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THE STATUS OF CANIDS IN THE ECONOMY OF THE EPIGRAVETTIAN GROUPS OF THE DESNA VALLEY

ABSTRACT

The Upper Palaeolithic sites of the East European Plain are well known for the high level of exploitation of mammoth and other big mammals by human groups. Indeed, most of the studies focused on the big game economy. However, canids (fox and wolf) are represented in significant numbers at the sites, particularly at the Epigravettian sites of the Desna valley. The goal of the study was to reveal the role of canids in the economy of the Upper Pleniglacial human groups from the Desna valley comparing to the data obtained from the sites of the Eastern Euro-

pean Plane. The results of our analysis of Epigravettian sites in comparison to the Gravettian sites of the Desna valley showed that canids were increasingly involved in human activities during the second part of the Upper Pleniglacial. The zooarchaeological analysis of the faunal remains from the Eliseevichi 1 site (excavations of 1935–1936) highlighted the modalities of acquisition and use of canids both as food and non-food resources. We conclude that canids were significantly exploited not only as a result of a secondary activity but also as a main one.

Key words: Epigravettian, Desna valley, zooarchaeology, canids, Paleolithic, East European Plain.

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РОЛЬ ПСОВЫХ В ХОЗЯЙСТВЕННОЙ ДЕЯТЕЛЬНОСТИ ЧЕЛОВЕКА НА ЭПИГРАВЕТТИЙСКИХ СТОЯНКАХ БАСЕЙНА ДЕСНЫ

АННОТАЦИЯ

Верхнепалеолитические памятники Восточно-Европейской равнины хорошо известны широким использованием в качестве ресурса жизнеобеспечения мамонтов и других крупных млекопитающих. Именно на определение их роли в хозяйственной жизни древних людей сфокусировано внимание большинства исследований. Вместе с тем на этих стоянках также достаточно широко представлены кост-

ные остатки животных семейства псовых (лисица, песец и волк), особенно много их найдено на эпиграветтийских памятниках бассейна Десны. Целью настоящего исследования является определение роли этих животных в хозяйственном укладе групп населения поздней поры верхнего палеолита бассейна Десны на основе ранее полученных данных по позднеплейстоценовым памятникам Восточно-Европейской равнины. По

сравнению с граветтийскими памятниками бассейна Десны в позднюю пору верхнего палеолита псовые чащи становятся объектом хозяйственной деятельности человека. Зооархеологический анализ фаунистических остатков с поселения Елисе-

евичи 1 (раскопки 1935–1936 гг.) выявил способы добычи и использования псовых в качестве как пищевого, так и непищевого ресурса. Нами сделан вывод, что псовые использовались не только как вспомогательный, но и основной ресурс.

Ключевые слова: эпиграветт, бассейн Десны, зооархеология, псовые, палеолит, Восточно-Европейская равнина

INTRODUCTION

The Upper Pleniglacial sites of the East European Plain are well known for the high exploitation of mammoth resources by human groups. With regard to the subsistence strategies, most of the studies focused on the exploitation of large herbivorous mammals. Among the other taxa often associated with these assemblages, canids are represented in significant numbers, particularly in the Desna valley, that tend to increase in Epigravettian technocultural complexes. The purpose of this research is to better understand the subsistence activities of Paleolithic human groups through their relation with fauna. The goal is to better define the status of canids (foxes and wolves) among the exploited faunal spectrum and to identify the modalities of acquisition, use, and their role in human activities.

The second part of the Upper Pleniglacial began after the Last Glacial Maximum (21 000–18 000 years BP). It is marked by alternating periods of warm (organogenic deposits) (Laurerie between 18 000–17 000, Lascaux between 16 000–15 000, Bølling-Allerød around 12 500 years BP) and cold periods (Brandenbourg–Leszno–Bologovo / Prichernomorski around 17 000–16 000, Pomerania–Vepsovo — 15 000–14 000 and Oldest Dryas around 13 000–12 500 years BP). [Dolukhanov 1993; Stepanchuk 1999; Haesaerts et al. 1998; Haesaerts et al. 2003]. Deglaciation took place under very continental conditions with mild summers and cold winters. The wettest periods alternating with progressive levels of warming caused the retreat of the ice sheet.

The east European plain is divided into the three larger regions: the plain (notably with the Dnieper

and Don valleys, the extracarpatic area (notably with the Dniester valley) and the southern steppes.

Concerning the techno-cultural complexes developed by human groups, the main entity is known as Epigravettian, with different facies. The Epigravettian succeeds the Gravettian and lasts between 19 000 and 11 500 years BP, in Italy and in Eastern Europe. There are typological changes during the Epigravettian, but the laminar production techniques are similar to those of the Gravettian. The archaeological sites have also provided many bone objects, especially conical spears and handles often with lateral grooves. There are also objects of adornment, such as pendant type, sometimes with geometric decorations. The Epigravettian techno-complex is divided into two phases, the old Epigravettian (18 000–17 000 years BP) and the recent Epigravettian (14 000–11 500 years BP). The old Epigravettian is sometimes called Gravettien stage IV [Noiret 2009].

Four main facies have been described: Dnieper basin, Don basin, Dniester basin, and southern steppes. On the one hand, in the Dnieper basin two facies were described, the Mezinian and Eliseevichian [Djindjian et al. 1999]. The Mezinian (Mezin, Mezhirich, Dobranichevka, Gontsy) regards to the lower basin of the Desna where sites are characterized by dwellings structures in mammoth bones and pits. The industry there is homogenous, quite simple, tools are made on blades, composed of burins, scrapers, and backed bladelets. Objects in bone and ivory are numerous (points, needles, bâtons percés, awls). Also known portable art and ornaments, such as schematic anthropomorphic statuettes, pendants, and bracelets, all with many engraved geometric patterns. The Eliseevichian (Eliseevichi, Yudinovo,

Timonovka, Suponevo, Chulatovo) facies is quite similar and characterized by the predominance of burins, particular artistic pieces such as *churingas*, and more realistic female statuettes. On the other hand, it is one culture, the Eastern Epigravettian, characterized by four local versions, namely Mezinian, Ovruchian, Mezhirichian and Yudinovian. Two single series coexist with this culture: Eliseevichi 1 and Zhuravka [Nuzhnyi 2006].

In the Don basin, the sites of Kostenki (2, 3, 11/1a, 19) have cultural features, grouped together under the Zamiatnine facies. The lithic industries there are characterized by the predominance of bi- or quadrupole splintered pieces and many flake-tools. Burins and scrapers are numerous. There are few artifacts related to the bone industry: ivory awls and spears with circular section. Habitat structures differ from those of the Dnieper basin.

In the Dniester basin, the Gravettian artifacts are present up to 22 000–18 000 with the development of Epigravettian cultures from about 18 000 years BP. The cultural aspects are fairly homogeneous in the region. Human groups adopt a hunting strategy based on reindeer migrations, setting up their camps at river crossing points [Chirica, Borziac 2009]. The lithic industries are characterized by the appearance of a specific tools, including truncated elements, then large points of La Gravette, and finally convex backed points. These cultural peculiarities are grouped under the same regional facies, the Molodovian, or Eastern Epigravettian [Boriskovskiy 1953; Grigoriev 1970; Chernysh 1973; Otte et al. 1996; Borziac, Koulakovska 1998; Borziac, Chirica 1999; Noiret 2007; Nuzhnyi 2009].

