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New geoarcheological studies at the Middle Paleolithic sites of Khotylevo I and Betovo (Bryansk oblast, Russia): Some preliminary results

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A R T I C L E I N F O

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A B S T R A C T

The paper presents and discusses the evidence obtained as a result of recent fieldwork at the Middle Paleolithic sites of Khotylevo 1 and Betovo in the Upper Desna river basin, Bryansk oblast of Russia. The stone industries of both sites are based on local tabular good quality flint and contain more (Khotylevo 1) or less (Betovo) representative bifacial components, as well as varying quantities of Levallois products. Previously, all the Middle Paleolithic assemblages of Khotylevo 1 were thought to occur in a redeposited alluvial context dated by different authors to either early Late or even late Middle Pleistocene. The materials of Betovo were thought (mainly on typological grounds) to postdate those of Khotylevo 1. The new stratigraphic observations, supplemented with the results of sedimentological analyses, show that Khotylevo 1 is a multilayered site with some cultural horizons displaying few or no signs of post-depositional dislocation. Coupled with the results of paleomagnetic studies and a radiocarbon date, this data seems to suggest that the formation of the deposits enclosing the known Middle Paleolithic assemblages at both sites might have taken place during the first half of the Middle Valdai mega-interstadial (MIS 3).

1. Introduction

Despite recent claims to the contrary, there is little (if any) reliable evidence that the Neanderthals or other Middle Paleolithic hominids ever penetrated north of the 55th parallel (Vishnyatsky and Pitulko, 2012). In Europe the northernmost indisputable traces of their presence, both paleoanthropological (Czarnetzki et al., 2001; Hublin et al., 2009; Urbanowski et al., 2010) and archaeological (Veil et al., 1995; Boismier et al., 2003), seem to be concentrated between the 52nd and 54th parallels. They are not numerous, and the largest cluster of Middle Paleolithic sites is known in the eastern part of this zone, on the western flank of the Central Russian Upland. Of special importance among these sites are Betovo and Khotylevo 1, which yielded rich and representative lithic assemblages associated with stratified contexts. Unfortunately, and despite a long history of research, the age and depositional conditions of these contexts remain poorly known, which limits our ability to understand their cultural and behavioral/adaptational significance. To improve the situation, we have started a new field project, the first preliminary results of which are reported in this paper.

2. Location

The Middle Paleolithic sites of Betovo and Khotylevo I are situated in the Bryansk oblast of Russia, in the eponymous villages, about 20 and 10 km west of Bryansk, respectively (Fig. 1). Both sites are confined to the high right bank of the asymmetric Desna river valley. The Desna basin is one of the most interesting places of concentration of Paleolithic localities in the East-European Plain, famous for both its Middle and Late Paleolithic sites.

3. Geological setting

The bedrock on the right bank of the Desna belongs to the Upper Cretaceous. It is represented by Cenomanian quartz and green glauconite sands and Turonian marl and chalk, containing black

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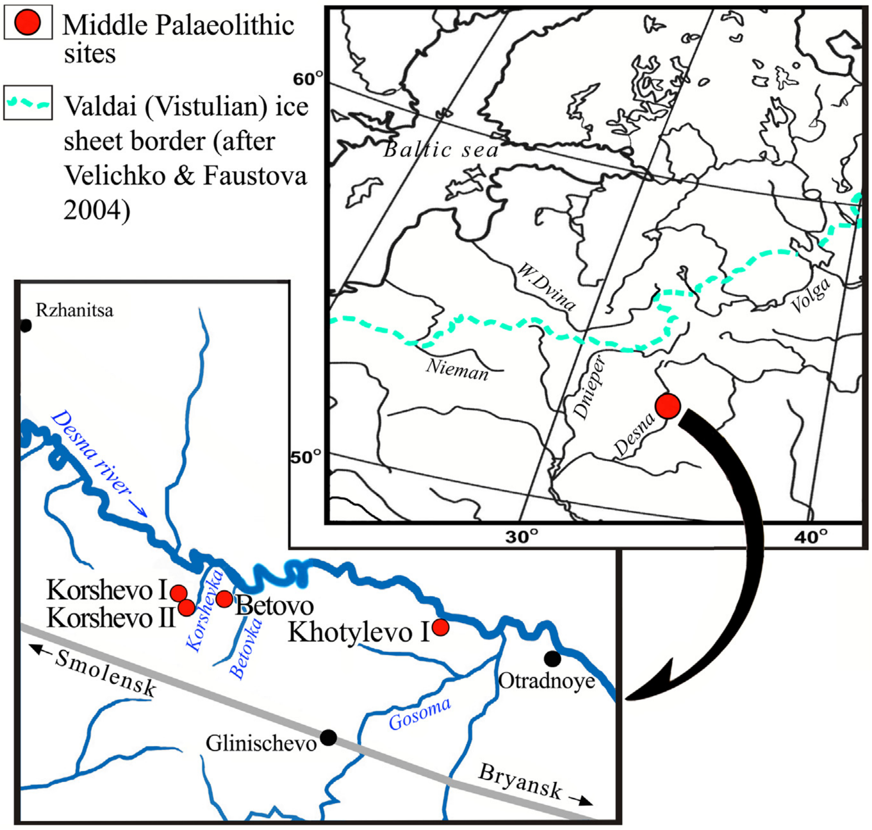

Fig. 1. Location of Middle Paleolithic sites in the Upper Desna basin.

flint concretions (which served as the primary source of raw material for the Paleolithic people). In the Quaternary, this region witnessed the alternation of glacial and interglacial periods. During the Dnieper Middle Pleistocene glacial (MIS 6), an ice sheet covered most of the Desna basin (Gribchenko, 2002; Velichko et al., 2002). The Desna valley and its tributaries served as drainage channels for glacial meltwater. The fluvioglacial Middle Pleistocene sediments are light gray coarse-grained sands interlayered with greenish marl clay and numerous fragments of marl, chalk, and concretions of flint. Sediments of this sort constitute the parent material of the Mezin pedocomplex, the early (Salyn) stage of which corresponds to the Mikulino interglacial (MIS 5e), while its late (Krutitsy) stage corresponds to an interstadial within the Early Valdai (MIS 4) period (Velichko and Morozova, 1982; Velichko et al., 2010). The Salyn paleosol of the Mezin pedocomplex can be interpreted as a luvisol, and the Krutitsy palaeosol can be presumably classified as a humic regosol (Little et al., 2002) or as a cold steppe phaeozem (Velichko et al., 2006).

The soil profile on the valley slope displays deformations due to cryogenic and slope processes. The cryogenic deformations attributable to the Smolensk cryogenic stage are represented by small polygonal fissures in the Salyn soil, and solifluction and cryoturbations in the humus horizon of the Krutitsy soil (Morozova and Nechaev, 2002). The overlying thick loess and soil series was formed in the periglacial zone of the Valdai glacial. It consists of three loess horizons which are intercalated with Bryansk buried soil (MIS 3) and weakly developed Trubchevo gley. Deformations recorded in this series are correlated with the Vladimir and Yaroslavl cryogenic stages. Therefore, the Late Pleistocene slope sediments of the right bank of the Desna have a considerable thickness and a complex history of formation (Voskresenskaya, 2010). The reference horizons of buried soils within the slope sediments covering the basal portions of the slopes are often discontinuous and represented mostly by pedosediments. The slope apron overlies the back part of the fluvial terrace surface. There are separate fragments of the first and second fluvial terraces, which rise above the floodplain some 8–12 m and 15–20 m, respectively. The periods of the two terraces formation are correlated with the middle (second fluvial terraces) and late (first fluvial terraces) stages of the Late Pleistocene (Velichko, 1961; Panin et al., 2011).

