



Preliminary results of studies of the Valea Morilor Upper Palaeolithic site (Chişinău, Republic of Moldova): A new camp of mammoth hunters

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ABSTRACT

Preliminary results are presented from the studies of a newly found Paleolithic site – Valea Morilor (Chişinău, Republic of Moldova). The excavations produced unquestionable evidence of mammoth hunting (*Mammuthus primigenius* Blumenbach, 1799). Excavations of 2009–2010 opened an area of 1264 m². Three radiocarbon datings (¹⁴C) of the fragments of fossil bones of mammoths performed in the Groningen University gave very similar results: in the excavation sector Nr.1 – 20770 ± 90 BP (GrA-46004; Obadă and van der Plicht, 2010); the sector Nr.2 – 20570 ± 80 BP (GrA-52424); and the sector Nr.3 – 20560 ± 80 BP (GrA-52425). Faunal remains are represented by more than 550 mammoth bones (belonging to at least 6 animals), as well as bones of bison (*Bison priscus* Bojanus, 1827), small mammals [*Ochotona pusilla*?], *Spalax zemni* Erxleben, 1777; *Lagurus lagurus* (Pallas, 1773)] and terrestrial molluscs *Helicopsis striata* (Mull.), *Pupilla muscorum* (L.), *Vallonia pulchella* (Mull.), and *Succinea oblonga* (Drap.).

The assemblage of lithic tools includes 72 objects made of flint, 7 sandstone pebbles, and one made of white quartz. It seems likely that at least one wind-break (shelter) was constructed by the site dwellers. Numerous bones bear traces of cutting, splinting, grinding, and scraping. Darts and spear points found in the vicinity of large bones suggest the weapons deeply penetrated into the animals' soft tissues, and indicate that the Paleolithic inhabitants of the site actively hunted mammoths. A mammoth's elbow bone (ulna) was pierced with some weapon.

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1. Introduction

More than a hundred Palaeolithic sites attributed to different epochs and containing mammoth remains are known in the Carpathian-Dniester region: however, no more than 40 have been excavated (Borziac and Obada, 1999). Only two localities with collections of the Upper Paleolithic flint artifacts were found in the Chişinău District (Chetraru, 1973).

2. A short record of the studies

On Friday 13 March, 2009, M. Robu, a bulldozer driver, discovered a cluster of large animal bones when clearing the drained lake bottom in the eastern part of Valea Morilor (Chişinău, Republic of

Moldova) (Fig. 1). Mr. A. Țăşevschi, Director of S.A. “Autocomtrans” who was in charge of the works, informed the National Museum of Archeology and History of Moldova of the findings. The same day, the location was visited by the researchers from the museum. The studies were carried out since March 14, 2009, by archeologists: Dr. Prof. I. Tentiuc, V. Bubulici, A. Levinschi, V. Bicbaev (National Museum of Archeology and History of Moldova) and Dr. Th. Obadă, paleontologist from Institute of Zoology, Academy of Sciences of Moldova.

At the very beginning of the works, archeologist V. Bicbaev was surveying the area south of the main excavation and found some fragments of mammoth tusk and bones at a distance of 90–100 m (excavation 2). More remains, including an incomplete lower molar (M₂) and fragments of the mammoth lower jaw, were found 50 m north of the main excavation by student volunteer O. Cazachenco (excavation 3).

As the cleaning of bone samples began, it appeared that some ribs and large tubular bore bear distinct traces of human action. There was a flint flake found in the northwestern sector of

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Fig. 1. Excavation 1A viewed from the north, the studied excavations indicated as follows: Exc. 1A – excavation nr. 1A; Exc. 1B – excavation nr.1B; Exc. 1C – excavation nr.1C; 4th pit – prospecting pit nr. 4; Exc. 2 – excavation nr.2; Exc. 3 – excavation nr.3.

excavation 1A by V. Tihon (volunteer) on March 18. The archeologists, however, thought it was a chance finding or a redeposited object and considered the site to be of paleontological significance only. From April 3 to December 5, 2009, the excavations were performed by Th. Obadă and A. Cebotari (both from the Institute of Zoology, Academy of Sciences of Moldova), with occasional help of some volunteers. In 2010, field work was continued by Obadă and A. Pascari (student volunteer) from February 13 to August 25. For a short period in July (10th to 20th) archeologists S. Covalenco and V. Burlacu (Institute of Cultural Heritage, Academy of Science of Moldova) took part in the excavations, together with students of the High Anthropological School in the course of their field practical training.

3. Materials and methods

The works were carried out at three excavated areas (Fig. 2): principal excavation No. 1 (1246 m² in area altogether) divided for convenience into three units, namely 1A (495 m²), 1B (230 m²), and 1C (516 m²). Excavation No. 2 (16 m² in area) is 68 m south of excavation unit 1B. Excavation No. 3 (4 m²) is approximately 50 m north of 1A excavation and pit No. 3 (3 × 2 m in size).

The bone material is of poor or satisfactory degree of preservation. To make it more resistant, it was impregnated with a special substance as well as with BF-6 and PVA glues. Some bone specimens were taken as monoliths, together with the enclosing sediments, and others were put into plaster jackets.



Fig. 2. Position of excavations at the Upper Palaeolithic site of Valea Morilor: 1A – excavation nr. 1A; 1B – excavation nr.1B; 1C – excavation nr.1C; 4th pit – prospecting pit nr. 4; 2 – excavation nr.2; 3 – excavation nr.3.

Of the large bone remains, more than 550 are those of mammoth (*Mammuthus primigenius* Blumenbach, 1799) belonging to at least 6 animals. One fragment of bison horn (*Bison priscus* Boj) was also found.

Microfossils were recovered from the bone-bearing (cultural) layer by washing the sediments (1 ton) through sieves with 0.5 mm openings. When recovering microfossils, a forehead magnifying glass of 3.5 power was used. The lithic tools collected include 72 objects made of flint, 7 of sandstone pebbles, and one made of

white quartz. All the samples are kept in the collection of Museum of fossil faunal complexes of Moldova (Institute of Zoology, Academy of Sciences of Moldova).

