

Interdisciplinary studies of the Cis-Ural Neolithic (Upper Kama basin, Lake Chashkinskoe): palaeoecological aspects

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ABSTRACT – *In this paper we present preliminary results of the first palaeoecological investigations in the Cis-Ural region. This was an area of intensive Neolithic occupation of fluvial landscapes within the basin of the Upper Kama River, the largest river in the area. We selected the area of Lake Chashkinskoe as a key region, where around 10 sites have been found on the remains of the fluvial terraces of the Kama River. We used palaeochannel analysis, radiocarbon dating, and palynology for past landscape reconstruction.*

IZVLEČEK – *V članku predstavljamo preliminarne rezultate prvih paleoekoloških preiskav na območju zahodnega dela Uralskega gorovja. Tukaj je potekala intenzivna neolitska poselitev rečne pokrajine znotraj bazena zgornjega dela reke Kama, ki je hkrati največja reka v regiji. Za ključno območje smo izbrali jezero Chashkinskoe, kjer je bilo na ostankih rečnih teras reke Kama odkritih 10 najdišč. Za rekonstrukcijo pretekle pokrajine smo uporabili analize paleostrug, radiokarbonsko datiranje in palinologijo.*

KEY WORDS – *Upper Kama basin; Mesolithic; Neolithic; radiocarbon dating; palaeochannel analysis; pollen analysis*

Introduction

The Lake Chashkinskoye area has been the subject of archaeological studies for over 20 years (Lychagina 2008:347), nevertheless, we concluded that artefact analysis of one culture or another is not adequate in contemporary research. Interdisciplinary research is required to understand the intensive occupation of this territory in Prehistory as well as the reconstruction of the environment (*i.e.* landscape, climate, flora and fauna) in which human societies developed. The methods, such as radiocarbon dating, paleogeomorphology, paleohydrology, palynology, carpology *etc.*, can be used for these purposes (for the Middle Vychegda basin see Karmanov et al. 2011; 2012; Zaretskaya et al. 2012).

Lake Chashkinskoe

The study area is situated in the Cis-Urals flatlands, in the Kama River basin, after its confluence with the Vishera River (Fig. 1). The Kama and Vishera rivers are the largest rivers in this high plain. Shallow-lying, resistant Pre-Quaternary rocks, outcropping on the sides of the river valley, create specific relief features. The valleys that were cut into these deposits have box-shaped cross-sections: relatively wide bottoms composed of loose alluvium, and steep solid sides, including cliffs of basement terraces. The Kama and Vishera valleys are asymmetrical: the steep right side is bedrock, while the left side is mostly accumulative or formed by a cliff of the second or higher basement terrace. The bottom of the Kama valley reaches

its greatest width in the study area, within a widened part of the valley, on the large left bank of the floodplain near Lake Chashkinskoe and on the bedrock (and terrace) banks of the river.

Lake Chashkinskoe is a system of oxbow lakes, interconnected with abandoned channels (Fig. 2). Before the river was dammed, creating the Kama reservoir (Kamskoe Vodokhranilishche), *i.e.* until the mid-20th century, the lake was not a single system: there was only a near-terrace depression of the Chashkinsky floodplain containing an abandoned channel, drying in low-water periods. The rise in water levels on the margin of the backflow zone of the Kama reservoir closed this depression, forming a single oxbow lake and opening its lower part into the Kama reservoir; during flooding, this forms a corridor for the water flow. The right side of the valley, where Lake Chashkinskoe widens, is concave and steep, formed by resistant Pre-Quaternary rocks and cut with hollows. The left bank of the lake is not a floodplain, but formed by an accumulative terrace. The climate of this area is moderately continental. Precipitation is relatively high for this latitude and longitude due to its piedmont position. The peak of the hydrological regime of the rivers is mostly during the spring flood; in winter, the rivers are frozen. The landscapes of the Chashkinsky floodplain consist mostly of willow/poplar forests on sod-fibrous sandy floodplain soils. The high right bank landscape is forest-steppe (grassland); the left bank terrace is covered with secondary pine forest.

