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MIDDLE PALAEOLITHIC MAMMOTH SITE AT MOLODOVA I (LAYER IV) – ZOOARCHAEOLOGICAL STUDIES OF COLLECTION STORED IN IVAN KRYPIAKEVICH INSTITUTE OF UKRAINIAN STUDIES, NATIONAL ACADEMY OF SCIENCES OF UKRAINE, IN L'VIV

INTRODUCTION

Molodova I is an open-air archeological site located in the south-western part of the Ukraine, at the southern bank of the Dniester River, in the middle part of its downstream. The archaeological field research of Molodova I were conducted since 1950's till 1980's by Aleksandr Chernysh. During Chernysh'es works the deluvial and loess sediments [Иванова, 1982] with number of cultural layers dated to Middle Palaeolithic, Upper Palaeolithic and Mesolithic were discovered [Черныш, 1965, 1982]. The excavation yielded a great number of stone tools associated with bones of large mammals.

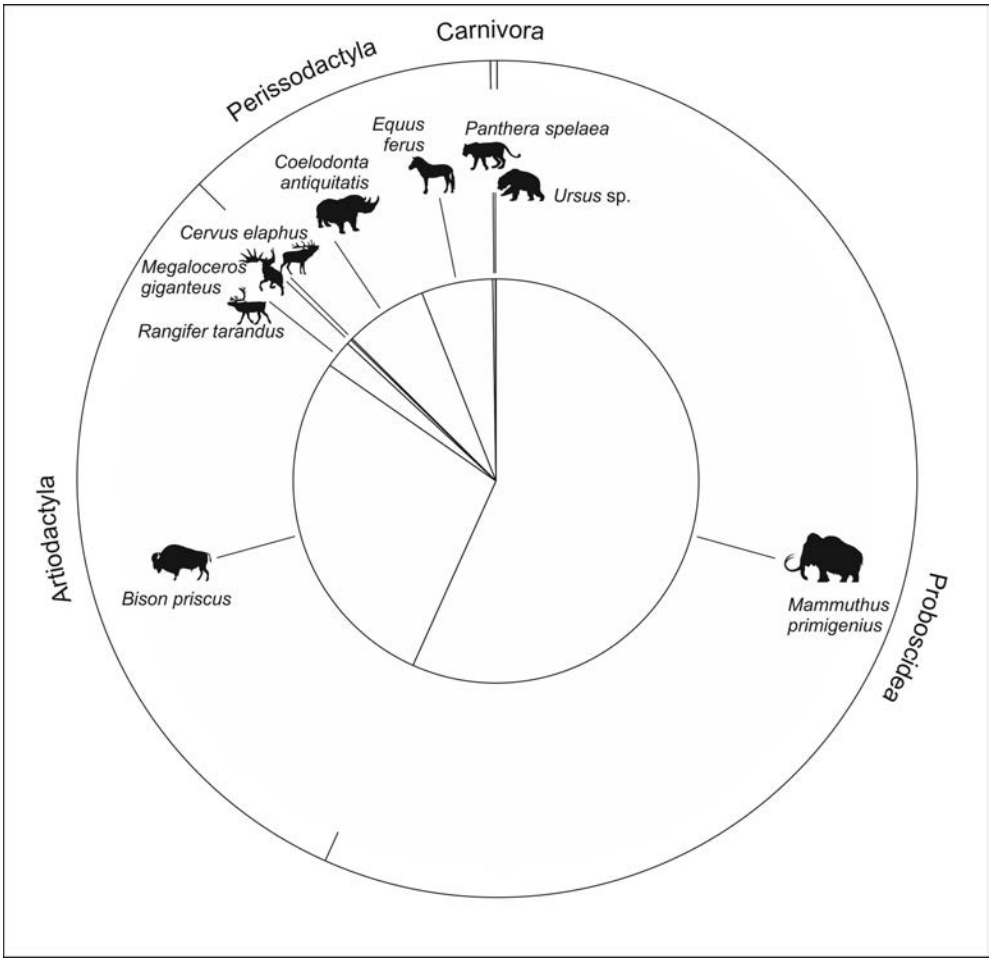

Fig. 1. Percentage participation of species determined in Molodova I, layer IV, collection of Ivan Krypiakevich Institute of Ukrainian Studies in L'viv.

Рис. 1. Відсоток різних видів тварин визначених у Молодовому I, шар IV, збірка Інституту українознавства ім. І. Крип'якевича НАН України у Львові.