4. Geographical setting

The Valea Morilor locality is situated within the boundaries of the recreation and entertainment park of the same name, in the western part of the city of Chişinău. It is near the western bank of an

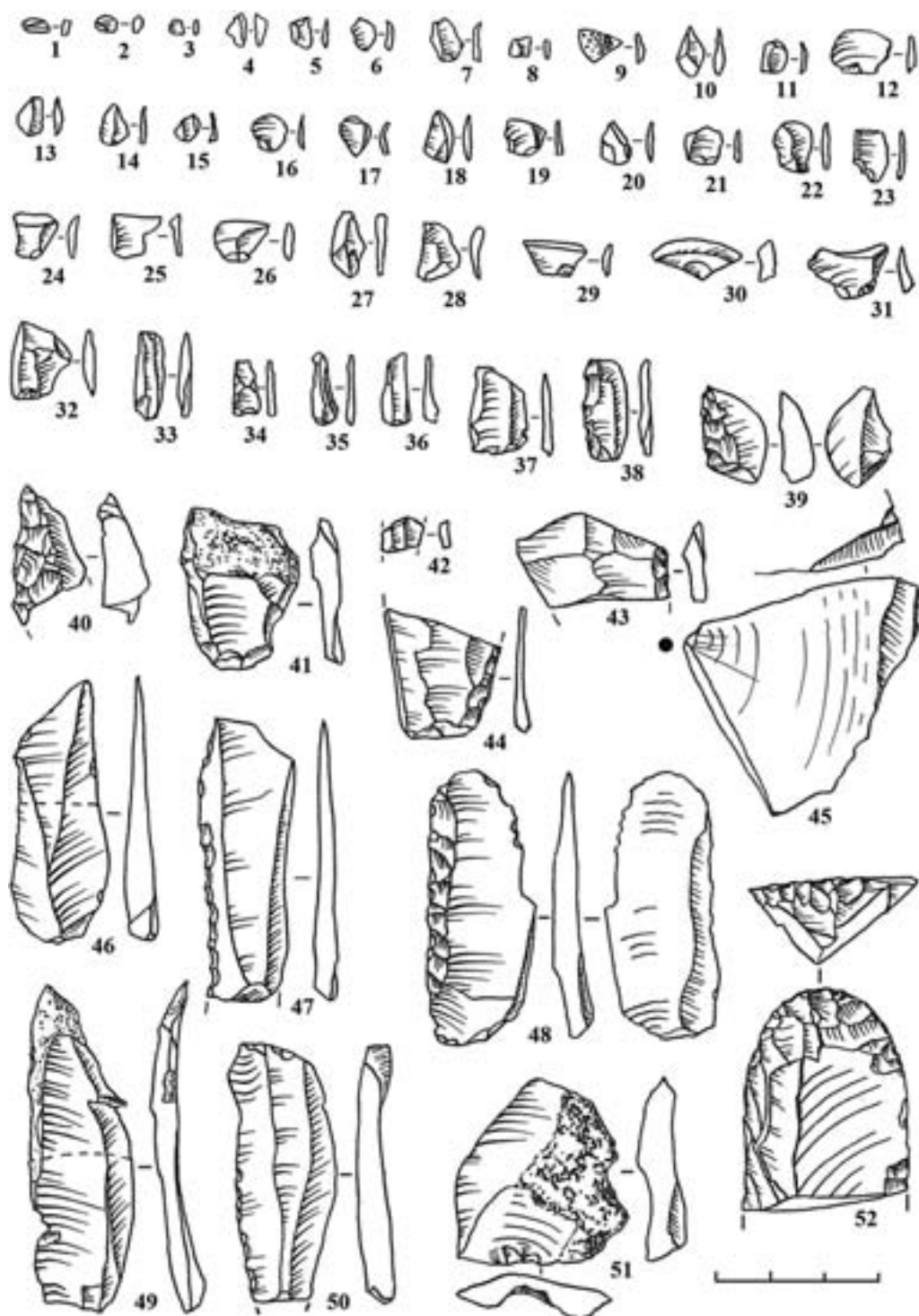


Fig. 3. Flint implements recovered from the Valea Morilor Upper Palaeolithic site: 1 – from excavation 1A; 2–14, 30, 34–38, 45–47, 49, 51 – from excavation 1B; 15–29, 31–33, 39–44, 48, 50, 52 – from excavation 1C (drawings by S. Covalenco).

artificial pond, opposite the life boat station. The coordinates of the site (northern zone of excavation 1A) are as follows: N 47°01'095"; E 28°48'400". The cultural layer of the site occurs at an altitude of 68 m a.s.l. The site itself is located on the gentle left slope of the Durlești R. valley (a right tributary of the Byc R.). Near the river meander are preserved a part of a formerly wide floodplain and adjoining lower fluvial terrace. An important constituent of the landscape is the valley slopes: because of their steepness they are prone to erosion and landslides. Two deeply incised small stream valleys (Nogornyi and Tamara creeks) bound the site area to the northeast and southeast respectively, and the Durlești R. flows east of it. Both at present and in the past, this part of the valley was well sheltered from winds and weather from northwest, east and south.

5. Geological setting

The locality is confined to sediments of the Durlești R. low terrace represented by clayey and silty yellowish-gray sands, presumably of fluvial and deluvial (slope wash) origin. Locally, over areas of a few square meters, they change to light greenish. In some places, under bone remains, the sediments are black. Together with a distinct odor of swamp, this suggests the presence of organic matter of plant origin in abundance that could accumulate in the past in natural or human-made pits or depressions.

The sands display stratification close to horizontal. The layers, 0.5 to 1–3 cm thick, are cyclical. The entire series rises gradually (at an angle of 7–10°) from SW to NE. Small gravel and pebbles (0.5 to 1–3 cm) of sandstone, and much less commonly small grains of quartz, are found in the fossiliferous horizon. Locally, some rounded formations of calcium carbonate “loess dolls” occur under the bones. The thickness of the sediments, as exposed in 3 prospecting pits at excavations 1A, 1B (1.8 m below the cultural layer) and in the main 4th pit 3.45 m deep 30 m west of excavation 1C, exceeds 3.5 m.

In the eastern wall of the 4th pit, in the lower part of the sequence, a bone fragment not unlike the mammoth bone in texture was recovered from a gleyed interlayer with inclusions of coal particles. That may be considered an indication to the stratigraphic position of the cultural layer which is lithologically similar to enclosing sediments at excavation 1C. The gleyed interlayer with disseminated particles of charcoal is more than 40 cm thick, and may be attributed to the ancient hearth being eroded by slope wash.

6. Chronology

A fossil mammoth bone fragment dated by radiocarbon in the Gröningen University yielded the age of $20\,770 \pm 90$ BP (GrA-46004 Mammuth) (Obada and van der Plicht, 2010). That result is close to



Fig. 4. Hammerstones from the Upper Palaeolithic site of Valea Morilor.



Fig. 5. Position of bones and their fragments in clusters. Excavation 1A viewed from the north (total opened area is 495 m²).

the age of the first Paleolithic cultural layer of the Climauți II site in Moldova (Borziac et al., 2007): $20\,350 \pm 230$ BP (LU-2431).

As stated by Anikovich and Anisyutkin (2001, p. 321): “In Eastern Europe the end of the earlier part of the Upper Palaeolithic is usually thought to be associated with immigration of a part of Central European population – bearers of highly developed and specific cultural traditions (the Willendorf–Kostenki archeological culture). The culture came into being in the middle reaches of the Danube about 28 ka BP and appeared on the Russian Plain approximately 23 ka BP. Sites attributed to this culture are known from the Desna and Don drainage basins (Avdeev, Berdyj, Kostenki 1, layer I, Kostenki 13, Kostenki 14, layer I, Kostenki 18, Gagarino) to Moscow (Zaraysk site).”