On the eastern side of the lake, more than 10 archaeological sites dating to the late Mesolithic/Chalcolithic are located close to each other for some 7km along the bank (Fig. 2). Such density shows that this region was favorable for habitation in the Early Holocene. The initial stage of settlement started after the peak of the Holocene arid period (*i.e.* 7300±50 BP, 6218–6152 calBC (at 1σ), 6250–6051 calBC (at 2σ); GIN-13276) (Fig. 11), which is well defined in the pollen spectra (Alioshinskaya 2001). The late Mesolithic sites date to this period: Lake Chashkinskoe V and Zaposelye (Fig. 2.9, 12–13). The construction of small shelters and the use of narrow blades from local pebble flint as the basic blanks for making tools are typical features of these settlements. The need

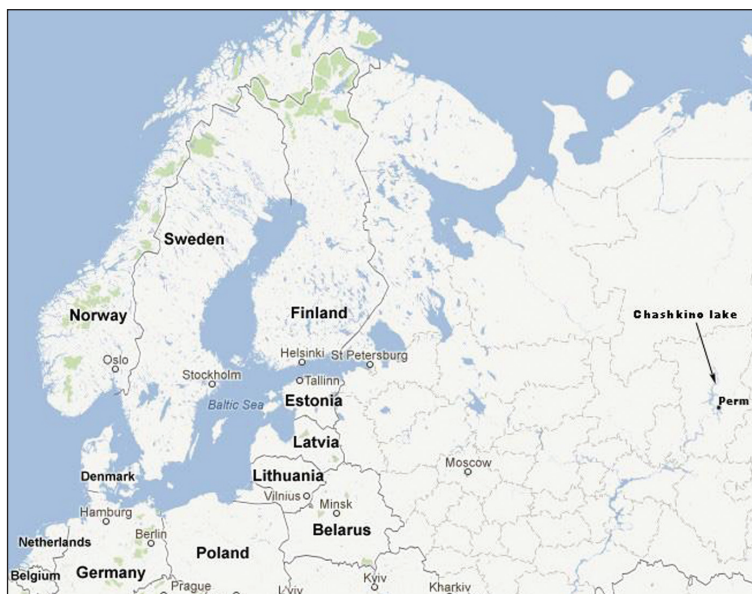


Fig. 1. Map of the Lake Chashkinskoye area.

of water led the people to settle either immediately on the bank of today's lake (as seen at sites Lake Chashkinskoe V and Zaposelye), or on the banks of small streams flowing into the lake (such as the Zaposelye site). The present elevation above the water level is 4 – 7m, as compared to 7 – 11m before damming. The presence of small arrowheads and fine pebbles (gastroliths) in construction fills indicate widespread hunting of birds (including waterfowl) (Fig. 3) (Lychagina 2009a.150).

The active settlement of the study area coincides with the climatic optimum of the Atlantic period – a gradual increase in rainfall and rise in the river level (6300–5100 BP) (Fig. 11) (Lychagina 2011a. 28–33; Karmanov et al. 2012.1–8). The late Neolithic sites are as follows: Khutorskaya I–II, Chashkinskoe Lake I, IIIa, IV, VI–VIII (Fig. 2.1–2, 4, 6–8, 10–11).

At present, there are two approaches of defining the Neolithic. In the first case, the presence of farming (agriculture or cattle husbandry) is emphasised. The second approach is based on other signs such as sedentary fishing, wide use of woodworking tools, and beginning of pottery production. The reason for this divergence is that in a number of regions most sites have no signs of farming, but nevertheless have apparent qualitative differences from the preceding Mesolithic. The forest zone of the Cis-Urals is among these regions.

Two archaeological Kamskaya and Volga-Kamskaya cultures were widespread within this area in the Neolithic. It is generally thought that the origin of Kam-

skaya culture is connected with the further development of local tribes living on the territory of the Perm Province in the Mesolithic. The construction of large rectangular earth-sheltered dwellings, pottery with comb and stamp decoration, and tools made from tabular flint with bifacial treatment are typical elements in this culture (*Bader 1970.157–171*). Artefact assemblages from the Khutorskaya site are the most typical for the Kamskaya culture (Fig. 4).

The origin of the Volga-Kamskaya culture is connected with migration from southern regions of the Middle Volga/Lower Kama (the Middle Volga culture) (*Lychagina 2006.121–124*). Small rectangular dwellings, ceramics with incised ornamentation, and blades with edge retouching are typical element of this culture (Fig. 5). The assemblages of the early stages of the Chashkinskoe Lake VIII and late stages of the Chashkinskoe Lake IV are most typical representations of the Volga-Kamskaya culture (*Lychagina 2009b.154–158*).

