East Gravettian Khotylevo 2 site: Stratigraphy, archeozoology, and spatial organization of the cultural layer at the newly explored area of the site

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ARTICLE INFO

Article history:
Available online 30 September 2014

Keywords:
Khotylevo 2
Upper Paleolithic
Eastern Gravettian
Spatial organization
Anosovka-Mesin type dwellings
Upper Pleistocene mammalian fauna

ABSTRACT

The present paper discusses the spatial and stratigraphic analysis of an assemblage of archeological remains from the newly found point B (lettered in Cyrillic) of the Eastern Gravettian site Khotylevo 2. The new find was discovered by the Khotylevo Archaeological Expedition in 2005. The cultural layer of the site relates to a level of initial soil formation at the base of the Desna loess horizon. The stratigraphic position of the cultural layer at point B is typical of the entire Khotylevo 2 site and does not differ substantially from those at points A and B. Currently, two closely related assemblages of archeological remains have been discovered at point B over an area of 45 m². The first assemblage is noted for the presence of rounded shallow pits and embedded mammoth bones surrounding concentrations of bone coal; it also contains split animal bones, and flint splinters. Similar assemblages were discovered by F.M. Zavernyaev during the excavations at Khotylevo 2 in the 1970s. The second assemblage is marked by large clusters of intentionally arranged bones of woolly mammoth (Mammuthus primigenius). There is a certain pattern traceable in the bone arrangement, similar to those observed in mammoth bone structures of the Anosovka-Mesin dwellings. Microstratigraphic correlation of the two assemblages considered together with the radiocarbon dates strongly suggests them to be of different ages. The most abundant bone remains within the studied area belong to woolly mammoth. The list of mammal species identified from this site shows no significant difference from species lists known from other sites of the Russian Plain dated to the same chronological interval. The scarcity of bones belonging to other herbivorous mammals may be due to the fact that no butchering was performed at this part of the site. The abundance of mammoth bones does not directly indicate simultaneous overkill of those animals; it is quite possible, however, that individual animals were killed periodically.

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1. Introduction

The Upper Paleolithic site Khotylevo 2 is situated 400 km SSW of Moscow and 25 km NW of Bryansk (Fig. 1). The site was discovered in 1968 by F.M. Zavernyaev (Zavernyaev, 1974) who continued the excavations from 1969 to 1981, with a few interruptions. In 1993 the field excavations were reopened by the Khotylevo Archeological Expedition (hereafter referred to as KhAE) of the Institute of Archeology, Russian Academy of Sciences.

Prior to the 2000s, the studies of Khotylevo 2 were mostly based on the results of excavations performed in the part of the site adjoining the valley slope (Zavernyaev, 1974; Gavrilov, 2008). It was as early as in the 1970s, however, that a team of researchers under the direction of A.A. Velichko (Velichko et al., 1977) discovered the presence of a cultural layer on the plateau at some distance from the valley To verify the information, test pit No. 5 was dug by the Khotylevo Archeological Expedition (IA RAS) in 2003, and the exposed sequence appeared to include a cultural layer abounding

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http://dx.doi.org/10.1016/j.quaint.2014.08.020
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in archeological remains. The new area of the cultural layer was designated as “point B”. It is at some distance from the Desna valley slope and 50 m south of the 1981 excavation by F.M. Zavernyaev. It was excavated between 2005 and 2011 (Gavrilov and Voskresenskaya, 2012).

2. Geomorphology and stratigraphy

The Khotylevo 2 site is located near the edge of the watershed plateau on the right side of the Desna R. valley, about 20–25 m above the water level (Fig. 2). The valley side rises steeply above the Holocene floodplain level. The relative elevation of the highest point on the watershed plateau above the river channel is up to 60 m. The watershed surface is gently rolling and densely dissected by an erosional network. The erosional landforms related to the Desna floodplain vary widely in size and cross-profile, from long well developed flat-bottom valleys (“balkas”) penetrating deeply into the watershed area to smaller V-shaped ravines; the latter cut the valley side into a series of regular protrusions (“promontories”) facing north. At present the cultural layer attributable to Khotylevo 2 was found in four points lettered in Cyrillic as А, Б, Г, and І (Fig. 2). The stratigraphic sequence of the loess, paleosols, and cryogenic horizons dated to the Late Pleistocene is practically identical in all four points (Voskresenskaya, 2007; Voskresenskaya and Gavrilov, 2011).