It is quite possible that the second Paleolithic cultural layer of the Climauți II site (Borziac et al., 2007) dated as $24\,350 \pm 410$ BP (LU-2351) also belongs to this group of sites on the Republic of Moldova territory.

7. Lithic inventory

Seventy-two samples of flint pieces have been recovered from Valea Morilor site. They are made of gray semitransparent Cretaceous flint. No deposits of similar material have been found in the vicinities of the site, so it was likely imported from the Dniester River valley, most probably from its middle reaches. No traces of the crude

(initial) treatment of the raw material (flint), such as flint fragments, chips and primary flakes, are present on the site. It may be safely supposed that only finished objects were brought to the site, with a sizable proportion of implements or tools. Among the latter, noteworthy are an end scraper, a burin, a backed knife, five fragments of blades with intended retouch, three knife-like blades, and a flake with a retouch indicative of usage (Fig. 3, Obadă et al., 2011).

Another group of lithic objects consists of seven sandstone pebbles (Fig. 4) collected in the southwestern zone of excavation 1C. All are not *in situ* and were likely removed by a bulldozer from a destroyed cultural layer at the southern zone of this excavation. They are presumably related to the cultural layer of the site. The pebbles vary in size and configuration as seen from the following list:

1. The largest specimen (No. 1) made of less compact sandstone measures $75 \times 63 \times 40.7$ mm;
2. A sandstone pebble (No. 2), $96.3 \times 60.8 \times 65$ mm in size;
3. A fragment of pebble of foliated schist (No. 3), $80.5 \times 89.9 \times 33.2$ mm in size;
4. A sandstone pebble (No. 4), $63.8 \times 46 \times 22.7$ mm in size;
5. A hammerstone of fine-grained sandstone (No. 5), flattened-oval in configuration, with partly worn-out edges, $87.8 \times 49.6 \times 27.2$ mm in size;
6. A fragment of flattened pebble of compact sandstone, $100.1 \times 49 \times 33.3$ mm in size;
7. A short and solid pebble hammer (No. 7), $83.3 \times 53.9 \times 37.9$ mm in size.

A smaller-size quartz pebble ($37 \times 26.6 \times 17$ mm) was found in excavation 1C (grid square 9D); one end of the pebble is stricken off, and one of lateral surfaces bears a lengthwise scratch (27×7.6 mm).

It is not inconceivable that the pebbles served as a store of potential hammers for knapping flint. Part of the reserve was not used due a relatively short period of the site functioning.

8. Spatial organization of the bone remains in the site area

Bone remains of mammoths are found in clusters, with isolated bones and their fragments in between (Fig. 5). Some bones are found connected with each other; those are mostly vertebrae, ulna bones and radii. Some bones were crossed (Fig. 6), occasionally overlying one another (excavations 1A, 1C and 2).



Fig. 6. Two ribs lying criss-cross (excavation 1A).



Fig. 7. Accumulation of sorted large mammoth bones (tusk, femoral and pelvis bones and ribs) and an artificial cavity under the bones suggest the presence of some dwelling a kind of shed or shelter.

Of the mammoth skulls, only tusks were found: two whole tusks in excavation 1A (1440 and 1660 mm long and 70 and 80 mm in diameter respectively); one whole tusk 1116 mm long and 70 mm thick in excavation 1C (grid square 10C); some tusk fragment were also found in excavations 1 (1A, 1B, 1C) and 2. The tusks are relatively short and thin, which suggests female animals. In all probability, the skulls (with tusks already removed) were taken away by Paleolithic hunters as valued trophies to be used for dwellings or religious constructions. Such a usage of mammoth skulls is known from other Upper Palaeolithic sites of Eastern Europe: Climăuți II (Borziac et al., 2007), Mejirich, Mezin, Iudinovo et al. (Abramova, 1995; Gladkih, 2003).

One lower jaw was found teeth down in excavation 1A (with M_1 – M_2 ? replacement) and two jaws in the same position in excavation 1C (with replacement of M_1 – M_2 ? and M_2 – M_3 ?). The only finding in excavation 3 was a separate fragment of lower jaw with a fragment of M_1 or M_2 (?) molar.

A high concentration of bone remains was discovered in excavation 1A (square H-F/5–7), in its northwestern zone. It consists of a tusk (I^2), a femur and a fragment of pelvis bones, as well as ribs (costae) which could be interpreted as remnants of a wind-break or protective shelter (Fig. 7). The sediments underlying the bones are gray and black and smell of organics. Seemingly, there was a small human-made cavity (10–25 cm deep) probably filled with plants to form a floor. The construction could be a shelter for humans behind the wind-break. The arrangement of the mammoth tusk and bones resembles the assortment of large mammoth bones and stones, remnants of an aboveground dwelling, discovered at the Mousterian site of Chetrosy (excavation 1) in the middle reaches of the Dniester R., Ukraine (Anisyutkin, 1981, 2005–2009), attributed to the mature Mousterian culture and dated to ~90–60 ka BP (Anikovich and Anisyutkin, 2001–2002).

The cultural layer dimensions were determined from the size of the bone-bearing horizon. The maximum vertical spread of finds did not exceed 30 cm, considered to be a quite admissible degree of archeological material dissemination within enclosing rocks of fluvial origin. The cultural layer thickness varied in excavation 1A from 11 to 15 cm. In excavation 1B, the mammoth bone fragments, coaly mass and occasional flint objects formed a more compact

layer, with individual finds insignificantly varying in depth of occurrence. A charcoal lens in square F/7 occurred at a depth of 20 cm below the zero mark, and a flint flake in square O/18 at 29 cm. Positions of the other objects also indicates that the archeological and paleontological material was hardly displaced at all.

Judging from the character of the cultural remains occurrence, the site may be considered as a single-layered one, representing a relatively short period of time. The assortment of found objects suggests they were accumulated in the course of butchering (Obadă et al., 2011).