In the southern steppes, the period between 20 000 and 13 000 years BP is characterized by two facies, the Epigravettian of Gravettian tradition and the *Aurignacoid Epigravettian*.

The Epigravettian of Gravettian tradition was developed in Amvrosievka, Anetovka II, Yami as well as in the lower layer of Vladimirovka. These are short sequences corresponding to the seasonal habitats. The lithic industries are characterized by laminar debitage and backed edge tools. There are numerous burins and backed bladelets. Hunting is more

oriented on bison, horse, and saiga [Pidoplichko 1953; Krotova, Belan 1993; Julien 2001]. Decorated objects are rare. The *Aurignacoid Epigravettian* was developed in the same steppes, in particular at the sites of Muralovka, Zolotovka and Sagaidak I. These are unique levels without development of the space of occupation, except for Muralovka, which presents a paving. The lithic industries are characterized by flake and lamellar debitage. The nose scrapers are thick, made on large splinters. The bladelets and small flakes have been transformed into microlithic armatures. The fauna is represented by mammoth, rhinoceros, horse, reindeer, bison, and wolf. It appears that practices are varied, but with main tendencies of exploitation of fauna: mammoth in the plain, reindeer in the extracarpatic, and bison in the southern steppes [Shydlovskiy 2008].

Among the carnivores that are present at the archaeological sites of this area, canids are most abundant. This group includes wolves (*Canis lupus*) and foxes. Foxes are represented by the three species: red fox (*Vulpes vulpes*), corsac fox (*Vulpes corsac*), and polar fox (*Vulpes lagopus*). By actualistic comparisons we can reconstruct biological and ethological data about these species. Wolves reached 65–90 cm in height and 15–50 kg in weight. These wolves had an exceptional sense of smell and a very developed hearing. It was a very enduring animal, which could travel very long distances in trotting and could reach peaks of 45 km/h at gallop. Wolves preferred big game, especially cervids, and they hunted in a very organized way. In more drastic periods they fed on small mammals, sometimes even birds and fish. They could also carve carcasses. Wolves lived in packs led by a dominant couple. A pack may have consisted of 5–15 individuals. Occasionally some individuals lived solitary or as a couple. Only the dominant couple bred. They bred between January and March to have cubs in a den in spring between March and June. In July, the pack abandoned the den to settle in another sector until the end of summer. The pack frequented the same places each year and was very territorial.

The dog (*Canis lupus familiaris*) is a domesticated canid evolved from the wolf. The period of



Fig. 1.
*Location of the
Epigravettian
sites of the
Desna valley*

Рис. 1.
Местораспо-
ложение
эпигравет-
тийских
памятников
бассейна Десны

this process is currently under debate. The oldest traces of dogs in Europe date back to the beginning of the Paleolithic, on the site of Goyet (Belgium) around 34 000 years BP, Předmostí (Czech Republic) around 24 000, and the Altai region (Russia, Siberia) around 31 000 [Germonpré 2009; Germonpré *et al.* 2015a; Germonpré *et al.* 2015b]. A genetic study showed that the divergence between the wolf and the dog would have occurred around 25 000 years BP [Skoglund *et al.* 2015]. Other authors do not agree with the fact that they were dogs. Or they may have been dogs from which no lineage has resulted, and current dogs being descendants of dogs that were a result of much later domestication processes [Druzhkova *et al.* 2013].

Foxes reached 5–15 kg weight. They fed on arctic hares, lemmings, small rodents, birds, berries, and eggs as well as carrions. They followed the large predators to access the remains of their prey. Foxes lived in a den. They could lead a solitary life as well as live as couples or groups. They bred between January and March to have cubs in spring between March and June.

With all that said, a further study of the remains of canids in archaeological context is necessary. Our goal is to better understand the part of canids de-

pending on the regions during the Epigravettian. In particular, we focus on the main sites of the Desna valley, an affluent of the Dnieper river (Fig. 1): Yudinovo, Chulatovo I and II, Mezin, Timonovka 1 and 2, Suponevo, Eliseevichi 1 [Velichko 1961; Shovkopljas 1965; Polikarpovitch 1968; Pidoplichko 1969; Soffer 1985; Khlopachev 2006; Nuzhnyi 2006; Sablin 2014; Demay *et al.* 2016; Demay *et al.* 2017; Demay *et al.* 2019].

MATERIALS AND METHODS

For this study we used published data of the main Epigravettian sites of the Eastern European Plain and Gravettian sites of the Desna valley (Fig. 1; Table 1; Table 2; Table 3).

For the statistical comparisons we used the adjusted residuals. They are the raw residuals (or the difference between the observed counts and expected counts) divided by an estimate of the standard error. They allow to take into account the variations due to different sample size. Thus, it is possible to highlight the influence of each species on all the samples [Grayson, Delpech 2003].

The Z-test was used to determine if some samples are different. This test is a hypothesis test based on the Z statistics, which follows the standard normal distribution under the null hypothesis. It makes it possible to test the probability of differences between samples, in particular following the highlighting of the confidence interval. If Z or the difference is greater than 1,96, the difference is significant or highly significant according to $p < 0,01$ or $< 0,001$.

We studied the faunal material discovered by K.M. Polikarpovich at Eliseevichi 1 (Russia) in 1935–1936, deposited at the Peter the Great Museum of Anthropology and Ethnography (the Kunstkamera) and the Zoological Institute of the Russian Academy of Sciences in Saint-Petersburg (Russia). The study includes paleontological analyzes, analysis of biological and ethnological data of the species by actual comparisons, as well as taphonomy and palethnographic data [Binford 1979; Behrensmeier 1978; Lyman 1994; Lyman 2008; Denys, Patou-Mathis 2014].

Table 1. Mentioned sites and total minimum number of individuals concerning fauna Eastern European Plain archaeological sites (based on published data)

Таблица 1. Упомянутые в работе археологические стоянки Восточно-Европейской равнины с указанием общего минимального числа особей млекопитающих

Sites				Minimum number of individuals		
Dnieper valley	Desna valley	Gravettian	Pushkari 1	exc. I; II; V; VII	146	
			Pushkari 8 (Pogon)	exc. VII	8	
			Obollonia		7	
				Khotylevo II		68
				Mezhirich		301
				Gontsy		157
				Fastov		16
Zhuravka				24		
Dobranichevka				114		
Dniester valley					Epigravettian	Babin 1
	Raşkov VII		89			
	Cosauți	10; 9; 8; 7; 6; 5; 4; 3; 2; 1	307			
	Cotești		23			
	Molodova V	I.6; I.5; I.4	103			
	Korman IV	5; 5a; 4; 3	79			
Southern steppes			Anetovka		200	
			Amvrosievka	bone bed WE; bone bed 1935, 1940, 1949; camp	274	
			Osokorovka	II–III	16	
			Kammenaya Balka 2	2	85	

Table 2. The list of mammal species presented at the archaeological sites of the Don valley (based on published data)

Таблица 2. Виды млекопитающих, представленные на археологических памятниках бассейна Дона