The bedrock in the Desna drainage basin is Middle Jurassic and Upper Cretaceous. The present-day Desna channel cuts Jurassic (Callovian) black clays extending below the water edge near Khotylevo village (Geological..., 1998). The Upper Cretaceous sediments are represented by Cenomanian quartz-glaucolithic sands with phosphorite nodules exposed near the base of the recent river valley side about 1–2 m above the water level in the Desna channel. They are overlain with Turonian chalk and marls including grayish-black siliceous concretions. Directly on the top of Turonian rocks there are loess-paleosol-cryogenic series accumulated during the last glacial–interglacial cycle. The thickness of the subaerial series excavated at point B is 6.4 m (Fig. 3). In the upper part of the sequence (layers 1–3) there is a modern gray forest soil with horizons A1arable – A – B – Bt developed on the loess-like sandy loam attributed to the Altynovo loess horizon (layer 4) (Velichko et al., 2010). The Holocene soil-forming processes exerted a noticeable influence on the loess-like sandy loams to a depth of 1.5 m. In the excavations close to the valley slope, there are clearly distinguished funnel-shaped structures (standing out sharply due to oxidized interlayers of the illuvial horizon Bt) – the upper parts of huge ice-wedge pseudomorphs penetrating to a depth of 5 m. In the sequence of loess-like deposits (layers 4, 6, 8) up to 4.7 m thick, there are discernible intervals when sedimentation slowed or completely stopped (layers 5, 7). Traces of weakly pronounced soil formation are noticeable at a depth of 2.3–2.5 m. The resulting profile consists of a shallow humus horizon and carbonate accumulation with a characteristic tongue-like lower boundary. The described level is correlatable with the Trubchevsk soil-formation level dividing the Altynovo loess from the lower-lying Desna loess horizon. In the sandy loam of layer 6, there are thin lenses with a noticeable, though varying, admixture of sand, indicative of activated processes of slope wash. The gradient of the lenses suggests that the most active wash was directed eastwards (lenses dipping at an angle of 5–7°) at all the stages of loess accumulation, towards the depression at the head of a gully. It may be suggested that the depression east of the excavation already existed at the time of the site functioning and later, after it had been abandoned. The interlayers oriented northwards, towards the Desna valley, occur almost horizontally or at an angle no more than 2°.

The horizon of bluish-gray silt at a depth of 3.6 m fringed with iron oxide at the lower boundary (layer 7) probably indicates the position of the former active layer. There is a fine grid of oblique frost fissures traceable from the top of this horizon downwards, as deep as the cultural layer, and breaking the latter into polygons 30–50 cm across over the entire excavated area.

The boundary between the sterile loess-like deposits of layer 8 and the cultural layer is marked with isolated lenses of medium-to fine-grained quartz sand. This is evidence of the slope wash activation after the site stopped functioning. The cultural layer itself does not bear traces of distortion and deformations correlatable with the period of the early human habitation at the site.
Occasional fragments of weathered bones occur in the gleyed loam from a depth of 4.6 m. The majority of findings are concentrated 5–10 cm lower, in a horizon of dark-brown light silt 2–4 cm thick, rich in organic matter. The humified interbed is broken into fragments slightly displaced relative to each other by subvertical fissures penetrating from layer 7. At the level of the cultural layer, individual fissures are widened and form funnel-shaped bulges filled with humified loam from the bone-bearing interbed. Above the humified interbed, there are some dark brown lamina plunging towards large bones. The enclosing material is grayish-yellow moist silt with gleyed and oxidized spots scattered over the layer and occasional inclusions of bright-blue vivianite. Some finds are recorded below the main concentration zone, in the heavily gleyed silty loam underlying the cultural layer, which could result from the material being entrapped into fissures. The cultural layer is underlain with heavy clay loam, gray with yellowish hue (layers 10–12). There is another weakly pronounced soil-formation level at a depth of 4.5 m, very similar in structure to the bone-bearing one, although lacking artifacts (layer 11). The humified loam of layer 13 containing abundant debris of flint and chalk crumbs lies directly on the irregular surface of the Cretaceous bedrocks. In essence, it is displaced and cryoturbated pedosediments of the Bryansk and Mezin paleosols.