Most large bones were found with their epiphyses oriented either east–west or north–south. There are some overlapping clusters of bones. It seems possible that the main work on the carcass butchering took place in the morning or during the day. That would account for most of large bones being thus oriented (S–N or E–W). At sunrise, the animal carcasses would be more conveniently positioned for skinning and butchering so that the sunlight fell from east. Long tubular bones oriented north–south could be easily

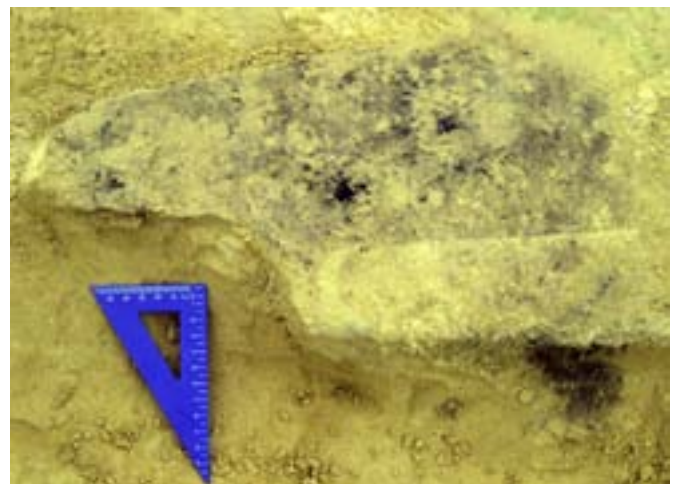


Fig. 8. Northeastern zone of excavation 1B, soil with ash patches and charred wood from a partly eroded fireplace.

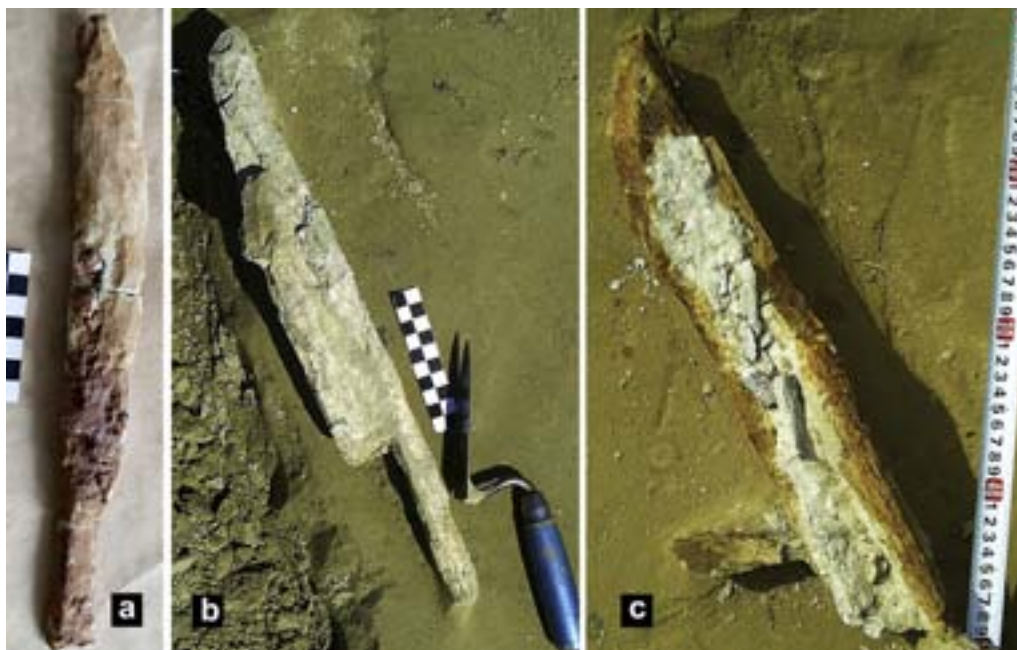


Fig. 9. Spear points: a – point of the light bone spear (excavation 1C), its narrow basal part being inserted into the spear shaft; b – thinned point “pointe à crane”, made from a splinted bone (excavation 1C), the basal part is cut to be fixed at the shaft; c – a point of a heavy spear made of split bone (excavation 1B), the sharp end is modeled using spiral cutting technique.

scraped on sides, while those turned to the east were scoured on the ends. The Paleolithic people had a clear notion about four cardinal points as early as the Mousterian (Gladkih, 2003).

9. Traces of fire

There are small charred pieces of wood found in all the parts of the excavation 1 (namely, 1A, 1B, 1C). Some mammoth bones also bear traces of fire treatment.

No pronounced ash patches have been found in excavation 1A, though there are charred bones. The charred wood fragments were found there only after the soil had been washed through sieves in search for microfauna.

An area distinct for a high concentration of ash patches was found in the northeastern zone of excavation 1B (Fig. 8), the patches being oriented either from north to south (9 m) or from east to west (7 m). There are numerous fragments of small charred bones and wood here. At the northwestern margin of excavation 1B was



Fig. 10. The bone dart points situated at right angle to the axis of four mammoth vertebrae (excavation 1C).

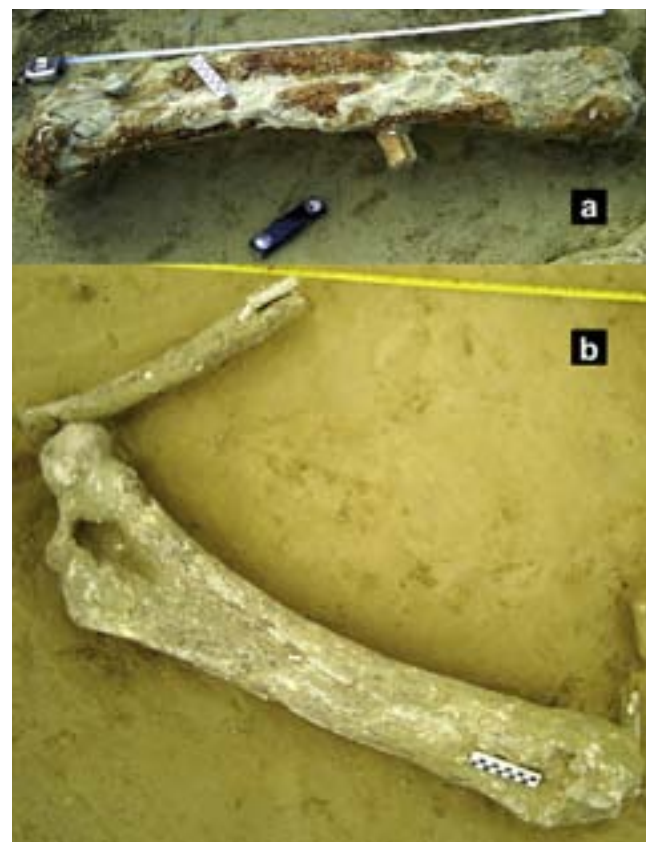


Fig. 11. Bone points were found in immediate vicinity of large tubular bones (excavation 1C): a – underneath them; b – and at distal or proximal zones, in places of the bones articulation.



Fig. 12. The assemblage of four dart points (excavation 1C).

a burnt rib of an adult mammoth. Farther east, within an area completely destroyed during municipal earth works, a single piece of bison horn was found along with some charred mammoth bones. It is quite possible that other mammoth bones as well as hearths could be found to the east of the northwestern zone of excavation 1C.

