Статті

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NEW COMPLEX INVESTIGATIONS OF THE NOVHOROD-SIVERSKYI UPPER PALAEOLITHIC SITE

In the article the materials of the Novhorod-Siverskyi site research both in the 1930's, and relatively recently, are analyzed. First of all, attention is paid to the faunal collection. The faunal associations from old excavations are coherent, typical of a cold steppe environment from the glacial period, near a riparian forest. However, it seems to result to a mix between natural taphonomic complexes and animal remains associated with human activity. Judging by the flint collection from the old excavations, the site was inhabited by representatives of the Pushkari type. New research yielded two archaeological layers that are very poor in flint artefacts. Concerning fauna, the faunal spectrum is restricted in both layers, with the woolly mammoth, the woolly rhinoceros, the horse and the reindeer in the lower and upper layers. In the upper layer there are also the bison, the fox and the hare. According to taphonomic observations, the bones had remained for a long time at an open air before being buried, in subsurface in a wet environment but few submitted to precipitations in link with permafrost activities. Particularly in the lower layer (2) some remains appear to be in place, while others seem to have been imported by hydraulic phenomena, either from the top of the promontory or from the Desna River. In the upper layer (1), some bones show possible anthropogenic impacts of breakage, linked to marrow recovery. In both layers we have some cranial and postcranial elements, mainly from adults sensu lato which could correspond to human predation. They could correspond to temporary camps of quite small human groups, potentially occupied at the end of the cold season/ beginning of the warm season.

K e y w o r d s: Last Glacial Maximum, Upper Palaeolithic, Gravettian, Pushkari type, zooarchaeology, palaeoecology, Middle Desna basin, Upper Pleniglacial.

Introduction

The climatically unstable final part of the Pleistocene has caused paleoenvironmental and geographical changes and forced Palaeolithic hunters-gatherers to adapt (Clark et al. 2009, p. 710-714; Lambeck et al. 2014, p. 15296-15303). The Upper Pleniglacial started around 26 000 BP, corresponding to the OIS 2. It is characterized by aeolian sedimentation in colder and more arid conditions until reaching its peak during the Last Glacial Maximum (Величко 1961; Velichko, Zelikson 2005, p. 137-151; Haesaerts et al. 2007, p. 31-52; Clark et al. 2009, p. 710-714). In the East European Plain, it is well known in the loess sequences from the Eastern Carpathians (Haesaerts et al. 2007, p. 31-52).

The active development of the territory of the Middle Desna basin in the Upper Palaeolithic is associated with the ancient population, which left behind the sites of the so-called Pushkari type. This specific variant of the Gravettian technocomplex is represented foremost by the sites of Pushkari I, Pohon and Kliusy, which are dated by 23—20 000 BP (Рудынский 1947a, c. 171-198; 1947b, c. 7-22; Беляева 2002a; 2002b, c. 133-137; Воеводский 1950, c. 40-54; Грибченко, Куренкова 2014, c. 109-113; Васильев 2018, c. 297-315; 2019, c. 129-147; Васильєв, Дудник 2019, c. 100-110; Ступак 2008, c. 71-85; Нужний 2015, c. 69-92; Demay et al. 2016, p. 16-36; 2021, p. 258-289; Demay et al. in press). However, in addition to them, the earliest evidence of the development of the territory by ancient people includes the complex of Obolonnia site with Epiaurignacian features (Ступак та ін. 2014, c. 9-30; Demay et al. 2020, p. 83; 2021, p. 258-289) and probably the complex of the site of Pushkari III, which has specific features

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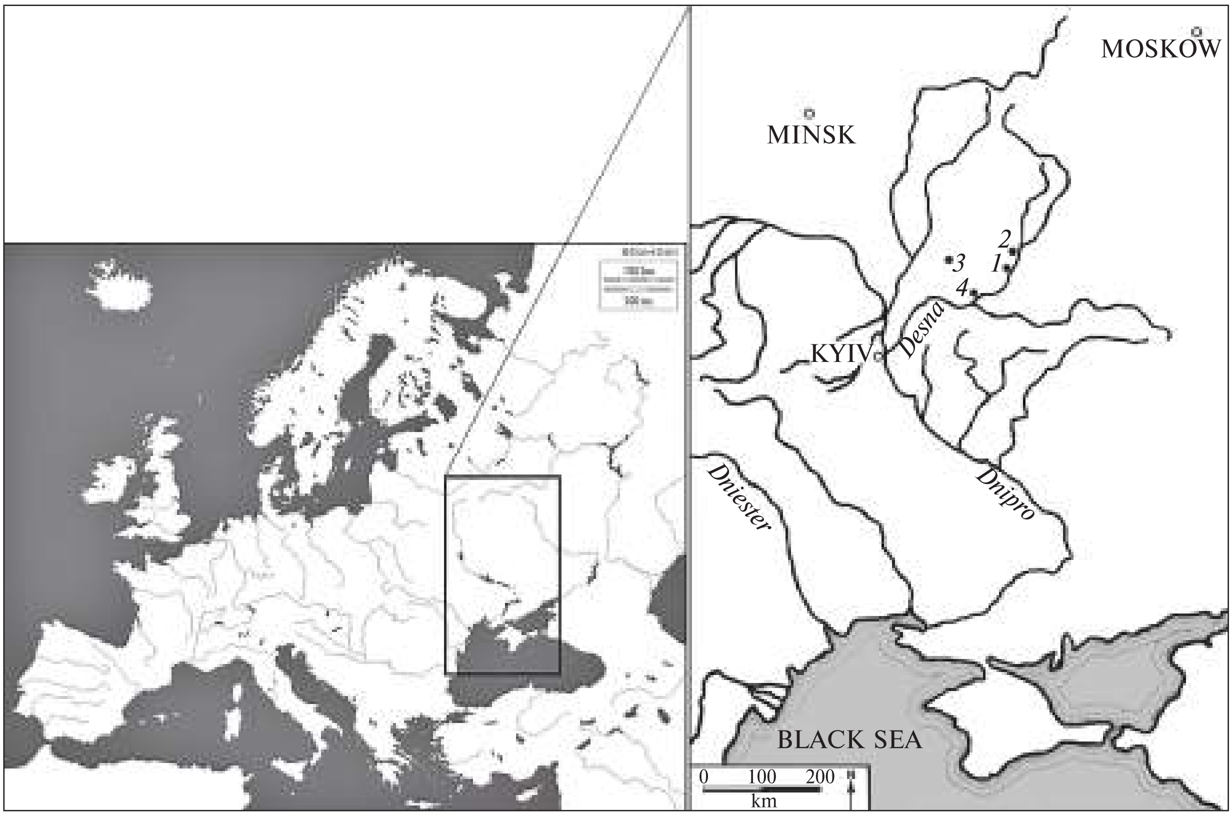

Fig. 1. The earliest Upper Palaeolithic sites in the Middle Desna River basin: *1* — Novhorod-Siverskyi site; *2* — Pushkari I, III, Pohon; *3* — Kliusy; *4* — Obolonnia

of the Gravettian technocomplex, which distinguishes it from sites of the Pushkari type and which have analogies in the materials of the site from the Dniester valley Molodovo 5, layer 7 (Васильєв, Дудник 2019, с. 109).

One of the earliest manifestations of human activity in the region is the Novhorod-Siverskyi site (Fig. 1). Despite the fact that the settlement was actively investigated in the 1930's, its materials require more detailed study. The interest in the site was revived by the materials obtained as a result of new works.

The current research primarily aims to identify this site on the basis of faunal remains studying, both in terms of conservation and in terms of the environment, in order to obtain more data on the archaeological situation and human activities.

Research history and characteristics of the Novhorod-Siverskyi site

The Novhorod-Siverskyi (also Novgorod-Siversk, Novgorod-Severskii, Novgorod-Severskaya, Novgorod-Severskij) archaeological site is located within the limits of the eponymous city in Chernihiv Oblast, in Ukraine, on the right bank of the Desna River, 30 meters above the actual river.

Some bones of Palaeothic fauna and lithic remains were discovered in 1933, following the exploitation of quarries of sandstone and quartzite. Geologist Yu. M. Abramovich collected several flints and bones of mammoth and rhinoceros. In the same year, the expedition headed by M. Ya. Rudynskyi conducted an excavation, the result of which was a discovered site. It was carried out in the south-eastern part of the quarry, at 34 m^2 and 3—4 meters deep. It was stopped because of the small amount of archaeological material and the weather conditions.

Two years later, at the opening of a new sandstone mining area, animal bones and lithic artefacts were again revealed. Excavations were carried out in 1936—1938 by I. H. Pidoplichka. A total of 238 m^2 of area were excavated in the 1930's (Підоплічка 1947, с. 65-106; 1949, с. 65-106; Борисковский 1953, с. 291-299) (Fig. 2: 1).

Palaeolithic materials from excavations of the second half of the 1930's were located in the basal part of a loess-like loam, on the surface of an eroded moraine at a depth of 6—7 m from the modern surface (Воєводський 1947, с. 47; 1949, с. 47). According to I. H. Pidoplichka (Підоплічка 1947, с. 68; 1949, с. 68) and V. I. Gromov (Громов 1948, с. 147, 148), the ancient inhabitants of the site used small grot-

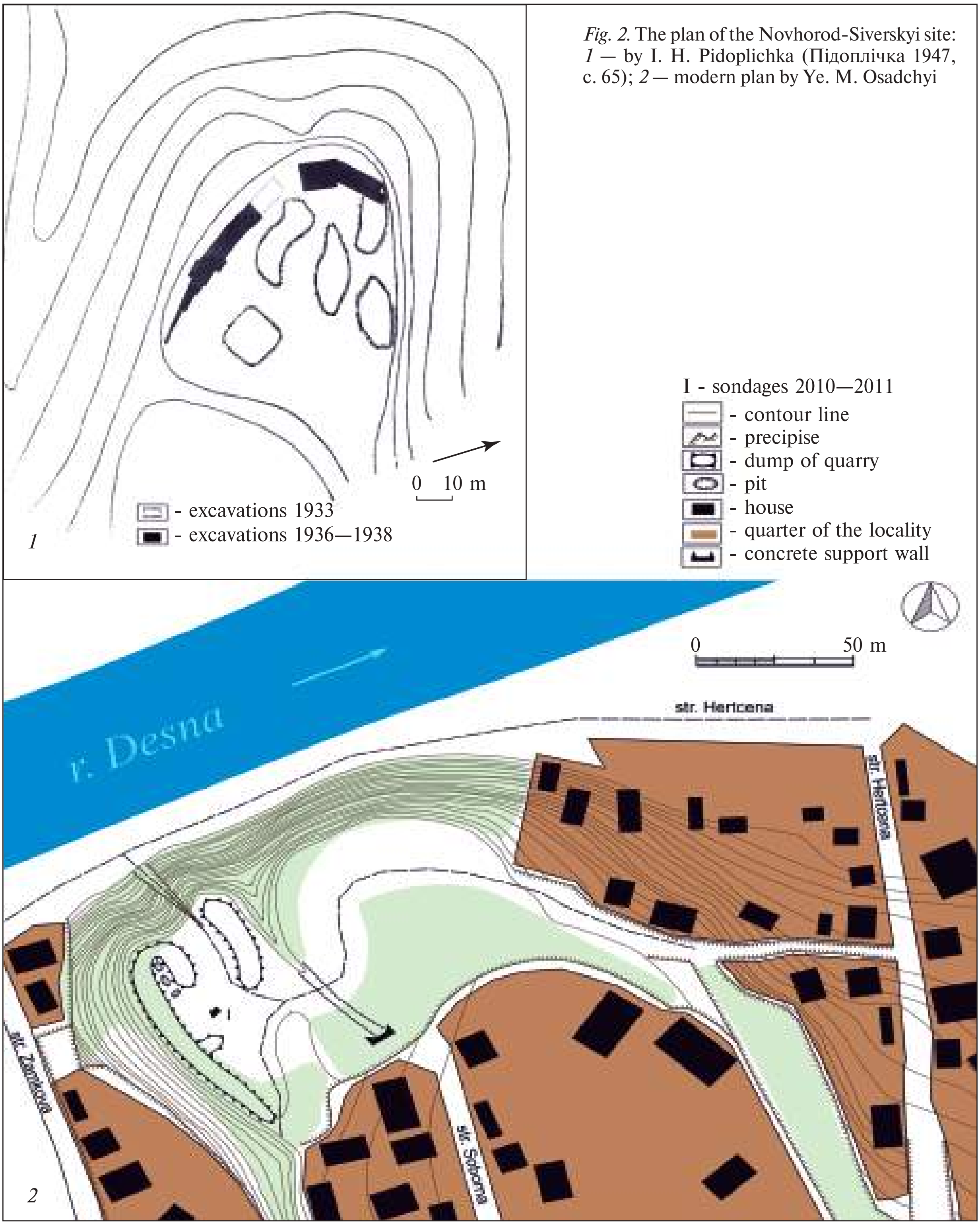

Fig. 2. The plan of the Novhorod-Siverskyi site: *1* — by I. H. Pidoplichka (Підоплічка 1947, c. 65); *2* — modern plan by Ye. M. Osadchyi

toes and sheds for life. Later they collapsed. The site was exposed to the action of alluvial and deluvial waters, as a result of which the cultural remains were displaced and often, together with the bones of animals, not related to the economic activities of ancient man, tightly clogged the cracks between the fragments of the sheds. The finds consisted of bone fragments, flints and rare ocher fragments.

The mammoth tooth sample from the excavations of that time was dated by 1980 ± 350 BP (OxA 698) (Svezhentsev, Popov 1993, p. 499). Another dating was obtained from a mandible of *Dicrostonyx* sp.: 15 340 ± 60 BP (GrA-41725) (Ponomarev et al. 2015, Tadle A3).

The site has attracted attention for a number of features. Firstly, because of finds of human bones fragments. They were studied by M. A. Hremiatskyi (Підоплічка 1947, с. 93-94; 1949, с. 93-94). Secondly, because of an unusually wide variety of faunal complex. It consisted of approximately 50 species, of mammals, micromammals, avifauna and piscifauna of the glacial period. The number of bone remains is 6187, which is a minimum number of individuals estimated — 1910. They will be considered below.

Although the flint complex was small, only 570 artefacts, but it was unusual in finding the three so-called gigantoliths. I. H. Pidoplichka interpreted them as tools for cutting bones, and did not exclude their use for other kinds of works (Пидопличка 1941, с. 26-36; 1947, с. 85-91; 1949, с. 85-91). Two of three artefacts are a part of the collection that has survived (collection No. a-207 of the National Museum of History of Ukraine). One of them is a pre-core, the other one is a unipolar core left at an early stage of exploitation, the surfaces of which were prepared by double-sided proces sing. It should be noted that they stand out for their size. Dimensions of the first: 45.4 × 19.3 × 9.9 cm; second: 33.9 × 13.9 × 9.2 cm (Пидопличка 1941, с. 27; 1947, с. 86; 1949, с. 86).

Today, the flint collection from the studies of the Novhorod-Siverskyi site during the XX century consists of 546 artefacts (Table 1). These are 539 artefacts of 1930's research and 7 items of 1954. The latter were probably collected as surface finds. This collection includes collection No. a-207 of the National Museum of History of Ukraine (9 flint artefacts) and materials (537 flint artefacts) that were found not so long ago by D. Yu. Nuzhnyi (Нужний 2015, с. 91).

At the site, mainly local flint was used. The so-called Desnianskyi flint type is known from the Cretaceous deposits near the site (Пидопличка 1941, с. 27; 1947, с. 70; 1949, с. 70). It is a high-quality flint, mainly in nodules, dark gray often with light gray small dots and specks.