Among all of beds from Molodova I the most debated was the Middle Palaeolithic layer IV, dated to early Weichselian Glaciation [Иванова, 1982]. Radiocarbon dating of charcoal from the layer showed the age greater than 44 000 BP. Palynological investigation indicated the period between Brørup and Amersfoort interstadials. The layer become known for the presence of large accumulation of mammoth bones.

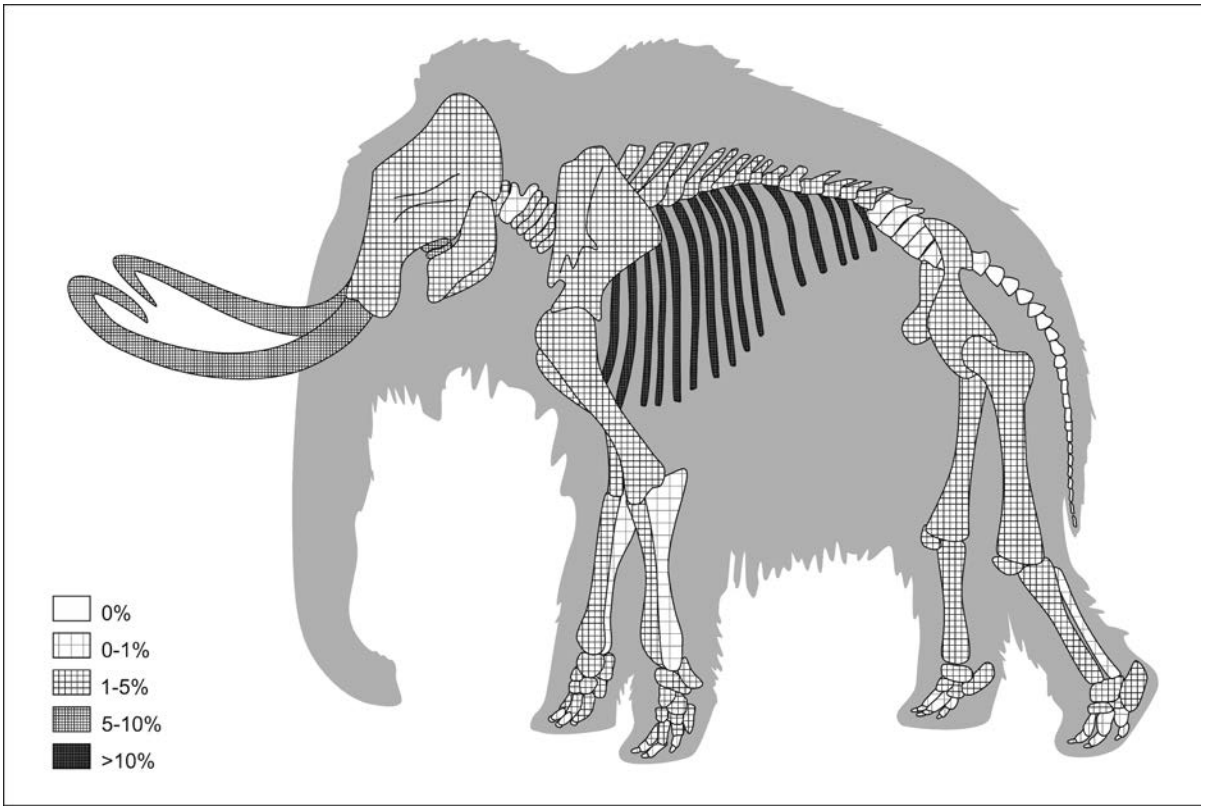

Fig. 2. Percentage representation of wooly mammoth skeletal elements at Molodova I, layer IV (% NISP).
Рис. 2. Відсоток скелетних решток волохатого мамонта у збірці Молодове I (% NISP).

Even though the excavation at Molodova I was finished over 30 years ago, the bone material from layer IV have not been a subject of comprehensive paleozoological studies till now. Only partial paleozoological studies were conducted by specialists from different scientific centers (А. Агаджанян, Л. Алексеева, В. Мотуз, И. Пидопличко, Э. Вангенгейм), however only scarce results were published [Агаджанян, 1982; Мотуз, 1982; Черныш, 1982].