The general stratigraphic situation strongly suggests the cultural layer in point В developed immediately after the Bryansk interval. The Late Valday loess-paleosol-cryogenic series similar to those enclosing the cultural layer of the Khotylevo 2 site formed in the periglacial zone of the Valday ice sheet under cryoarid conditions (Morozova and Nechaev, 2002; Velichko et al., 2006). The human occupation of the site was related to a transitional interval from a relatively warm middle Valday megainterstadial (MIS 3) to the coldest and most severe conditions of the late Valday maximum cooling (MIS 2). The immature soil horizons found at the Paleolithic site, including that with the cultural layer, indicate stages of various duration marked by a reduced rate of loess accumulation or slightly milder climate within the late Valday interval. Each of those stages terminated with a renewal of the loess accumulation and frost fissuring (Voskresenskaya and Morozova, 2009).

3. Spatial organization of the cultural layer

During the course of the investigations at point В, the cultural layer was studied in two sectors — A and B over an area of 45 m² altogether (Fig. 4). The discovered archeological materials included isolated mammoth bones and bone fragments arranged in sizes and anatomical groups, collections of flint artifacts, and charcoal, as well as isolated coals and debitage, ocher spots, and artifacts of bone and ivory. In accordance with the present-day topography, the surface of the cultural layer was distinctly tilted towards north and east.

The studied area is clearly divided into two concentrations, referred to as assemblages, of interrelated archeological remains which correspond, with a few exceptions, to the division of the studied area into excavations A and B. The subsequent description of the spatial structure of the cultural layer is performed from north to south. First, we describe the assemblage recorded in sector В (squares А-Д/1′-4′). Next, we describe the assemblage coming mainly from sector А (squares А-Д/1′-3′; В/1′-2′) and partly from the southwestern (sq. А/1′-3′; В/1′-2′) and southeastern (sq. Д/1′) sectors of sector В.
Fig. 4. Khotylevo 2 site, point В. Combined scheme of sectors А and Б. The black-filled outlines are objects of split flint, diagonal hachure and dots — concentrations of bone coal, split flint, and fragmented bones.
The spatial organization of the cultural layer over most of sector Б (Fig. 5) is determined by the distribution of cultural objects belonging to the following categories: a) pits numbered sequentially as 4, 5, and 6 in northwestern, central, and northeastern sectors, respectively; b) concentration of bone coal in sq. Б-В/1’ recorded south of pit No. 5; c) concentration of bone coal, debitage, fragmented animal bones, and ochre west of pit No. 6 (sq. Б-В/4’); d) concentration of bone coal, debitage, and ochre east and southeast of pit No. 6 (sq. Д/4’); e) ochre and concentration in sq. Г-Д/3’; f) mammoth bones intentionally embedded in the ground by the site dwellers in vertical or oblique position.

Pits discovered in sector Б are round or close to oval in outline, with sloping walls and flat bottom. Their depth ranged from 7 cm (pit No. 6) to 10 cm (pits Nos. 4 and 5). The majority of bone and bone fragments found in all pits belong to woolly mammoth *Mammuthus primigenius* (Blumenbach 1799). Another characteristic common to all pits was the presence of ochre forming sizeable concentrations at the bottom of pits Nos. 4 and 5 and in the middle part of pit No. 6. A distinctive feature of pit No. 6 was the abundance of debitage and bone coal. This may be attributed to the position of pit No. 6, found in the direct vicinity of concentrations of such archeological materials. The pits were arranged over the excavated area in such a way that in plan view they formed a circular arc around the concentration plotted in sq. Б-В/4’ (archeological object c). In the eastern part of the concentration, near pit No. 6, two objects of art were found: a double female statuette (Fig. 6: a) and a schematic anthropomorphic figurine (Fig. 6: b) carved of chalk.

Formerly, the embedded mammoth bones were considered to be an element of a construction that served to secure the base of the poles forming the dwelling frame (Shovkoplyas, 1965; Pidoplichko, 1969; Zavernyaev, 1974; Gavrilov, 1998; Sergin, 1998; Trusov, 2011). After studying similar objects in sector Б, however, the newly obtained data altered our views on the function of these bones. In the southeastern sector of grid square Д/2’, a group of mammoth bones fixed in the ground was found, the medial part of the bones having been previously fragmented. Directly below was a pre-core covered in ochre. Half a meter to the north of the first group, in the southern part of square Д/3’, another group of embedded long mammoth...
bones was found, also deliberately fragmented. The bone ends rising above the former day surface bear a blotchy ochre coloration. A quartzitic hammerstone occurred directly under the bones. West of the groups of bones, in the eastern sector of square G/3, there was a pendant made of bear canine (Gavrilov et al., 2013) stuck into the ancient day surface, and heavily stained with ochre. Next to it, a double female statuette, b — a schematic figurine.