Sites	<i>M. primigenius</i>	<i>Equus</i> sp.	<i>C. antiquitatis</i>	<i>R. tarandus</i>	<i>C. elaphus</i>	<i>Bison</i> sp.	<i>S. tatarica</i>	<i>U. arctos</i>	<i>Vulpinae</i>	<i>C. lupus</i> — Large canids	<i>P. I. spelaeus</i>	<i>Lepus</i> sp.	Lemmings
Kostenki 2	x	x	x					x	x	x	x		
Kostenki 3	x	x			x				x	x	x		x
Kostenki 11/1a	x			x						x		x	
Kostenki 19	x	x				x		x	x				

Table 3. Mentioned sites and total minimum number of canid individuals at the Desna valley Epigravettian archaeological sites (based on published data)

Таблица 3. Упомянутые в работе эпиграветтийские памятники бассейна Десны с указанием минимального числа особей псовых

Sites	Minimum number of individuals		
	Total	Large canids	Foxes
Yudinovo	102	3	27
Chulatovo I	37	3	6
Chulatovo II	124	3	17
Mezin	486	59	116
Timonovka 1	24	1	2
Timonovka 2	23	1	6
Suponevo	16	2	1

RESULTS

Distribution of canids in the East European Plain

By comparing the minimum number of canid individuals of the Epigravettian occupations between the different regions, we can observe that they are highly represented in the Dnieper valley (Fig. 2). We do not have precise data on the sites of the Don valley, but mammoth is often predominant and some canids were present at the sites (Table 2).

Using comparison of the adjusted residual between the different regions — Dniester valley and southern steppes — we can observe that vulpines and large canids have a significantly high representation in the Dnieper valley (Fig. 3; Fig. 4).

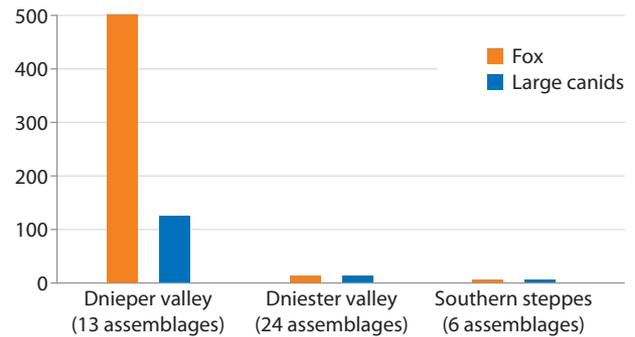


Fig. 2. Minimum number of canid individuals from the Eastern European Plain archaeological sites pooled for three large areas

Рис. 2. Минимальное число особей псовых на археологических памятниках Восточно-Европейской равнины (сводные данные по трем крупным ареалам)

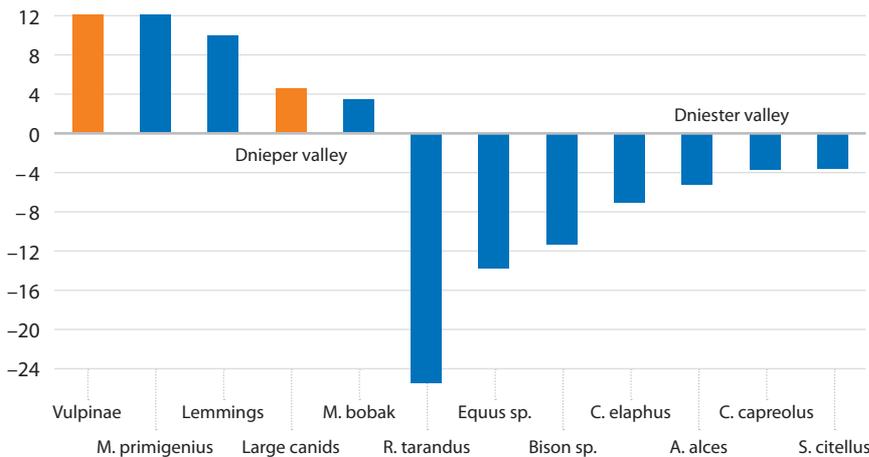


Fig. 3. Adjusted residuals from the number of individuals of the main species (>3 individuals; p -value < 0,001) between the Epigravettian sites of the Dnieper and Dniester valleys (27 taxa, 2986 individuals, 37 archaeological assemblages) $\text{K}hi^2 = 1334$; $P < 0,001$

Рис. 3. Разница в количестве особей основных видов млекопитающих на эпиграветтийских памятниках бассейнов Днестра и Днепра

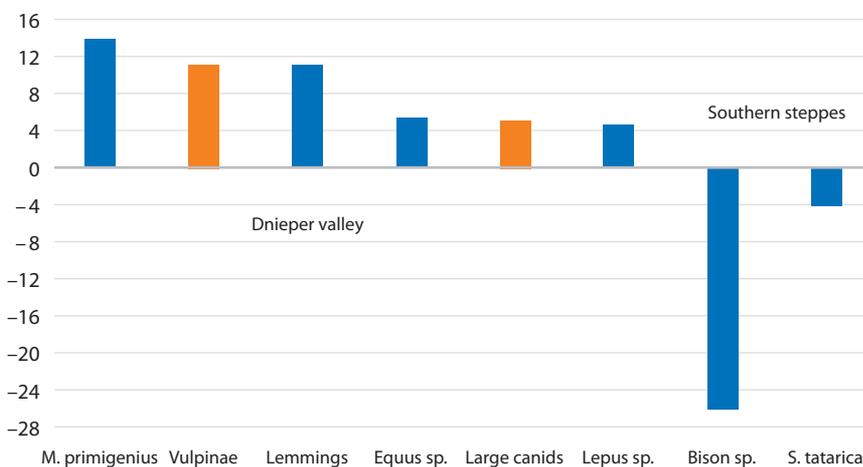


Fig. 4. Adjusted residuals from the number of individuals of the main species (>3 individuals; p -value < 0,001) between the Epigravettian sites of the Dnieper valley and the southern steppes (25 taxa, 2845 individuals, 25 archaeological assemblages) $\text{K}hi^2 = 2279$; $P < 0,001$

Рис. 4. Разница в количестве особей основных видов млекопитающих на эпиграветтийских памятниках бассейна Днепра и зоны Причерноморских степей

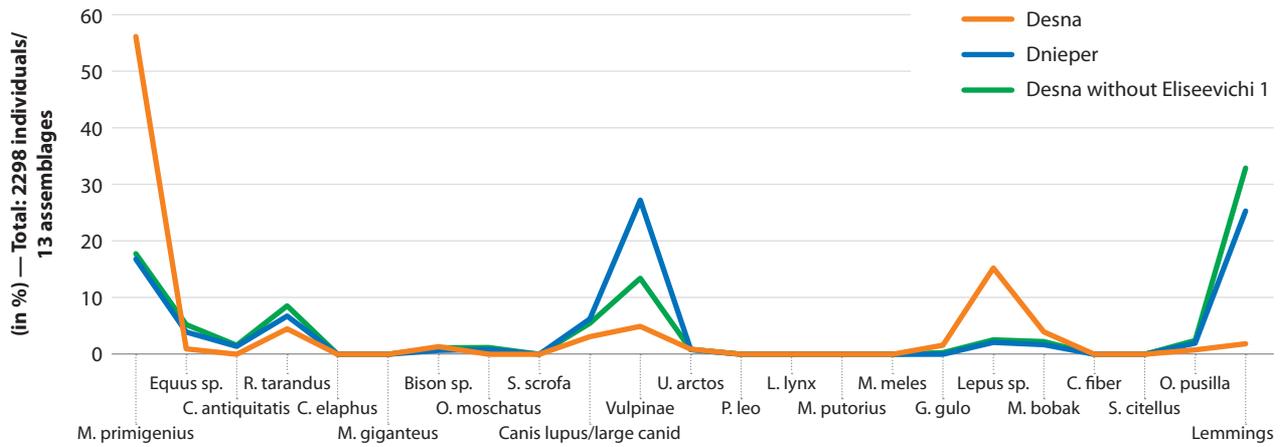


Fig. 5. Minimum number of individuals in percentage of species in Epigravettian sites of the Desna and Dnieper valleys