4. Historical background

The study of Middle Paleolithic sites in the upper reaches of the Desna started more than 70 years ago. The first surface finds of the Middle Paleolithic aspect were collected in this area in 1939 by the expedition headed by M.V. Voevodsky. In 1960 the archaeologist of the Bryansk Regional Museum, F.M. Zavernyaev, started the excavations at those areas of Khotylevo 1 where surface finds were previously gathered by local schoolchildren. During five years his team put 6 large trenches and a number of test pits along the right bank of the Desna (Fig. 2). The results of Zavernyaev's works were summarized in his monograph (Zavernyaev, 1978).

The second important Middle Paleolithic site in this region, Betovo, was discovered by L.M. Tarasov from the former Leningrad Branch of the Institute of Archaeology of the Academy of Science of the USSR (now Institute for the History of Material Culture of the Russian Academy of Sciences) in 1971. The site is situated 10 km upstream of Khotylevo 1. It was excavated by Tarasov's expedition from 1972 through 1983 and yielded a cultural layer with

Fig. 2. Panoramic view (from the north) of the right bank of the Desna in the region of Khotylevo 1. The supposed or exact location of Zavernyaev's main trenches (1–6) is indicated by punctuated or solid arrows, respectively.

numerous lithics and faunal remains (Tarasov, 1977, 1995). In addition, as a result of field surveys conducted from 1971 to 1974 in the environs of Betovo, Tarasov found two more stratified Middle Paleolithic localities (Korshevo 1 and Korshevo 2) and a surface occurrence (Lebedevka).

The discovery of Middle Paleolithic sites in the central part of the East European Plain provoked a great interest. Khotylevo 1 immediately attracted attention as the northernmost and largest Middle Paleolithic site in East Europe. In addition, it gave a highly representative collection of stone artifacts which can be paralleled only by that of Sukhaya Mechetka. However, in contrast to Sukhaya Mechetka whose material was confined to a buried soil and occurred in all likelihood nearly *in situ*, the finds from Khotylevo 1 were associated with alluvial sediments and occurred in a redeposited context (Goretsky, 1970; Zavernyaev, 1978).

The previous views on the age of the Betovo and Khotylevo 1 artifact-bearing layers can be shortly summarized as follows. The Middle Paleolithic materials of Khotylevo I, associated with sandy-gravel sediments of the basal alluvium layer of the Desna, were dated to either the Mikulino interglacial or the transitional time between Mikulino and Early Valdai, although some authors assumed an older, Dnieper age (for overview see Ocherednoi, 2011). The chronological placement of the Betovo materials remained equally uncertain, but on typological grounds they were thought to postdate those of Khotylevo 1 (e.g. Tarasov, 1991).

5. Recent excavations

In 2009, the Upper Desna Expedition of the Institute for the History of Material Culture of the Russian Academy of Science (St. Petersburg) resumed the fieldworks at Betovo and Khotylevo 1. The new project was aimed at the study of the depositional history of these sites and clarification of the stratigraphic and chronological position of their artifact-bearing strata. Some limited works, which are not reported here, were undertaken at Korshevo 1 and 2.

5.1. *Betovo*

The site is confined to a large promontory, limited by the Desna from the north and two its tributaries, the Betovka and Korshevka brooks, from the west and east. The surface of the promontory rises above the present day flood plain some 15 m. In 2009, a test pit was put adjacent to Tarasov's trench of 1977. The only cultural level of the site was exposed over an area of 2 m^2. It is associated with the basal part of the Late Pleistocene sediments resting on Cretaceous bedrock.

The deposits underlying the cultural level are represented by pedosediments of paleosols, deformed and displaced due to slope and solifluction processes. Only the lowermost part of the buried soil, consisting of fine-grained rusty illuvial sands (layer 19), seems to occur *in situ*. Down the section they gradually change to laminated greenish-gray small- and middle-grained Cenomanian sands with intercalations of ortsands (Fig. 3). The artifacts are associated with lithological layers 17–18, formed by intercalating horizons and lenses of grayish-brown loam, fine-grained ocher sand, heavy clay, and weathered chalk with inclusions of rolled greenish pieces of marl. The remains of the humus horizon of a paleosol form isolated dark-brown spots and streaks enriched with organic matter. The absence of any sorting of the material as well as the occurrence of intermixed horizons and lenses, which are often concentrated in potholes, may be indicative of post-depositional creep caused by solifluction (Fig. 4).

The cultural level is overlain with deluvial laminated loess-like sandy loams up to 3.8 m thick (layers 4–16). A level of weak soil-formation (layer 7), which can provisionally be correlated with the Trubchevo gley, is observed at a depth of 1.35–1.75 m from the present surface. It is represented by a thin humus horizon (its upper part bears signs of water erosion and redeposition), and a horizon of carbonate accumulation. The homogenous loess-like sandy loams forming the upper part of the section served as the parent material for the Holocene soil (layers 1–3). Faunal remains were absent.

5.2. *Khotylevo 1*

The Khotylevo I site extends about 800 m along the Desna riverbed (Fig. 2). The right bank rises above the water's surface some 22–25 m. The features of relief such as high floodplain areas and the first terrace are clearly visible. The structure of the high bank shows considerable variability between the downstream and the upstream sections of the site.

Current works at Khotylevo 1 are mainly concentrated in the upstream section of the site. However, as early as 2006 a test pit was put in the downstream section, near Zavernyaev's trench 2 of 1964. Artifact bearing deposits are associated here with the basal alluvial horizon. Tabular flint pieces (including some artifacts), rounded pebbles of crystalline rocks and occasional bone remains of the mammoth faunal complex were recovered from a depth of 10.44–10.55 m below the surface (Fig. 5). This cultural horizon directly overlies bedrock (Cenomanian) quartz-glauconite sands (layer 22). Overlying sediments are divided into alluvial and subaerial series. The alluvial unit, up to 5–7 m thick, comprises riverbed, oxbow lake, and floodplain facies (layers 21–14). The upper part of the profile is formed by subaerial sediments. These sediments are essentially the redeposited Mezin pedocomplex (layers 6–3), overlain by a thick horizon of the Late Valdai loess (layers 2–1) with a recent luvisol on top (Ocherednoi and Voskresenskaya, 2009).