The foundings from layer IV have recently became a subject of taphonomic research [Nowell and d'Errico, 2010, Krajcarz and Krajcarz, 2011]. The latest zooarcheological studies of collection from Molodova I, layer IV, stored in the National Museum of Natural History in Kiev and partially from Ivan Krypiakevich Institute of Ukrainian Studies in L'viv, were presented by Demay et al. [Demay et al., 2012].

The problem of Neanderthal-made tool marks on bones and the issue of Neandethal-made art was solved by Krajcarz and Krajcarz (2011) and Nowell and d'Errico (2010). Both studies confirmed that most of marking on bones from Molodova I were caused by either natural process or by excavators, and only several specimens of cut marks might be classified as Neanderthal-made.

Except of making few cut marks, the pattern of interaction between Neanderthals and bone assemblage at site Molodova I remains still ambiguous. The goal of this work is to present the results of paleozoological studies of complete osteological material from layer IV of Molodova I, stored in the Ivan Krypiakevich Institute of Ukrainian Studies, National Academy of Sciences of Ukraine, in L'viv. Authors' aim was to recreate the genesis of bone assemblage from layer IV of Molodova I.

MATERIAL AND METHODS

The paleontological material studied in this paper is stored in the Ivan Krypiakevich Institute of Ukrainian Studies, National Academy of Sciences of Ukraine in L'viv.

The bone material was taxonomically and anatomically determined. Studied specimens were identified to anatomical element and species where possible. The quantification of examined bone material follows Lyman (1994, 2008).

The number of identified specimens (NISP), minimum number of elements (MNE) and minimum number of individuals (MNI) were calculated. The MNE was calculated separately for each element.

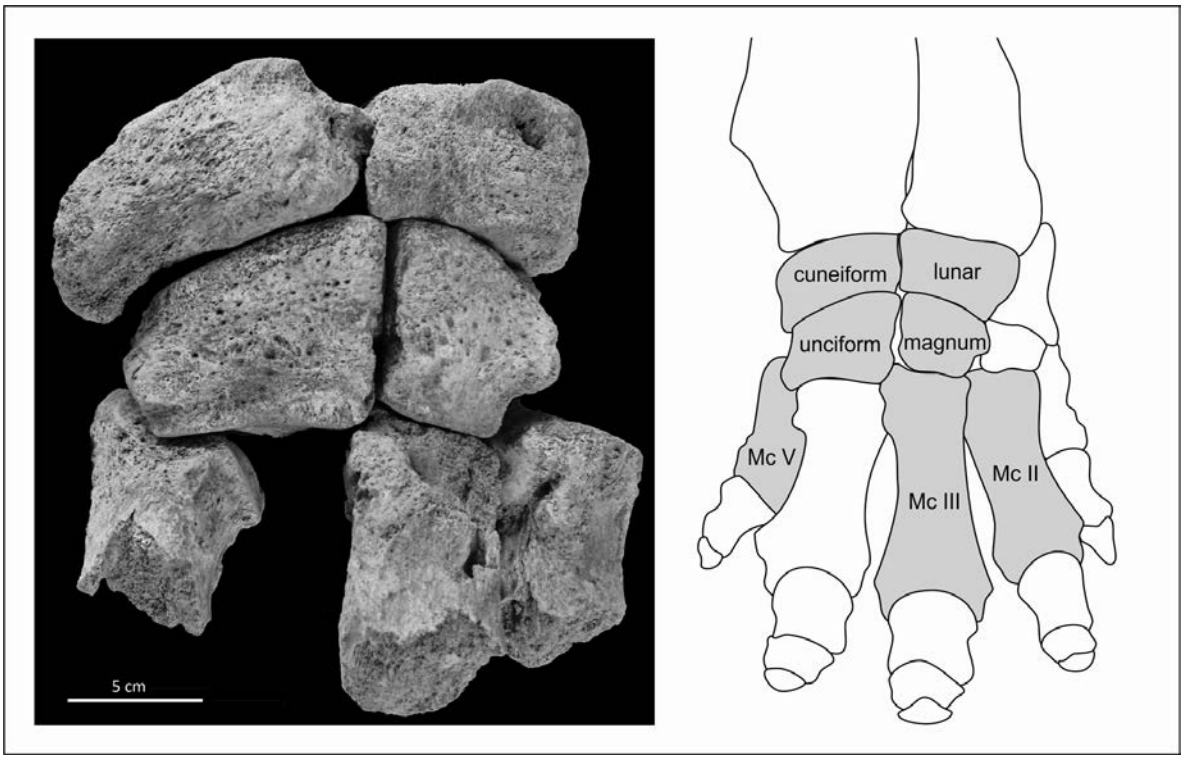

Fig. 3. Fragments of mammoth right manus preserved in anatomical position of bones.
Рис. 3. Фрагменти правої стопи мамонта, збережені у анатомічно правильній позиції.