In excavation 1C there are blurred concentrations of exceedingly small fragments of charcoal, occasionally with hardly perceptible ash patches. Many bones bear distinct traces of fire (burnt spots), in particular on their lower surfaces. It seems they could result from torch wicks getting under the bones.

Two mammoth shoulder-blades burnt all over their down-looking sides were found in excavation 2, though neither charred wood fragments nor ash patches are present in this excavation. It is not inconceivable that they did exist in some adjoining areas destroyed by digging machines and had been transported from the fireplace (hearth).

An exploration pit (No. 4, 1.5 × 4 m) was dug 30 m west of excavation 1C. Accumulations of charred wood and ash patches were discovered at a depth of 2.80–3.15 m. The probable area of intensive human activities on the site exceeded 80 m from east to west. Assuming that bone remains recovered from excavation 2 (which is more probable) and those from excavation 3 (less probably) are directly related to excavation 1, it may be safely concluded, that the total area of human activities on the site measured more than 180–200 m from north to south.

10. Bone tools and bone treatment

Among the bones recovered from the Valea Morilor site, there are broken, cut and sharpened large fragments of tubular bones. They served as darts and points of heavy and light spears secured to shafts (Fig. 9a,b,c). The spears were used for inflicting deep wounds on the animals.

In excavation 1C, there have been found flat bone dart heads with acute, oblique and perpendicular cuts, some of them trapezoidal. A point (171.5 mm long and 33 mm wide) was found in the vicinity of a vertebra process (the first vertebra in the group of 4 isolated thoracic vertebrae) (Fig. 10). Such a bone dart point could be left after the hunter delivered a thrust to the fat hump of the animal, when it was falling on its forelegs exhausted by wounds and loss of blood, or had already dropped to its knees. In that case the hunter would be facing the fallen or falling animal.

Other bone points were found in the vicinity of large tubular bones, underneath them (Fig. 11a) and at distal or proximal zones, in places of the bones articulation (Fig. 11b). The points were arranged in that way about the bones not by chance: it seems possible that they become embedded in the animal's soft tissues (fat hump, muscles or joints) as a result of strong blows delivered by hunters.

A cluster of 4 dart points was found (Fig. 12). In common with some other points from the Valea Morilor site, they are noted for a flat trapezoidal configuration with a sharp tip cut obliquely.

Two long points of light spears made of ribs were found (Fig. 13a,b,c):

1. The lower lying point is flat and straightened, with traces of grinding (sharpening the tip); it is 338 mm long, 47.7 mm wide maximum and 27.5 mm thick, also maximum.
2. The second point is a harpoon. Its length along the middle arc measures 405 mm, and maximum width and thickness are 48 and 25.4 mm respectively. It overlies the first one at an oblique



Fig. 13. Two long points of light spears made of ribs were found lying criss-cross: a – *in situ*; b – view from above, c – underside view.

angle. When the enclosing soil was brushed off, the harpoon appeared to have grooves for flint blade fixing on lateral (upper and lower) surfaces and on the very tip of the tool. The length of the upper groove is 159 mm, that of the lower is 142 mm, their width is 9.9 and 16.5 mm respectively; maximum depth of the upper groove exceeds 1.5 mm. It is quite possible that the grooves were filled with microlites. Together with its arched outlines, that made it a very cunning weapon to thrust into animal's belly. It could inflict deadly wounds with the animal entrails flowing out. An isolated light bone spear point was found; its length being 302 mm, maximum width – 33 mm and maximum thickness 13 mm (Fig. 9a).

A hammer-like club (Fig. 14) 302 mm long and 40 mm wide at most, was made of a fragment of rib (*costae*) and radial bone (*os carpi radiale*). The proximal end of its shaft is cut obliquely so that it could be easily tucked under the belt for convenience. Its configuration is not unlike that of the ornamented hammer made of a reindeer antler found at the Upper Palaeolithic site of Yudinovo (Grigorieva, 2001–2002). The weapon could be used in defense from large carnivores (primarily wolves) while the carcass being butchered, or for other use (such as a musical percussion instrument).

In a heap of bones bearing distinct traces of cutting, was found a fragment of a mammoth tubular bone cut out in the shape of a blunt subtriangle (Fig. 15a,b). Its dimensions (measured lengthwise on the three lateral surfaces) are $>288 \times 153 \times 101.3$ mm, the maximum width is 42.5 mm, the maximum thickness is 35.1 mm. The shorter sides (“catheti”) were evidently finished by grinding



Fig. 14. Hammer-like club (excavation 1C) made of a fragment of rib (*costae*) and radial bone (*os carpi radiale*).



Fig. 15. Subtriangular smoother (polisher) of a kind, its two work surfaces being used for sharpening wooden or bone points (made from a fragment of mammoth tubular bone, excavation 1C): a – side view, b – view of the work surfaces (catheti).

and bear concavities in the middle of long axis. During the first days after the tool had been extracted from the sediments it displayed distinct traces of polishing (the fact was confirmed by the late archeologist, prof. I. Borziac, pers. comm. 2009), but the glance disappeared after the bone had dried. A similar phenomenon was noted on the open-air Upper Palaeolithic site of Zaraysk (Amirkhanov et al., 2009a,b, p. 188). The tool could probably serve as a smoother (polisher) of a kind, its two work surfaces being used for sharpening wooden or bone points. Its lateral subtriangular surface (Fig. 15a) is similar in configuration with that recovered from the Yelisseyevichi 1 site and published by Khlopatcev (2001, Fig. 1d).

Also found was a distal fragment of a large femoral bone (*femur*) cut in the form of an acute-angled triangle bearing traces of splitting on one side (303 mm long) and cutting on the other (407 mm long) (Fig. 16). Its tip was scraped over a length of 86 mm at the inner surface of the bone. Locally, the bone was slightly burnt.

A cluster of several flat bone fragments modeled by cutting in a “petal” form was found in the eastern zone of excavation 1C (Fig. 17). Their purpose is still unidentifiable.

11. Human-made holes in the large mammoth bones

During the works on excavation 1C, in its northwestern zone, 3 large tubular bones bearing traces of human-inflicted holes were discovered. At least one of them had been inflicted on the still alive animal. Below are given descriptions of the holes.



Fig. 16. A distal fragment of a femoral bone (excavation 1C), an acute-angled triangle in configuration, bearing traces of splintering on one side and cutting on the other (the pointed tip of the bone scraped on its inner side).

1. The left ulna (excavation 1C) was found with a hole in its left lateral proximal zone (Fig. 18). The hole is shaped as a narrow oval 18×4 mm in size. After the hole was partly cleaned, it appeared to be more than 32 mm deep. As the hole scanning has shown, it could be punctured with a trapezoidal point (Fig. 19). The question as to whether a tip of some stone or bone weapon still persists in the depth of the hole calls for further investigations.