Table 1. Lithic artefacts of the Novhorod-Siverskyi site, from old collection

Artefacts	Number	%	%, esse
Pre-cores	3	0,55	0,85
Cores	13	2,38	3,66
Flakes	186	34,07	52,39
Blades	90	16,48	25,35
Bladelets	17	3,11	4,79
Microblades	4	0,73	1,13
Tools	42	7,69	11,83
Chips	69	12,64	—
Unidentifiable debitage	40	7,33	—
Chunks	81	14,84	—
Flint nodules	1	0,18	—
Total	546	100,00	100,00

Among pre-cores, only one is distinguished by the thoroughness of preparation for exploitation — gigantolith. Cores are dominated by unidirectional ones for blades and bladelets — 7 (Fig. 3: 2, 3). The bi-directional cores which are present in the collection can be the result of more intensive use of unidirectional ones that served for more efficient usage of the volume of raw materials. They are represented by one bidirectional and two bidirectional adjacent. Four specimens are fragmented cores. Flakes dominate among the debitage, as in the entire collection. If we exclude from the calculations, chips, chunks, and unidentifiable debitage and flint nodule, then the part of flakes in the collection will be more than 50 %. Blades significantly outnumber bladelets and microblades (Table 1).

Tools is a significant part of the collection. Essential calculations show this especially clearly (Table 1). About three-quarters of the toolkit are: blades with retouch — 13, bladelets with retouch — 1, flakes with retouch — 13, chunks with retouch — 2 and unidentifiable fragments — 2. The collection consists of five tools that belong to the equipment of projectile weapons (Fig. 4: 1—4, 6). One point, which consists of two parts, was fragmented during the manufacturing process (Fig. 4: 4). This can be assumed for two other artefacts (Fig. 4: 3, 6). One point has obvious traces from impact with a hard obstacle (Fig. 4: 2). The burins are represented by a dihedral on blade (Fig. 4: 7) and an angle burin (Fig. 4: 5). For two fragments of burins, the type is unidentifiable. One fragment belongs to double-sided processed tool (Fig. 3: 1). It probably got fragmented during manufacture. One fragment of the tool is unidentifiable.

Unfortunately, the collection lacks the points presented in the article by I. H. Pidoplichka (Підоплічка 1947, рис. 9: 2, 6; 1949, рис. 9: 2, 6) (Fig. 4: 8, 9). The bigger one is especially interesting. According to P. I. Boryskovskyi, it resembles the best sample from Pushkari I (Борисковський 1953, с. 292). Moreover, in the collection there are no truncated scrapers and burins, which, according to M. V. Voievodskyi, were the main type among the tools (Воєводський 1949, с. 47).

I. H. Pidoplichka (Підоплічка 1947, с. 91-93; 1949, с. 91-93) mentions the existence of several human-modified bones: a perçoir on an isatis ulna (Fig. 5: a), a fragment of male woolly rhinoceros bone with anthropogenic impacts (Fig. 5: b—c) and a piece of mammoth ivory with impacts. To these pieces, should be added a decorated rib of mammoth (59.5 cm long and 0.8 cm thick) (Fig. 5: d). Its ends are rounded and cut, the surface is polished and completely covered with parallel trans-

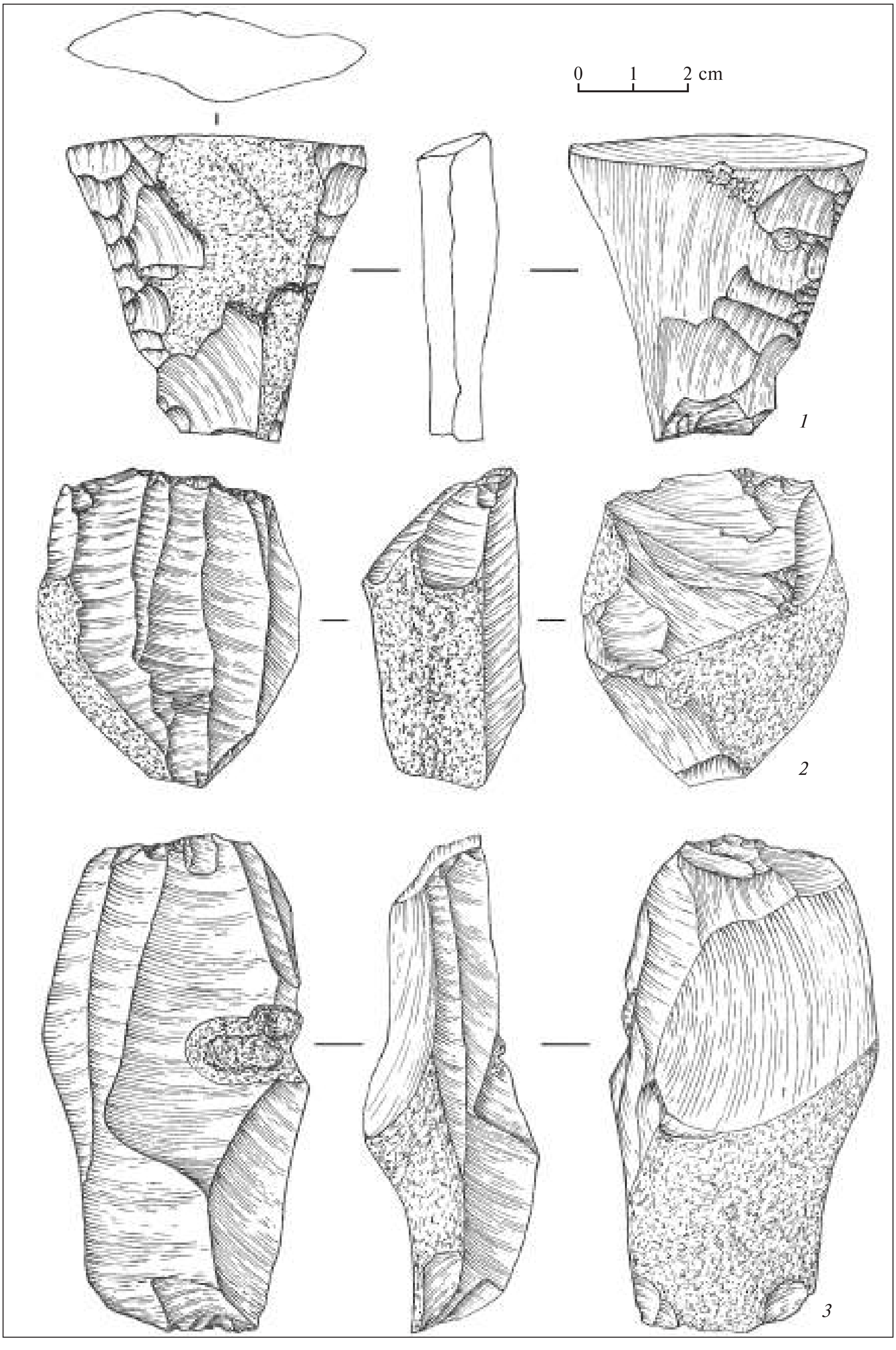

Fig. 3. Novhorod-Siverskyi site. Flint artefacts from old collection: *1* — a fragment of double-side processed tool; *2*, *3* — cores

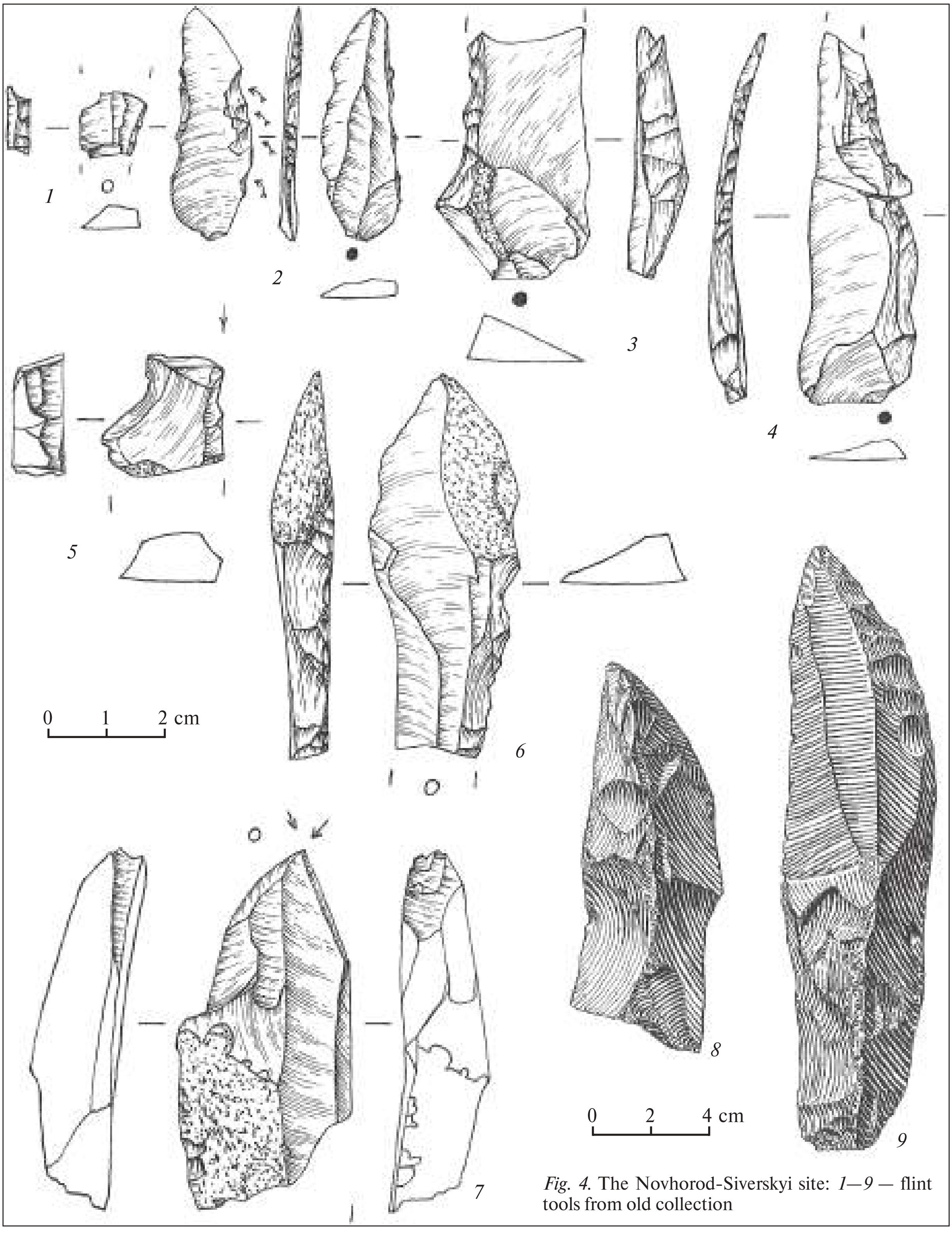

Fig. 4. The Novhorod-Siverskyi site: *1—9* — flint tools from old collection

verse incisions. I. H. Pidoplichka (Підоплічка 1947, с. 91; 1949, с. 91) also mentions a thin decorated bone blade.

I. H. Pidoplichka attributed the Novhorod-Siverskyi site to the Magdalenian time, in accordance with the chronological scheme of that time (Підоплічка 1947, с. 94; 1949, с. 94). V. I. Gromov classified the site in one group together with Pushkari I, Pohon and Mizyn. He expressed the opinion that it is possible in the future that Pushkari I, Pohon and Novhorod-Siverskyi should be attributed to a separate group of the most ancient sites in the Desna River basin (Громова 1948, с. 135-136, 146-153). M. V. Voevodsky saw in the Novhorod-Siver-

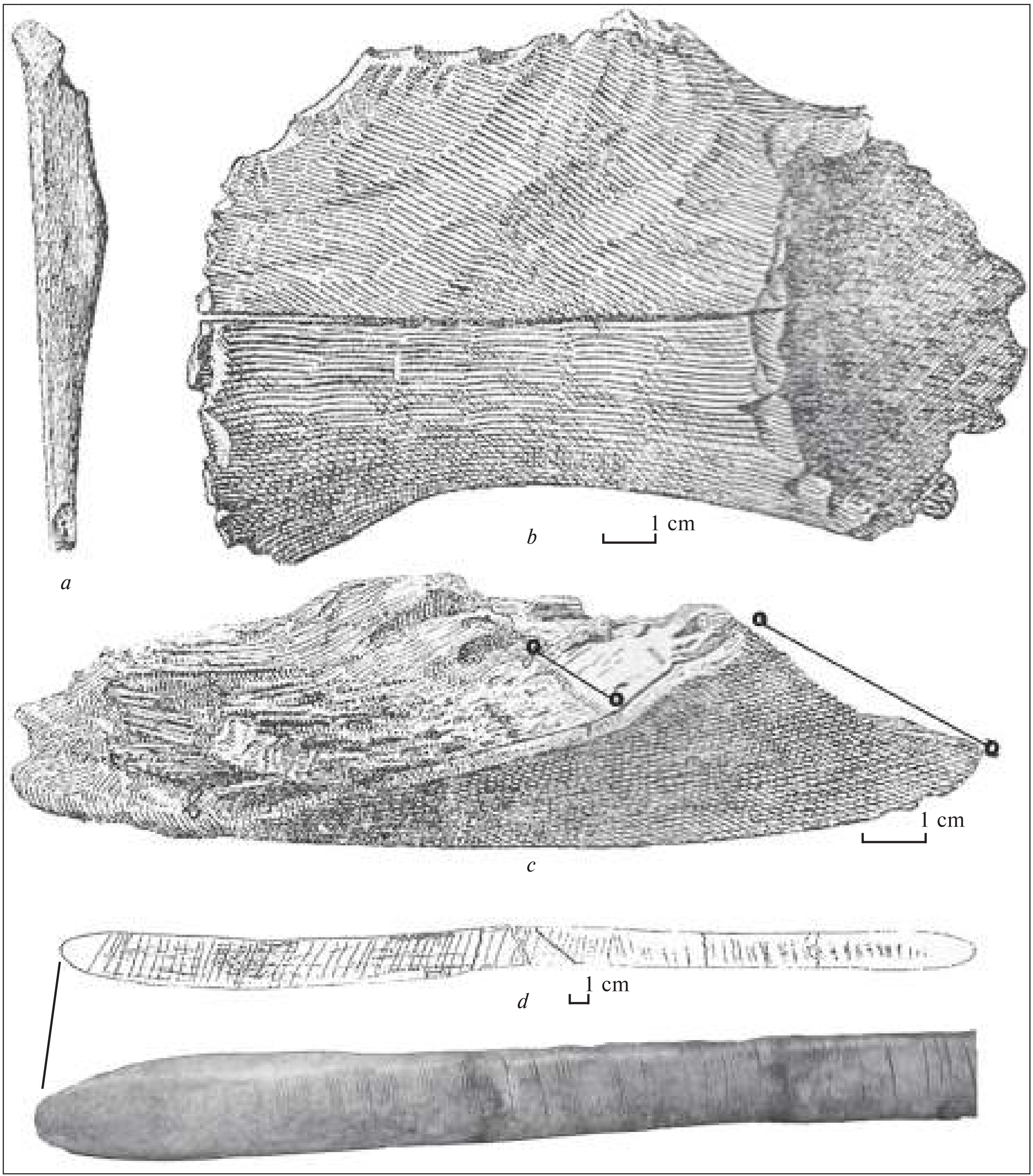

Fig. 5. Bones of the Novhorod-Siverskyi site with anthropogenic modifications (Підоплічка 1947): *a* — perçoir (ulna of fox); *b* — a fragment of femur of the woolly rhinoceros with impacts of fracturation; *c* — a fragment of tusk of the woolly mammoth with impacts of fracturation; *d* — a rib of the mammoth with incisions (Abramova 1995; photo by L. Demay)

skyi site similarities with Pushkari I and Chulativ I and dated its time no later than the early Magdalenian time (Воєводський 1947, c. 48, 55; 1949, c. 48, 55). According to P. I. Boryskovskyi, later M. V. Voevodsky considered Novhorod-Siverskyi site to be simultaneous with Pushkari I. P. I. Boryskovskyi considered that this site, together with Pushkari I, is one of the oldest Upper Palaeolithic sites in the Desna River basin (Борисковський 1953, c. 298-299). D. Yu. Nuzhnyi considered that some of the materials from the Novhorod-Siverskyi site are similar to the materials of the Pushkari type sites, and that the complex of the site also contains an Epigravettian admixture (Нужний 2015, c. 91).