Teeth, mandibles, cervical vertebra, scapulae, humeri, ulnae, radii, femora, tibiae, patellae, fibulae, metatarsals and tarsals were used to determine MNE. The highest MNE of a particular species in a cluster determined the minimum number of individuals (MNI) of the species in that accumulation.

The age of mammoths was estimated based on epiphysial fusion and tooth progression according to Hyanes (1991).

RESULTS AND DISCUSSION

Bone assemblage from layer IV of site Molodova I consists of 9515 animal remains: bones and teeth. The studied specimens are poorly preserved. The remains bear many traces of modern damages and most of them (especially ribs, teeth, vertebra and flat bones) are highly fragmented.

Fresh surfaces of fractures prove that bones were fragmented after excavation, most probably during storing in wooden boxes. Among all examined bones and teeth only 2317 remains were certainly identifiable at species level (table 1).

Table 1

Species and skeletal representation at Molodova I, layer IV
(% NISP counted for identified specimens of particular species): rt – right, lf – left, ind – indeterminate

TAXON	ELEMENT	NISP	% NISP	MNE			MNI
				rt	lf	ind	
Mammuthus primigenius							
	HEAD:						
	cranium	20	1.5			20	
	mandibula	18	1.4	6	4	8	6
	cheek teeth	125	9.5	2	2	121	2
	tusk	117	8.9			117	
	AXIAL:						
	atlas	19	1.4			19	
	axis	10	0.8			10	10
	cervical	50	3.8			50	
	thoracic	64	4.9			64	
	lumbar	6	0.5			6	
	vertebra	182	3.9			182	
	sacrum	3	0.2			3	3
	rib	364	27.7			364	
	FORELIMB:						
	scapula	52	4.0	21	11	20	21
	humerus	23	1.8	7	4	12	7
	radius	15	1.1	4	8	3	8
	ulna	8	0.6	3	5		5
	carpal	54	4.1	25	16	13	6
	metacarpus	32	2.4	14	6	12	6
	phalanx	2	0.2			2	
	HINDLIMB:						
	pelvis	29	2.2	4	5	20	5
	femur	30	2.3	1	3	26	3
	patella	13	1.0	7	2	4	7
	tibia	16	1.2	3	6	7	6
	fibula	1	0.1			1	
	tarsal	47	3.6	14	18	15	8
	metatarsus	10	0.8	5	5		5
	phalanx	4	0.3			4	
Equus ferus							
	HEAD:						
	mandibula	4	3.0	2	2		2
	teeth	23	17.4	11		12	3
	AXIAL:						
	axis	1	0.8			1	1
	thoracic	2	1.5			2	
	lumbal	7	5.3			7	
	vertebra	1	0.8			1	
	rib	73	55.3			73	
	FORELIMB:						
	scapula	2	1.5	2			2

TAXON	ELEMENT	NISP	% NISP	MNE			MNI
				rt	lf	ind	
	humerus	2	1.5	1		1	1
	radius	2	1.5	1	1		1
	ulna	2	1.5	1	1		1
	metacarpus	2	1.5			2	
	HINDLIMB:						
	pelvis	2	1.5	2			2
	femur	2	1.5		1	1	1
	tibia	3	2.3	3			3
	tarsal	2	1.5		2		2
	metatarsus	2	1.5	1		1	1
Coelodinta antiquitatis							
	HEAD:						
	mandibula	1	0.7	1			1
	AXIAL:						
	thoracic	2	1.3			2	
	vertebra	6	3.9			6	
	rib	115	75.2			115	
	FORELIMB:						
	scapula	1	0.7		1		1
	humerus	1	0.7			1	
	radius	5	3.3	2	1	2	2
	carpal	4	2.6		3	1	1
	metacarpus	1	0.7			1	1
	HINDLIMB:						
	pelvis	9	5.9	2	2	5	2
	femur	1	0.7	1			1
	tibia	2	1.3			2	
	metatarsus	4	2.6	1	1	2	1
	phalanx	1	0.7			1	
Bison priscus							
	HEAD:						
	cranium	5	0.8	2		3	2
	AXIAL:						
	vertebra	1	0.2			1	
	rib	617	95.1			617	
	FORELIMB:						
	radius	3	0.5	3			3
	ulna	1	0.2			1	
	carpal	4	0.6			4	
	metacarpus	2	0.3	2			2
	HINDLIMB:						
	pelvis	3	0.5		1	2	1
	patella	1	0.2	1			1
	tibia	2	0.3		2		2
	tarsal	1	0.2	1			1
	phalanx	8	1.2			8	
	sesamoid	1	0.2			1	