Fig. 6. Objects of art from sector Б: a — a double female statuette, b — a schematic figurine.

A quartzitic hammerstone occurred directly under the bones. West of the groups of bones, in the eastern sector of square G/3, there was a pendant made of bear canine (Gavrilov et al., 2013) stuck into the ancient day surface, and heavily stained with ochre. Next to it, a double female statuette, b — a schematic figurine.

The southern edge of the bone accumulation was in squares G/3 and Г/4. In this part, three skulls of an adult mammoth were found, rather poorly preserved, as well as a number of fragments of postcranial bones. The surface the mammoth skulls lay on in sq. Г/3 was colored with ochre, as were all the scapulae found in sq. Д/1-3.

South of the central tusk, in sq. B/5, pit No.2 was discovered in 2005. The pit was circular in plan, 80 cm in diameter, about 16 cm deep, with sloping walls. Above the pit, there was a cluster of faunal remains, including various complete and fragmented mammoth bones. A group of mammoth foot bones in anatomical position formed the central element of pit No.2, with two mammoth ribs on each side of it. Two mammoth vertebrae occurred between the foot bones and a rib. Another anatomical group consisting of mammoth tail vertebrae was found in the SW sector of sq. B/5, near the aforementioned cluster. Adjacent to it there was a small spatula with shaped head carved from a mammoth rib (Fig. 8). Under the mammoth foot bones was another bone accumulation consisting of three long bones of the animal’s leg arranged in the form of a three-rayed star. Long bones and vertebrae of the mammoth were put directly into pit No.2.

Another additional bone cluster was discovered in sq. A-B/2-3. From north to south, the bones were arranged as follows: bison scapula; adult mammoth scapula with a man-made perforation at its distal edge; and a mammoth pelvis. There were two mandibles of an adult mammoth, as well as a shoulder blade partly overlain with a crushed mammoth skull, the latter being laid frontal side down. West of the pelvis bone, two mammoth scapulae were placed at the excavation boundary, one of them overlaying a complete femur and a tusk of mammoth. Under the cluster of the above-listed bones there was a large elongated cavity, pit No.3, up to 2 m wide. The aforementioned femur was part of the infilling of the pit, and was tilted NW.

The archeological assemblages described from sector A and Б differ not only in their spatial organization and inner structure but also in the stratigraphic position of the assemblages within the cultural layer of the site. The most significant picture of their interrelationship at a microstratigraphic level can be seen in the profile of southern wall of sector Б (Fig. 9), l, and in the northern...
wall of sector A. Three levels with archeological and paleontological findings were identified in the latter:

1) Dark brown silty loam, weakly humified, broken by fissures into separate blocks, with small weathered bone fragments; the level of buried cultural layer;

2) Horizon a – an interlayer of gray-brown humified silty loam up to 3 cm thick, inclosing lenses of bone coal, occasional flint and bone fragments; it is underlain with gleyed silt, practically sterile, most probably removed from pit No. 5 (Fig. 9, I, II, left).

3) A narrow, slightly tilted eastwards strip of gray-brown humified material, composed of separate small lenses 2–3 cm thick; the lenses enclose fragments of bones up to 1.5 cm long and smaller bone material; some gleyed spots are seen – horizon b (Fig. 9, I, II, left).

Horizons a and b have been also traced into excavation B, sq. B/B/1'-2', in its part closest to the above-described northern wall of sector A, that is western shield of microprofile (Fig. 9, II, right). Horizon a rich in bone coal, related to a coal concentration recorded south of pit No. 5 in square B/1'. In addition the coal concentration contained scattered bone fragments and objects made of flint. Under the concentration there was a thin lamina of humified silty loam associated with occasional fragments of unidentifiable bones.
and split flint. The lamina was separated from the coal concentration by a unit of colorless silty loam about 1 m thick and corresponded to horizon b of the stratigraphic profiles. In excavation B, this horizon was traced over squares B-Г/1' and Б/2'. In the north it was cut through with pit No. 5, with material filling this pit wedging out at a level of horizon a. Accordingly, concentrations of animal bones and the dug-in objects of excavation A were recorded at a level of horizon I.

We will not give a detailed analysis of the stone implements excavated from Khotylevo 2 point B, since this will be the focus of a future publication. The lithic assemblages from both excavated sectors display practically identical technological and morphological characteristics. The total number of lithics collected from the 2003–2011 excavations amounts to 2229 items. These include core blanks, core reshaping flakes, primary flakes, and partings of the raw material. Hence, the entire cycle of primary knapping of flint and its usage had been performed within this area.