The site was considered as completely excavated. However, in 2010, an undiscovered part was accidentally discovered during test excavation work (1.5 × 1.5 m) by medievalists. Fragments of

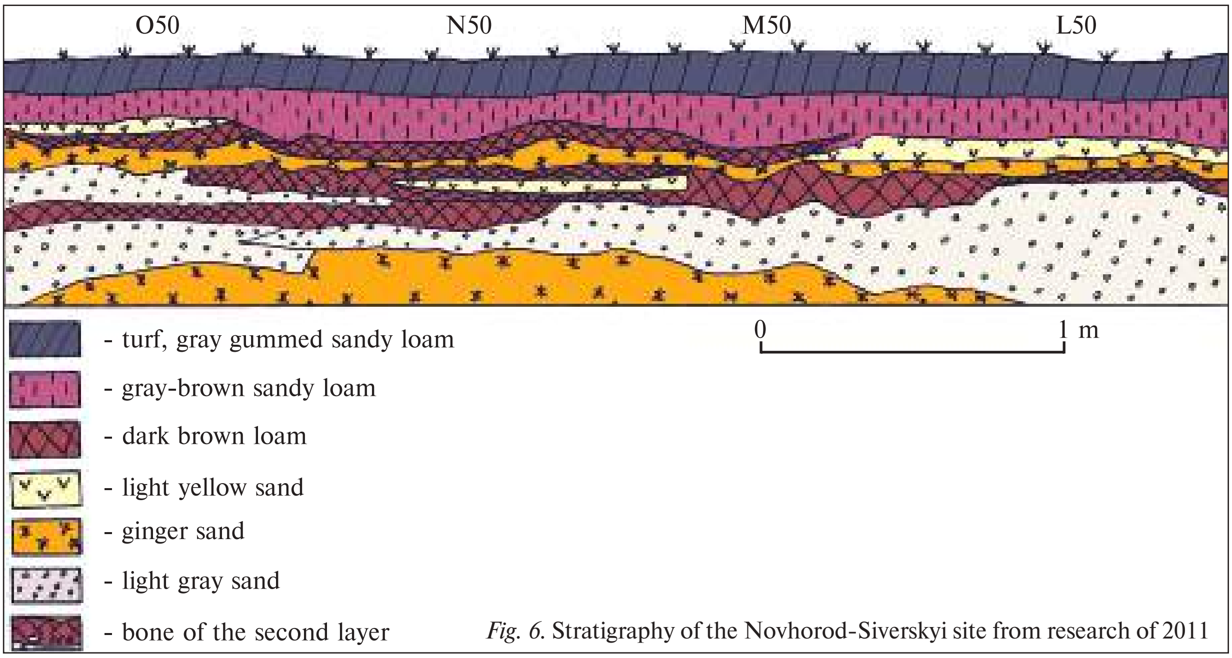

Fig. 6. Stratigraphy of the Novhorod-Siverskyi site from research of 2011

a human skull were of particular interest. In addition, some faunal remains and a unipolar core were found (Кедун, Потєхіна, Ступак 2011, с. 172-173). In 2011, new excavations were carried out by D. V. Stupak on 6 m^2 (Ступак 2012, с. 100-102; Ступак, Потехіна 2012, с. 516-517). The excavation was located near the test excavation of medievalists and near the alleged location of the previously examined area. The quarry for the extraction of sandstone and quartzite had continued to work after the excavations of the 1930's, so it is not possible to correlate the exact location of old and new excavations (Fig. 2: 1, 2).

The stratigraphic profile survey from 2011 was made on the south-eastern wall (Fig. 6) (square No. O50, from the reference point):

–1.20—1.28 m turf, gray gummed sandy loam;
–1.28—1.37 m gray-brown sandy loam;
–1.37—1.42 m dark brown loam;
–1.42—1.44 m lens of light yellow sand;
–1.44—1.57 m layer of ginger sand;
–1.57—1.69 m light gray sand;
–1.69—1.76 m dark brown loam;
–1.76—2.00 m light gray sand.

It should be noted that in all layers there are natural fragments of quartzite. They are of different sizes and occur with various density.

Two cultural layers were identified. Findings of the first lay in the upper layer of loam and some animal bones occurred in the lower part of dark-gray sandy loam above. Judging by the fact that the part of the bones is located vertically, at least part of the material is redeposited. The second cultural layer is located in the lower layer of dark brown loam and is separated from the first by sterile layers. It is less replete with finds and probably has not been as heavily exposed to post-depositional processes as the first one (Ступак 2012, с. 100-102; Ступак, Потехіна 2012, с. 516-517) (Fig. 6).

The first cultural layer consisted of fragments of a human skull, faunal remains, and flint finds. The second cultural layer included only faunal remains and flint artefacts.

The fragment of a human skull was dated by 1439—1620 Cal AD (OxA-26797). This confirms that at least a part of the materials in the first layer are in a non-*in situ* position.

In both layers, all lithic pieces were made on the local Desna flint type, the deposits of which are near the site. Seven flint artefacts occur from the upper, first cultural layer. Four pieces are covered with white-blue patina of different depths. Typologically, the flint finds are distributed as follows: two proximal blade fragments, two flakes and three artefacts are related to unidentifiable *debitage*. Five flint artefacts occur from the lower, second layer: one flake, one chip, two chunks and one item related to unidentifiable *debitage*. The flake and chunks are partially covered with a white-blue patina.

The faunal material of both layers will be analyzed below.

There are also bones of micromammals in the upper layer, identified by Ye. S. Nezdolii as *M. gregalis*, *A. terrestris*, *Ochotona* sp., *D. torquatus* and *Spermophilus* sp., typical for mixed steppe and arctic environment.

Thus, judging by the results of recent studies, the Novhorod-Siverskyi site was populated at least twice. The flint material from recent studies cannot help in the cultural and chronological attribution of the materials of the site. Judging by the complex from the studies of the 1930's, the site was definitely inhabited by representatives of the Pushkari type. The idea of an Epigravettian admixture, in our opinion, is very controversial. For the role of an Epigravettian admixture from the material that has been preserved, it can be claimed, first of all, one point (Fig. 4: 2). This point was formed by abrupt retouching, which in the proximal and distal parts is directed from the ventral surface to the dorsal, and in the medial part from dorsal to the ventral. In our opinion, this point could belong to the Gravettian technocomplex and even Pushkari type. Such a specific design of the points is rare and situational. However, sometimes they are found, as, for example, in the materials of the Kliusy site (Stupak 2008, Fig. 8: 17, 23). To our mind, about the admixture more likely can claim a fragment of a double-sided processed tool (Fig. 3: 1).

Materials and methods

In the aim to better define the palaeoecological situations of the site we applied different methods to analyze the faunal composition of the older excavations of the Novhorod-Siverskyi site. Moreover, we studied the faunal remains coming from more recent excavations of zooarchaeological approach, in order to highlight the conditions that make up the archaeological assemblages and the anthropogenic implication.

On the one hand we used the bibliographical data concerning fauna from explorations of 1933—1937 and 1938—1939. They were synthesized by I. H. Pidoplichka (Підоплічка 1947, c. 65-106; 1949, c. 65-106) on the background of N. Kuznetsov-Ugamskii work (Кузнецов-Угамский 1934, c. 73-74), I. H. Pidoplichka (Пидопличка 1934, c. 80-82; 1938, c. 1-96), N. V. Sharleman (1934, p. 94-96; 1935, p. 651-73) and A. A. Brauner (1934, p. 92-93). These collections, unfortunately, no longer exist.

We consider the ecological niches. The ecological niche is one of the concepts of ecology. It highlights the characteristics of species and its relationship to the ecosystem and the conditions necessary for the viability of the population in order to reconstruct the paleoenvironment. For this, it is necessary to define the physicochemical parameters of this ecosystem, the relationships between different species and their place within it. The animal species, other than the human species, allow us to understand the ecosystems better, the habitats they frequent and the food, energy and nutritive needs that concern them. It is notably through faunal associations that this ecosystem can be apprehended. This restitution is made from malacofauna, birdlife, fish fauna, small mammals and large mammals.

Rodent associations are studied according to specific ecological groups taking into account lagomorphs, and larger animals as the hare, the marmot, the pika and the sousliks, according to the Marquet method (1989; 1993). Large herbivorous mammals are also very informative in terms of woodland wildlife, open arctic or non-arctic environments (Delpech 1983). The climatic and environmental parameters specific to many species have been described by c. Griggo (1996, p. 81-97).

We also use ecological diagrams. They were developed from different actual species by T. H. Fleming (1973, p. 555-563). They were applied to fossil faunas by P. Andrews et al. (1979, p. 177-205) and M. Faure and c. Guérin (1984, p. 215-228). This method makes it possible to evaluate palaeoecological diversity, according to four parameters:

— taxonomic diversity;
— body mass;
— diet;
— locomotion.

These data are expressed in the form of histograms, according to the percentage of species studied. The data for the species concerned by this study are specified in the table (Table 2).

It usually takes about twenty species for maximum interpretation. The main interpretations can be given according to the representations of the different groups. The strong representation of carnivores, rodents and artiodactyls is often attached to an open environment. Large species are usually linked to a wetland. They are also representative of an open environment. Medium-sized species, entomophagous, brachyodont herbivores and omnivores are linked to a more closed environment. Hypsodont herbivores, frugivorous / granivorous and large runner mammals are typical of grassland areas. The simultaneous presence of these different species can be significant of wooded areas near meadows.

The method of cenograms, developed by J.-A. Valverde (1964, p. 121-154), provides information on the environment and temperature of an environment (aridity/moisture and open/closed) (Fig. 7), by relating the mass of species to the trophic level (Legendre 1986, p. 191-212). To do this, it is necessary to have the abscissa in descending order of weight and ordered natural logarithm (= LN (mass)) of their weight, by removing carnivores and chiroptera (Montuire 1994). From there, two regression lines can be calculat-

Table 2. Information for ecological diagrams

Species	Taxonomy	Weight	Alimentation	Locomotion
Mammuthus primigenius	Pb	> 1000	Hh	gMt
Coelodonta antiquitatis	Pe	> 1000	Hb	gMt
Equus sp.	Pe	200—1000	Hh	gMt
Ovibos moschatus	Ar	200—1000	Hb	gMt
Bison priscus	Ar	200—1000	Hh	gMt
Alces alces	Ar	200—1000	Hb	gMt
Cervus elaphus	Ar	100—200	Hb	gMt
Capreolus capreolus	Ar	10—45	Hb	gMt
Rangifer tarandus	Ar	100—200	Hb	gMt
Crocuta crocuta spelaea	C	45—100	C	gMt
Ursus arctos	C	100—200	C	gMt
Canis lupus	C	10—45	C	gMt
Vulpes vulpes	C	1—10	C	pMt
Alopex lagopus	C	1—10	C	pMt
Vulpes corsac	C	1—10	C	pMt
Lynx lynx	C	10—45	C	gMt
Mustela putorius	C	< 1	O	pMt + F
Mustela erminae	C	< 1	C	pMt + F
Mustela nivalis	C	< 1	C	pMt + F
Lepus sp.	R	1—10	Hh	pMt
Marmota bobak	R	1—10	Hh	pMt + F
Spermophilus suslicus	R	< 1	Hh	pMt + F
Spermophilus major	R	< 1	Hh	pMt + F
Ochotona pusilla	R	< 1	Hh	pMt + F
Dicrostonyx torquatus	R	< 1	Hh	pMt + F
Lemmusobensis	R	< 1	Hh	pMt + F
Lagurus luteus	R	< 1	Hh	pMt + F
Lagurus lagurus	R	< 1	Hh	pMt + F
Microtus gregalis	R	< 1	Hh	pMt + F
Arvicola sapidus	R	< 1	Hh	pMt + Aq + F
Microtus oeconomus	R	< 1	Hh	pMt + F
Cricetulus migratorius	R	< 1	Hh	pMt + F
Alactagajaculus	R	< 1	Hh	pMt + F
Myogalemoschata	I	< 1	I	Aq + pmt + F
Sorex araneus	I	< 1	I	pMt
Anser sp.	O	1—10	O	Ar + Aq
Anas platyrhyncha	O	1—10	O	Ar + Aq
Anas querquedula L.	O	1—10	O	Ar + Aq
Anas clypeata L.	O	1—10	O	Ar + Aq
Lagopus lagopus	O	< 1	F	Ar
Falco tinnunculus	O	< 1	C	Ar
Circus sp.	O	< 1	C	Ar
Buteo sp.	O	< 1	C	Ar
Emberiza sp.	O	< 1	O	Ar
Alaudaarvensis	O	< 1	O	Ar
Galerida cristata	O	< 1	O	Ar
Motacilla alba	O	< 1	I	Ar
Parus major	O	< 1	O	Ar
Hirundo rustica	O	< 1	I	Ar
Esox lucius	Ps	1—10	C	Aq
Salmo sp.	Ps	1—10	C	Aq
Rutilus rutilus	Ps	< 1	O	Aq
Silurus glanis	Ps	10—45	C	Aq
Leuciscus sp.	Ps	< 1	C	Aq
Abramis sp.	Ps	1—10	O	Aq
Sander lucioperca	Ps	1—10	C	Aq
Perca fluviatilis	Ps	1—10	C	Aq
Lota lota	Ps	1—10	C	Aq

Taxonomy: R — rodents; I — insectivorous; Pm — primates; Ar — artiodactyl; C — carnivorous; Pe — perissodactyl; Pb — proboscidean; Ps — fish; O — birds.
Alimentation: I — insectivorous; F — frugivorous; Hb — herbivore brachyodont; Hh — herbivore hypsodont; C — carnivorous; O — omnivorous. *Locomotion*: gMt — large-sized terrestrial mammals; pMt — small-sized terrestrial mammals; GetA — climber and arboreal; Aq — aquatic; Ar — aerial; F — burrower

ed, on the one hand, for mammals of more than 500 grams and, on the other hand, for mammals of less than 500 grams.

Moreover, we process to the zooarchaeological study of the faunal remains discovered during the excavations from 2011 lead by D. V. Stupak. They are kept in the Institute of Archaeology at the National Academy of Sciences, Ukraine. We studied bones from the lower (2) and upper (1) layers.

We used methods including paleontology, taphonomy and paleoethnography (Poplin 1976, p. 124-141; Binford 1979, p. 255-273; Behrensmeyer and Kidwell 1985, p. 105-119; Lyman 1994; 2008; Denys and Patou-Mathis 2014; Fernández-Jalvo and Andrews 2016).

Taxonomic references and systematic were made from the code of zoological nomenclature (1999). The vernacular anatomical terms are used after R. Barone (1986).

Measurements were taken from A. von den Driesch (1976). To determine the age, we used stages of bone growth and stages of eruption and tooth wear for woolly mammoth (Laws 1966, p. 1-37; Haynes 1991) and woolly rhinoceros (Guérin 1980).

The cycle of reindeer antler is based on N. A. Murray (1993). We used quantitative units after F. Poplin (1976) and R. L. Lyman (2008).

The fragmented remains can also be studied, according to the size of the fragments and classes, allowing us to identify the possible agents (Patou-Mathis (dir.) 1994).

Paleoenvironmental study

We proceeded to the paleoenvironmental research from previous works (Table 3).

In the case of mammals, excluding small rodents, species such as the horse, the bison, the wolf, the bear, the common fox, the lynx, the polecat, the hermine, the weasel and the hare are ubiquitous. Pika prefers steep places in cold and arid areas. In general, the hare and the pika roam open areas with groves. Mustelids will choose areas where small rodents are abundant. The marmot lives in steep environments, with a cool climate. The sousliks live in dry steppes. The weasel is a fairly ubiquitous species, it chooses its habitat near voles, which are its favorite preys. The woolly mammoth and woolly rhinoceros are typical for steppe landscapes and the reindeer for cold environments.