TAXON	ELEMENT	NISP	% NISP	MNE			MNI
				rt	lf	ind	
Megaloceros giganteus							
	HEAD:						
	mandibula	2	22.2	1	1		1
	AXIAL:						
	atlas	2	22.2			2	2
	FORELIMB:						
	radius	1	11.1	1			1
	ulna	1	11.1	1			1
	HINDLIMB:						
	femur	1	11.1	1			1
	tarsal	1	11.1			1	1
	metatarsus	1	11.1			1	1
Cervus elaphus							
	HEAD:						
	antler	3	100.0	1	1	1	2
Rangifer tarandus							
	HEAD:						
	mandibula	1	2.0	1			1
	cheek teeth	13	25.5			13	
	antler	13	25.5	1		12	1
	AXIAL:						
	rib	1	2.0			1	
	FORELIMB:						
	scapula	5	9.8	4	1		4
	humerus	1	2.0		1		1
	radius	2	3.9	1	1		1
	metacarpus	5	9.8			5	
	HINDLIMB:						
	patella	1	2.0	1			1
	tibia	4	7.8	2	1	1	2
	tarsal	5	9.8	2	2	1	2
Cervidae							
	HEAD:						
	mandibula	2	20.0	1	1		1
	AXIAL:						
	rib	1				1	
	antler	5	10.0			5	
	FORELIMB:		50.0				
	scapula	1				1	
	radius	1	10.0			1	
Panthera spelaea							
	HEAD:						
	cranium	2	40.0	1	1		1
	mandibula	2	40.0	1	1		1
	cheek teeth	1	20.0	1			1
***Ursus* sp.**							
	HEAD:						
	deciduous cheek teeth	1	100.0		1		1

The layer IV may be described as accumulation of remains of different species, where remains of wooly mammoths (*Mammuthus primigenius*) dominates (64,4 % of NISP, MNI=21). This assemblage, according to classification of mammoth sites proposed by Gaudzinski et al. (2005), should be regarded as accumulation of diverse fauna with mammoth domination. Beside the mammoths, remains of four species of Artiodactyla (*Bison priscus*, *Cervus elaphus*, *Megaloceros giganteus* and *Rangifer trandus*), two species of Perissodactyla (*Equus ferus* and *Coelodonta antiquitatis*), and two species of Carnivora (*Ursus* sp. and *Panthera spelaea*) were found (fig. 1).