A very different situation has been observed in the upstream part of the site as a result of excavations carried out in 2010 and 2012 (Fig. 6). A trench of 7 m^2 adjacent to Zavernyaev's trench 6 exposed the left bank of a ravine, which cuts one of the promontories overlooking the floodplain, designated as Khotylevo I-6-2. It has exposed a series of Middle Paleolithic cultural horizons

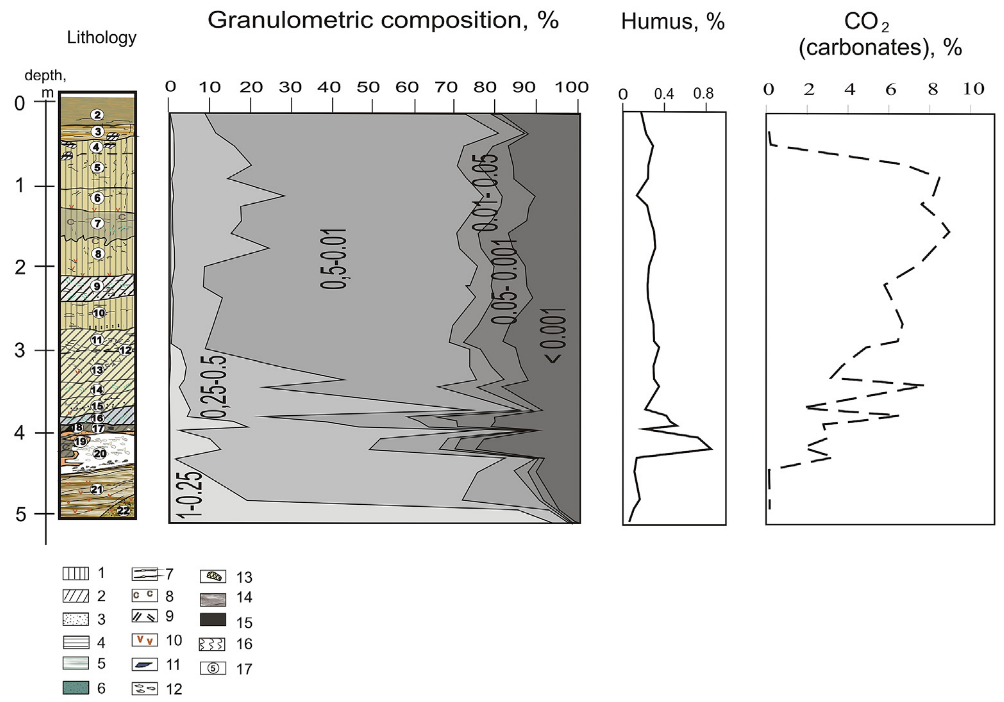

Fig. 3. Betovo. Stratigraphy, granulometric and geochemical composition of the sediments exposed in the eastern wall of the 2009 test pit. Symbols: 1 – loess-like sandy-silt; 2 – silt; 3 – sand; 4 – clay; 5 – weathered chalk; 6 – cenomanian glauconite sand; 7 – sand lenses; 8 – carbonate; 9 – gleyification; 10 – ferrugination; 11 – flint; 12 – chalk and marl gruss; 13 – krotovina; 14 – disturbed humus horizons of paleosol; 15 – humus horizon of modern soil; 16 – illuvial soil horizons; 17 – layer number.

associated with different lithological layers. The lowermost cultural horizon 4 is the only one that occurred in a position analogous to that of the cultural horizon in the downstream section. It is associated with a layer of light gray coarse-grained sand (layer 15), resting on the Cenomanian sands (layer 16), and intercalated with

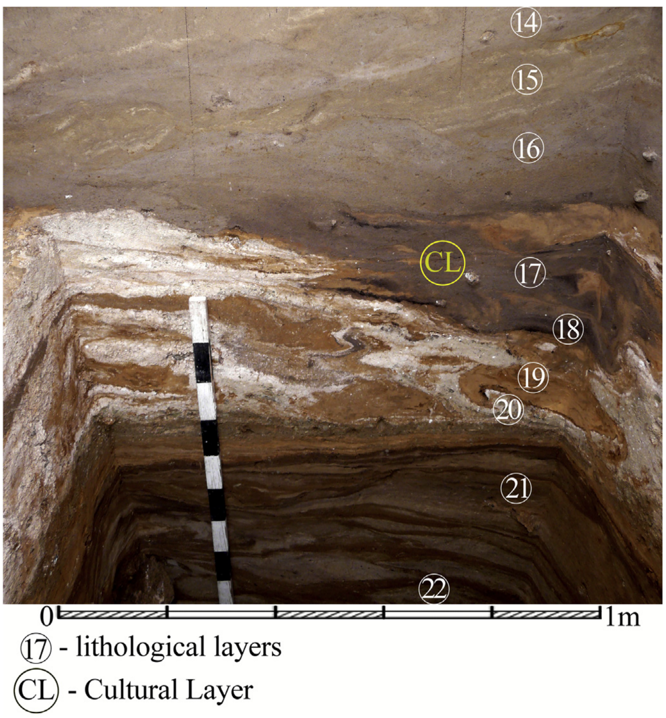

Fig. 4. Betovo. East section of the test pit (2009).

bands of greenish clay. It contains numerous chalk and flint concretions. The overlying layers of floodplain alluvium up to 90 cm thick (layers 14–13) are represented by gray laminated small-grained sands and silts. Sparse finds of cultural horizon 3 are associated with layer 13. The overlying laminated paleosol (layer 12) comprises cultural horizon 2. This horizon can be further subdivided into four subhorizons (2.1, 2.2, 2.3 and 2.4), associated with thin subhorizontal humus layers separated by sterile intercalations of fine rusty sand (Fig. 7). The artifacts of the uppermost cultural horizon 1 are enclosed in lithological layer 9 represented by brown sandy loam with lenses of black humus. The properties of reworked soil material indicate that the soil profile was disturbed as a result of moving of slope material in hydromorphic conditions with cryogenic deformation. The overlying deposits consist of thick series of laminated loess-like carbonate-free silt sediments (layers 8–4) with some gley horizons and lenses of weathered pieces of chalk. Topping the section is the modern sod-podzol soil (layers 3–1).

The degree of preservation of cultural horizons at Khotylevo I-6-2 varied. While the finds from horizon 1 were confined to a buried soil heavily deformed by slope and cryoturbation processes, the materials of cultural horizon 2 seem to occur *in situ*. At least some of its four subhorizons may represent discrete occupation episodes, although much more data is needed to substantiate this supposition. Horizons 3 and 4 were exposed over very limited areas and both their formation and degree of preservation remain to be clarified. Neither of the horizons had faunal remains.

6. Lithological studies

Geochemical and grain size analyses were carried out in the Laboratory of Evolutionary Geography and Laboratory of Soil Science of the Institute of Geography of the Russian Academy of Sciences (Moscow). Grain size analysis of 119 samples was performed by the Kachinsky pipette technique for 64 samples, and by the Sabanin technique of wet mechanical analysis for 45 samples