There are 235 tools of flint, which is about 10% of the entire collection (Fig. 10). The most representative series of implements include burins, end-scrapers, various points on blades, and microtools, such as microblades and backed bladelets. There are occasional finds of Kostenki-type knives, including one of a classic variant of the type, which is not typical for the Khotylevo 2 assemblage. One of the recovered implements may be considered as a fragment of leaf-shaped point of the Kostenki type. On the whole, the assortment of tools is characteristic of this Paleolithic site. The presence of the leaf-shaped point and the typical Kostenki knife in this assemblage suggests a certain variability in the material culture of the site.

4. Radiocarbon age of the cultural layer

A series of radiocarbon determinations were obtained for Khotylevo 2, point B, under the auspices of the AHOB project (U.K.) and the sub-project “Radiocarbon dating of the European Gravettian” led by one of us (KD) as well as Tom Higham (University of Oxford) and Rob Dinnis (University of Edinburgh).
The material selected was animal, from various areas of the site (the location of the samples is shown in Fig. 11 and details are given in Tables 1 and 2. Some of the samples were previously conserved with a PVA consolidant. These samples were treated with an additional preparation protocol (immersion in acetone and methanol), prior to the routine ultrafiltration protocol performed at the Oxford laboratory.

In Fig. 11c, we attempted to estimate the absolute duration of the occupation on sector B, which is better dated than that of A. The Bayesian model suggests that the occupation lasted between 0 and 300 years (68.2%). Due to the nature of radiocarbon and the relatively small number of new determinations from the site, it is likely that this interval is largely overestimated in the aforementioned estimate, and we are probably looking at a much shorter occupation span, in the range of a generation or even less. All the three points from the Khotylevo 2 site (A, B, and C) appeared to be of almost identical 14C age, as this has been confirmed by the new series of radiocarbon dates from point B, which were produced using state-of-the-art methodologies.

Table 1
New radiocarbon determinations for bone samples from Khotylevo 2, point B (sectors A and B). See text for details.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Site</th>
<th>Lab code</th>
<th>14C (BP)</th>
<th>±</th>
<th>Material</th>
<th>Species</th>
<th>Context details (year of excavation, sector, square, depth mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khot2-1-2012</td>
<td>Khotylevo 2, point B, sector A</td>
<td>OxA-27000</td>
<td>23,470</td>
<td>170</td>
<td>Bone</td>
<td>Large mammal</td>
<td>XA‘3-2005/P-A/[T-1]-873</td>
</tr>
<tr>
<td>Khot2-9-2012</td>
<td>Khotylevo 2, point B, sector B</td>
<td>OxA-27223</td>
<td>23,050</td>
<td>150</td>
<td>Bone</td>
<td>Wolf</td>
<td>X-2010/104/P/6-3/PT4/-877</td>
</tr>
<tr>
<td>Khot2-12-2012</td>
<td>Khotylevo 2, point B, sector B</td>
<td>OxA-27224</td>
<td>23,160</td>
<td>160</td>
<td>Bone</td>
<td>Bird</td>
<td>X-2010/107 or 108/P/8-2/PT5/-881</td>
</tr>
<tr>
<td>Khot2-13-2012</td>
<td>Khotylevo 2, point B, sector B</td>
<td>OxA-27225</td>
<td>22,720</td>
<td>150</td>
<td>Bone</td>
<td>Large mammal</td>
<td>X-2010/51/P/[T-4]/PT6/-876, -889</td>
</tr>
<tr>
<td>Khot2-17-2012</td>
<td>Khotylevo 2, point B, sector B</td>
<td>OxA-X-2500-11</td>
<td>23,020</td>
<td>210</td>
<td>Bone</td>
<td>Rangifer tarandus</td>
<td>X-2010/51/P/[T-4]/PT6/-894, -898</td>
</tr>
<tr>
<td>Khot2-5-2012</td>
<td>Khotylevo 2, point A, sector 13</td>
<td>OxA-27001</td>
<td>23,240</td>
<td>160</td>
<td>Bone</td>
<td>Mammoth</td>
<td>XA’x-1997/F: 13/1/-1028, -1027.5</td>
</tr>
<tr>
<td>Khot2-6-2012</td>
<td>Khotylevo 2, point B, sector B</td>
<td>OxA-27002</td>
<td>22,900</td>
<td>150</td>
<td>Bone</td>
<td>Mammoth</td>
<td>XA’x-2002/P-L/B-4/-1063</td>
</tr>
</tbody>
</table>