Before the perforated mammoth ulna was found at the Valea Morilor site, there had been known two Paleolithic sites with unquestionable evidence of mammoth being actively hunted: namely, perforated bones with fragments of a hunting weapon. Those are two finds from the Kostenki site (the Voronezh Region, Russia): a) "... a fragment of flinty point stuck in the pectoral rib of a young mammoth found in the upper layer of Kostenki 1 site and dated to about 23 ka BP (Praslov, 1995); b) – a find of a point piercing the center of an adult mammoth frontal bone recovered from the same site that has not been described nor published as yet; and c) a laterally penetrated mammoth vertebra found at the Mamontovyi Ruchei (Mammoth Creek) site in Khanty-Mansiysk Autonomous Area, Russia (Maschenko et al., 2005; Maschenko, 2009; Anikovich et al., 2010).



Fig. 17. Several flat bone fragments modeled by cutting in a "petal" form (excavation 1C).



Fig. 18. The left ulna (excavation 1C) with a hole in its left lateral proximal zone.

2. About 30 cm north of the above described find (excavation 1C, grid squares 13G–14G) a left humerus was recovered, gnawed in its proximal part and bearing an obliquely dented hole in the proximal-median zone (Fig. 20). The hole has the shape of an acute elongate triangle. Assuming the still alive animal was stricken by a heavy spear with a massive point (Fig. 9c), the hunter would stand behind the back of the head or neck vertebrae of the animal that had already fallen on its right side.
3. The right femoral bone found in excavation 1C (grid squares 15B') bears an indented hole in the frontal proximal-medial zone (Fig. 11b). If this hole was also intravital, the hunter must have been to the right from the animal. A sharpened fragment of rib bone, supposedly, the point of a light spear, was found closely to the proximal part of the same bone. In its distal zone, also close to the bone itself, a trapezoidal dart point is found; in all probability, it became embedded in the cartilage zone of the joint. From the analysis of that bone cluster it may be concluded that the hunters intentionally aimed at the animals' joints in order to immobilize them as soon as possible. The shafts of weapons used by the hunters were made of bone or wood and certainly could not persist.

12. Mammoth hunting and catching technique applied by hunters at the Valea Morilor site

Variants of different processes used by Paleolithic humans in collecting bone remains, necrophagy, hunt and capture of mammoths were actively debated in the recent publications (Anikovich and Anisutkin, 1995, 2001, 2001–2002; Sergin, 2001; Patou-Matis, 2004; Pitulko, 2005–2009; Maschenko, 2009; Anikovich et al., 2010; Brugère, 2010). Supposedly, the hunting process at the Valea Morilor site took place in winter, in the evening or at night. Camouflaging did not require a great deal of time and efforts from the hunters: they could easily come closely to the animals as they already knew their routes. The group of hunters could attack several animals at the same time, as the latter moved in trail or as a dispersed group.

It is not inconceivable that the hunters could use some techniques of the so called "passive hunting" as suggested by Pitulko (2005–2009), with light and strong snares weaved from horse hair (which was a certain break-through in technology at that stage of the Upper Paleolithic). Other means of mammoth catching could be a trap for clutching at a mammoth trunk. A mammoth trapped in this manner would be limited in its movements, and after that the hunters could use their weapons, such as heavy spears with

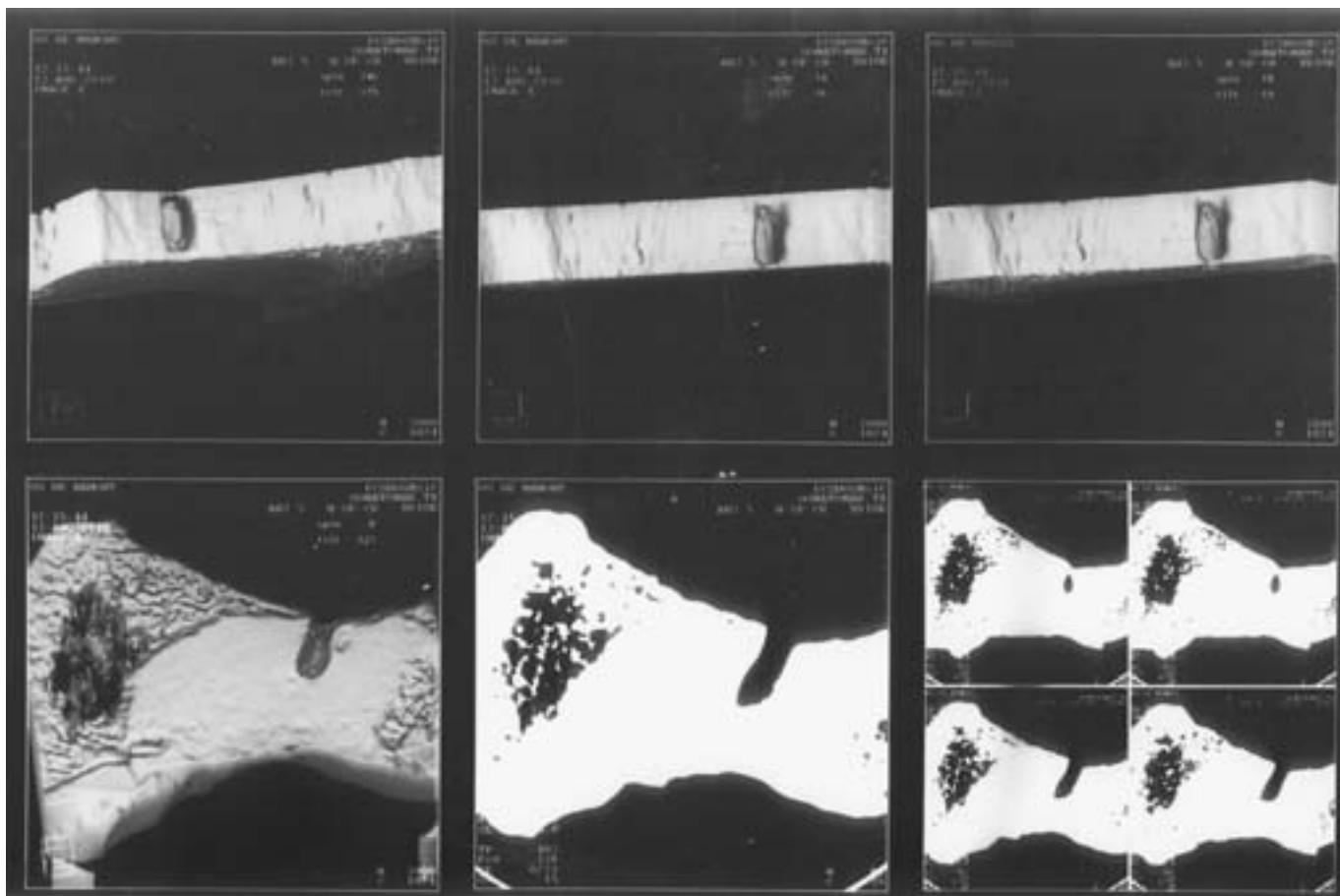


Fig. 19. X-ray picture of the mammoth left ulna, with results of the hole scanning.

massive points (Fig. 9c), light spears (Fig. 9a,b), darts (Figs. 10, 11a and 12), and arrows (Fig. 21).