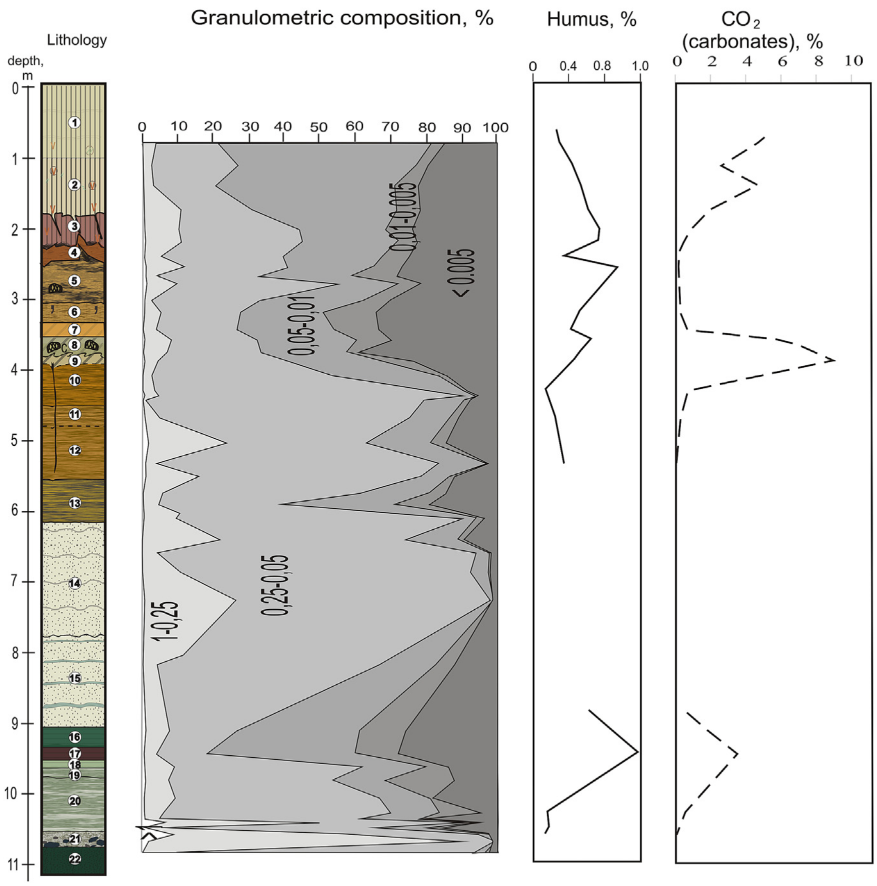

Fig. 5. Khotylevo 1. Stratigraphy, granulometric and geochemical composition of the sediments exposed in 2006 in the downstream section of the site. Explanations for symbols see on Fig. 2.

(Ananev and Potapov, 2002). Carbonate content of 75 samples was measured by the volumetric method and recalculated to CO_2 equivalent (Arinushkina, 1970). No HCl treatment was performed and 250 m wet sieving was used for sand separation with pipette analysis. The percent of organic carbon was determined by $K_2Cr_2O_7$ oxidation of 75 samples and recalculated to the soil humus content with a 1.72 ratio (Zyrin and Orlov, 1980). The results of the lithological studies are presented in Figs. 3, 5 and 6.

Micromorphological description and microphotography were conducted on thin sections of loess, paleosols and modern soils to refine interpretation of geochemical analyses and to reconstruct the soils' genesis. The thin sections of oriented blocks of undisturbed sediment (about 0.03 mm thick) were prepared using the technique proposed by Mochalova (1956) with some modifications. Micromorphological investigations were made with the use of digital polarization system, consisting of stereomicroscopes Altami Polar 1, digital camera Canon PowerShot A640 and program of image processing Altami PhotoKit. The 33 thin sections from Betovo and Khotylevo I were observed with a petrographic microscope at magnifications between 20× and 400× under plane polarized (PPL) and crossed polarized (XPL) light.

The paleosol profile at the bottom part of the Betovo section is dominated by sand skeletal grains represented by rounded grains of quartz, glauconite, and feldspars. There are plasmic-sandy microfabrics with clay coatings (Fig. 8a). Micromorphological data is indicative of a weakly developed clay illuviation in the lower part of the paleosol. The micromorphological structure of humus lenses is characterized by ooid pedogenic aggregates of the first and second-order. This type of microaggregate could have formed due to cryogenic structuring of the material (Fig. 8b) (Velichko and Morozova, 1972; Morozova, 1981). The composition of b-fabric is humus-clay. The organic components are represented by dispersed humus and charcoal particles. The weakly stratified loess-like sediments in the middle part of the Late Valdai loess have different pedogenetic features. Their microfabrics have sandy-plasmic-silt or sandy-silty-plasmic structure. The b-fabric composition is clay-carbonate (Fig. 8c). The coarse silt grains predominate in the skeletal structure. The carbonate features are represented by microcrystalline calcite and concretions of sparite (Fig. 8d).

At Khotylevo 1-6-2, the microstructure of the soil profile with cultural horizon 1 is similar to that of the Betovo soil profile. The disturbed material of the humus horizon is characterized by humus-clay composition of b-fabric, coagulated in ooid pedogenic aggregates (Fig. 9a). Plasmic-sandy-silt microfabrics are well developed in the B horizon. Rare curve-plate clay coatings occurred here (Fig. 9b). The humus horizon of the alluvial soil, which enclosed cultural horizon 2, is characterized by the same type of pedogenic microstructure with ooid pedogenic aggregates, but smaller in size (Fig. 9c). The C horizon of this paleosol has plasmic-sandy microfabrics with iron-clay b-fabric, which developed around sandy grains (Fig. 9d).

7. Radiocarbon dating

As neither animal bones, nor charcoals, nor other organic remains suitable for radiocarbon dating were found during the first seasons of excavations, we attempted to date a humus sample selected from Khotylevo 1-6-2, layer 12, cultural subhorizon 2.2.

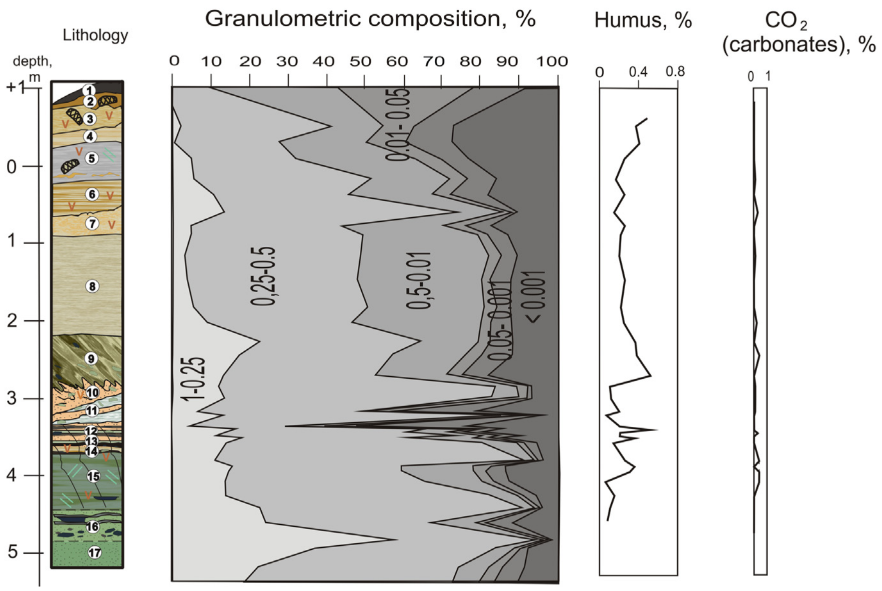

Fig. 6. Khotylevo 1. Stratigraphy, granulometric and geochemical composition of the sediments exposed in 2010 and 2012 in the upstream section of the site (Khotylevo I-6-2, eastern wall). Explanations for symbols see on Fig. 2.