Seven determinations were obtained, all of which show significant consistency. Six of the new determinations come from sector B, and one from sector A. When calibrated (using IntCal13) the single determination from sector A (OxA-27700) falls between 27.9 and 27.4 ka cal BP (95.4%), while the series from sector B lies between 27.5 and 26.6 ka cal BP. Although it is difficult to be confident about the absolute temporal relationship of the two sectors without more determinations from point A, if we combine our stratigraphic observations from the cultural layer at both sectors, we may suggest that the archeological assemblage revealed on sector A is slightly older from that of sector B.

Using the OxCal platform, we have modelled the results from sector B as belonging to a single phase. This allowed us to estimate the most likely start and end dates of the occupation of that sector (B) and also calculate the duration of the phase, and compare it to the single determination from sector A. The results are shown in Fig. 11a–c.

Fig. 11a shows the modelled results from point B, sector B, and the calibrated determination from sector A. The results from sector A are statistically identical and fall between 27.5 and 27.1 ka cal BP. This places the occupation of sector A at the very end of the short interstadial 3 and most likely at the beginnings of the following cooling (stadial) conditions on the Greenland oxygen isotope record. In contrast, the result from sector A, at 27.8-27.4 ka cal BP, also shown in Fig. 11a falls well within the interstadial 3.

In Fig. 11b, an estimate of the occupation of sector B is compared to OxA-27700 from sector A, which confirms our hypothesis that sector A is slightly older by a couple of hundred years. The two age estimates overlap at the 2σ (95.4%) level of confidence.
5. Preliminary data on the large mammal fauna

The assemblage is dominated by mammoth. Calculations of mammoth teeth and bones followed standard methodologies. Both data obtained from teeth and postcranial elements calculate the total number of individuals present at the site. Teeth replacement and morphological characters of the postcranial bones demonstrated that all ontogenetic groups are present at the Khotylevo mammoth bone assemblages. Adult individuals (both male and female) as well as subadult individuals and calves have been identified previously at other sites of Khotylevo (Maschenko, 2002; Maschenko et al., 2006). The vast majority of mammoth bones and bone fragments at Khotylevo 2 belong to adult animals. Only three mammoth calf remains have been identified on the excavated part of the site, one individual 1–2 years old and two ~2–4 years old; in addition, two fragments of bones were tentatively attributed to a fetus of the same species. The individual age of the young animals was determined using the method developed by Maschenko (2002).

Specifically at Khotylevo 2 (point B), a large number of large mammal remains (more than 2188) have been recovered between 2005 and 2011. The total number of the mammal remains found at point B amounts at least 824. The following species were identified: Lepus sp., Panthera spelaea, Canis lupus, Gulo gulo, M. primigenius, Rangifer tarandus, and B. priscus (Chubur A.A., Appendix of the field report, 2005–2006). The summary list of mammal species recovered from the area of the Khotylevo 2 site, point B, and adjoining areas includes 10 species: Rodentia gen. ind., Lepus sp., P. spelaea, Alopex lagopus, C. lupus, G. gulo, Ursus arctos, M. primigenius, R. tarandus, B. priscus, Equus ferus??, and Coelodonta antiquitatis. In 2011 fragments of two diaphyses of tibia bone, both belonging to a single bird (Aves gen ind.) of a swan size-class were discovered. The other large mammal species are scarce at the Khotylevo site and each is represented by remains of one to three individuals. Sometimes remains of a certain species are represented by a single bone (C. antiquitatis and G. gulo). For some species, e.g. E. ferus and C. antiquitatis, only one bone fragment of each was found, and a precise species attribution was hampered by poor preservation.

The woolly mammoth is the most abundant species recovered from all parts of the Khotylevo 2 site. Among the remains recovered from the area excavated by F.M. Zavernyaev, at least 1364 bones from most parts of skeletal system was identified (Chubur, 2003). The number of the woolly mammoth individuals calculated by A.A. Chubur from drawings and charts of mammoth teeth available for that part of the site is close to the number of individuals counted by F.M. Zavernyaev — about 50 (Chubur, 1995).

Noteworthy is the fact that mammoth bones make up about 99% of the total amount of large mammal bones collected from the studied area. The large mammal species composition as listed above, as well as the percentage of various species, is typical of many Late Paleolithic sites on the Russian Plain (Maschenko et al., 2003; Gavrilov et al., 2013).