Рис. 5. Процентное соотношение минимального числа особей млекопитающих различных видов, представленных на эпиграветтских памятниках бассейнов Десны и Днепра

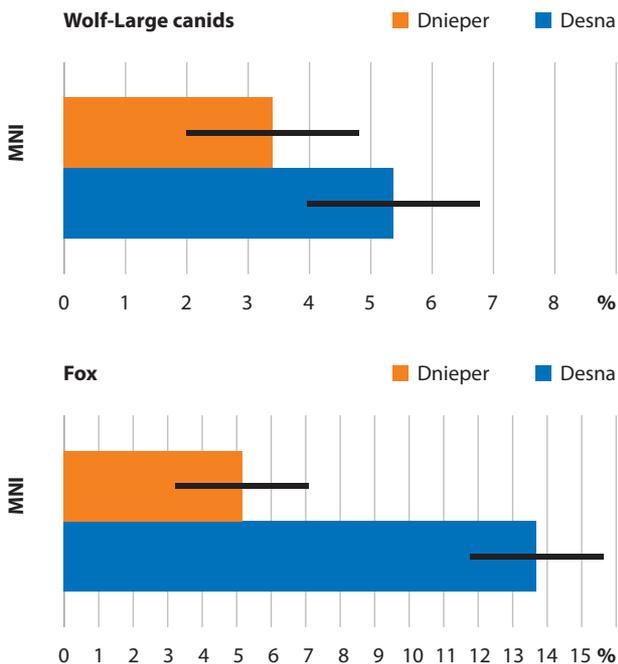


Fig. 6. Comparison of minimum numbers of individuals in percentage of wolf and fox between Epigravettian sites of the Dnieper and Desna valleys with confidence intervals

Рис. 6. Сравнение процентного соотношения минимального количества особей волка и лисицы / песца на эпиграветтских памятниках бассейна Днепра и Десны с доверительными интервалами

Distribution of canids in the Dnieper valley

Comparing the archaeological sites of the Desna valley and the other sites of the Dnieper valley, we can describe the general trends. The dominant species are mammoth, reindeer, lemmings, hare, and then horse (Fig. 5). Given the fact that in the Desna valley, the site of Eliseevichi 1 furnished many remains of vulpines and wolf-size canids, we excluded it from the test (Fig. 5; Fig. 6).

We tested the confidence intervals between sites of the Desna and Dnieper valleys without taking in account Eliseevichi 1. Concerning the number of wolves, the trends are not similar, but the confidence intervals overlap (Fig. 6). According to the Z-test ($z = 2,06$; $p = >0,04$), the result is slightly greater than 1,96, meaning the difference is relatively significant. Concerning the number of foxes, the trends are not similar and the confidence intervals do not overlap (Fig. 6). According to the Z-test ($z = 5,5$; $p = >0,001$), the result is much greater than 1,96, meaning the difference is very significant. Even without Eliseevichi 1, the proportion of canids is more important in the Desna valley than in the Dnieper valley.

On the basis of the data obtained from the adjusted residual and taking into account Eliseevichi 1, we

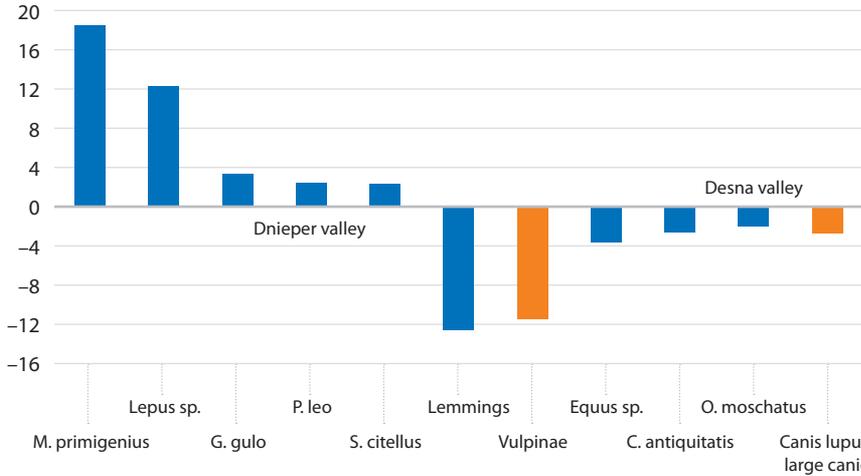


Fig. 7. Adjusted residuals by species present in Epigravettian sites in number of individuals (>3 individuals; p -value < 0,001) between the Desna and Dnieper valleys (25 taxa, 2298 individuals, 13 archaeological assemblages) $Khi^2 = 696$; $P < 0,001$

Рис. 7. Разница в количестве особей различных видов млекопитающих на эпиграветтийских памятниках бассейнов Десны и Днепра

confirm a higher representation of canids in the Desna valley (Fig. 7).

Chrono-cultural distribution of Canids in the Desna valley

Focusing on the Desna valley, we compare the evolution of representation of taxa between Gravettian and Epigravettian sites (Fig. 8). We can see that there is a high proportion of mammoth in Gravet-

tian sites and a high proportion of vulpines in Epigravettian sites.

However, from adjusted residual, in fact mammoth took a greater place in Epigravettian occupations comparing to lemmings and vulpines (Fig. 9).