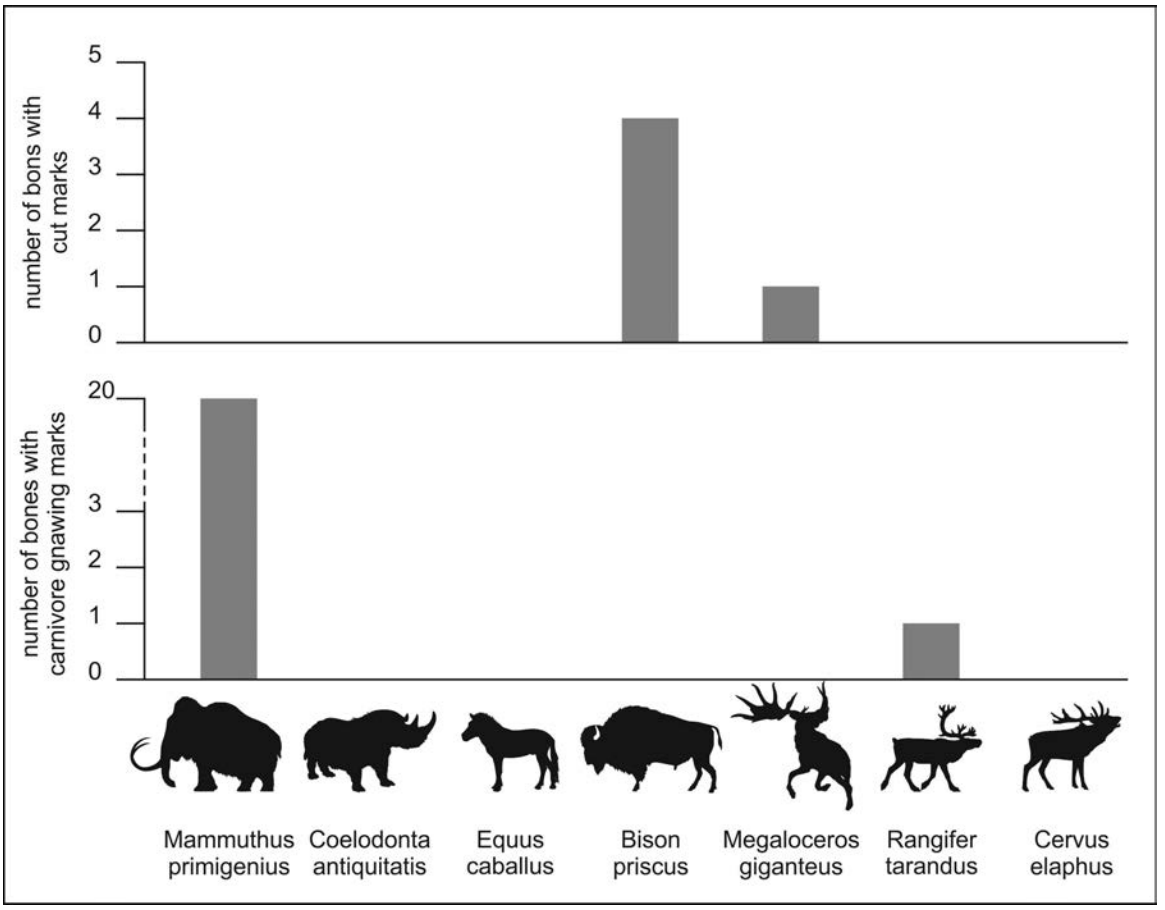

Fig. 4. Number of Ungulates' bones with carnivore gnawing marks in comparison to number of bones with Neanderthal-made marks [partially by: Krajcarz and Krajcarz, 2011].

Рис. 4. Кількість кісток копитних зі слідами погризів, зроблених хижаками, у порівнянні з кількістю кісток зі слідами діяльності неандертальців [частково за: Krajcarz and Krajcarz, 2011].

30 years after Chernysh'es excavation unfortunately nothing can be said about the primary location of the bones at the site Molodova I. Skeletal element representation shows that each part of mammoth is present. It suggests that bones or meat portions were not taken off the site by Palaeolithic people. The high representation (highest % NISP) of tusks, molar teeth and ribs is caused by high level of fragmentation (fig. 2). Some of stored small bones were still in anatomical position (fig. 3).

Layer IV of Molodova I yielded large number of bones and teeth, but their preservation is very poor, so the estimating of MNI value is difficult. The highest MNI, based on MNE counted for scapulae, was 21 specimens. The age profile of mammoths from Molodova I is also hard to describe due to bones and teeth preservation state. Large group of specimens consists of fully fused bones of adult individuals. Based on the pelvis fusion, at least two individuals were under 8 years old. Based on the eruption and wear of the separated teeth the age of ten specimens may be evaluated (table 2). Only two preserved mandibles allow to estimate the age (table 2). The number of individuals with estimated

age (12 specimens) is too low to construct a reliably age profile of taphocenosis. In addition the poor preservation state suggests that younger and smaller remains may not be preserved.

Table 2

Age estimation of mammoths from Molodova I (layer IV) based on stage of teeth eruption and wear

AGE CLASS	NUMBER OF LOOSE TEETH	NUMBER OF MANDIBLES
0.1–2 years	1	0
0.3–4.5 years	2	1
2–14.5 years	3	0
13–43 years	4	1

It is more likely that this accumulation is a result of natural death, not regular human hunting activity. The lack of human-made tool marks on bones cannot definitely excluded that Neanderthals had processed mammoth carcasses [Hyanes, 1991]. However the presence of carnivore gnawing marks is evident (fig. 4) and indicates that not only Neanderthals had access to wooly mammoth carcasses deposited at Molodova I.