Woolly mammoth bones are most often grouped and distributed over the excavated area according to the domestic needs of the Paleolithic humans. In a number of cases, bones found in different parts of the excavated area may be recognized as belonging to the same individual skeleton; such was the case of two femurs belonging to the same adult woolly mammoth and found in squares KhAE B2′ No. 2 and KhAE J2′ No. 3.

Woolly mammoth bones often bear evidence of special treatment, indicative of their being used as implements in economic activities. Such evidence exists, for example, on a humerus of an adult individual, KhAE–2010 No. 46, from which the spongy constituent was removed from the diaphysis. In contrast to the preservation of mammoth bones, bone remains of other species do not usually show any trace of modification and occasionally form anatomical groups belonging to one individual. This pattern has been repeatedly noted for C. lupus (Gavrilov, 2008, Fig. 47). Such good preservation of C. lupus remains is shown by at least two adult individuals; these include skulls (Fig. 12), metapodial bones, phalanges, radial bones (more than 40 bones altogether) found in 2003, point B, sq. A–7, A–9.

The number of mammoths recovered at point B is tentatively estimated at 12, including 5 adults (2 males and 3 females), 5 subadult ones (from 3 to 4 to 5–6 years old), and 2 calves (1.5–2 years). The amount of bones from each woolly mammoth individual does not exceed 2–3% of the total number of bones in the mammoth skeleton.

Judging from the recovered remains of the woolly mammoth fetus (supposedly the 2nd half of the second year of prenatal development)
development) and shed horns of reindeer (KhAE-2010, sq. Ñ–1', No. 195), it may be suggested that the animal died (or shed its horns) late in winter or early in spring.

In spite of the fact that R. tarandus bones were found scattered over a considerable area and at different stratigraphic levels (2010, bone No. 195, sq. Ñ–1; depth — 8.94/8.98 m and Ñ–2', depth 8.89), these may be attributed to one individual, as indicated by the skeleton morphology. Those data suggest a complicated situation at the considered part of the site at the time of the formation of the cultural layer.

The analysis of mammal bone assemblages at the Khotylevo 2 demonstrated an absolute predominance of woolly mammoth remains (99% of the total number of bones). This data in our opinion does not provide evidence that people of the Khotylevo 2 systematically hunted this species. Such a hunt and mammoth overkill in a sector does not provide evidence that people of the Khotylevo 2 systematics (99% of the total number of bones). This data in our opinion demonstrates an absolute predominance of woolly mammoth remains (99% of the collected bones). The concentrations are characterized by a well-pronounced intentional arrangement of skulls and large bones of the postcranial skeleton: long bones of legs, shoulder blades, and pelvic bones. Some analogs of such bone arrangements are found in dwelling constructions of the so-called Anosov-Mezin type, quite common at the sites dated to the late Late Paleolithic on the Russian Plain (Rogachev, 1962; Polikarpovich, 1968; Pidoplichko, 1969; Sergin, 1981, 1987, 2003). Concentrations of intentionally arranged mammoth bones were also found in point A of Khotylevo 2 by F.M. Zavernyaev (Zavernyaev, 1974, 2001; Gavrilov, 2008); they were, however, much fewer/smaller in size than those described in sector A, point B. The northern assemblage distributed over the major part of sector B and beyond its limits resembles more closely one of the assemblages studied by F.M. Zavernyaev — No. 1 according to our numbering system (Gavrilov, 2008).

Structural characteristics of the discovered assemblages suggest their symbolic character, indicated by several features. First, ochre was found applied in abundance both to the material filling of the pits and to the mammoth bones in clusters. In the latter case, a few flat bones were completely covered with ochre; some mammoth skulls also occurred together with large lumps of mineral paint. Second, it is also indicated by a specific system in mammoth bone selection and arrangement — skulls, scapulae, and pelvis bones are intentionally combined in a certain order. Third, some details of objects also allow us to suggest a ceremonial (ritual) purpose; among them, there is a double female pendant made of mammoth tusk thrust vertically into ancient surface colored with ochre. The spatial arrangement of individual

Table 4
Size comparison (mm) of tibia of Mammutus primigenius (Blumenbach 1799) from Khotylevo 2 site. Measurements are given only for exemplars with completely fused distal epiphysis.