To compare to the final Paleolithic occupations, there is only one site, Pushkari 9 (Bugorok). The faunal spectrum was represented by woolly mammoth (*Mammuthus primigenius*), bison (*Bison sp.*), muskox (*Ovibos moschatus*), arctic fox (*Vulpes lago-*

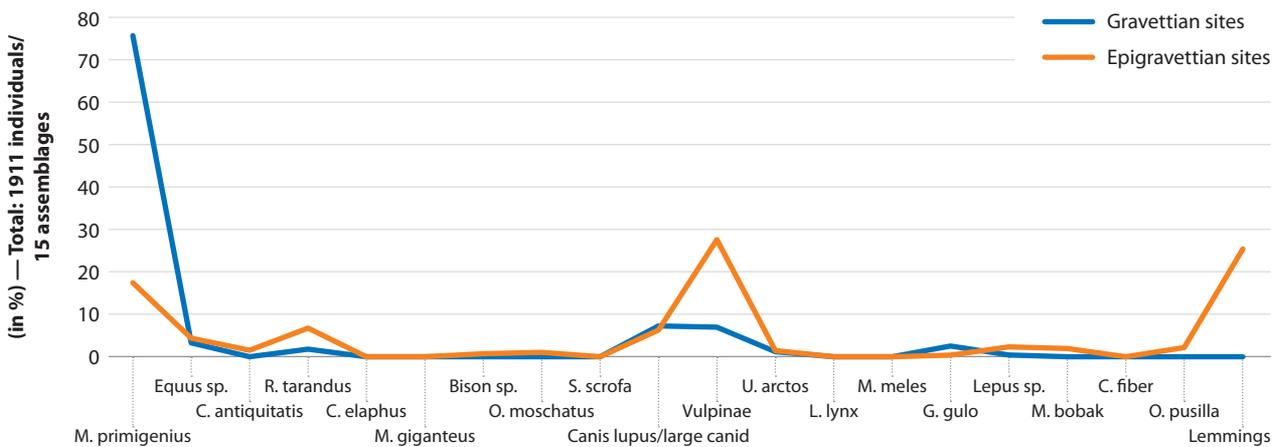


Fig. 8. Minimum number of individuals in percentage of species in Gravettian and Epigravettian sites of the Desna valley
Рис. 8. Процентное соотношение минимального числа особей различных видов млекопитающих на граветтийских и эпиграветтийских памятниках бассейна Десны

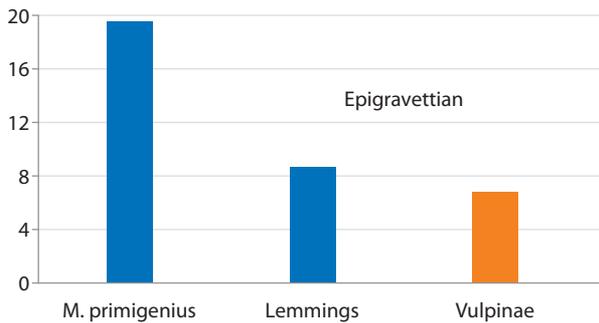


Fig. 9. Adjusted residuals by species present in Desna valley in number of individuals (>3 individuals; p -value < 1) between Gravettian and Epigravettian (20 taxa, 1911 individuals, 15 archaeological assemblages) $\text{Khi}^2 = 421$; $P < 0,001$

Рис. 9. Разница в количестве особей трех видов млекопитающих на граветтийских и эпиграветтийских памятниках бассейна Десны

pus), and hare (*Lepus* sp.) [Khlopachev 2014: 88]. Thus it appears that canids had a particular status in Epigravettian occupations of the Desna valley.

Canids in Epigravettian sites of the Desna valley

The main Epigravettian sites of the Desna valley are dominated by mammoth and canids (Fig. 10; Fig. 11). Focusing on canids, they represent about a third of the faunal spectrum, up to three-quarters at Eliseevichi 1 (Fig. 12). Long bones of foxes were incised, sawn, abraded, and appointed in Suponevo [Shovkopljas 1952], Timonovka [Velichko et al. 1977], and Mezin [Shovkopljas 1965].

Through the zooarchaeological analyses of the faunal remains from Eliseevichi 1 (Table 4) we can precise the information about exploitation of canids. There are two canid skulls (MAE 447/5298; ZIN 23781/24) that were previously identified as dogs [Polikarpovich 1968; Velichko et al. 1997]. New studies [Sablin, Khlopachev 2001; Sablin, Khlopachev 2002; Germonpré et al. 2015a] confirmed this identification. They are accounted as two individuals different from the rest of the canids. Furthermore, they could be paired with post-cranial elements determined as *C. lupus*.

According to our taphonomical analyses, the bones from Eliseevichi 1 (1935–1936) are very well

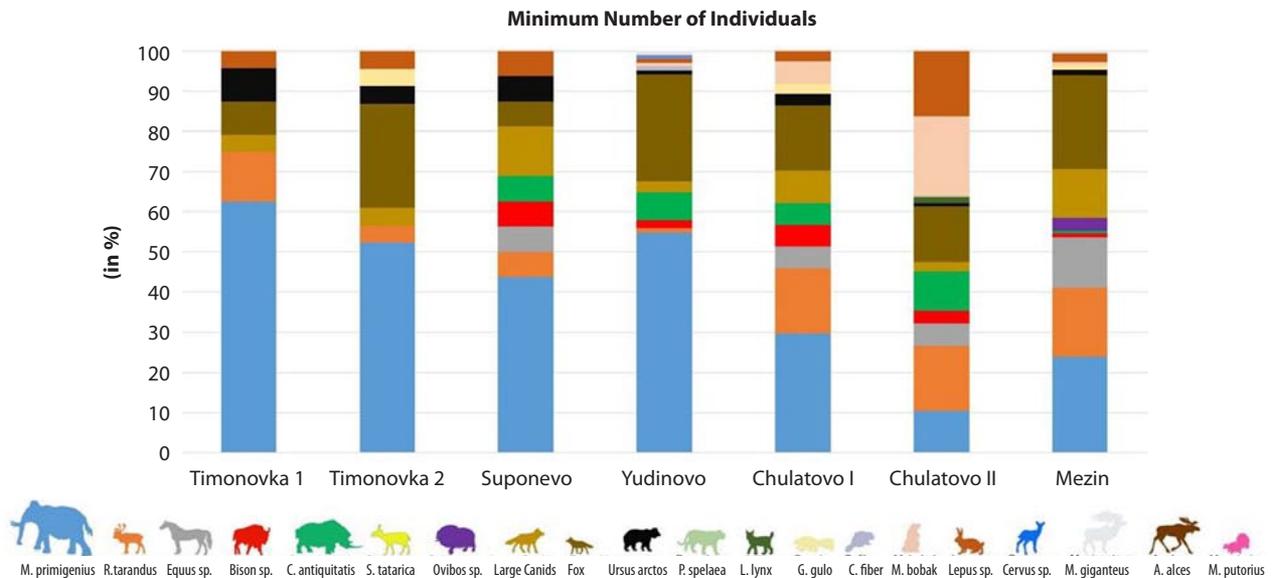


Fig. 10. Minimum number of individuals of different species in the Epigravettian sites of the Desna valley (in percentage)

Рис. 10. Процентное соотношение минимального числа особей различных видов млекопитающих на эпиграветтийских памятниках бассейна Десны

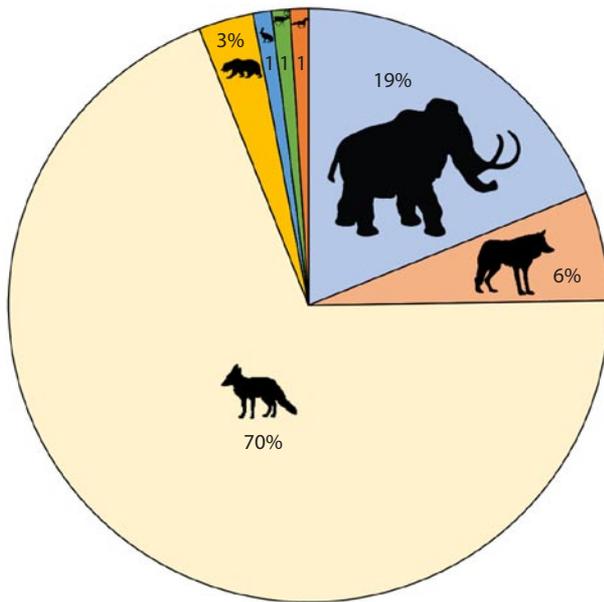


Fig. 11. Representation of the fauna species from the Eliseevichi 1 settlement according to the minimum number of individuals in percentage

Рис. 11. Процентное соотношение видов млекопитающих на стоянке Елисеевичи 1 (по числу особей)

preserved. They were buried quickly and deeply under a dry and cold climate conditions. Some bones of foxes were still in anatomical connexion, meaning

they were fresh carcasses. Mammoth bones show a different stage of preservation with much more deterioration caused by percolating and runoff waters. Based on taphonomical observations, skeletal representation and features on the site, related with mammoth remains, we think that pits could have been used for natural maceration to collect tusks.