Among the bone assemblage two species of carnivores were stated: bear (*Ursus* sp.) on the basis of single juvenile tooth; and cave lion (*Panthera spelaea)* on the basis of skull fragments of probably one adult specimen. Based on the size of gnawing marks it is possible that they were made by such big animal as cave lion. With no doubts Neanderthal hunters processes the carcasses of species other than wooly mammoths, i.e. steppe wisent and giant deer [Krajcarz and Krajcarz, 2011; Nowell and d'Errico, 2010].

The studies of material from layer IV of Molodova I, conducted parallel by Demay et al. [Demay et al., 2012] showed very similar zooarchaeological results in case of anatomical determination of bones as well as spectra of identified species. However our studies of collection stored in Ivan Krypiakevich Institute of Ukrainian Studies in L'viv completed the list of Ungulate species with *Megaloceros giganteus*, which was not stated by Demay et al.

The lists of carnivores show more differences. Authors of this paper did not stated remains of artic fox, wolf and leopard in collection. We have determined the skull fragments of cave lion, not specified by Demay et al. It is possible that the specimens described by Demay et al. as leopard (*P. pardus*) and by us as cave lion (*P. spelaea*) are the same specimens.

Those felid remains are rather small, however their measurements fit to the range of cave lion, but not of leopard (Marina Sotnikova – pers. comm., Adrian Marciszak – pers. comm.).

Both papers indicate the wooly mammoth as the most common species, however the minimum number of individuals determined in this paper is higher (MNI=21 based on scapula) than the number achieved by Demay et al. (MNI=15 based on scapula). The second most abundant species is steppe wisent according to the authors of this paper, however the reindeer according to studies of Demay et al.

Demay et al. [Demay et al., 2012] suggest that some bones were used by Neanderthal people to build house-like structures, as it was claimed in older works [Черныш, 1965, 1982]. However researches of authors of this paper do not support that thesis.

Differences may be caused by different material – authors of this paper have researched the whole collection from L'viv; while Demay et al. investigated a part of collection from L'viv and whole collection from Kiev. The additional important information is that only sparse remains from the whole collection stored in L'viv still have accurate data on their position in layer.

Part of documentation has been lost, so it is impossible to connect most of remains with structures found during archaeological excavation.

CONCLUSION

Based on taphonomic data the site Molodova I during Early Weichselian Glaciation (OIS 5a-d) was a place of mass death of animals, mostly mammoths. The animal carcasses were eaten by huge carnivores (fig. 5). The connection between Neanderthal people and bone assemblage is confirmed by cut marks [Nowell and d'Errico, 2010; Krajcarz and Krajcarz, 2011; Demay et al., 2012]. It is probable that humans hunted or scavenged the smaller ungulates in the area – steppe wisent and giant deer. That conclusion is supported by presence of cut marks on the bones of mentioned species, and also by different distribution of carnivore gnawing marks, which are present on the remain of other species than human-impacted species [see also Krajcarz and Krajcarz, 2011].