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Khotylevo 2 (Maschenko et al., 2006)</th>
<th>Sevsk (Maschenko et al., 2006)</th>
<th>Zaraisk (Burova and Maschenko, 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M3</td>
<td>m3</td>
<td>M3</td>
</tr>
<tr>
<td>Length</td>
<td>470.0–590.0</td>
<td>470.0–513.0</td>
<td>490.0–540.0</td>
</tr>
<tr>
<td>Lateral-medial/anteporoposterior diameter of the proximal end</td>
<td>163.0/126.0</td>
<td>112–144.0/n.d</td>
<td>130.0/n.d</td>
</tr>
<tr>
<td>n.d – No data.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Discussion and conclusions

The structure of archeological remains recorded over the area of sectors A and B, as well as their spatial position relative to each other, suggests that two different assemblages of remains were partially recovered on the studied area of point B of the Khotylevo 2 site. The southern assemblage, mostly confined to sector A, is remarkable primarily for the presence of large concentrations of animal remains, mostly those of woolly mammoth (99% of the collected bones). The concentrations are characterized by a well-pronounced intentional arrangement of skulls and large bones of the postcranial skeleton: long bones of legs, shoulder blades, and pelvic bones. Some analogs of such bone arrangements are found in dwelling constructions of the so-called Anosov-Mezin type, quite common at the sites dated to the late Late Paleolithic on the Russian Plain (Rogachev, 1962; Polikarpovich, 1968; Pidoplichko, 1969; Sergin, 1981, 1987, 2003). Concentrations of intentionally arranged mammoth bones were also found in point A of Khotylevo 2 by F.M. Zavernyaev (Zavernyaev, 1974, 2001; Gavrilov, 2008); they were, however, much fewer/smaller in size than those described in sector A, point B. The northern assemblage distributed over the major part of sector B and beyond its limits resembles more closely one of the assemblages studied by F.M. Zavernyaev — No. 1 according to our numbering system (Gavrilov, 2008).

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Table 3
Quantitative and qualitative parameters of M3/m3 morphology of Mammutus primigenius (Blumenbach 1799), Khotylevo 2 site.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Khotylevo 2</th>
<th>Sevsk (Maschenko et al., 2006)</th>
<th>Zaraisk (Burova and Maschenko, 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of plates</td>
<td>—</td>
<td>22–26</td>
<td>22–24</td>
</tr>
<tr>
<td>Crown width (mm)</td>
<td>75.0—100.0</td>
<td>60.0–90.0</td>
<td>75.0–95.0</td>
</tr>
<tr>
<td>Enamel thickness (mm)</td>
<td>1.8–2.0</td>
<td>1.5–2.1</td>
<td>1.2–1.4</td>
</tr>
<tr>
<td>Plates/10 cm</td>
<td>—</td>
<td>7.4–10.7</td>
<td>10–11</td>
</tr>
</tbody>
</table>

Fig. 12. Khotylevo 2 site, point B, excavation I. Wolf skull (Canis lupus). Scale 2 cm.
constituents of the identified assemblages suggests a unified context including both single items and each archeological remain.

Stratigraphic correlation of the assemblages under study led us to conclude that the northern assemblage developed after the southern one had been abandoned. Judging from specific features of the cultural layer stratigraphy, as well as the evidence from the radiocarbon dating programme, we may suggest that the time lapse between the two occupation phases of sectors A and B was not large, since in absolute statistical terms the two overlap temporally.

The list of mammal species recovered from Khotylevo 2, point B, is not different from the lists from other sites of the same age found on the Russian Plain. The bone remains are dominated by a single species — woolly mammoth (98–99%), while bones of carnivorous mammals amount to 1–5% of the total. Most of them belong to wolf and arctic fox (in Khotylevo 2, point B, 3–5 individuals, respectively). The carnivorous species exceed all others in number not only at Khotylevo 2, but at other sites and localities of the same age on the Russian Plain. Even-toed and perissodactyl mammals are found only occasionally at the studied area of the site, each species being represented by 1 or 2 occurrences. It is still unknown whether E. ferus remains are present at the area under study.

Acknowledgments

K. Gavrilov and E. Voskresenskaya and the excavations at the Khotylevo site are supported by the RFBR grant No 12-06-00375. The work of E. Maschenko is supported by the RFBR grants No 12-04-98510, 13-06-12015. The radiocarbon determinations reported in this study were undertaken within the framework of the AHOB 3 Project ("Ancient Human Occupation of Britain"), funded by the Leverhulme Trust (U.K.), and within the sub-project "Dating of the European Gravettian" led by Katerina Douka, Rob Dennis and Tom Higham.

References