Small mammals have been re-studied by D. Ponomarev et al. (2015, p. 88-98) from the synthesis of L. I. Rekovets (Рековец 1985). They highlight that the micro-mammal community represented on the site is dominated by xerophilic species (organisms living in water-poor environments), in association with tundra and riparian species. Forest species are absent.

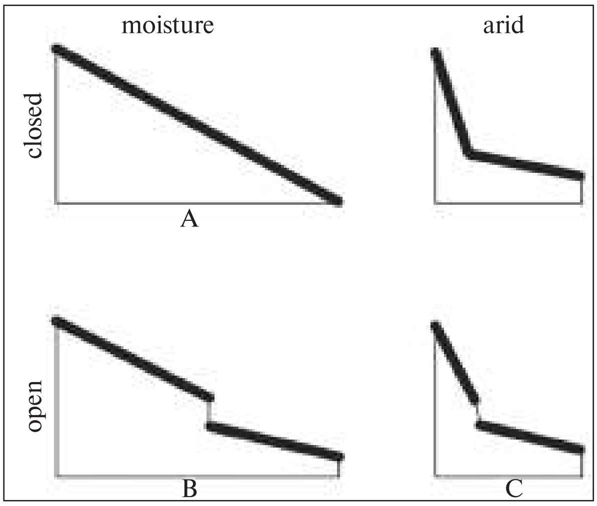

Fig. 7. Interpretation of cenograms: *A* — forest type; *B* — plain type; *C* — steppe type (after Legendre 1986)

Based on the faunal list synthesized by I. H. Pidoplichka (Підоплічка 1947, c. 72-73; 1949, c. 72-73), according to the micromammal associations, most of the species are attached to an open cold steppe environment, with the presence of groves. The migratory hamster is generally subservient to rocky slopes. The water vole and the desman reflect the presence of a relatively slow and relatively nutrient-poor watercourse (Table 4).

The associations of rodents and lagomorphs make it possible to restore an open, steppe, cold and arid environment, but with the presence of a nearby watercourse and sufficient plant resources available. Several species show relatively steep terrain (Table 5; Fig. 8).

Regarding avifauna, the species are also very varied. The genus *Anser* includes different species of geese that live in the holarctic regions. They migrate in autumn to more temperate zones of Southern Europe. They favor wetlands, such as rivers, especially estuaries, marshes and lakes. To nest on the ground, they need isolated areas. The mallard (*Anas platyrhynchos*) lives in wetlands, near calm rivers, ponds, salt water or salt marshes, freshwater lakes, estuaries. It migrates from August to November, from Northern Europe to Southern Europe, the Black Sea and the Mediterranean, to spend the winter and go back in spring. Some groups remain sedentary in order to obtain food, composed of aquatic invertebrates and seeds, it needs a floating vegetation. It can also eat mollusks, insects, fish and fish eggs. The summer teal, not to be confused with the teal (*Anas crecca*), lives near open wetlands, such as shallow steppe lakes, ponds

Table 3. Faunal remains of research seasons of 1933—1937 and 1938—1939 from the Novhorod-Siverskyi site (after Pidoplichka 1947)

Species		Excavations of 1933—1937		Excavations of 1938—1939		Total	
Latin name	**Vernacularname**	**NR**	**MNI**	**NR**	**MNI**	**NR**	**MNI**
Mammuthus primigenius	Woolly mammoth	328	13	45	2	373	15
Coelodonta antiquitatis	Woolly rhinoceros	81	12	14	1	95	13
Equus sp.	Horse	50	7	2	1	52	8
Bison priscus	Bison	9	4	4	1	13	5
Rangifer tarandus	Reindeer	83	20	34	5	117	25
Ursus arctos	Brown bear	2	1	2	1	4	2
Canis lupus	Wolf	5	3	4	1	9	4
Vulpes vulpes	Red fox	—	—	3	1	3	1
Alopex lagopus	Polar fox	127	17	42	6	169	23
Lynx lynx	Boreal lynx	3	2	1	1	4	3
Mustela putorius	Polecat	—	—	2	1	2	1
Mustela erminae	Ermine	—	—	4	2	4	2
Mustela nivalis	Weasel	1	1	13	4	14	5
Lepus sp.	Hare	51	20	35	6	86	26
Marmota bobak	Marmot	92	25	48	6	140	31
Spermophilus suslicus	Spotted souslik	11	6	37	10	48	16
Spermophilus major	Russet ground squirrel	70	15	17	4	87	19
Ochotona pusilla	Steppe pika	121	37	208	61	329	98
Dicrostonyx torquatus	Arctic lemming	268	105	226	111	494	216
Lemmus obensis	Siberian brown lemming	11	7	4	3	15	10
Lagurus luteus	Yellow steppe lemming	12	5	5	5	17	10
Lagurus lagurus	Steppe lemming	567	248	845	372	1412	620
Microtus gregalis	Narrow headed vole	567	257	665	319	1232	576
Arvicola sapidus	Southern water vole	14	11	10	6	24	17
Microtus oeconomus	Tundra vole	5	3	10	8	15	11
Cricetulus migratorius	Migratory hamster	3	3	13	8	16	11
Alactaga jaculus	Great jerboa	332	15	297	13	629	28
Myogalemos chata	Russian desman	26	3	17	3	43	6
Sorex araneus	Eurasian shrew	4	3	4	3	8	6
Total of mammals		**2843**	**843**	**2611**	**965**	**5454**	**1808**
Anser sp.	Goose	1	1	1	1	2	2
Anas platyrhyncha	Mallard duck	—	—	3	1	3	1
*Anas querquedula*L.	Garganey	2	1	2	1	4	2
*Anas clypeata*L.	Shoveller	—	—	1	1	1	1
Anas sp.	Duck	—	—	27	11	27	11
Lagopus lagopus	Willow ptarmigan	10	4	11	1	21	5
Falco tinnunculus	Kestrel	9	2	9	2	18	4
Circus sp.	Harrier	2	1	_	_	2	1
Buteo sp.	Buzzard	—	—	1	1	1	1
Emberiza sp.	Bunting	—	—	2	2	2	2
Alauda arvensis	Skylark	2	1	7	2	9	3
Galerida cristata	Crestedlark	—	—	4	3	4	3
Motacilla alba	White wagtail	—	—	1	1	1	1
Parus major	Great tit	—	—	2	2	2	2
Parus sp.	Tit	—	—	1	1	1	1
Hirundo rustica	Barn swallow	—	—	7	5	7	5
Aves	«Bird»	139	10	174	12	313	22
Total of avifauna		**165**	**20**	**253**	**47**	**418**	**67**
Esox lucius	Northernpike	8	1	2	1	10	2
Salmo sp.	Salmon/Trout	—	—	3	1	3	1
Rutilus rutilus	Roach	—	—	2	1	2	1
Silurus glanis	Wels catfish	—	—	1	1	1	1
Leuciscus sp.	Common dace	—	—	3	1	3	1
Abramis sp.	Bream ormullet	—	—	1	1	1	1
Sander lucioperca	Zander	—	—	1	1	1	1
Perca fluviatilis	Perch	—	—	2	1	2	1
Lota lota	Monkfish	—	—	2	1	2	1
Pisces	«Fish»	162	20	128	5	290	25
Total of piscifauna		**170**	**21**	**145**	**14**	**315**	**35**
Total						**6187**	**1910**

Table 4. Faunal list of micromammals of research seasons of 1933—1937 and 1938—1939 from the Novhorod-Siverskyi site, due to the number of remains (after Pidoplichka 1947) and their environment

Species	Vernacularname	NR	Environment
Dicrostonyx torquatus	Arctic lemming	494	very cold, arctic
Lemmus obensis	Siberianbrown lemming	15	cold steppic environment
Lagurus luteus	Yellow steppe lemming	17	steppicenvironment
Lagurus lagurus	Steppe lemming	1412	cold and dry deserts
Microtus gregalis	Narrow headed vole	1232	steppic environment
Arvicola sapidus	Southern water vole	24	water body and slow currents, varied temperatures, herbaceous vegetation
Microtus oeconomus	Tundra vole	15	on the banks, cold climate
Cricetulus migratorius	Migratory hamster	16	rocky environment, continental climate
Alactaga jaculus	Great jerboa	629	cold steppic environment
Myogalemos chata	Russian desman	43	oligotrophicsemi-aquatic environment, herbaceousriparianvegetation in a cold environment
Sorex araneus	Eurasianshrew	8	vegetated areas, cold and temperate climate
Total		**3905**	

and swamps. It migrates in August and September to spend the winter to the south of the Sahara. It goes back to the North from the end of February to the end of April. Its diet is composed of plants, insects, crustaceans and mollusks. The teal may live near low-flow rivers. The Northern Shoveler (*Anas clypeata*) lives near calm, soft, brackish wetlands such as ponds, marshes, and the backwaters of rivers and streams. In September—October, it moves towards more temperate seacoasts and goes back in February—April. The Willow Ptarmigan (*Lagopus lagopus*) is distributed on the northern hemisphere boreal belt. It is found mainly in lower elevation areas, in tundras and forests with ponds. It avoids rocky and bare environments. The Common Kestrel (*Falco tinnunculus*) lives in heathlands, meadows, marshes, peat bogs and areas with little forest. It can be found as much on the seashores as in the mountains, up to 2.500 meters above sea level. It is sedentary, however, when this bird lives in cold areas, it migrates in August—September to spend the winter in southern Europe and on the African continent and returns in the spring. It feeds on insects, small birds and small rodents. The harriers (*Circus* sp.) are represented by several species. The harrier nowadays is more or less migratory, but when it lives in cold zone it spends the winter in

Table 5. Ecological groups of rodents and lagomorphs of research seasons of 1933—1937 and 1938—1939 from the Novhorod-Siverskyi site, due to the number of remains (after Pidoplichka 1947) and percentage

Ecological groups of rodents and lagomorphs	NR	%
Arctic steppes	494	10,7
Boreal forests	/	/
Sunny rocky slopes of cold areas	485	10,5
Boreal marshy open spaces	/	/
Very arid continental steppes	2142	46,6
Arid continental steppes	1392	30,4
Low arid open spaces	/	/
Grasslands and wetlands	/	/
Water borders	82	1,8
Sunny rockyslopes	/	/
Temperate forests	/	/
Mediterranean areas	/	/
Indeterminate areas	/	/
Areas inhabited by man	/	/
Total	**4595**	**100**

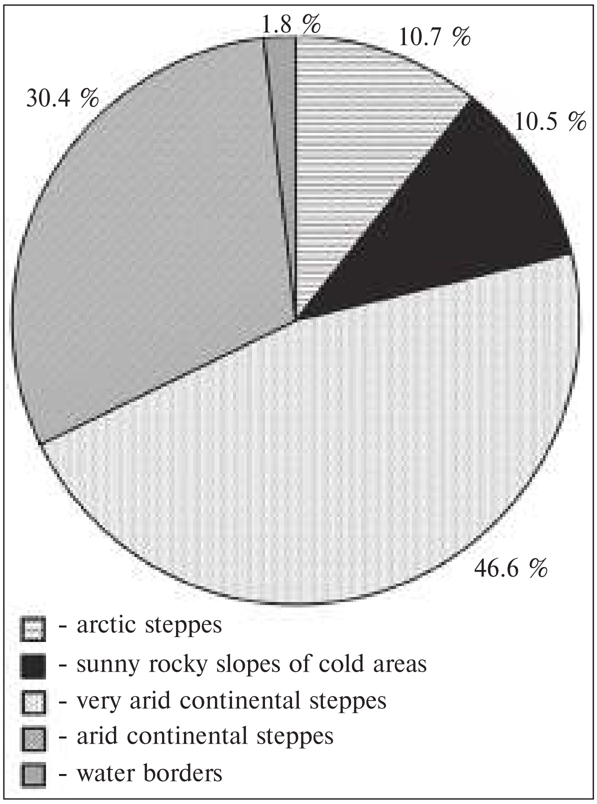

Fig. 8. Representation in percentage of ecological groups of rodents and lagomorphs of research seasons of 1933—1937 and 1938—1939 (after Підоплічка 1947) from the Novhorod-Siverskyi site

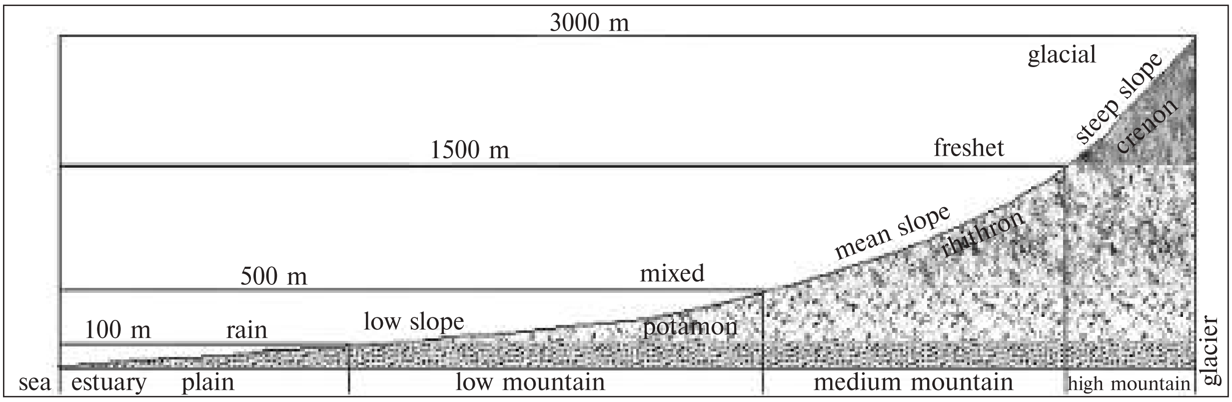

Fig. 9. River fish areas (after L. Demay)

more temperate regions. They are fond of wetlands such as the edges of lakes and ponds, and open habitats and feed on insects, small birds and small rodents. The genus Buteo includes different species commonly known as buzzards. This bird lives near woods and groves, sometimes in meadows and marshes. The laying takes place on the ground, but the nozzle likes to nest in the trees. Some of them migrate over fairly short distances in autumn. They feed on insects, small birds, rodents and carrion and are generally quite opportunistic. The Emperiza genre includes the buntings. Some current populations are migratory and spend winter in Southern Europe. It favors rocky environments like rocky coast or mountain. It can also adapt to the tundra if there are rocks. It feeds on insects and seeds (grasses, heather, shrubs). The skylark (*Alauda arvensis*) lives near streams, in open areas such as marshes, meadows, dunes. It is at medium and high altitude and cannot adapt to a continental climate. This bird lives on the ground most of the time. It migrates fairly short distances in February—March and then returns in September—October—November. She feeds on insects. The Crested Lark (*Galerida cristata*) lives in grasslands, steppes. It is a relatively sedentary bird, but some still move in winter. It can adapt to quite varied temperatures. It feeds on insects and seeds (mostly grasses). The Yellow Wagtail (*Motacilla alba*), also known as Gray Hocktail, lives near waterholes, in an open, low-growing environment and can live in a cold climate. It migrates from August to October to spend the winter in the Mediterranean region, to see Central Africa and goes back in March. Its diet is composed of insects. The genus *Parus* includes the species of tits. They generally live in forests (mainly coniferous), temperate and cold environments, in plain and mountain. They are sedentary animals that feed on larvae, insects and conifer seeds. The great tit (*Parus major*) lives in mixed or deciduous forests. It adapts easily and especially to the cold and feeds on insects, seeds, fruits and caterpillars. Finally, the Barn Swallow (*Hirundo rustica*) lives in grasslands, near streams, marshes and ponds. This species feeds and drinks in flight, which explains its attachment to an open environment. The mud serves to it for building the nest. This bird can live in temperate and cold areas. It migrates in autumn to South Africa and goes back in spring. Its diet consists of insects.

Birdlife is represented by species that can adapt to cold environments, with the presence of groves, trees and streams.