The alkaline extract from this sample produced an uncalibrated date of 42,270 ± 3300 BP (GIN-14414) (Voskresenskaya et al., 2011) which appears to be in general agreement with stratigraphic and lithological evidence. For the time being this is the only numerical date available for the Middle Paleolithic of the Desna basin. More analyses on humus samples as well as charcoals found at Khotylevo 1 are now underway in several laboratories.

8. Paleomagnetic studies

In 2009–2012, extensive paleomagnetic studies were conducted both at Betovo and Khotylevo 1 in hope of clarifying their chronology or at least to obtain additional points of reference for correlating the two sites. With these purposes in mind, two representative series of 262 and 272 samples were taken from the eastern profiles of the Betovo test pit and Khotylevo 1-6-2, respectively. The magnetic susceptibility (MS) and natural remanent magnetization (NRM) both prior and after demagnetization were measured in the Laboratory for Magnetic Stratigraphy and Paleomagnetic Reconstructions of the All-Russia Petroleum Research Exploration Institute (St. Petersburg). The measurements and data reduction process followed the methodology described in Khramov et al. (1982). The NRM was measured using a JR-5 magnetometer and was demagnetized with temperature. Prior to demagnetization, MS was measured using a KLY-2 susceptibility bridge.

The results of paleomagnetic measurements are presented on Fig. 10. At Betovo (Fig. 10a) the MS ranges from 0,6 to 4,4 SI units. A short interval of reversed directions can be observed in layers 19–21 (total depth from 4.3 to 4.7 m). The virtual geomagnetic pole (VGP) movement within this interval was compared with the first directional phase of the Blake geomagnetic event (Tric et al., 1991). The similarity consists in the VGP position and identical trend of the curves (clockward) (Fig. 11).

The MS diagram obtained for the eastern section of Khotylevo 1-6-2 (Fig. 10b) shows several peaks. Within the intervals of 2.1–2.16 m and 2.2–2.3 m the MS value increases to 0.5×10^{-3} SI units, and within the interval of 2.45–2.6 m it increases to $0.2–0.4 \times 10^{-3}$ SI units. All these intervals correspond to lithological layer 9 (cultural horizon 1). High values of kappa were obtained on the samples taken from the lenses of humic loam, whereas the samples from the horizons of fine-grained sand gave low values of kappa. A less significant increase of MS values (to 0.2×10^{-3} SI units) can be seen in the interval of 3.3–3.7 m, corresponding to lithological layer 12 (cultural horizon 2). The most anomalous behavior of paleomagnetic field has been recorded in samples from layer 13. This anomaly can be interpreted in two ways. First, the comparison of its VPG with the known paleomagnetic excursions has revealed similarity to Laschamp field behavior (Laj et al., 2006), as illustrated by Fig. 12. If it does correspond to the Laschamp (which should be verified by future research), all the overlying sediments, including Middle Paleolithic cultural horizons 1 and 2, cannot be older than 42 ka. On the other hand, at the present stage of the research it cannot be excluded that this anomaly may also be accounted for by mechanical reorientation of magnetic particles in laminated alluvial sediments with a high rate of deposition. In any case, the

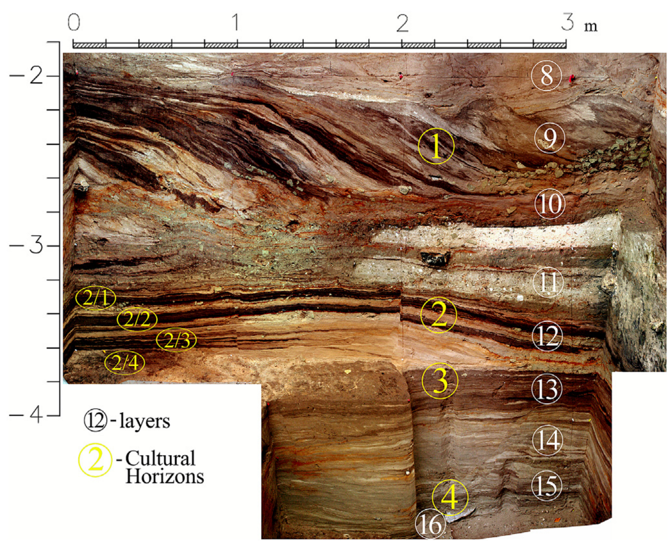

Fig. 7. Khotylevo 1-6-2. East section (2010).

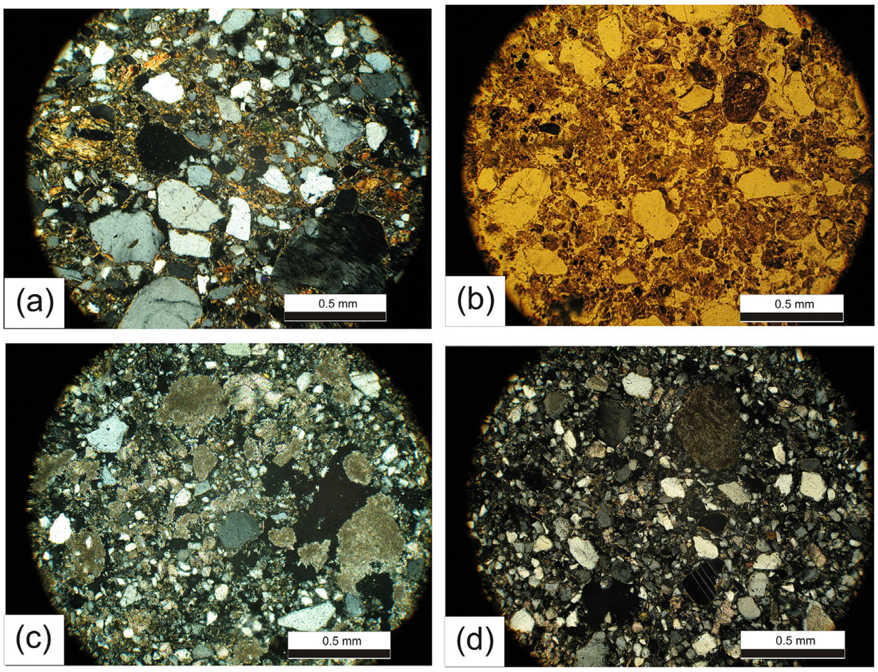

Fig. 8. Betovo. Micromorphological structure of sediments: (a) clay coatings, located on the packing voids and on sand grain (layer 21, PPL); (b) ooid-shape microstructure of humus-clay aggregates (layer 18, PPL); (c) concentration of microcrystalline calcite (layer 7, XPL); (d) irregular distribution of sparite particles in the main mass (layer 11, XPL).

evidence gives some clues about the relationship between different Khotylevo 1 and Betovo.