13. Evidence of cults and rituals

An additional area in a form of rectangle (2×10 m) was cleared in the western zone of excavation 1C. Only one incised bone fragment cut in a shape of acute-angled triangle a few centimeters in size was found in the area. At the western end of the added area there was found a patch (0.25×0.9 m) bearing smears of rusty-red color. The coloration could be interpreted as traces of partly washed off red ochre that mammoth hunters used in their ritual ceremonies (Fig. 22).

A flat rounded or ground pebble of slate ($27.2 \times 25.6 \times 10.1$ mm), greenish-gray, was found in the southeastern zone of excavation 1C. One of its flat surfaces resembles a mammoth left profile in outlines (Fig. 23). The following features were noted: a) a relatively proportionally rounded high head; b) a trunk hanging down; c)

outlined shoulder and back zones; d) a short tail. The lower portions of legs are shown only tentatively, as a hollow in the lower middle zone. The rounded slate surface has some spots of dull rusty color (ocher?). The largest spot resembling a right triangle in outline is at the proximal part of the femoral bone, and other



Fig. 20. Left humerus with a dented hole and traces of gnawing (excavation 1C).



Fig. 21. Arrow point found in the area with patches of ash (excavation 1B).

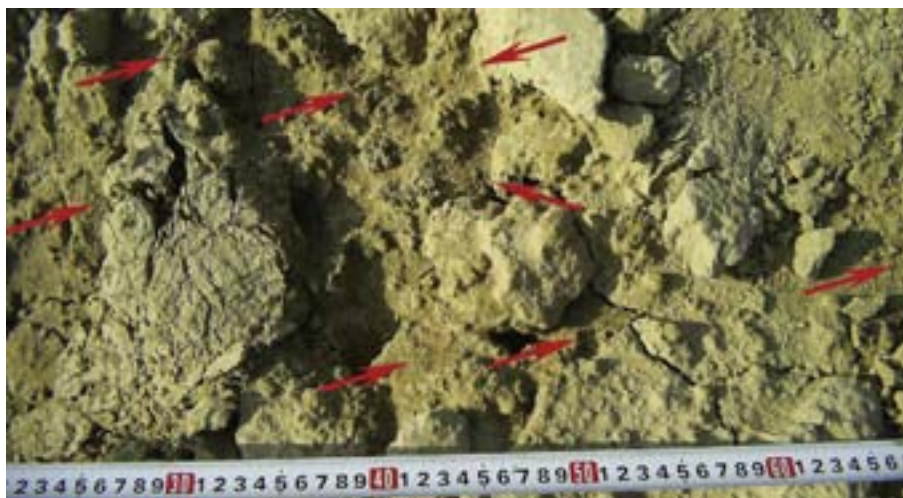


Fig. 22. Rusty-red smears in the western zone of excavation 1C, supposedly traces of red ochre, partly washed off. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

smaller spots correspond to the distal zone of humerus, ribs, heart and belly. No other small pebbles of slate have been found in the excavated area (1264 m²). The uniqueness of the object makes it possible that it was specially made, kept, probably transferred from one generation to another, and brought to the locality by the people. The amulet from the Valea Morilor site is not unlike in outlines and proportions to figurines found at the sites of Kostenki, Russia, and Predmosti, Tchech Republic (Vialou, 2004).

A pendent made of light grayish sandstone was found in excavation 1C (square 5C'). It measures 20.4 × 13.6 × 6.7 mm at maximum and resembles a bean in configuration (Fig. 24a,b). There is an incision 5.7 mm long and 1.8 mm wide at its concave surface, and it is cut obliquely across the long axis, rather close to one of rounded ends. On the opposite flattened surface, there are scarcely noticeable traces of another incision or a scratch also cut obliquely, dissymmetrical (mirror-like) with regard to the incision on the concave side. Those could be intended for a string, probably made of horse hair.



Fig. 23. Mammoth amulet made on flat plate of clay slate.

14. Microfauna

14.1. Small mammals

An analysis of the taken samples revealed remains of some small mammals, as follows: pika – *Ochotona* sp. (steppe pika – *Ochotona pusilla*?), two teeth; mole rat – *Spalax zemni* (Erxleben, 1777), skull, lower jaw, postcranial skeleton; steppe lemming – *Lagurus lagurus* (Pallas, 1773), a small fragment of tooth (M₂?). All found small mammal species inhabited open steppe-like landscapes. The modern steppe pika *O. pusilla* is distributed on the spurs of south Urals and surroundings steppes to the Saratov province. Also, this species is distributed in the Eastern Kazakhstan steppes. During the Late Pleistocene, steppe pika inhabited wide territories of the periglacial steppes as well as in Eastern and Western Europe (Markova and Kolfshotten, 2008). Modern Podolsk mole rat (*S. zemni*) is endemic to western and central Ukraine. At present, this species is distributed westward from the Dnieper River. The western boundary of the modern *S. zemni* range is the Dniester and Yuzhnyi Bug River basins. The typical biotopes of *S. zemni* are the open steppes, including sandy steppes.

Modern steppe lemming *L. lagurus* is distributed in southern forest-steppes, steppes and northern semi-desert from Dnieper River basin in the west to western Mongolia and China. The favorite biotopes for steppe lemming are steppes. This species and its



Fig. 24. A pendent made of light grayish sandstone: a – top left, concave side with an incision; b – convex side of the pendent.

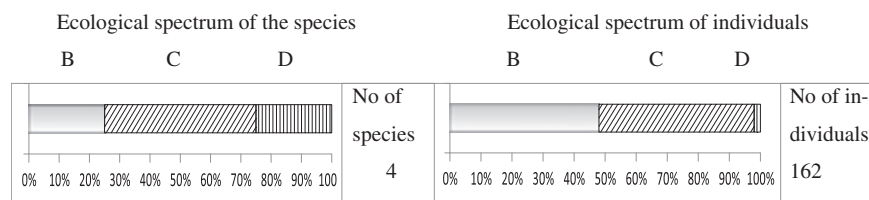


Fig. 25. Ecological structure of malacocenosis from cultural layer of site Valea Morilor.

ancestors were very widely distributed in open landscapes of Eastern Europe throughout the Pleistocene. Steppe lemming lived in open landscapes during Interglacials and Glaciations, when huge territories of Eurasia were occupied by periglacial open landscapes (Markova and Puzachenko, 2007). This species is one of the most important for Pleistocene stratigraphy and palaeogeography.