The fish fauna, based on current data, makes it possible to establish a distribution profile of the different species to identify the piscicultural zones of the rivers. Glacial rivers are rivers of high mountains fed by melting glaciers. The flow is the strongest, especially during the hot season, and they are very cold. Snow rivers are rivers of medium and high mountains, where the water is cold and fed by snowmelt, with a steep slope and maximum flow in the spring. Mixed or rainy-nival rivers are mid-slope rivers of low and medium mountains that are fed by rain and snowmelt. Rainfed rivers are rivers of low or moderate slope of plain or low mountain fed by rain. The flow is maximum in winter and spring.

The fish areas are thus distributed (Huet 1949, p. 333-351) (Fig. 9):

— the crenon: part where one finds rheophilous species (which like the current) and riffles (zones without depth where the water flows quickly). Some trouts may be found, including brown trouts;

— the rhitron: part of the middle mountain where we find cyprinids, studs;

— the potamon: a low slope area where the bream, the roach, the carp and the zander are found;

— the estuary: the part where the shad collects during the beginning of the summer before going back up the rivers, such as the salmon, the sea trout.

The fish species identified are *Esox lucius*, *Salmo* sp., *Rutilus rutilus*, *Silurus glanis*, *Leusiscus* sp., *Abramis* sp., *Sander lucioperca*, *Perca fluviatilis*, *Lota lota*. The great pike (*Esox lucius*) inhabits rivers, lakes and ponds. It likes clear waters. Young individuals prefer fast currents where they can find their food. Once they become adults, they become established in slow-flowing rivers, the backwaters. They can withstand low temperatures, however, the lower is the temperature, the lower is their activity. These are animals that stay on the surface, except during strong temperature rises. The *Salmo* genus includes the salmon and the trout. The «salmon» are anadromous species. They live in the sea, but go up the rivers in the fall to lay eggs and the hatching takes place in March—April. As for the trout, they live in clear and bright waters. While some individuals remain sedentary, others go up the rivers to white water from November to February. The roach (*Rutilus rutilus*) is typical for cold areas. It is fond of currents and eddies. It is found in beds of 2 to 3 meters and in herbaria. The Glaucous Catfish (*Silurus glanis*) appreciates the deep, sheltered waters of the strong current, especially the muddy bottomlands. It spends most of the day there. That fish prefers the surface to be cluttered and warm. It is activated mainly at dusk. Adults move and hunt alone while young individuals are in a group. The genus *Leuciscus* includes several species, the minnows and the carp, which, in general, lives in fresh and clear waters. These fish move in a more or less gregarious way between two waters in a running river. The genus *Abramis* includes the bream and the mullet. The bremen lives in calm waters, in wide and slow streams, lakes and ponds. It is confined to the muddy and silty bottoms. The mullet is a fish that grows in freshwater in the mouths, but goes to live in the sea. The Pikeperch (*Sander lucioperca*) swims in fresh water at depth (2 to 6 meters), but can adapt to brackish water. It enjoys big slow streams, as well as lakes and ponds. This fish prefers sand or gravel bottoms. It is able to withstand large thermal amplitudes (between 0 ° and 26 °C). The common Perch (*Perca fluviatilis*) lives in slow-moving rivers or in lakes. It needs potential hiding places such as rocks or trees. The Monkfish (*Lota lota*) lives in rivers and lakes, in fresh and clear waters. The species found here are typical for the potamon.

The various authors also mention the presence of molluscs in the sediments adjacent to the archaeological remains. The genera *Unio* sp., and *Anodonta* sp., have been described as well as the species *Sphaerium solidum* typical for pure and fast waters. Water-related phenomena have therefore interfered with accumulation. The authors con-

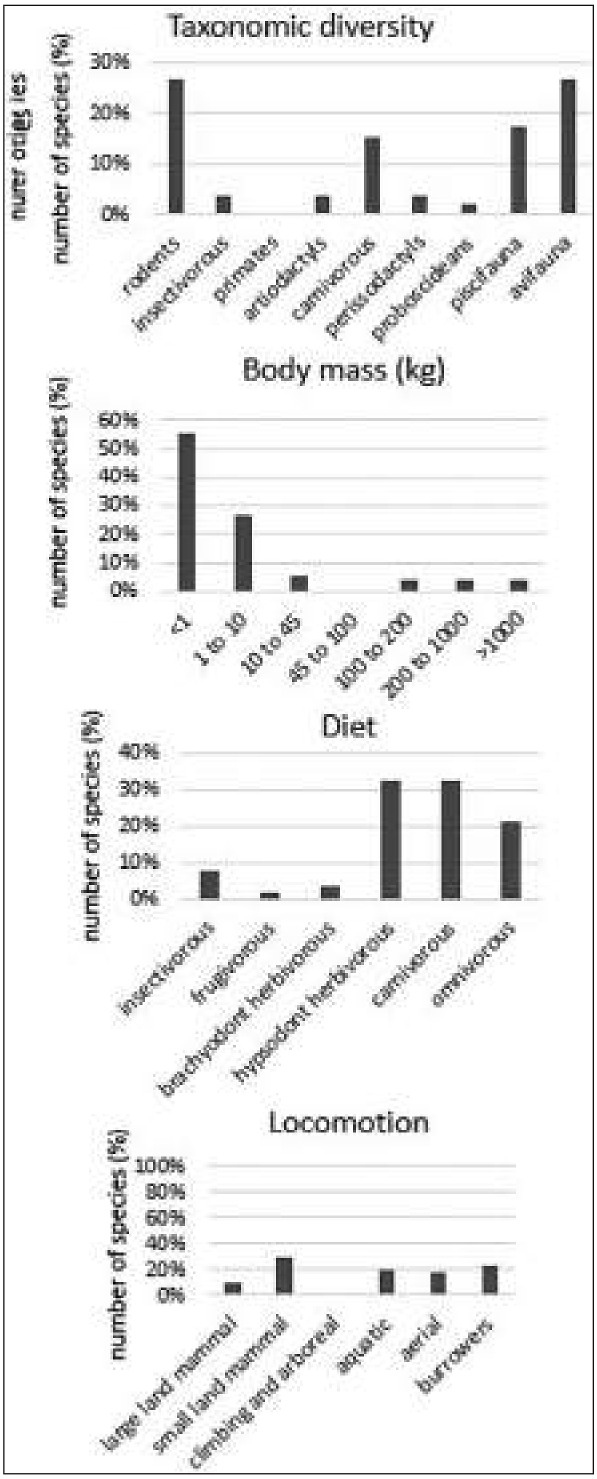

Fig. 10. Ecological diagrams of fauna of research seasons of 1933—1937 and 1938—1939 from the Novhorod-Siverskyi site (after Підоплічка 1947)

cluded that in spring this place is being flooded by the deluge and alluvial waters.

According to the ecological diagrams that take into account all the species represented in the site (Fig. 10), the spectrum is dominated by rodents / lagomorphs (26.9 %), bird life (26.9 %), ichthyofauna (17.3 %) and carnivores (15.4 %). Insectivores (3.8 %), artio-

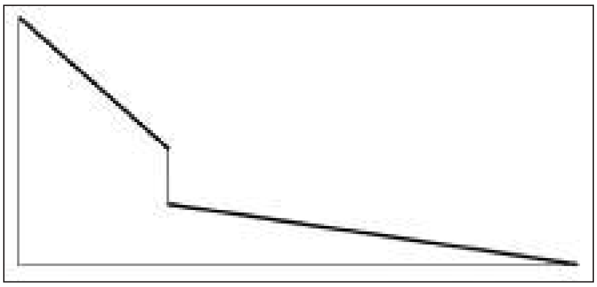

Fig. 11. Cenogram of fauna (after Підоплічка 1947) of research seasons of 1933—1937 and 1938—1939 from the Novhorod-Siverskyi site

dactyls (3.8 %) and perissodactyls (3.8 %) are poorly represented, as proboscidians (1.9 %). The presence of large mammals and megaherbivores testifies to abundant pastures. The strong representation of carnivores reflects the great availability of game. From the mass histogram, small species (<1 kg: 55.8 %, 1—10 kg: 26.9 %) are represented the best. Animals over one ton are not very well represented (3.8 %). According to the fauna present in the region during this period, these proportions are usual. According to the food adaptation histogram, carnivores (32.7 %), hypodonous herbivores (32.7 %) and omnivores (21.2 %) are represented the best. There are few insectivores (7.7 %), brachyodont herbivores (3.8 %) and frugivores (1.9 %). Hypsodont herbivores suggest an open environment typical for the steppe environments of this period. The presence of insect larvae consumers indicates the proximity of a watercourse. According to the locomotor adaptation histogram, small terrestrial mammals (29.3 %) are represented the best, many of which are also burrowing (22.7 %), requiring the presence of soft soils such as relatively wet meadows or the proximity of water points. Aquatic (20 %) and aerial (18.7 %) species are well represented, reflecting the presence of a river and trees. The presence of large land mammals (9.3 %), including runners such as horses, reflects the existence of large grasslands.

According to the cenogram based on the faunal list, the Novhorod-Siverskyi assemblage is representative of an open, arid environment, but with a nearby wetland (Fig. 11).

Table 6. Representation of the certain species of mammals by: total number of faunal remains (NR), minimal number of anatomical elements (MNE) and minimal number of individuals (MNI) from the Novhorod-Siverskyi site-2011/2 (lower layer)

Species/genus/category	NR	MNE	MNI
M. primigenius	9	3	1
C. antiquitatis	2	2	1
Equus sp.	3	3	1
R. tarandus	1	1	1
NISP	**15**	**8**	**4**
Large-sized mammal	9	3	/
Large or medium-sized mammal	2	1	/
Medium-sized mammal	6	3	/
Total	**32**	**16**	**4**

Zooarchaeological analyses (Excavation of 2011)

There are few remains in both layers. The faunal spectrum is relatively undiversified. It includes: *Mammuthus primigenius* (woolly mammoth), *Coelodonta antiquitatis* (woolly rhinoceros), *Equus* sp. (horse) and *Rangifer tarandus* (reindeer), in the lower layer also as in the upper layer plus *Bison* sp. (Bison), *Vulpinae* gen. et sp. (fox), *Lepus* sp. (hare) and *Castor fiber* (beaver) (Table 6; 7).

Among the determined species, the remains of mammoth are the most abundant. However, the number of elements is approximately equivalent for all the species.

These species are typical for steppe environment in a cold climate, but the presence of the beaver attests relative humidity and the presence of a river lined with trees near the site.

Bone remains are fragmented. The rate determination is 50 % for the lower layer and 29 % for the upper layer. The remains of mammoth are very fragmented (Fig. 12).

The bone remains are characterized by longitudinal and step fractures, typical of drying phenomena in an arid climate. Some bones were affected by compaction effects. Taking in account the size of bone fragments, in the lower layer, mostly classes II and III are represented, and for the upper layer, mostly the class II (Fig. 13). According to the taphonomic observations, the fragmentation results from anthropic actions and from those of climate and edaphic agents.

The larger fractured bones have longitudinal, step and spiral fractures. They can be a result of soil phenomena, desiccation, and cryoturbation.

Table 7. Representation of the certain species of mammals by: total number of faunal remains (NR), minimal number of anatomical elements (MNE) and minimal number of individuals (MNI) from the Novhorod-Siverskyi site-2011/1 (upper layer)

Species/genus/category	NR	MNE	MNI
M. primigenius	14	2	1
C. antiquitatis	5	2	1
Equus sp.	2	2	1
Bison sp.	1	1	1
R. tarandus	6	4	2
Vulpinae	1	1	1
Lepus sp.	1	1	1
NISP	**30**	**13**	**8**
Large-sizedmammal	30	3	/
Large or medium-sizedmammal	20	3	/
Medium-sizedmammal	21	7	/
Undetermined remains	2	0	/
Total	**103**	**26**	**8**

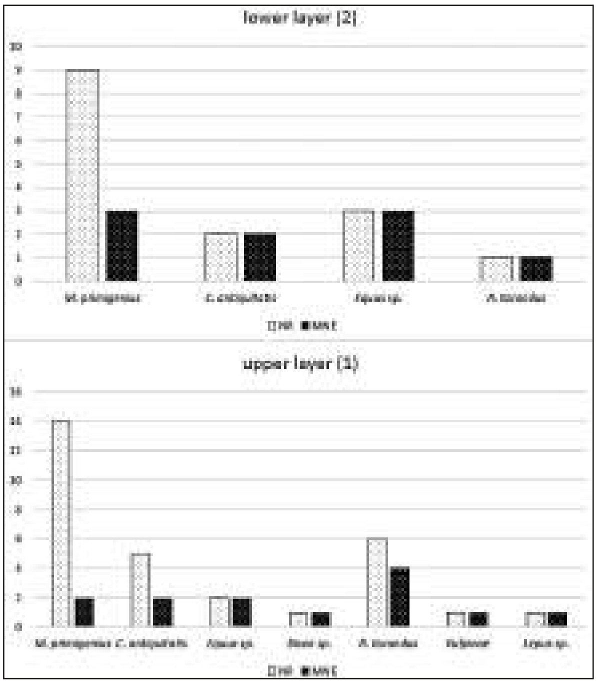

Fig. 12. Number of remains and elements by species from the archaeological layers of the Novhorod-Siverskyi-2011

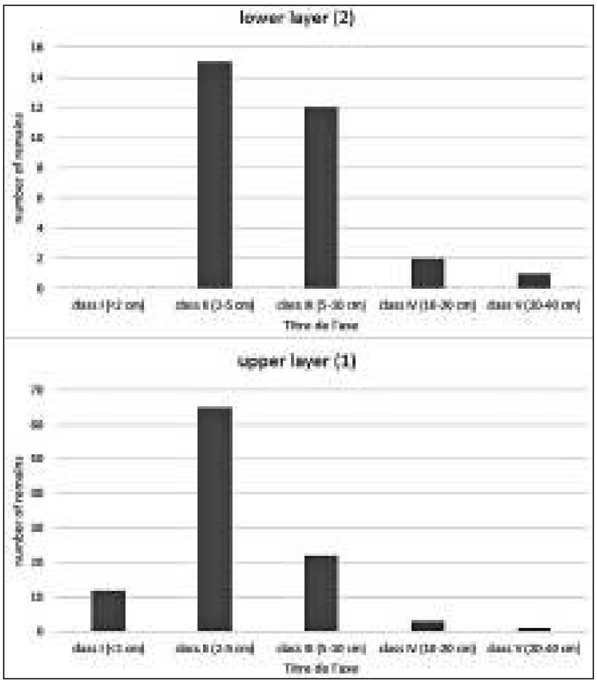

Fig. 13. Number of fragmented remains by size classes from the archaeological layers of the Novhorod-Siverskyi-2011

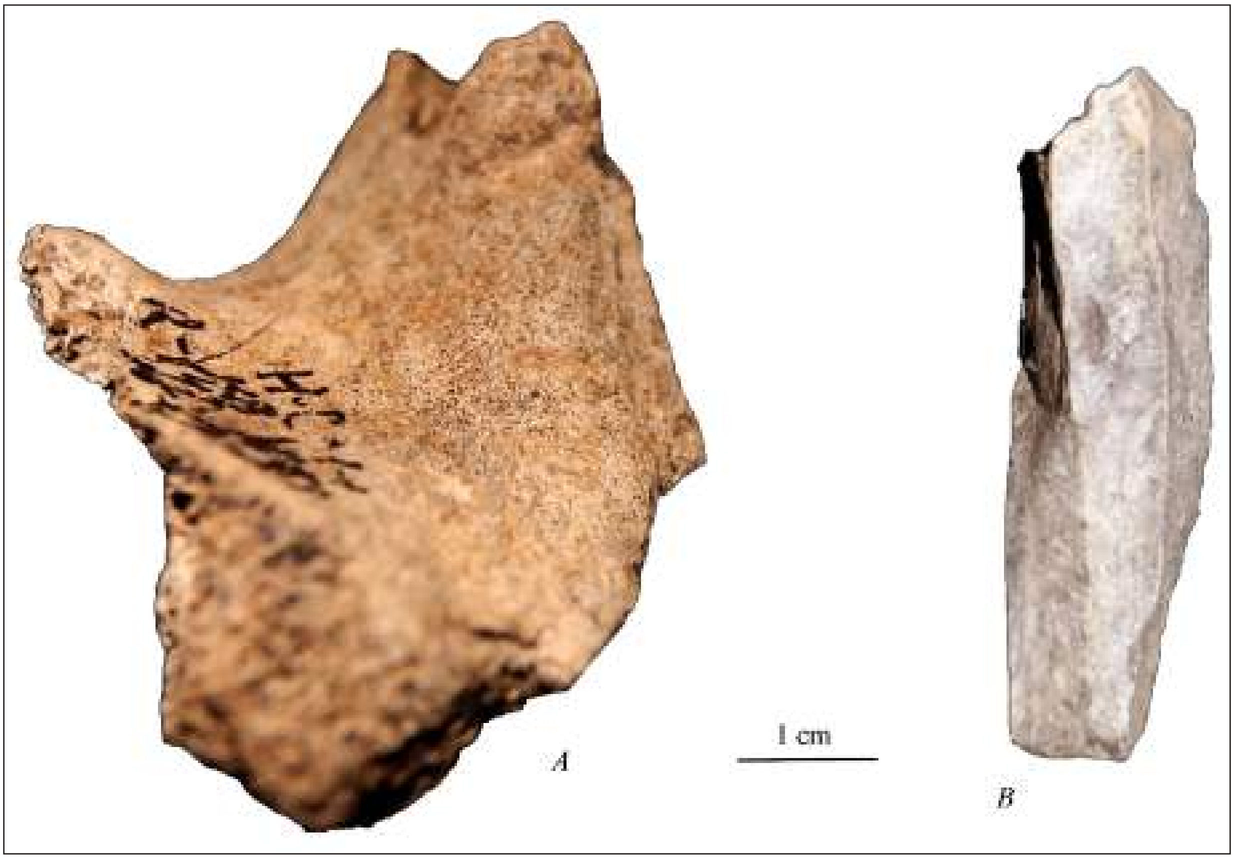

Fig. 14. Preservation of bones from the lower layer (2) of the Novhorod-Siverskyi-2011 (photos by L. Demay)

Bones have various surface conditions in the lower layer. Two categories stand out:

— the bones on the porous surface, altered by weatherization phenomena, and with impregnations of iron oxides and manganese (Fig. 14; A);

— the bones with a much more mineralized and smoother surface (Fig. 14; B).