9. Archaeological materials

There is no common opinion regarding the cultural affiliation of the Betovo and Khotylevo 1 industries. According to the original view by L. M. Tarasov, the lithic inventory of Betovo is distinct in the abundance of notches and denticulates, on one hand, and scarcity of Levallois products, on the other, and can be assigned to the Denticulate Mousterian (Tarasov, 1977). Later, he redefined this assemblage as belonging to the Developed Mousterian (Tarasov, 1995) and even considered it a possible source for the development of the Upper Paleolithic industries (Tarasov, 1999). The Middle Paleolithic collections from different layers and areas of Khotylevo 1 were described by Zavernyaev (1978) as "Acheulo-Mousterian", Mousterian of Quina type, and Mousterian "somewhat close to Ferrassie type". At both sites, the layers with archaeological finds

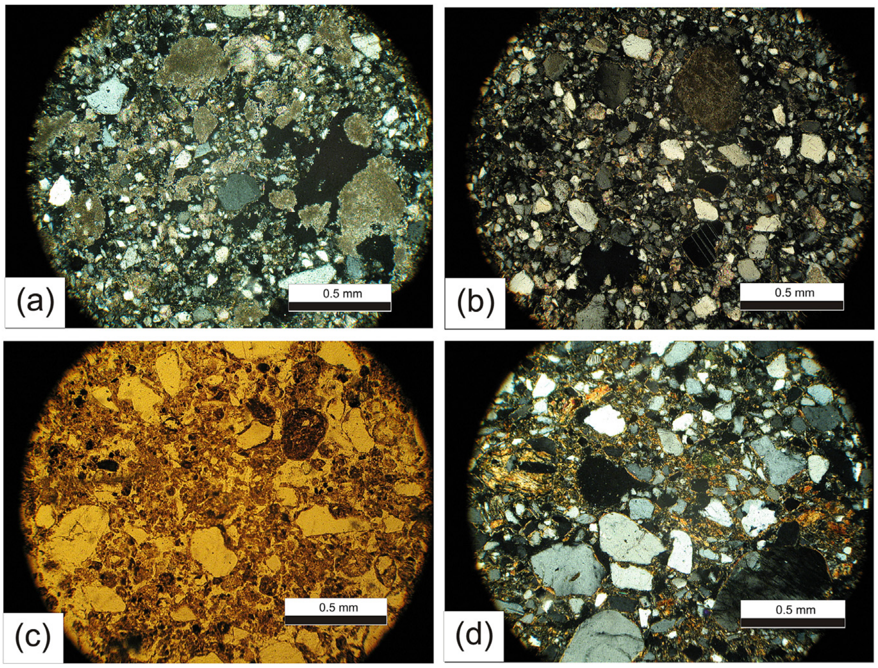

Fig. 9. Khotylevo 1-6-2. Micromorphological structure of sediments: (a) ooid-shape microstructure of humus-clay aggregates (layer 9, XPL); (b) curve-plate clay coatings (layer 10, PPL); (c) charcoal particle in the main mass (layer 12, XPL); (d) distribution of the iron-clay b-fabric around sand particles (layer 14, XPL).

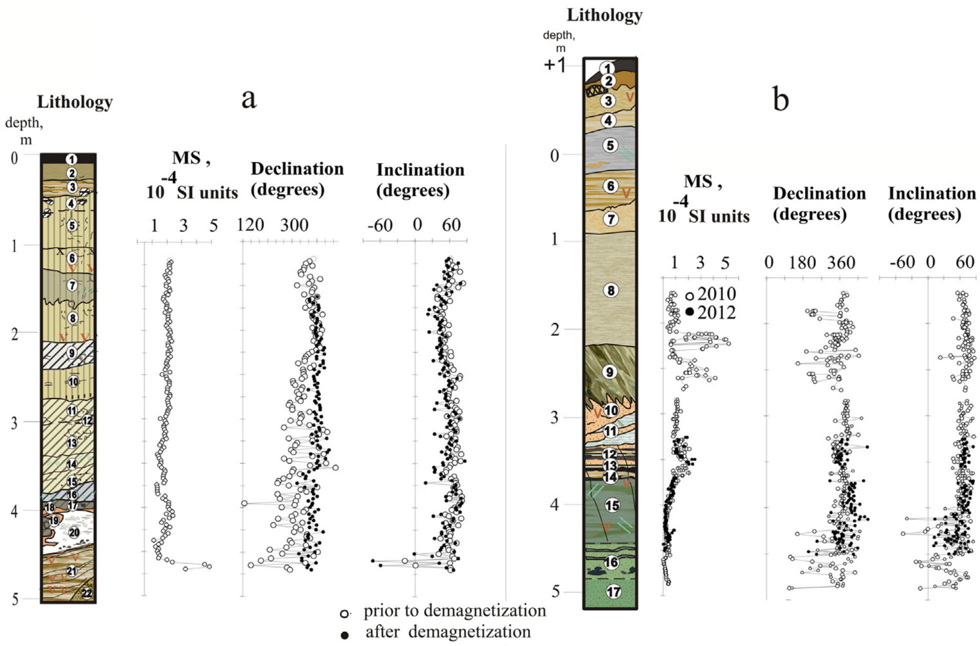

Fig. 10. Results of paleomagnetic measurements for Betovo, eastern and southern profiles (a), and Khotylevo I-6-2, eastern profile (b).

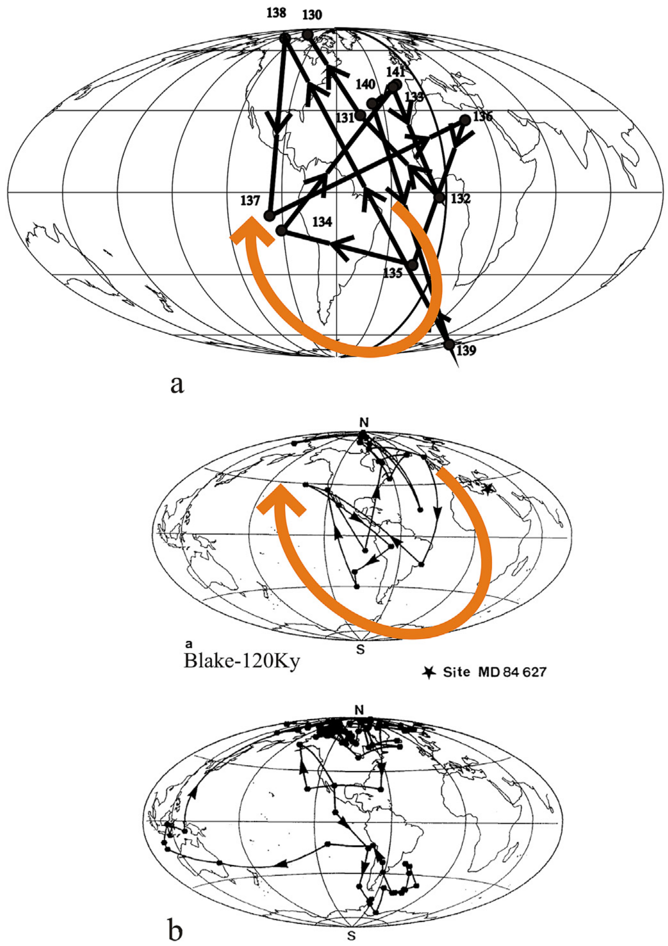

Fig. 11. Betovo. Paleomagnetic anomalies (a) and geomagnetic field behavior during the Blake excursion (b).

are very rich in natural flint chunks, including numerous tabular pieces, which served as the main source of raw material for the site inhabitants. It is partly for this reason that Khotylevo 1 and Betovo were considered to have been workshops or workshop/habitation sites (Tarasov, 1977; Zavernyaev, 1978; Praslov, 1984; Matyukhin, 2004).