Thus, all small mammals found in the cultural layers of Valea Morilor site belong to the ecological group of steppe mammals. This indicates the prevalence of steppe-like landscapes near the site during Paleolithic habitation.

14.2. Terrestrial molluscs

The remains of terrestrial molluscs in most cases are found in sediments that include traces of Paleolithic humans in open sites in the Dniester river basin. The interest in these fossils is conditioned by the fact that their modern representatives are confined to certain habitats.

Shells of 162 terrestrial molluscs were found (Prepelitsa et al., 2011). The malacocenosis identified includes 4 species: *Helicopsis striata* (Mull.) – 78 molluscs; *Pupilla muscorum* (L.) – 73 molluscs; *Vallonia pulchella* (Mull.) – 7 molluscs; *Succinea oblonga* (Drap.) – 4 molluscs. Read phonetically. All of them are present in actual malacofauna of given latitudes and have different ecological and zoogeographic peculiarities (Table 1).

H. striata (Mull.) is an inhabitant of dry warm meadows and is spread in Western and Central Europe. *P. muscorum* (L.) and *V. pulchella* (Mull.) are found in various habitats, mainly open, and have a Holarctic distribution. *S. oblonga* (Drap.) inhabits forests and bushes, an Euro-Asian species (Liharev and Rammelmeier, 1952; Liharev and Rammelmeier, 1952). The last three mollusc species are often found together in modern habitats (Grossu, 1955).

Based on the methodological principle of paleogeographic analysis of continental molluscs proposed by Lozek (1964), most of the remains in the fossil malacocenosis belong to *H. striata* (Mull.), representative of the steppe ecological group, and to *P. muscorum* (L.) and *V. pulchella* (Mull.) – inhabitants of open habitats whose ratio is respectively 48% and 50% (Fig. 25). Such malacofauna are common for loess deposits of Prut-Dniester interfluve to the south of 48° N (Prepelitsa, 2002). The composition and ecological structure, in which the leading role has the steppe form *H. striata* (Mull.), indicate the development of meadow-steppe landscape in the surroundings of the site. The absence of aquatic representatives in

the malacocenosis indicates that the area was not inundated, although the presence of shells of *S. oblonga* (Drap.) may indicate the proximity of a pond.

The accumulation of sediments, including cultural remains, occurred in subaerial conditions, with the main role of deluvial processes. In this case it can be assumed that they were rather intense, as indicated by the good preservation of the shells, because of their rapid preservation from weathering. The weak manifestation of soil formation processes during the formation of the cultural layer also facilitated preservation, because under their influence the shells of land molluscs are usually destroyed, especially the thin-walled species from genera *Pupilla* and *Vallonia*.

Thus, based on the ecological composition and taphonomy of fossil communities of terrestrial gastropods, we the mammoth hunters from Valea Morilor lived in a relatively dry periglacial climate, which caused the development of specific paleolandscapes around the loess steppe.

15. Conclusions

- I. A new short-term Paleolithic site has been discovered bearing reliable evidence of the mammoth hunting and carcass butchering. The excavations of 2009–2010 opened an area of 1264 m².
- II. More than 550 mammoth remains and a fragment of bison horn were collected. From the preliminary analysis, the remains belong to at least 6 animals. Microfauna is represented by a rather meagre collection of small mammals and a more representative assortment of terrestrial molluscs. The lithic inventory includes 72 flint objects, several hammers of sandstone, and one made of quartz.
- III. Three radiocarbon dates (¹⁴C) of the fragments of fossil bones of mammoths performed in the Groningen University gave very similar results: in the excavation sector Nr.1 – 20 770 ± 90 BP (GrA-46004; Obada and van der Plicht, 2010); the sector Nr.2 – 20 570 ± 80 BP (GrA-52424); and the sector Nr.3 – 20 560 ± 80 BP (GrA-52425). These dates correspond to the interval of maximum cooling within the last glacial epoch, when the southern boundary of the mammoth range shifted southwards. It was since that time that mobile groups of mammoth hunters began to penetrate from Central Europe into steppes north of the Black Sea, as well as into the valleys of the Dniester and its tributaries. It is still difficult to attribute them to a certain archeological culture, though even now it seems possible that they could be related to the bearers of epi-Aurignacian traditions (Obada et al., 2011).
- IV. Many bones bear traces of cutting (mostly straight across or obliquely to the bone axis), as well as of splitting, grinding, scraping. Bone points of darts (javelins) and spears found very close to large bones suggest their penetration into the animal soft tissue as a direct result of the hunting activities of Paleolithic humans. Dart and spear points cut from reindeer antlers, bone, tusks have been recovered from numerous Palaeolithic sites of various age (Bordes, 1968; Anikovich and

Table 1

Species composition, quantity of shells and ecological features of molluscs from the site Valea Morilor.

No	Species	Quantity of remains	Ecological group (by Lozek, 1964)
1	<i>Helicopsis striata</i> (Mull.)	78	Steppe
2	<i>Vallonia pulchella</i> (Mull.)	7	Unforested biotopes
3	<i>Pupilla muscorum</i> (L.)	73	(in general)
4	<i>Succinea oblonga</i> (Drap.)	4	Forest and open wet biotopes

Anisyutkin, 2001–2002; Khlopatchev, 2001–2002, 2006; Patou-Matis, 2004; Gaudzinski et al., 2005; Borziac et al., 2006, 2007; Piel-Descruiſseaux, 2007; Amirkhanov et al., 2009a,b; Bolus, 2010; Cărciumaru et al., 2010; Sinitsyn, 2010; et al.); those of wood were described by Müller-Beck (2010).

There is no question that the hunters of the Valea Morilor site used prehardened wooden spears with sharpened points, although they could not persist due to specific taphonomic conditions. Of the three large mammoth bones with holes, at least one suggests that the blow was inflicted when the animal was still alive. The site is the third discovered Paleolithic site with reliable evidence of early human hunting for mammoths, after the Paleolithic sites of Kostenki and Mamontoviſi rucheſi (Maschenko et al., 2005; Maschenko, 2009; Anikovich et al., 2010).

- V. Summing up the field and preliminary laboratory results of the works performed at the Upper Paleolithic Valea Morilor site, the site belongs to the type of short-term hunter camps. Its location was unquestionably predetermined as a place promising a successful hunt for mammoths, the main object of the Paleolithic hunting. The findings occur in a single horizon, also suggesting a short duration of the hunters' presence at the site. Other supporting evidence is a limited assortment of stone tools: the latter seemingly were brought to the locality ready to use from outside. The same is indicated by a limited assortment of operations the tools might be used for. They were mostly butchering and skinning of the game and wood processing (Obadă et al., 2011). Quite probably, implements carved of bone were also important for the hunting and domestic activities of the camp inhabitants. At least one wind-breaking shelter was probably constructed. That construction of the mammoth bones presents the southernmost and oldest of all the Upper Palaeolithic sites on record.

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