Bone surfaces from the layer 1 are more homogeneous, even if some bones are more mineralized.

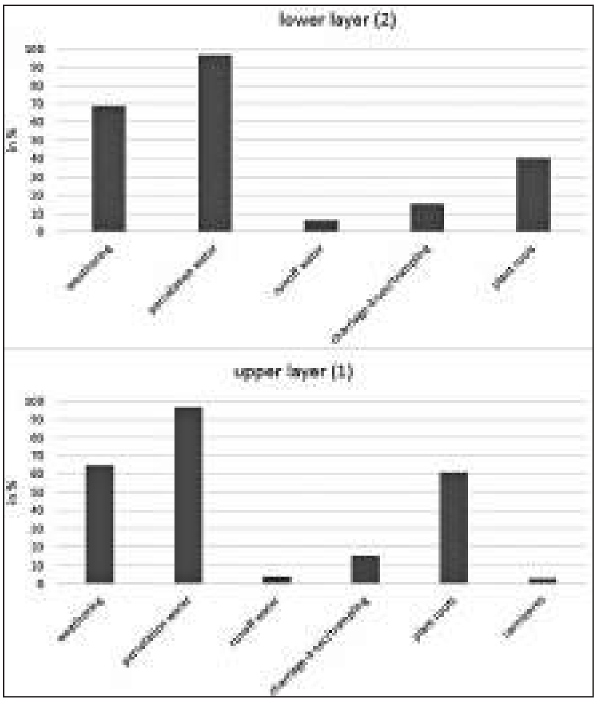

Fig. 15. Alterations due to climate and edaphic and non-human biological agents on bones, in percentage of the number of remains, from the archaeological layers of the Novhorod-Siverskyi-2011

Regarding climate and edaphic and non-human biological factors, the bones are heavily impregnated with oxides (manganese oxide and iron oxide) due to percolation water, in both layers. More than half of bones are affected by weathering in both layers. The effects of weathering are more important in the lower layer (fissuration of bones). Few bones are affected by dissolution due to runoff water. A small part of bones is affected by charriage-a-sec/trampling. Some bones were modified by plant root marks, particularly in the upper layer. Some remains were gnawed by carnivores in the upper layer (Fig. 15).

All species are quite affected in the same way in the lower layer (Table 8). The same situation is in the upper layer, except for mammoth remains which seem to have been less affected by weathering and charriage/trampling (Table 9). However, it is due to the high fragmentation of the second element.

Anatomical preservation and age determination

Lower layer (2)

The lower layer yielded remains of *M. primigenius*, c. *antiquitatis*, *Equus* sp. and *R. tarandus* (Fig. 16; 17).

Table 8. Alterations due to climate and edaphic and non-anthropogenic biological agents on bones, in percentage of the number of remains, from the Novhorod-Siverskyi site-2011/2 (lower layer)

Species/genus/category	Weathering		Percolating waters		Runoff waters		Charriage-a-sec/ trampling		Plants	
	NR	%NR	NR	%NR	NR	%NR	NR	%NR	NR	%NR
M. primigenius	8	88,9	9	100	0	0	0	0,0	8	88,9
C. antiquitatis	1	50	2	100	0	0	1	50	0	0
Equus sp.	3	100	3	100	1	33,3	0	0,0	1	33,3
R. tarandus	1	100	1	100	0	0	0	0,0	0	0
Large-sizedmammal	4	44,4	9	100	0	0	2	22,2	3	33,3
Large or medium-sized mammal	2	100	2	100	0	0	1	50	1	50
Medium-sized mammal	3	50	4	66,7	1	16,7	1	16,7	0	0
Total	**22**	68,8	**30**	93,8	**2**	6,3	**5**	15,6	**13**	40,6

Table 9. Alterations due to climate and edaphic and non-anthropogenic biological agents on bones, in percentage of the number of remains, from the Novhorod-Siverskyi site-2011/2 (upper layer)

Species/genus/ category	Weathering		Percolating waters		Runoff waters		Charriage-a-sec/ trampling		Plants		Carnivorous	
	NR	%NR	NR	%NR	NR	%NR	NR	%NR	NR	%NR	NR	%NR
M. primigenius	1	7,1	14	100	0	0	1	7,1	14	100	0	0
C. antiquitatis	0	0,0	1	50	0	0	0	0,0	0	0	0	0
Equus sp.	0	0,0	2	100	0	0	1	50,0	1	50	0	0
Bison sp.	0	0,0	1	100	0	0	1	100,0	0	0	0	0
R. tarandus	5	83,3	6	100	0	0	0	0,0	3	50	0	0
Vulpinae	1	100,0	1	100	0	0	0	0,0	1	100	0	0
Lepus sp.	0	0,0	1	100	0	0	0	0,0	0	0	0	0
Large-sized mammal	27	90,0	30	100	0	0	2	6,7	25	83,3	2	6,7
Large or medium-sized mammal	14	70,0	20	100	2	10	5	25,0	10	50	0	0
Medium-sized mammal	17	81,0	21	100,0	2	9,5	6	28,6	9	42,9	1	4,8
Undetermined remains	2	100,0	2	100	0	0	0	0,0	0	0	0	0
TOTAL	**67**	65,0	**99**	96,1	**4**	3,9	**16**	15,5	**63**	61,2	**3**	2,9

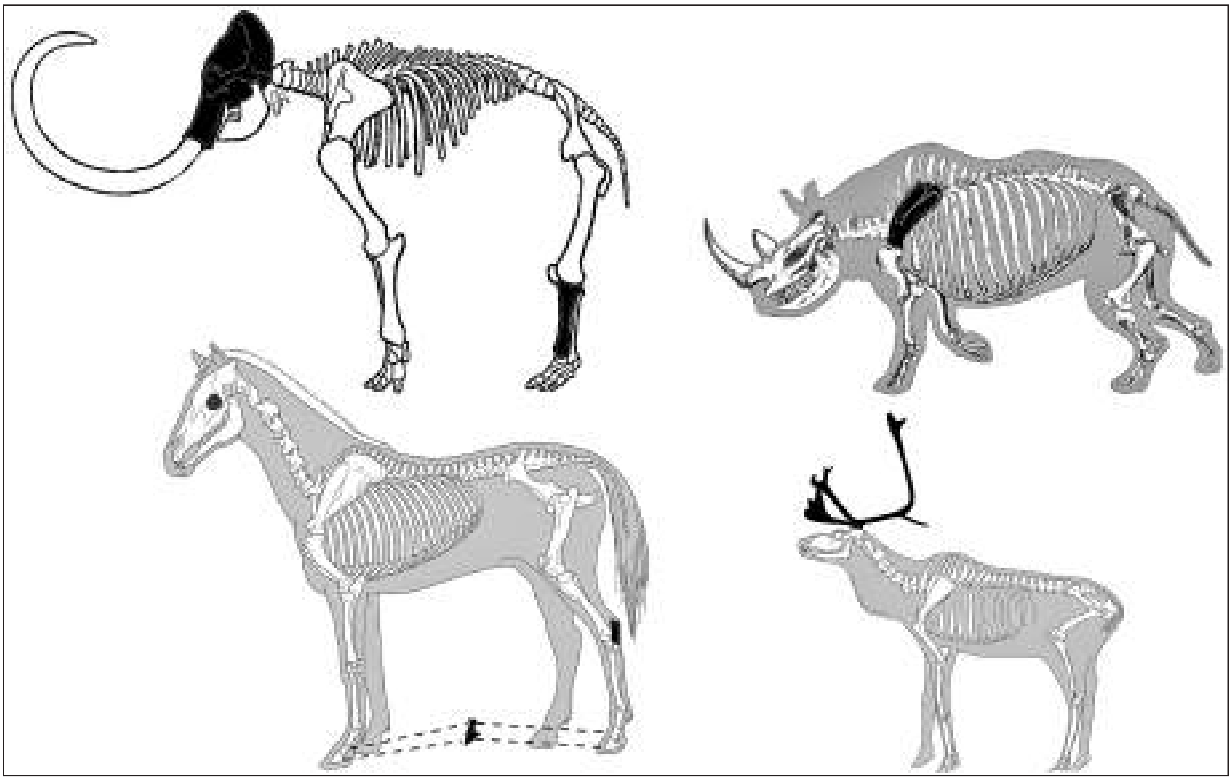

Fig. 16. Bones of the lower layer from the Novhorod-Siverskyi-2011

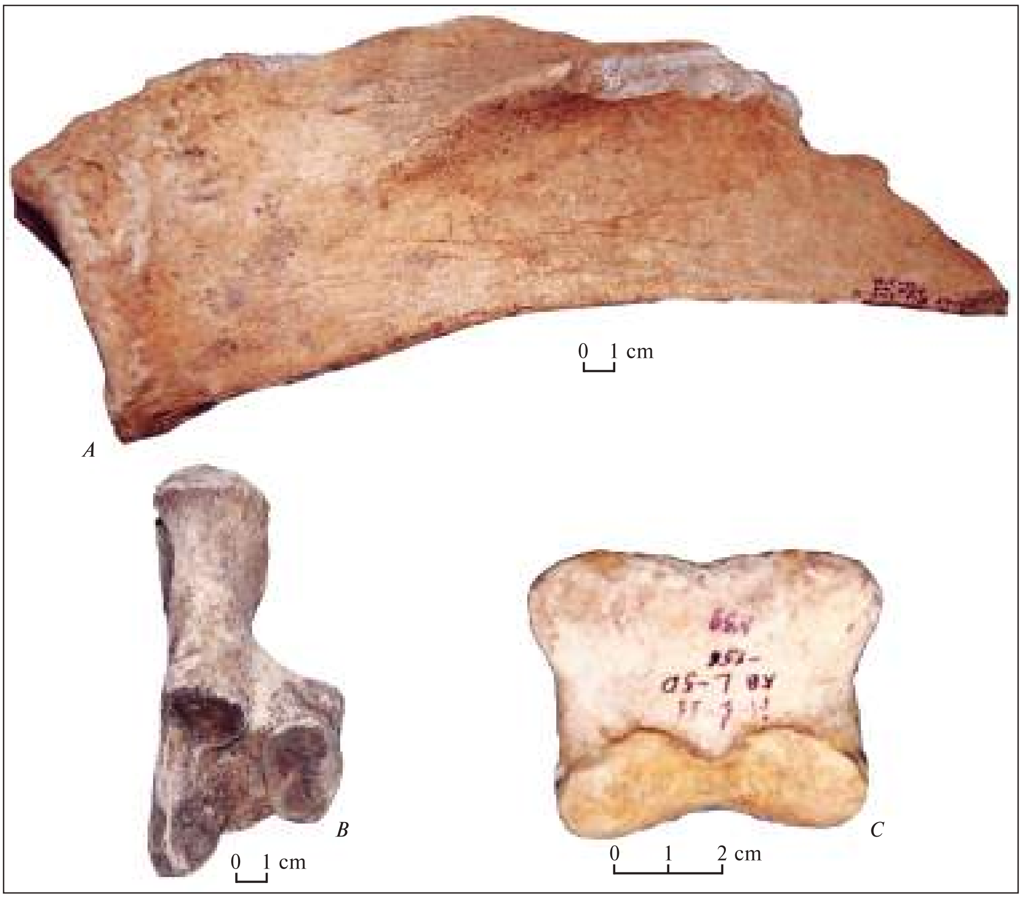

Fig. 17. Bones of the lower layer from the Novhorod-Siverskyi-2011: *A* — left scapula in lateral view of c. *antiquitatis*; *B* — right calcaneum in cranial view of *Equus* sp.; *C* — second phalanx in caudal view of *Equus* sp. (photos by L. Demay)

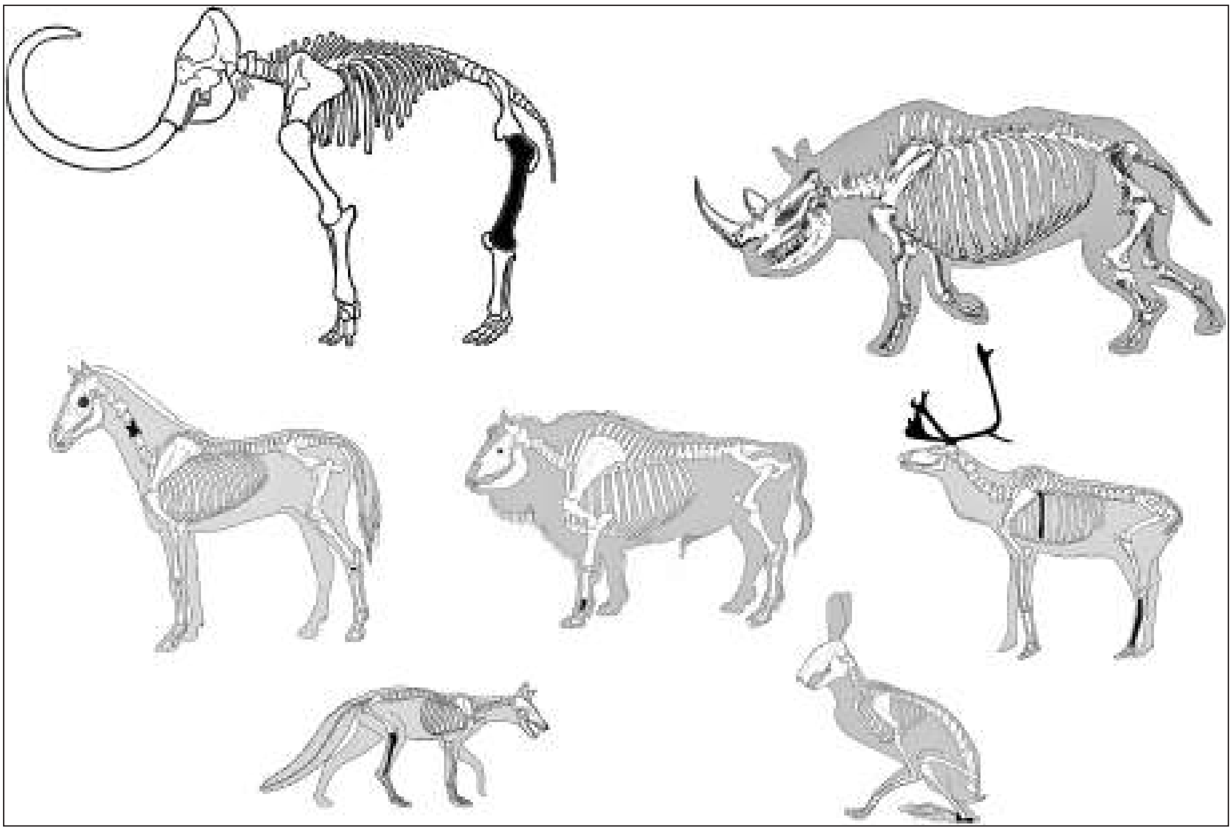

Fig. 18. Bones of the upper layer from the Novhorod-Siverskyi-2011

The woolly mammoth is represented by nine remains, corresponding to three elements, a fragment of skull, a left tibia and a part of long bone diaphysis of an adult *sensu lato*. The woolly rhinoceros is represented by two remains, which correspond to two elements, a proximal part of a right radius and a part of a scapula of an adult *sensu lato*. The horse is represented by three elements, a right calcaneum, mesial and distal phalanges. It is an adult *sensu lato*. A fragment of the reindeer antler is also present.