The most conspicuous trait of both assemblages is the presence of bifacially worked artifacts. The collection of Betovo contains series of unfinished or broken bifacial tools (Fig. 13: 1–3), as well as

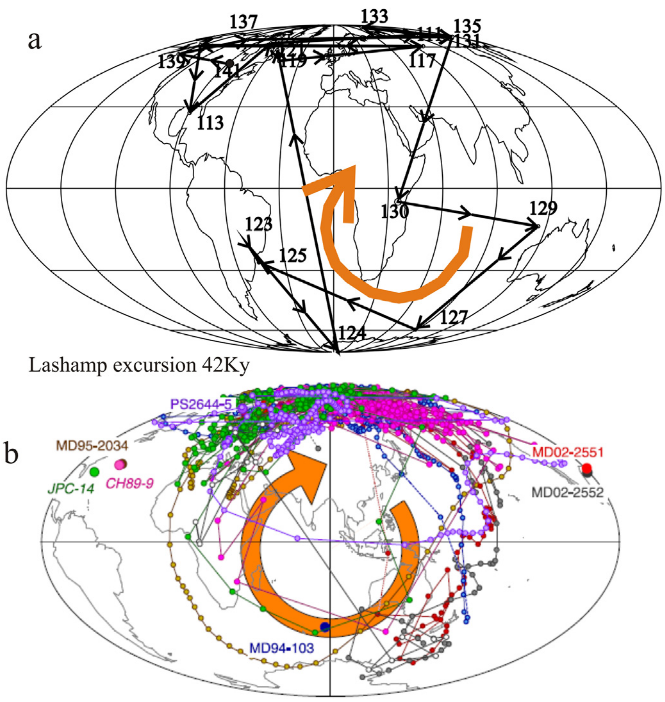

Fig. 12. Khotylevo I-6-2. Paleomagnetic anomalies (a) and geomagnetic field behavior during the Kargopolovo (Lashamp) excursion (b).

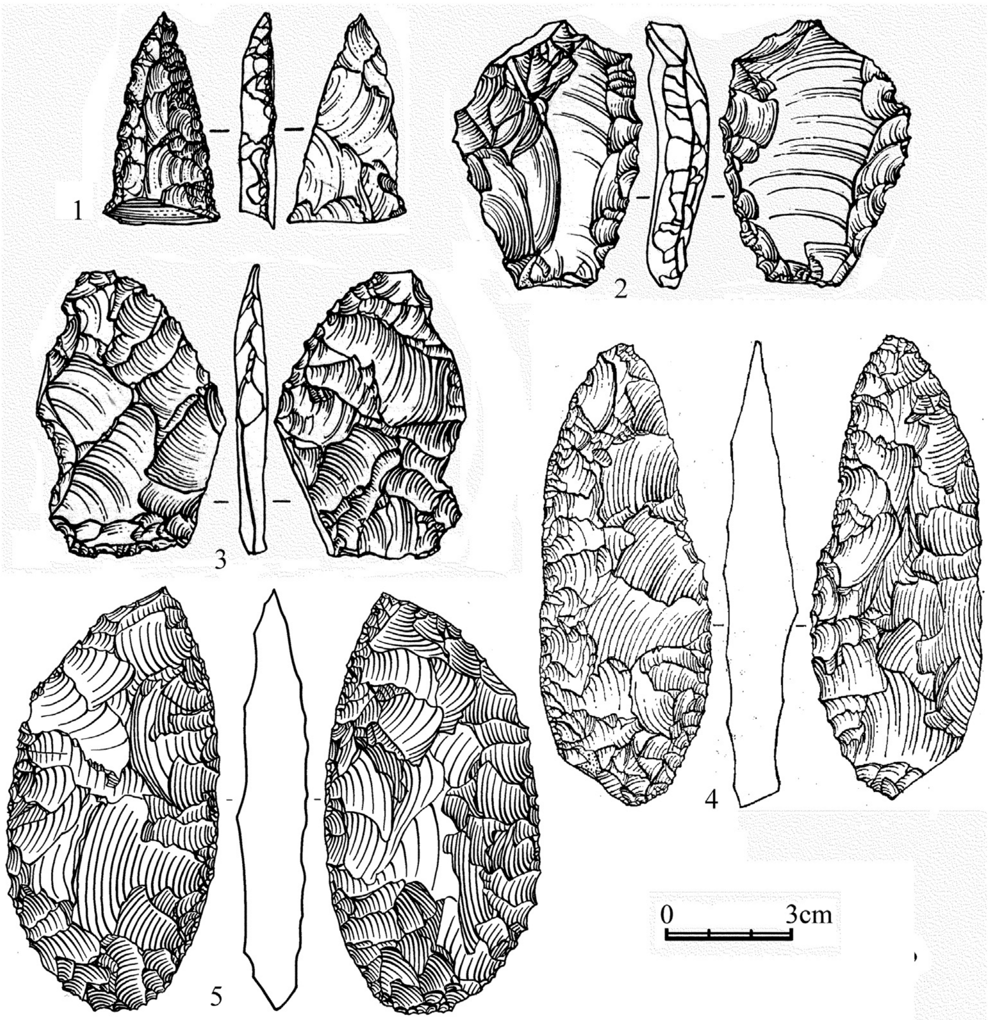

Fig. 13. Bifacial tools from Betovo (1–3, after Tarasov, 1977), and Khotylevo 1 (4–5, after Zavernyaev, 1978).

numerous longitudinal and transversal bifacial thinning flakes. In the old collections of Khotylevo 1 these forms are supplemented with different types of intact and very well made bifacial knives (Fig. 13: 4, 5). Although F.M. Zavernyaev noted the presence of "leafshaped forms resembling *Blattspitzen*" and compared some of the Khotylevo 1 assemblages to those of Chokurcha, Staroselie, and Sukhaya Mechetka (Zavernyaev, 1978), he never designated them as Micoquian. This term was applied to Khotylevo 1 materials by Gladilin (1985). We accept this definition (for details see Ocherednoi, 2011), and are inclined to extend it also to Betovo. At the same time, taking into consideration the extent of Khotylevo 1, the site may also contain assemblages belonging to other Middle Paleolithic traditions.

Though the newly obtained collections of stone artifacts are relatively small and lack any bifacially worked items, some contain series of retouched tools and technologically meaningful cores and flakes, including Levallois ones. At Betovo, the 2 m^2 test pit dug in 2009 yielded 71 artifacts, represented mainly by flakes, including tiny ones (scalar flakes), and a number of indentors and retouchers.

At Khotylevo, cultural horizon 1 yielded 315 artifacts, including Levallois flakes and cores, as well as several formal tools. Of special interest among the latter are a side scraper with thinning of its ventral face, an angular side scraper, and an asymmetrical point (Fig. 14: 1–3). The preservation of all the objects is rather good. A white patina characteristically covers (partly or entirely) one or both surface(s).

Especially rich in finds was horizon 2. Altogether, its assemblage consists of 1063 items, of which 643 come from subhorizon 2.1, 212 – from subhorizon 2.2, 145 – from subhorizon 2.3, and 63 – from subhorizon 2.4. Each of the subhorizons had numerous scalar and thinning flakes, which dominate in the collection of subhorizon 2.1. Although no tools with secondary retouch were found in the upper subhorizons (2.1, 2.2 and 2.3), the lowermost one (2.4) had a diagonal side scraper made on a small flake (Fig. 14: 8). Worthy of note are also large Levallois flakes from subhorizons 2.1 and 2.3 (Fig. 14: 3, 6), thinning flakes (Fig. 14: 7) and blade flakes (Fig. 14: 5). In addition, zones of concentration of tiny charcoal fragments were recorded in each of the subhorizons, coinciding spatially with the areas where other finds were concentrated.