Focusing on wolves, we identified at least 10 individuals. According to the growth development of bones, there are seven *s.l.* adults and three juveniles (Table 5). This finding would correspond to a pack or several packs.

Anthropic modifications were observed in 21 remains (Table 5; Fig. 13A). They correspond to butchering activities, such as skinning, disarticulation, and defleshing. Two long bone diaphysis bear percussion marks. Long bones, metapodials, and phalanges were incised, grooved, and sawn.

Foxes are represented by at least 131 individuals. All skeletal parts are represented. Anthropic modifications were observed on 244 remains (Table 6; Fig. 13B). These bones, same as wolves' bones, bear butchering marks and were fractured, incised, and grooved.

From the skeletal preservation and the anthropic marks it can be concluded that canids were skinned, disarticulated, and defleshed on the site. The recovery

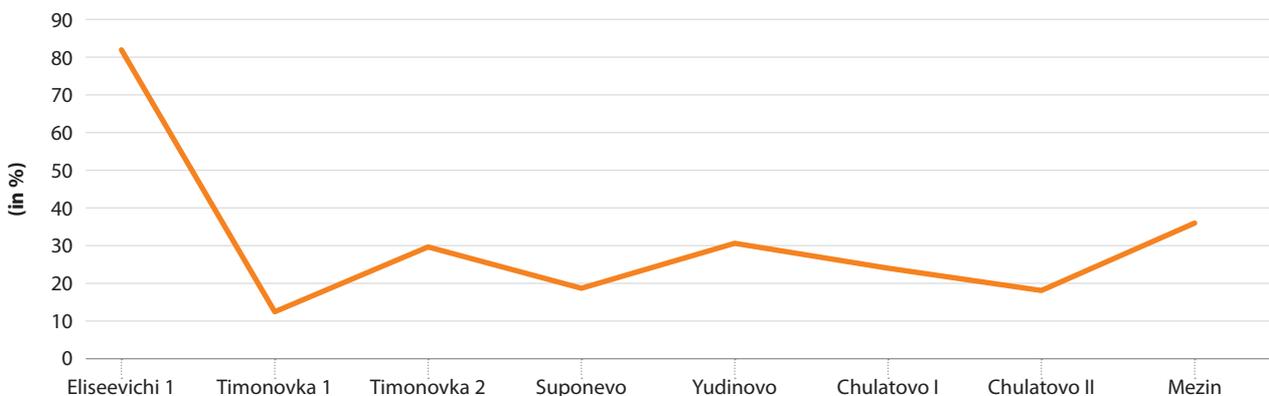


Fig. 12. Minimum number of individuals in percentage of canids (wolf-size canid and fox) among the faunal spectrum of the Epigravettian sites of the Desna valley

Рис. 12. Соотношение минимального числа особей псовых к другим видам млекопитающих на эпиграветтских памятниках бассейна Десны (в процентах)

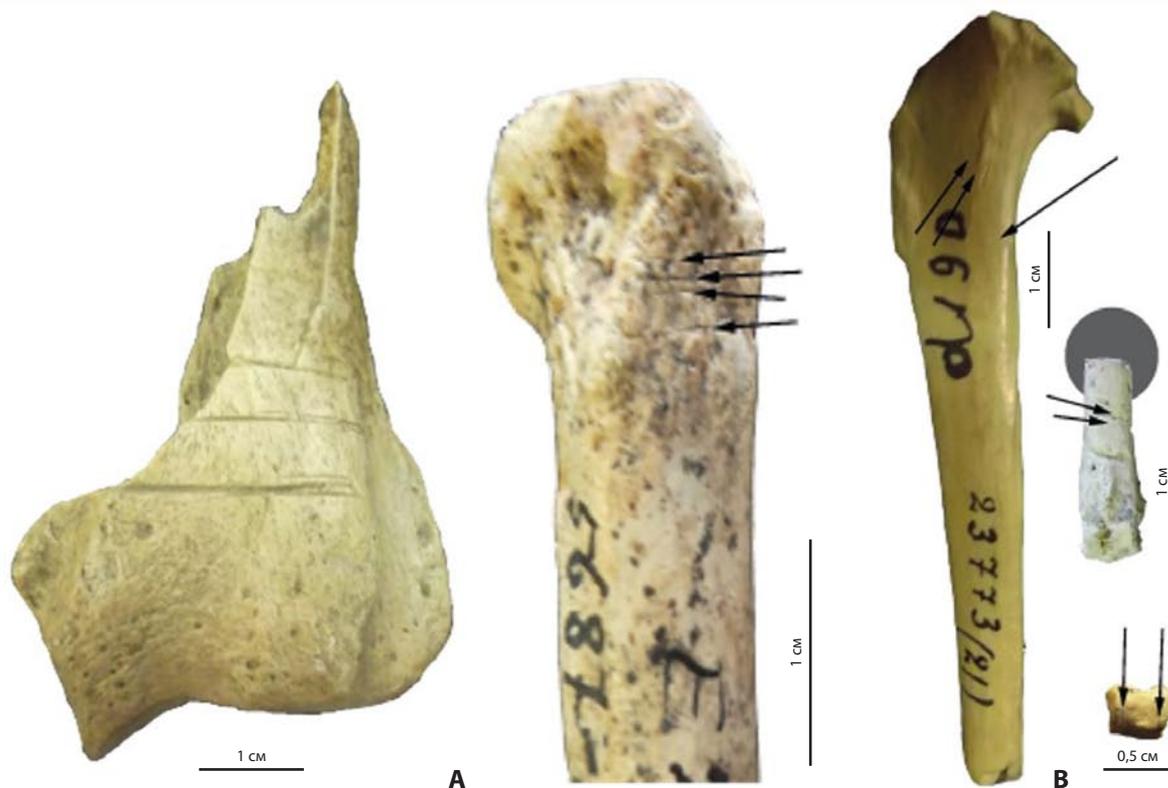


Fig. 13. Anthropomorphic modifications on wolf (A) and fox (B) bones from the Eliseevichi 1 site (excavations 1935–1936)
Рис. 13. Кости волка (A) и лисицы / песца (B) со следами воздействия человека со стоянки Елисеевичи 1 (раскопки 1935–1936 гг.)

of fur is quite important. Estimate measurements of fur by the number of individuals is as follows: wolf — $1,9 \times 0,8 \text{ m} = 1,52 \text{ m}^2 \times 10 \text{ individuals} = 15 \text{ m}^2$; fox — $0,7 \times 0,4 \text{ m} = 0,28 \text{ m}^2 \times 131 \text{ individuals} = 37 \text{ m}^2$.