Fragments of large-sized mammal bones correspond to at least three elements in addition, a rib and parts of two long bone diaphysis. Two large or medium-sized mammal ribs are also present. Eventually, a medium-sized mammal rib was identified, also as a flat bone and long bone diaphysis. There are no burned bones, neither anthropogenic marks.

The upper layer (1)

The upper layer yielded remains of *M. primigenius*, c. *antiquitatis*, *Equus* sp., *Bison* sp., *R. tarandus*, *Vulpinae* and *Lepus* sp. (Fig. 18; 19).

The woolly mammoth is represented by a proximal part of a femur and a fragment of another long bone. This individual is less than stages XVIa—XX (less than 18—35 years old).

The woolly rhinoceros is represented by a part of a cheek tooth and a right P4. This molar shows that the individual is a little bit more than six years old.

The horse is represented by a cervical vertebra and a right navicular, which belong to an adult *sensu lato*.

The bison is represented by a left proximal poster or phalanx.

The reindeer is represented by four elements. There are two antlers, a fragment of rib and a fragment of diaphysis of matatarsal. From antlers we have at least two individuals: a shed antler of a young individual (Fig. 20) and a fragment of antler of an adult *sensu lato*. The antlers of young individuals fall off after March—May, at the end of the winter season (Murray 1993).

A fox is represented by a distal part of right tibia.

There are also a right calcaneum of the hare.

We also identified three ribs of the large-sized mammal.

A fragment of mandible, a rib and a long bone of large or medium-sized mammal were present, also as two long bones and four ribs of medium-sized mammal.

There are no burned bones.

Two bone diaphyses bear helicoidal fracturations, which could be due to carnivores, but without other tooth marks, or anthropogenic breakage (Fig. 21).

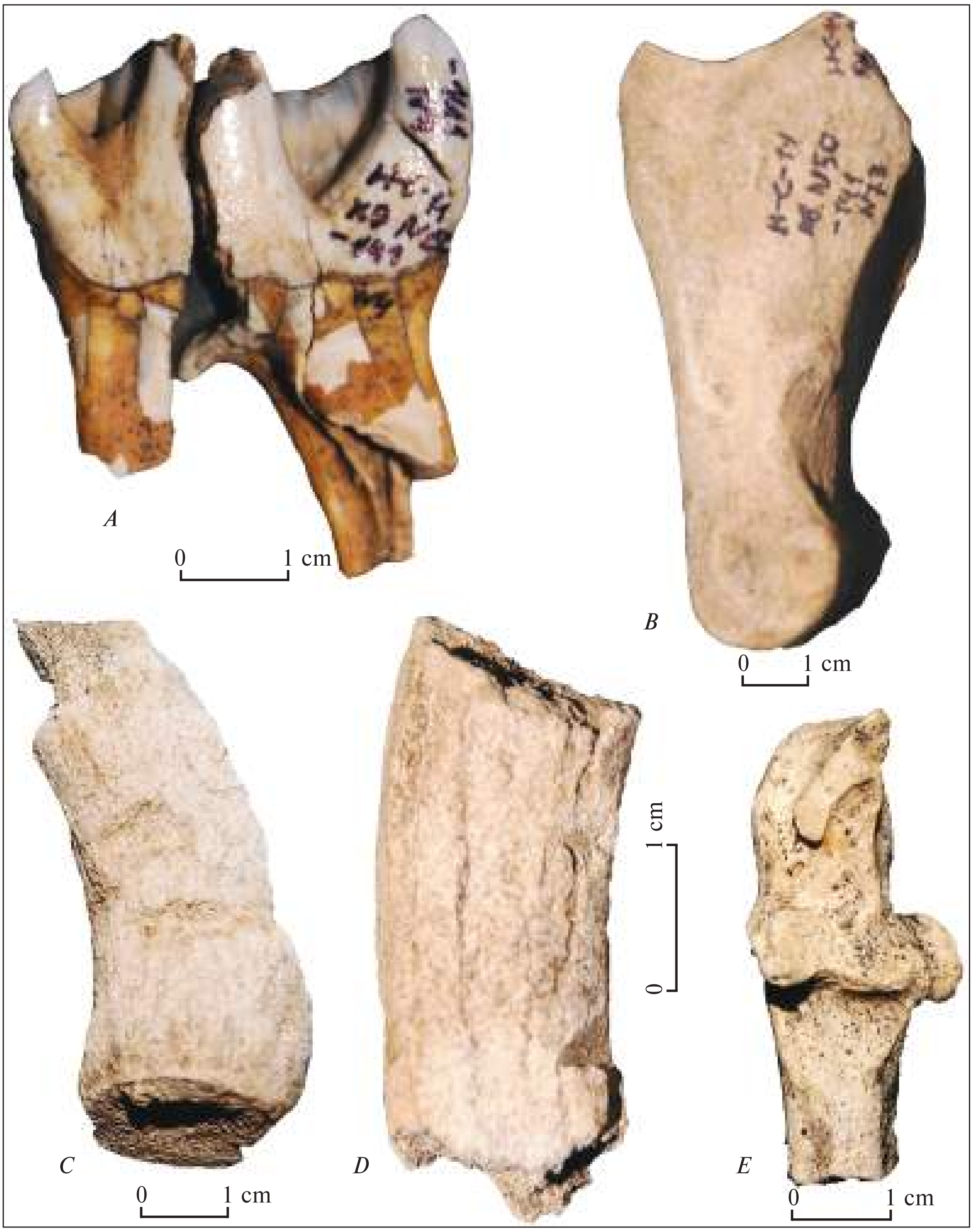

Fig. 19. Bones of the upper layer from the Novhorod-Siverskyi-2011: *A* — right P_4 of c. *antiquitatis* in lingual view; *B* — proximal phalanx of *Bison* sp. in lateral view; *C—D* — antlers of *R. tarandus*; *E* — calcaneum of *Lepus* sp. in anterior view (photos by L. Demay)

Spatial distribution

Concerning the spatial distribution, we have not pinpointed any area of activity in the lower and upper layers (Fig. 22; 23).

Discussion

Paleoecological analyses from old excavations. According to the faunal remains from old explorations (1933—37/1938—39), the faunal spectrum is very diversified. According to the faunal associations, this assemblage is coherent. It is typical for a cold steppe environment from the glacial period, near riparian forest. However, it is more representative of a natural spectrum than an anthropogenic selected assemblage.

Based on the species, which were identified within the assemblage, we can estimate seasons related to migration (Fig. 24). They were present during the warm season.

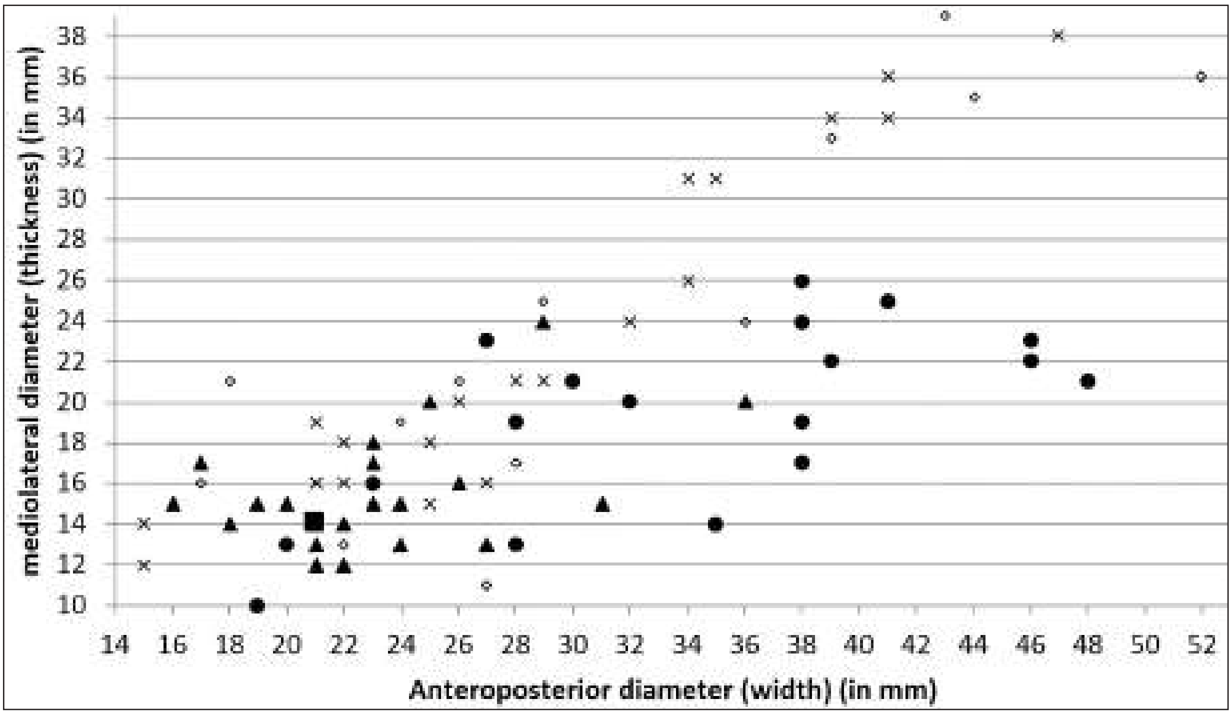

Fig. 20. Osteometric comparisons of the reindeer antlers of the upper layer from the Novhorod-Siverskyi-2011

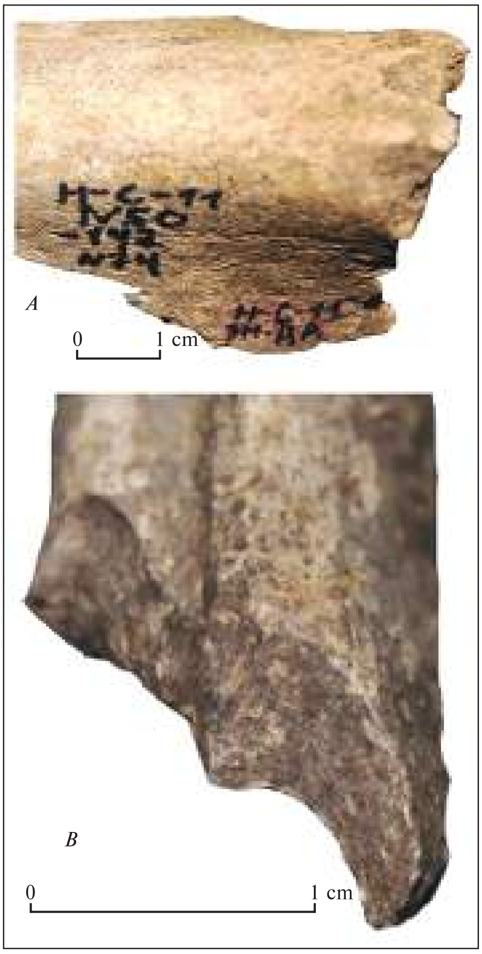

Fig. 21. Bone diaphyses with helicoidal fracturations of the upper layer from the Novhorod-Siverskyi-2011: *A* — long bone diaphysis of a large-sized mammal; *B* — the reindeer metatarsal (photos by L. Demay)

Paleontology and taphonomy of new excavations. In the excavations of 2011, the faunal spectrum is more restricted in both archaeological layers, with the woolly mammoth, the woolly rhinoceros, the horse, the reindeer in the lower and upper layers. In the upper layer there are also the bison, the fox and the hare. We cannot have enough data from the anatomical representation, however, we have mainly adults *sensu lato* and also the young reindeer in the upper layer, which could correspond to human predation. It is therefore difficult to know if the species were all acquired by the human group(s). Among the bones with fracturing impacts, it is about human activities related to the recovery of the marrow.

According to taphonomic observations, the bones of Novhorod-Siverskyi-2011 had stayed for a long time at an open air before being buried, in a wet environment, but a few of them submitted to precipitations. The high degree of alteration by plant root marks permits to highlight the presence of a vegetation cover and those bones were buried in subsurface. There have been significant movements within the bone assemblage. Several fracturations are due to cryoturbation. Some of the bones could also have been broken by the falling boulders. The surface of the bones shows states of differential preservation. Indeed, some of them are leathered and blunted due to hydraulic phenomena (solifluxion, river). Especially in the lower layer, some bones appear to be in a place, while others seem to have been imported by hydraulic phenomena, either from the top of the promontory or from the Desna River.

