A Reconsideration of Animal Body Part Utility Indices. *American Antiquity*, 53: 486-504.
- Miller, F.L. 1972. Eruption and attrition of mandibular teeth in barren-ground caribou. *Journal of Wildlife Management*, 36 (2): 606-612.
- Miller, F.L. 1974. *Biology of the Kaminuriak population of Barren Ground Caribou. Part 2: Biology of the Kaminuriak population of barren-ground caribou: Part 2. Dentition as an indicator of age and sex; composition and socialization of the population*. Ottawa: Canadian Wildlife Service Reports.
- Morin, E. 2012. *Reassessing paleolithic subsistence: the Neandertal and modern human foragers of Saint-Césaire*. Cambridge: Cambridge University Press.

- Murray, N.A. 1993. *The behavioural ecology of reindeer (Rangifer tarandus) during the last glaciation in Britain and its implications for human settlement, subsistence and mobility*. Ph.D. thesis, University of Edinburgh.
- Noiret, P. 2004. Le Paléolithique supérieur de la Moldavie. *L'Anthropologie*, 108(3-4): 425-470.
- Noiret, P. 2007a. Le Gravettien de Moldavie (30 000-23 000 BP). Spéciale table ronde (1ère partie) : Le Gravettien : entités régionales d'une paléoculture européenne, Les Eyzies, juillet 2004. *PALEO*, 19: 159-180.
- Noiret, P. 2007b. Les industries aurignaciennes et « aurignacoïdes » en Moldavie après 30.000 BP. *Annales d'Université « Valahia » Târgoviște, Section d'Archéologie et d'Histoire*, 8-9: 91-105.
- Noiret, P. 2009. *Le Paléolithique supérieur de la Moldavie. Essai de synthèse d'une évolution multi-culturelle*. Liège: Université de Liège.
- Obadă, T., van der Plicht, J. 2010. The Valea Morilor layer (Chisinau, Republic of Moldova) – a new station of mammoth hunters [Le gisement Valea Morilor (Chisinau, République de Moldova) – une nouvelle station de chasseurs de mammoths]. In F. Lacombat, D. Mol, (eds.), Mammoth and their relatives 2: Biotopes, Evolution, and Human Impact, 30th August-4 September 2010, Le Puy-en-Velay. *Quaternary International*, 276-277: 227-241.
- Obadă, T., David, A., Borziac, I. 1994. Fauna de mamut din stațiunea paleolitică Climăuți II din Basarabia (La faune de mammoth de la station paléolithique de Climăuți II de Bessarabie). *Studii si cercetari de istorie veche si arheologie*, 45(3): 251-255.
- Obadă, T., van der Plicht, J., Markova, A., Prepeliță, A. 2012. Preliminary results of studies of the Valea Morilor Upper Palaeolithic site (Chișinău, Republic of Moldova): A new camp of mammoth hunters. *Quaternary International*, 276-277: 227-241.
- Osborn, H.F. 1942. *Proboscidea: a monograph of the discovery, evolution, migration and extinction of the mastodonts and elephants of the world. Vol. II : Stegodontoidea, Elephantoidea*. New York: American Museum of Natural History: 805-1675.
- Otte, M., Lopez-Bayon, I., Noiret, P., Borziac, I., Chirica, V. 1996. Recherches sur le Paléolithique supérieur de la Moldavie. *Anthropologie et Préhistoire*, 107: 45-80.
- Outram, A., Rowley-Conwy, P. 1998. Meat and Marrow Utility Indices for Horse (Equus). *Journal of Archaeological Science*, 25: 839-849.
- Patou-Mathis, M., Péan, S., Vercoutère, C., Auguste, P., Laznickova-Gonysevova, M. 2005. Réflexions à propos de l'acquisition et de la gestion de matières premières animales au Paléolithique. Exemples : mammoth/ivoire-renne/bois. In D. Vialou, J. Renault-Miskovsky, M. Patou-Mathis, (eds.), *Comportements des hommes du Paléolithique moyen et supérieur en Europe : territoires et milieux*. Liège : Études et recherches archéologiques de l'Université de Liège: 27-38.