Cultural horizons 3 and 4 were exposed by a stratigraphic test pit over an area of 1 m^2. Although the former yielded just 9 artifacts, including 2 Levallois flakes, the latter had an assemblage of 142 items. Of special interest are cores and core fragments, Levallois flakes, 12 blade flakes, and a series of thinning flakes. Objects with secondary retouch have not been found.

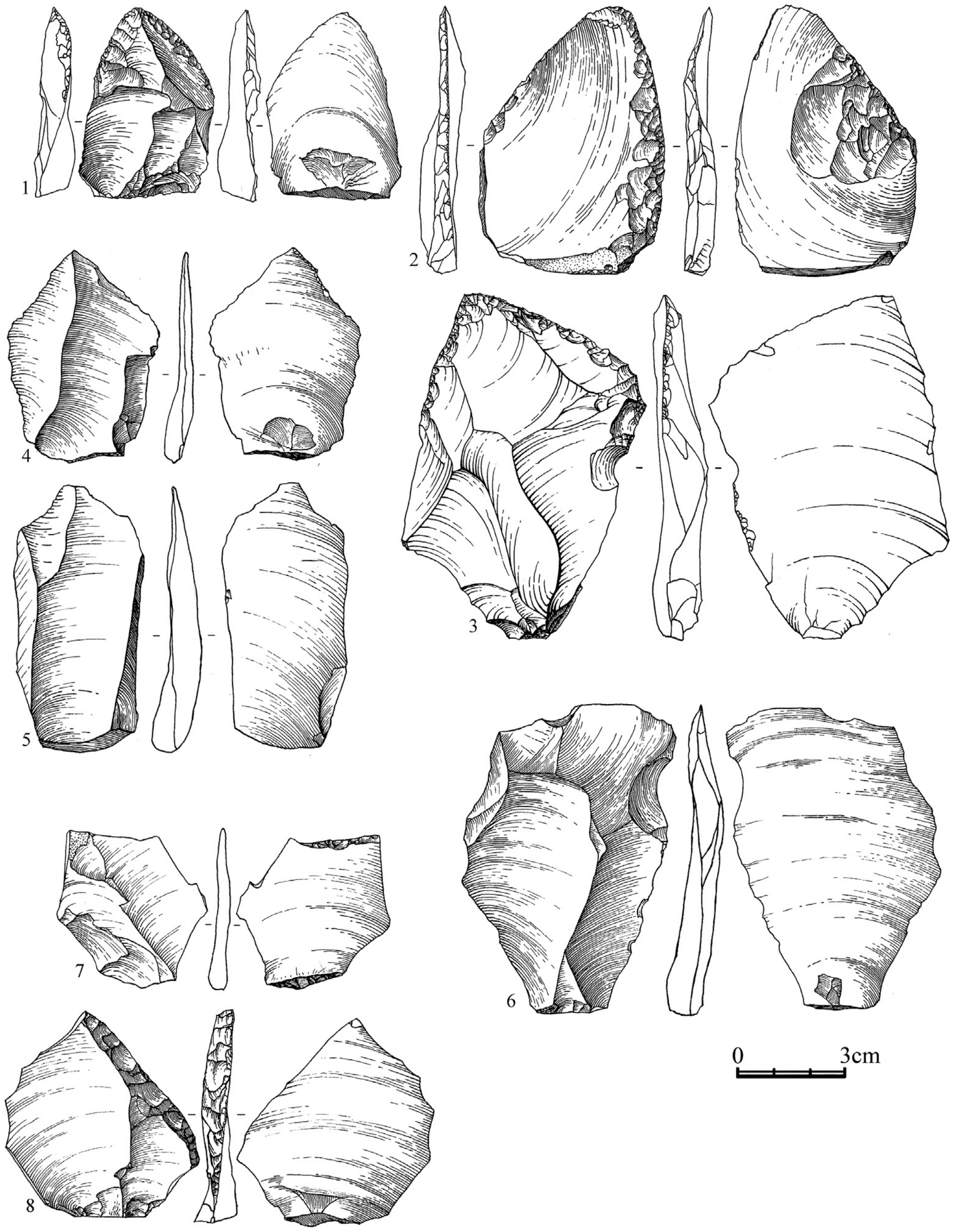

Fig. 14. Khotylevo I-6-2. Stone artifacts, 2010 and 2012 collections. 1–3 — cultural horizon 1; 4, 5 — cultural horizon 2.1; 6 — cultural horizon 2.3; 7, 8 — cultural horizon 2.4 (drawings by A.K. Ocherednoi).

10. Discussion

The pedosediments exposed in the lowermost part of the Betovo sequence display morphological features similar to those of horizon Bt of the Salyn phase of the Mezin soil complex, corresponding to the Mikulino (Eem) interglacial (Velichko and Morozova, 1963; Velichko et al., 2006). This conclusion is supported by the results of paleomagnetic studies: it is in this lithological layer that the Blake episode has been presumably identified. The age of the paleosol with the Middle Paleolithic artifacts is very difficult to determine because of post-depositional displacement and mixing of the sediments by cryogenic processes. Very tentatively, the period of its formation and subsequent displacement can be correlated with the first half of the Middle Valdai time, characterized by relatively mild climatic conditions (Velichko and Morozova, 1982). The accumulation of the overlying loess-like deposits took place under extreme cryo-arid (periglacial) conditions of the Last Glacial Maximum (Late Valdai).

The accumulation of the rhythmic stratified formation exposed at Khotylevo 1-6-2 took place in all likelihood in the rear part of the floodplain and was accompanied by a constant supply of materials from the slope. The laminated state of the two lower soils with humus horizons, their granulometric composition, and the presence of ferruginous-manganese neoformations, indicate similarity to alluvial bottom-land meadow soils. The new excavations have demonstrated the existence of several artifact-bearing layers associated with deluvial deposits with humus horizons and differing in the degree of their post-depositional dislocation.

Cultural horizon 1 is dislocated and disturbed, and is associated with pedosediments which on the basis of their morphological characteristics can be correlated with the Bryansk (Middle Valdai, MIS 3) buried soil. The microstructure of the soil profile with cultural horizon 1 is similar to that of the Betovo soil profile with finds. Cultural horizon 2 occurs in a laminated paleosol formation. It can be subdivided into 4 distinct subhorizons displaying few or no signs of disturbance, with some presumably representing traces of single occupational episodes. The stratigraphic position and morphological characteristics of these deposits, as well as the only radiocarbon date which is available at present, suggest that cultural horizon 2 should be placed within the first half of the Middle Valdai mega-interstadial. This dating appears to agree with the results of the paleomagnetic studies, although the interpretation of the latter remains ambiguous.

11. Prospects for the future

The works at Betovo and Khotylevo 1, as well as other Middle Paleolithic localities of the Upper Desna basin, will be continued. During the forthcoming field seasons, we will try to verify our preliminary conclusions and obtain more reliable information about chronological, cultural, and other characteristics of the sites in question.

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