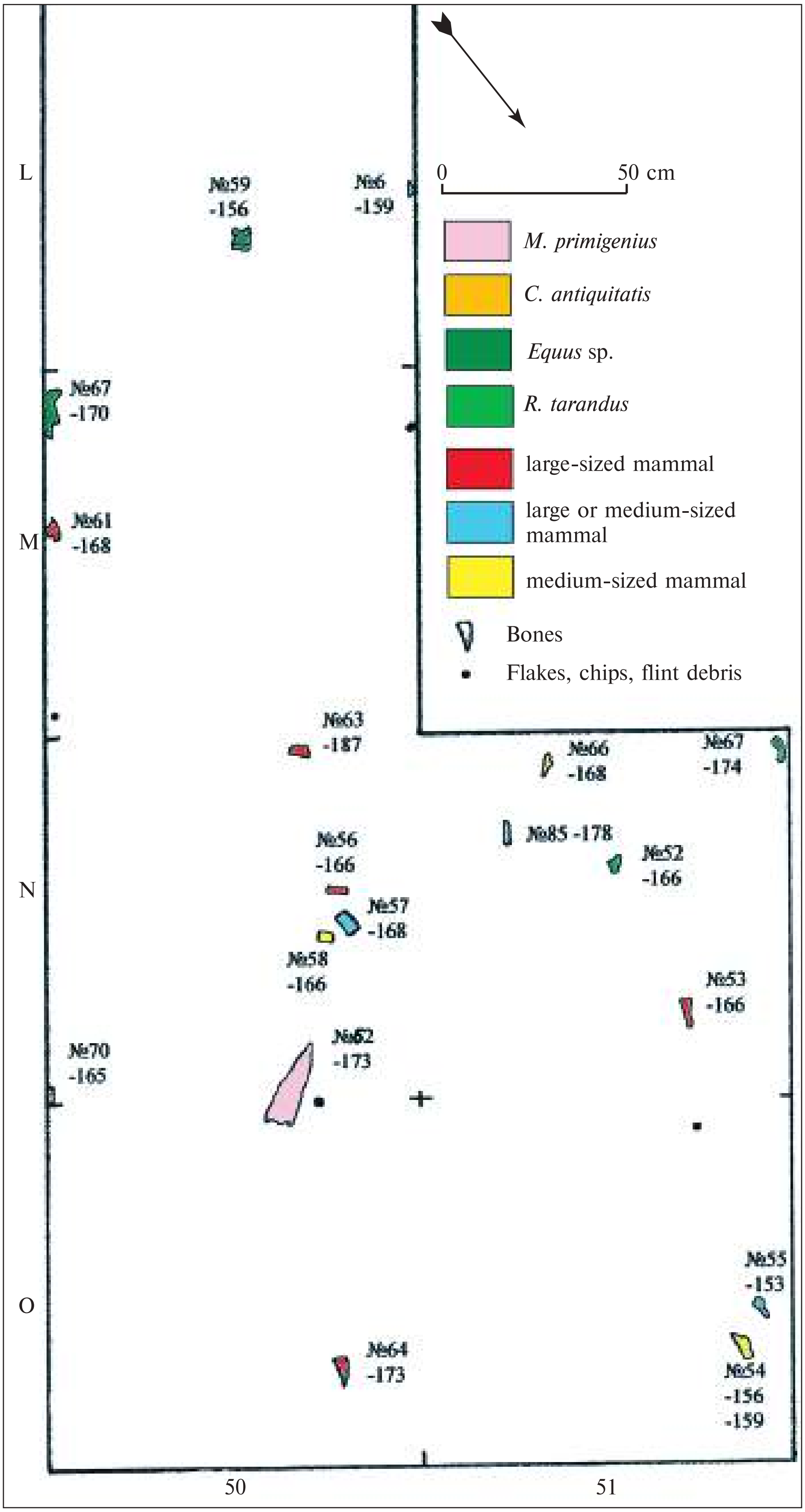

Fig. 22. Spatial distribution of the archaeological material from the lower layer of the Novhorod-Siverskyi-2011

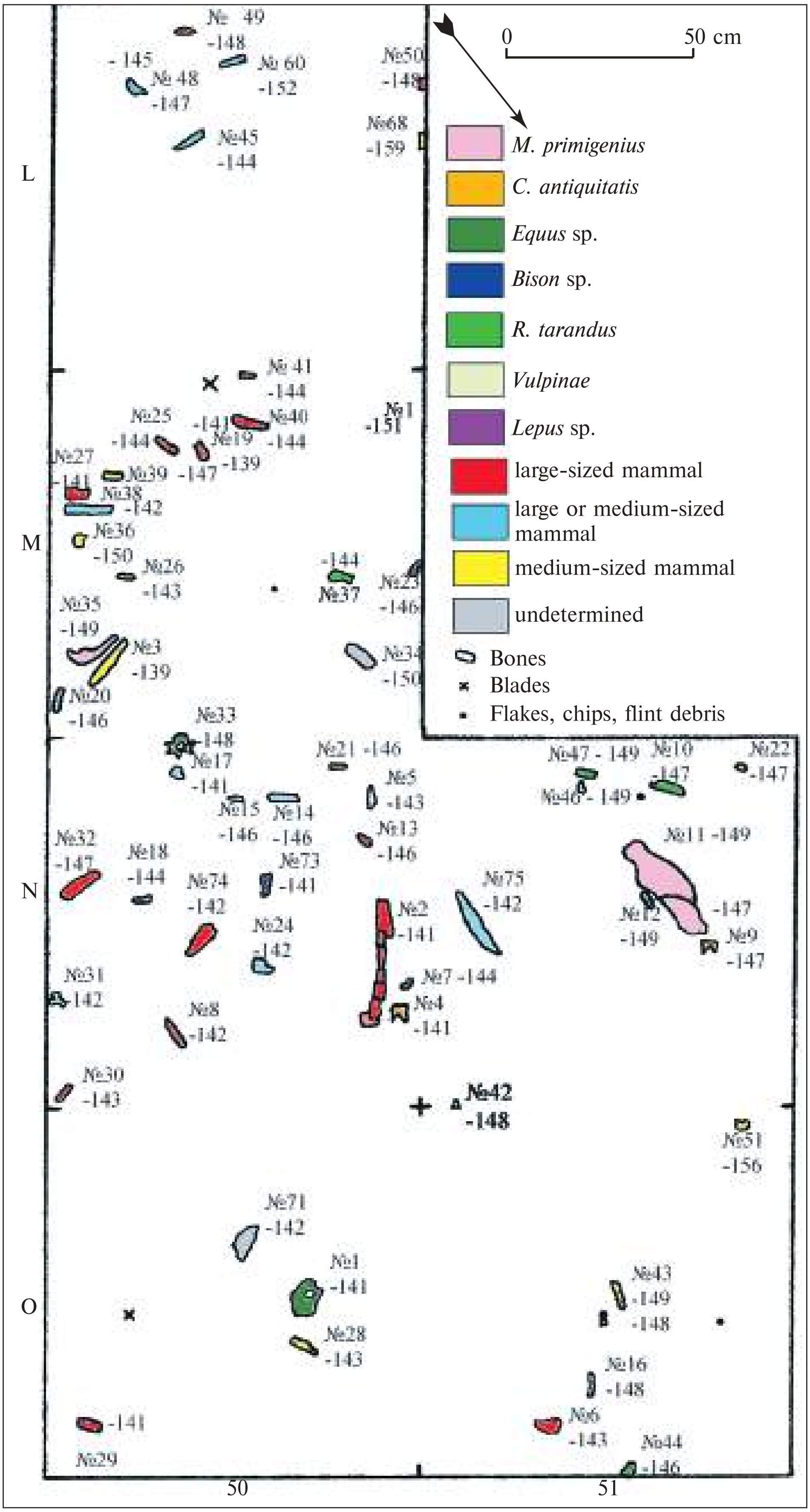

Fig. 23. Spatial distribution of the archaeological material from the upper layer of the Novhorod-Siverskyi-2011

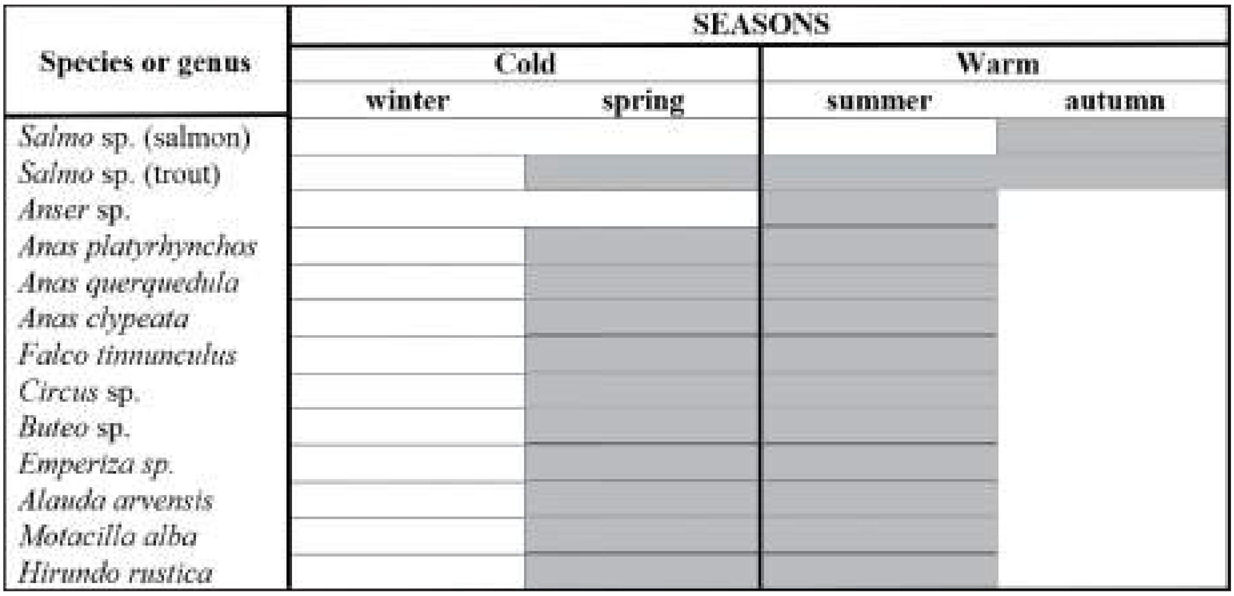

Fig. 24. Seasons and potential presence (in black) of species in the region

Although this site should be considered with caution, the new excavations show human occupations, rather temporary types. In the upper layer, the shed antler from a young individual could have been redeposited by natural element phenomenon or picked up by humans. The other fragment of antler belongs to a male or a female adult. It would correspond to around the month of May when the reindeers are migrating to calving grounds at the end of the cold season/beginning of the warm season.

Conclusions

Thus, judging by the flint collection from the studies of the 1930's, the site was inhabited by representatives of the Pushkari type. In our opinion, it is hardly worth talking about an Epigravettian admixture. If we talk about admixture, then this role in the first place can apply a fragment of a double-sided processed tool (Fig. 3: 1).

According to the faunal remains from old excavations, the faunal associations are coherent, typical of a cold steppe environment from the glacial period, near riparian forest. However, it seems to result to a mix between natural taphonomic complexes and animal remains associated with human activity.

The more recent excavations permit to highlight two archaeological layers that are very poor in flint artefacts. Concerning fauna, the faunal spectrum is quite restricted, with few remains in both layers. According to taphonomic observations, the bones remained for a long time in an open air before being buried, in subsurface in a wet environment, but a few of them submitted to precipitations in link with permafrost activities. The lower layer (2) yielded bones of the woolly mammoth, the woolly rhinoceros, the horse and the reindeer. Some bones appear to be in a place, while others seem to have been imported by hydraulic phenomena, either from the top of the promontory or from the Desna River. The upper layer (1) yielded remains of the woolly mammoth, the woolly rhinoceros, the horse, the reindeer, the bison, the fox and the hare. So, it more diversified than the lower layer. The bones with possible fracturing impacts could be related to the recovery of the marrow by humans. In both layers we have mainly adults *sensu lato,* which could correspond to human predation. They could correspond to temporary camps of quite small human groups, potentially occupied at the end of the cold season/beginning of the warm season. This site would need more investigations in still suitable parts for further research.

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НОВІ КОМПЛЕКСНІ ДОСЛІДЖЕННЯ НОВГОРОД-СІВЕРСЬКОЇ ВЕРХНЬОПАЛЕОЛІТИЧНОЇ СТОЯНКИ

Новгород-Сіверську стоянку відкрив і досліджував М. Я. Рудинський у 1933 р. Основні роботи на ній були проведені у 1936—1938 рр. під керівництвом І. Г. Підоплічка. У зв'язку із виявленням нових артефактів у 2011 р. на стоянці було здійснено нові невеликі дослідження. Стаття присвячена аналізу в першу чергу фауністичного комплексу стоянки, а також містить дані типологічного аналізу крем'яної колекції.

За колекцією кременю з досліджень 1930-х рр., стоянка була заселена носіями пушкарівського типу. На нашу думку, навряд чи варто говорити про епіграветську домішку. Якщо припускати іншокультурну складову колекції, то, скоріше за все, на її роль може претендувати фрагмент двобічнообробленого знаряддя (рис. 3: 1).

Судячи з фауністичних решток розкопок попередніх років, фауністичні комплекси є цілісними, характерними для холодного степового середовища льодовикового періоду біля прибережного лісу. Тим не менше це, здається, є наслідком поєднання решток тварин, похованих природним чином та безпосередньо пов'язаних із людською діяльністю.

Під час останніх досліджень стоянки було виявлено два культурні шари з бідним крем'яним інвентарем. В обох шарах з останніх розкопок мало знахідок фауни і фауністичний спектр досить обмежений. Згідно з тафономічними спостереженнями, кістки тривалий час залишалися на відкритому повітрі, перш ніж потрапили у вологий ґрунт, але лише деякі з них мають сліди, пов'язані з дією вічної мерзлоти. Нижній шар (2) дав кістки шерстистого мамонта, шерстистого носорога, коня та північного оленя. Деякі кістки, імовірно, лежали *in situ*, інші, мабуть, були переміщені під дією водних потоків або з вершини мису, або з річки Десни. У верхньому шарі (1) були залишки шерстистого мамонта, шерстистого носорога, коня, північного оленя, зубра, лисиці та зайця. Отже, видове різноманіття фауни верхнього шару є більшим, ніж нижнього. Кістки з можливими слідами розбивання можуть бути пов'язані з добуванням кісткового мозку давніми людьми. В обох шарах присутні кістки переважно дорослих особин *sensu lato*, наявність яких цілком може бути пов'язана з людською діяльністю, зокрема полюванням.

Ці шари можуть відповідати тимчасовим таборам досить невеликих людських груп, що могли існувати в кінці холодної/на початку теплої пори року. За результатами останніх досліджень, Новгород-Сіверська стоянка потребує додаткових розкопок у ще придатних для цього частинах.

Ключові слова: останній льодовиковий максимум, верхній палеоліт, гравет, пушкарівський тип пам'яток, зооархеологія, палеоекологія, басейн Середньої Десни, верхній пленігляциал.

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НОВЫЕ КОМПЛЕКСНЫЕ ИССЛЕДОВАНИЯ НОВГОРОД-СЕВЕРСКОЙ ВЕРХНЕПАЛЕОЛИТИЧЕСКОЙ СТОЯНКИ

Новгород-Северская стоянка была открыта и исследовалась М. Я. Рудинским в 1933 г. Основные работы на ней были проведены в 1936—1938 гг. под руководством И. Г. Пидопличко. В связи с выявлением новых артефактов в 2011 г. на стоянке были проведены новые небольшие исследования. Статья посвящена анализу в первую очередь фаунистического комплекса стоянки, а также приводятся данные типологического анализа кремневой коллекции.

Судя по коллекции кремня из исследований 1930-х гг., стоянка была заселена представителями пушкарёвского типа памятников. По нашему мнению, вряд ли стоит говорить об эпиграветтской примеси. Если допускать инокультурную составляющую коллекции, то, скорее всего, на её роль может претендовать фрагмент двусторонне обработанного орудия (рис. 3: 1).

Судя по фаунистическим остаткам из раскопок предыдущих лет, фаунистические комплексы являются целостными, характерными для холодной степной среды ледникового периода около прибрежного леса. Тем не менее это, кажется, является результатом сочетания остатков животных, захороненных естественным образом и непосредственно связанных с человеческой деятельностью.

В ходе последних исследований стоянки было обнаружено два культурных слоя с бедным кремневым инвентарем. В обоих слоях мало находок фауны и фаунистический спектр весьма ограничен. Согласно тафономическим наблюдениям, кости долгое время оставались на открытом воздухе, прежде чем попали во влажный грунт, но лишь некоторые из них имеют следы, связанные с действием вечной мерзлоты. Нижний слой (2) дал кости шерстистого мамонта, шерстистого носорога, лошади и северного оленя. Некоторые кости, вероятно, находились *in situ*, другие вероятно были перемещены действием водных потоков или с вершины мыса, или из реки Десны. В верхнем слое (1) обнаружены кости шерстистого мамонта, шерстистого носорога, лошади, северного оленя, бизона, лисы и зайца. Таким образом, он более разнообразен, чем нижний слой. Кости с возможными следами разбивания могут быть связаны с добычей костного мозга древними людьми. В обоих слоях присутствуют кости преимущественно взрослых особей *sensu lato*, наличие которых вполне может быть связано с человеческой деятельностью, в частности охотой.

Эти слои могут соответствовать временным лагерям достаточно небольших человеческих групп, которые могли существовать в конце холодного/вначале теплого времени года. Судя по результатам последних исследований, Новгород-Северская стоянка требует дополнительных раскопок в еще пригодных для этого участках.

Ключевые слова: последний ледниковый максимум, верхний палеолит, граветт, пушкарёвский тип памятников, зооархеология, палеоэкология, бассейн Средней Десны, верхний пленигляциал.

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