- Păunescu, Al. 1999. *Paleoliticul și epipaleoliticul de pe teritoriul Moldovei cuprins între Siret și Prut*. București: Editura Satya SAI.
- Polikarpovich, K.M. 1968. *Paleolit Verkhnego Podneprov'ya*. Minsk: Nauka i Teknika. (in Russian).
- Poplin, F. 1976. Remarques théoriques et pratiques sur les unités utilisées dans les études d'ostéologie quantitative, particulièrement en archéologie préhistorique. IXe Congrès UISPP, 13-18 septembre 1976, Nice, Thèmes spécialisés, B, Problèmes ethnographiques des vestiges osseux, CNRS. *Bulletin signalétique*, 31 (2): 124-141.
- Prat, F., Delpech, F., Cancel, N., Guadelli, J.-L., Slott-Moller, R. 2003. Le Bison des steppes, *Bison priscus* Bojanus, 1827, de la grotte d'Habarra à Arudy (Pyrénées-Atlantiques). *PALEO*, Société des amis du Musée national de préhistoire et de la recherche archéologique – SAMRA, 15 – Cahier spécial: 1-102.
- Roth, V.L. 1984. How elephants grow: Heterochrony and calibration of developmental stages in some living and fossil species. *Journal of Vertebrate Paleontology*, 4(1): 126-145.
- Roth, V.L., Shoshani, J. 1988. Dental identification and age determination in *Elephas maximus*. *Journal of Zoology*, 214: 567-588.
- Rozoy, J.-G. 1978. *Les derniers chasseurs. L'épipaléolithique en France et en Belgique – Essai de synthèse*. Reims: Société Archéologique Champenoise.
- Savoy, J., Scherler, L., Becker, D. 2012. Variabilité morphologique et biométrique des dents d'*Equus germanicus* des dolines pléistocènes d'Ajoie (Jura, Suisse). *Actes 2012 de la Société jurassienne d'Emulation*: 17-36.

- Shoshani, J., Tassy, P., (eds.), 1996. *The Proboscidea: evolution and palaeoecology of elephants and their relatives*. Oxford Science Publications, Oxford: Oxford University Press.
- Soffer, O. 1985. *The upper paleolithic of the central russian plain*. Orlando: Academic Press.
- Spinage, C.A. 1973. A review of age determination of mammals by means of teeth, with special reference to Africa. *East African Wildlife Journal*, 11, p. 165-187.
- Stefaniak, K., Piskorska, T., Witkowska, A., Wojtal, P. 2012. Morphometric variation of reindeer remains (*Rangifer tarandus*, Linnaeus, 1758) from Late Pleistocene cave localities in Poland. *Annales Societatis Geologorum Poloniae*, 82: 177-191.
- Steffánson, V. 2004. *My Life With The Eskimo*. Kessinger Publishing.
- Stiner, M.C. 1990. The use of mortality patterns in archaeological studies of hominid predatory adaptations. *Journal of Anthropological Archaeology*, 9: 305-351.
- Stiner, M.C. 1991. An interspecific perspective on the emergence of the modern human predatory niche. In M.C. Stiner, (ed.), *Human Predators and Prey Mortality*. Boulder: Westview Press: 149-185.
- Vaufrey, R. 1955. Proboscidiens fossiles. *Traité de zoologie*, 17: 784-875.
- Walde, D. 2006. Bison Breeding Characteristics and Interpretation of Archaeological Seasonality Revisited. *International Journal of Osteoarchaeology*, 16: pp. 481-492.
- Weinstock, J. 2000. Osteometry as a source of refined demographic information: sex-ratio of Reindeer, hunting strategies, and herd control in the late glacial site of Stellmoor, Northern Germany. *Journal of Archaeological Science*, 27: 1187-1195.
- Zwyns, N. 2004. La problématique de l'Aurignacien tardif dans la zone des steppes nord-pontiques / The late Aurignacian problematic in the north Pontic steppe zone. *L'Anthropologie*, 108: 471-493.
- ICZN (International Commission on Zoological Nomenclature), 1999 (4e ed.). *International Code of Zoological Nomenclature*, International Trust for Zoological Nomenclature, London.