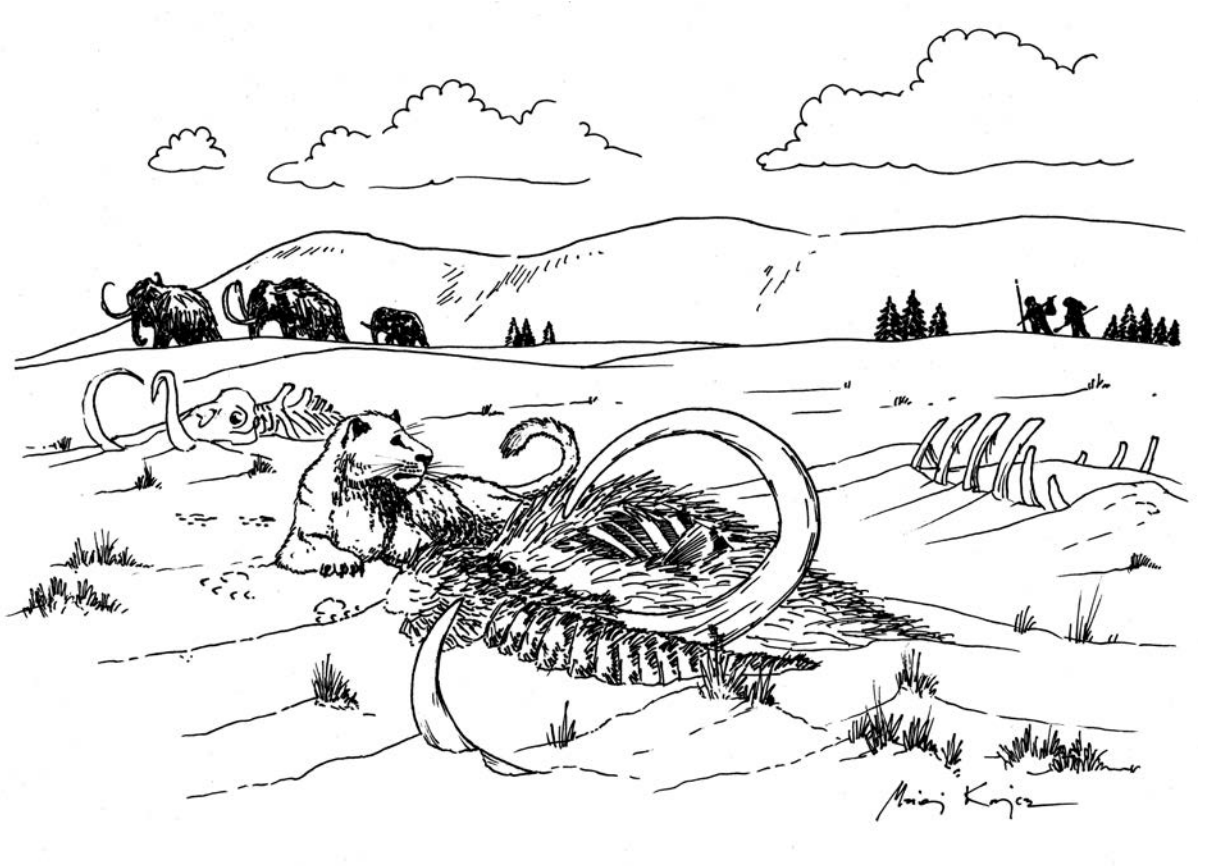

Fig. 5. According to the considerations of the newest research, layer IV of Molodova I records a place of mass death of ungulates, where huge carnivores used to feed. Human activity was focused on carcasses of ungulates smaller than mammoths.

Рис. 5. За результатами останніх досліджень шар IV стоянки Молодового I являє собою місце масової загибелі копитних, якими харчувались великі хижаки. Діяльність людини була сфокусована на мамонтах і, у меншій мірі – на копитних.

The bone assemblage stored in the Ivan Krypiakevich Institute of Ukrainian Studies in L'viv gave no data that could prove or deny a hypothesis that mammoth bones were used by Neanderthals as the source of building material for shelters.

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changes of Western Ukraine and South-Eastern Poland in Pleistocene and their influence on primeval settlement and migration pattern (based on loess and cave sites)".

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Магдалена КРАЙЦАЖ,
Мацей Томаш КРАЙЦАЖ

СЕРЕДНЬОПАЛЕОЛІТИЧНА СТОЯНКА МИСЛИВЦІВ НА МАМОНТІВ МОЛОДОВЕ I (ШАР IV) – ЗООАРХЕОЛОГІЧНІ ДОСЛІДЖЕННЯ ЗБІРКИ З ФОНДІВ ІНСТИТУТУ УКРАЇНОЗНАВСТВА ІМ. І. КРИП'ЯКЕВИЧА НАН УКРАЇНИ, ЛЬВІВ

Тафономічні дані свідчать, що стоянка Молодове I впродовж OIS 5a-d була місцем масової загибелі тварин, насамперед мамонтів. Кістки тварин мають сліди зубів великих хижаків. Існування зв'язку між поселеннями неандертальців та виявленими кістковищами підтверджується слідами нарізок. Ймовірно, люди полювали на цій території на копитних – зубрів та оленів, чи збирали рештки здобичі хижаків. На цю думку наводять як сліди нарізок на кістках означених видів, так і присутність слідів зубів хижаків на кістках тих тварин, які не були здобиччю первісних мисливців.

Збірка остеологічних решток з фондів Інституту українознавства ім. І. Крип'якевича у Львові не дозволяє підтвердити чи заперечити гіпотезу про використання неандертальцями кісток мамонта у якості матеріалу для спорудження жител.