Long bones and metapodials were relatively often sawed, grooved, and diaphysis parts were removed. They could have been used as a dimensional support to make different objects as ornaments or needle cases, described in current Inuit populations and from the palaeolithic site of Gagarino [Zamiatnine 1935]. In Eliseevichi 1 no reassembly of these fragments is possible. They were probably carried out elsewhere.

One of the dog skulls is characterized by anthropic modifications. It bears two cutmarks and the parietal bones were perforated (Fig. 14). This phenomenon was also observed on a dog's skull from the Gravettian site of Předmostí (Czech Republic) [Germonpré

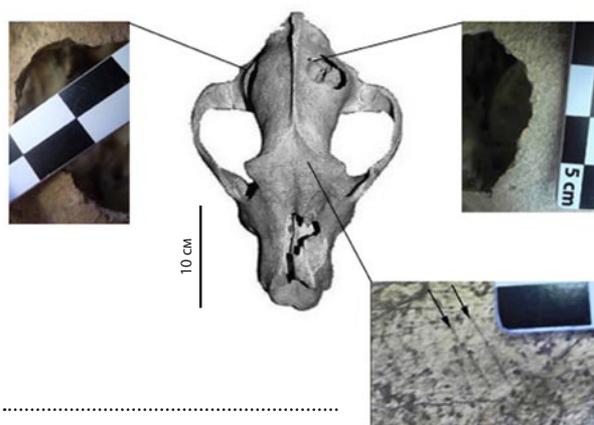


Fig. 14. Anthropomorphic modifications (perforations and cutmarks) on dog skull from the Eliseevichi 1 site (excavations 1935–1936)

Рис. 14. Следы воздействия человека (отверстия и порезы) на черепе собаки со стоянки Елисеевичи 1 (раскопки 1935–1936 гг.)

Table 6. *Anthropic modifications on the wolf bones from the Eliseevichi 1 site (excavations 1935–1936)***Таблица 6.** Кости волка со следами воздействия человека со стоянки Елисеевичи 1 (раскопки 1935–1936 гг.)

Bones	Skinning	Disarticulation	Defleshing	Fracturation	Shaping			
					Abrasion	Deep longitudinal incisions	Deep transversal incisions	Sawing
temporo-mandibular joint		x						
rib							x	x
radius								x
radius								x
radius								x
radius			x				x	x
radius							x	
radius					x		x	
ulna						x		
ulna							x	
ulna								x
metacarpal II	x							
metacarpal II								x
metacarpal IV	x							
proximal phalanx							x	
proximal phalanx							x	
sesamoid		x						
metapodial	x							x
metapodial	x					x		
long bone diaphysis				x			x	x
long bone diaphysis				x				x

Table 7. *Anthropic modifications on fox bones from the Eliseevichi 1 site (excavations 1935–1936)***Таблица 7.** Кости лисицы / песца со следами воздействия человека со стоянки Елисеевичи 1 (раскопки 1935–1936 гг.)

Bones	Number of remains	Skinning	Disarticulation	Defleshing	Fracturation		Shaping				
					Percussion	Flexion (?)	Striations/grooving	Deep longitudinal incisions	Deep transversal incisions	Sawing	
humerus	3										x
humerus	3				x						
humerus	1					x					
humerus	1			x							

Table 7. Continuation

Bones	Number of remains	Skinning	Disarticulation	Defleshing	Fracturation		Shaping			
					Percussion	Flexion (?)	Striations/ grooving	Deep longitudinal incisions	Deep transversal incisions	Sawing
ulna	1									x
ulna	5						x			x
ulna	15						x			x
ulna	20									x
ulna	1								x	x
ulna	1								x	
ulna	1							x	x	
radius	1		x							
radius	41						x			x
radius	1								x	
radius	19									x
radius	8							x		
radius	1							x	x	
metacarpal III	2									x
tibia	37						x			x
tibia	32									x
tibia	1		x	x						x
tibia	1							x		x
fibula	1								x	
metatarsal II	2								x	x
metatarsal III	5								x	x
metatarsal III	5								x	
metatarsal IV	11						x			x
cuneiform III	1	x								
long bone diaphysis	6						x			x
long bone diaphysis	3								x	
long bone diaphysis	12									x
metapodial	1									x
metapodial	1	x								

et al. 2012]. It could be explained by removal of skin and brain or as non-food human behavior.

In the wider context of fauna exploitation by humans in Eliseevichi 1, we have on the one side the exploitation of mammoth (probably in summer) for food and ivory to make tools (needles, points) and artistic pieces (decorated plates, female statuettes)

and, on the other side, the exploitation of canids (probably in winter) (Fig. 15).

We reinterpreted the site of Eliseevichi 1 as a workshop for flint, fur, bones, and ivory used in different seasons. Notably, exploitation of canids is also a one of the main activities realized by human groups on the site.



Fig. 15. Anthropogenic modifications of the animal bones from the Eliseevichi 1 site (excavations 1935–1936)

Рис. 15. Кости млекопитающих со следами воздействия человека со стоянки Елисеевичи 1 (раскопки 1935–1936 гг.)

DISCUSSION

From the archaeological data and ethnographic references we propose a reconstitution of the modalities of canid acquisition and exploitation to better define their place in the Epigravettian populations.

Acquisition

Canids can be hunted using trapping techniques. According to the ethnographic references, wood, vegetal fibres, leather, tendons, and intestines could be used for trapping in combination with bait and animal tracks [Baker 1993]. The traps can be snare, snare trigger, deadfall, snape trap, or hanged snare.

Wolves can also be trapped in snare using the tracks taken by the pack. Moreover, when the dominant individuals are trapped, the rest of the pack remains in the area and can also be hunted. Calling is a traditional wolf hunting. Hunters imitate wolf's howl to attract them. They can also use blood, carcass, or alive small animal to attract them [Mary-Rousseliere 1984]. A strategy of encircling of the pack can also be used.

The best season for human groups to exploit canids is winter. Indeed during the autumn they moult, and during the winter their fur have a large isothermal capacity. Thus it is the best period for optimal acquisition of fur by human groups. Moreover, the reproduction period of foxes and wolves is January-February. They deposit many faeces and

urine which are identifiable for tracking. Concerning foxes, during the winter, females settle in burrows while males travel several kilometers to find a female. At this time they are not very aware of their environment. They are vulnerable and easier to trap. Moreover, as they mark the territory, other males will inevitably return to the same place, suitable for trapping [Schemnitz 2005].

In addition to the process of domestication we discussed above, it is possible to tame some species. The most common case for taming is *via* imprinting, where a human substitutes the parents by taking care of the cub, or by frequently placing the cub in contact with humans during its first weeks.

Use

The furskin requires the technical mastery of a relatively long operational chain [Chahine 2002]. Different skinning techniques are known from trappers, ethnographic references [Beyries 2002], and experimentation, both on large mammals [Binford 1981] and small mammals such as leporids [Brugal 2006] and carnivores [Cochard 2004; Mallye 2011]. The first step is skinning and evisceration. The skin is removed from the animal by cutting and stripping. To do so, the animal can be suspended, especially for small mammals, or put on the back on the ground or on a support. The animal may be first skinned and then eviscerated or reverse. In the first case the skin is removed as a sock. In the second case, an incision is made on the abdomen.

With regard to the skinning of the skull, the skin is rolled up back and forward by making perpendicular incisions to the axis of the skull while turning around. Then the neck is stripped, and the passage of the ears is cut by incisions of the annular cartilage. It remains to strip the muzzle by perpendicular incisions to the axis of the body, turning around the head and muzzle until the complete release of the skin. With regard to skinning the legs, the first method is to remove the skin along the legs, like a sock; the second method is to disarticulate the metapodial block of the first phalanges. They can be separated from the rest or kept in the skin. Finally,

the last method is to cut the skin at the wrists and ankles, that again are either removed or kept in the skin. For the tail, there are also several methods. It can be stripped by making a longitudinal incision, it can be removed like socks by thin incisions around the caudal vertebrae, or it can also be left with the rest of the carcass and cut at the end.

Once the skin is removed from the carcass, it would undergo several treatments [Lompre, Negroini 2006]. The skin is composed of three layers. The epidermis is the outer layer of the skin which mainly consists of keratin. The dermis is a thick connective tissue mainly made of collagen fibers and water. The hypodermis is the inner layer with a looser connective tissue that contains fat cells. The transformation into leather corresponds to the reduction of the skin to its dermis. The epidermis is separated from the dermis by a transparent membrane (hyaline membrane); it must be intact to give the leather a smooth and shiny appearance. The fleshing should be done on fresh skin or a little drier, but fairly quickly after slaughter, in the aim to prevent the tissues from drying and amalgamation between them, to remove the remains of flesh of the hypodermis. This treatment is done using raw blades or scrapers. The drying allows to stop the putrefaction. The skin is stretched in the open air on a frame or nailed to the ground, in order to pull the fibers and prevent the skin from shriveling. To facilitate drying by absorbing excess fat, it is possible to use ocher or ash that also protects the skin from insects and bacteria. Hair removal can be carried out biochemically or mechanically. The first method requires the use of plants that fermenting will separate the dermis from the epidermis associated with the hair, or with the aid of alkaline products such as ash and lime that destroy the keratin. The second method consists of scraping the skin to remove non-detached hair. Then the epidermis is removed. This phase is optional depending on whether one wants to keep leather or fur. Hypodermis scraping permits to reduce the skin to the dermis by eliminating the layers of residual fats and the possible residues of ocher and ash, carried out on semi-dry to dry skins. Then the tanning permits to remedy the drying out of the skin.

In order to maintain the mobility of the fibers, it is necessary to transform the skin into leather, by an irreversible chemical combination between the collagen contained in the skin and a penetrating and fixing tanning substance. These substances vary depending on the natural environment. The different methods can also be combined. It can be fat-tanned or brain-tanned, applied to wet skin, by hand or with tools. It is also possible to use leaves, bark, and macerated seeds of plants (birch, alder); maceration, during several days or weeks. Hammering can help penetration. Finally, it can be tanning with smoke by placing skin over a fireplace. On the one hand, when the dermis has been greased before, the heat increases the oxidation of the fat. On the other hand, the combustion of resinous elements allows a relatively fast tanning of the skin. The skins are then more rigid than with the other methods. Finally the softening is the longest step in the process. For this the skin must be dry on the inner side. The fibers of the dermis are stretched and thus softened, by friction on a support or / and then using for instance raw blades by combining with a greasing.

These pieces of skin can be sewn. It involves cutting pieces and drilling them to join by seams. Furthermore, the most illustrative clue of this activity is the appearance of the eye needle around 13 000 years BP. The thread to sew can be obtained from tendons, thin leather ribbons and vegetable fibers (linden, nettle stems, wild flax, hemp, broom, willowherb, tapered leaves of grasses, rushes, and other carexes) [Minturn 1996; Adovasio et al. 1997]. Although the techniques employed are unknown for Palaeolithic period, we can postulate that overedge stitches were used.

Based on Inuit knowledge [Kobayashi Issenman 2007], the winter season is devoted to trapping for the acquisition and treatment of furs. Depending on the activity performed (hunting, walking, camp, dances) and the part of the body to be protected, the specific fur abilities of each species are used. The collar hood is often made with wolf or fox fur. Indeed, furs of wolf and fox have the most insulation ability [Folk 1966]. The tail can be used as a shawl.

When furs and clothing are not used, they are stored in cold shelters, outside of the habitat spaces. Indeed, they are characterized by a higher ambient temperature and low humidity, which would lead to a rapid deterioration of leather and furs. With good conservation methods and punctual repairs, fur elements can be kept for up to five years.

It should be noted that good care should be taken when handling wolf carcass and fur. Indeed, tapeworm eggs in feces remain infectious for prolonged periods and can remain attached to the fur, particularly under the tail. Alternating cold and warm temperatures as well as freezing during several days can destroy these parasites.

The meat can be a non-negligible food resource for humans. There is a debate around the meat consumption of carnivores. On the one hand, meat is not pleasant in terms of taste, chewy, hard to digest, and vectors for parasites (tapeworm, trichinellosis) [Kruuk 2002]. Moreover, there are taboos concerning the ingestion of carnivore meat by humans based on philosophical, religious, and sanitary reasons. On the other hand, the consumption of carnivores, especially that of the fox, is known in recent human populations [Toussaint-Samat 1997], particularly in circumpolar areas [Gilberg 1984]. Arguments of consumption of carnivore meat during the Paleolithic were advanced [Charles 1997; Vlačiky 2009; Wojtal et al. 2015]. Concerning wolves it is rare for them to be hunted for food. According to the current human populations, they have resorted to consuming wolf flesh as a part of rituals, for medicinal reasons, and in times of scarcity [Lopez 2016].

Bones and teeth can be used as raw materials to make ornaments and tools. It is often the case with fox remains. As we saw, the shaping of wolf bones is really rare.

Canids in the Epigravettian from the Desna valley

During all the Paleolithic period canid acquisition and exploitation was a recurring activity, but often occasional, non-systematized, as secondary complement linked to other activities (hunting, mineral raw material workshops). They are usually more repre-

sented in base camps, particularly in the Desna valley. The results coming from Eliseevichi 1 have particularly highlighted the existence of specialized workshops outside a base camp context, on the one hand concerning mammoth resources and on the other hand for canid exploitation. It would correspond to particular mobility strategies, defined as Serial Specialists [Binford 1980]. It is a high residential mobility linked local and scattered resources according to each season of year. So there are close links between this way of life and the systematization of canid acquisition and use by human groups in the Desna valley.

CONCLUSIONS

Within the Upper Palaeolithic occupation of the East European plain, big game, such as mammoth, bison, horse, and reindeer, and small game such as hare, marmot, and lemming have an important place in human economic activities. Carnivores, particularly bears and canids, are more or less exploited but on a less frequent basis. We highlighted that in Epigravettian occupations of the Desna valley canids took a prominent place as resources within economic activities and social organization.

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