High-intensity fishing and hunting were the main household activities of the Kamskaya culture people (*Lychagina, Poplevko 2011.4–10*). A number of researchers (*Denisov, Melnichuk 1986.52*) consider that cattle breeding entering the forest belt is connected to the Volga-Kamskaya cultural traditions, although this was not yet proven. These skills were probably lost during the movement north and this could be the reason why this culture relied mostly on hunting and fishing (*Lychagina, Poplevko 2012.16–30*). It is considered that active settlement of this area in the Late Paleolithic is connected to the development of high-intensity fishing. All Neolithic sites are situated on the first terrace (now at an elevation of 4 – 11m above the water; before the damming, this elevation was 7 – 14m) (Fig. 7). We think that this is connected to higher water levels of the Kama River during the Holocene climatic optimum. The same pattern of occupation is observed in the neighbouring Vychegda basin.

Sites of the Garinskaya culture (*e.g.*, Chashkinskoe Lake II–III, Khutorskaya I) represent the Chalcolithic period (Fig. 2.1, 3, 5). The sites at the Lake Chashkinskoe are still not adequately studied and not radiocarbon dated. The radiocarbon data obtained from other sites allow us to date the Garinskaya culture within the time span between 4500–3500 BP (*Lychagina 2011b.171–172*).

Rectangular earth-sheltered dwellings with passages, ceramics with a high admixture of organic temper

and with comb and stamp decorations, and tools with bifacial treatment are typical for the Garinskaya culture (Fig. 6). Judging by the great number of weights and arrowheads at the settlements, the main household activities of this culture had not changed in comparison with the previous Volga-Kamskaya culture. Garinskaya culture settlements, that include permanent dwellings, are located below the Neolithic sites on the Kama floodplain and partially under the lake waters (1 – 4m above the present water level, *i.e.* 4 – 7m before damming) (Fig. 8). We suppose it was connected with a period of low water level in the Kama River and people's preference to be as close to the water as possible.

Paleochannel analysis

The Chashkinskoe Lake is a system of oxbow lakes and abandoned channels remaining from the Kama paleochannel in the rear part of the vast left-bank floodplain. The relief of this floodplain preserves the larger part of traces of the Kama meandering across its valley bottom. The pattern of primary landforms on the Chashkinsky floodplain shows that its mosaic relief consists of many spots created by the Kama river at different times and in different geographical environments. Thus, the position of the Kama riverbed at different stages of its development does not coincide with its present configuration. We conclude that the ancient settlements, which are presently far from the river, could have been situated near the channel at that time.

It is known that the primary relief, *i.e.* floodplain ridges, the hollows between them, and abandoned channels, appears during the formation of the floodplain in the stage of channel deformation, and thus indicates the channel configuration when the relief originated (*Chalov 1970*). The changing of external conditions, including precipitation, volume of water in the river and its annual regime, caused changes in the channel geometry and in primary floodplain relief. The identification of floodplain spots formed at different times, and the analysis of the configuration of ridges, hollows and channels allows us to trace such changes (*Chernov 1983*). The identification of irregular floodplain parts, which can be called *generations*, was made by analysing the pattern of the floodplain landform: the position of ridges indicates the location of the ancient channel; ridges of later date cut in the earlier ridges have different orientations.

According to these principles, we identified seven generations on the Chashkinsky floodplain massif

and the adjacent areas (Fig. 9). The youngest generation 1 is currently being formed in the modern channel; it is characterised by the orientation of ridges coinciding with the present channel and is mostly represented by single near-bank islets. Generation 2 is older, but still adjoins the modern channel, indicating only slight changes, which occurred in the river after this generation was formed. These two generations can be considered as contemporary. The remnants of the generations mark the older position of the Kama channel; they were not inherited by the contemporary channel, and lie far from it. These generations can be better analysed starting from the most ancient and moving in time to the youngest. Generation 7; the earliest floodplain generation has not been preserved, except for a small fragment in the lower part of the massif. Nevertheless, even this fragment allows us to conclude that in time of its formation the Kama channel had two meanders in the study area, with the lower meander bearing with its apex and lower wing against the left side of the valley, where the early sites were situated.

Further changes in the Kama channel were probably caused by rising of water volumes (the greater the volume, the less the curvature of meanders); sharp meanders were cut off, and the channel approached the left bank much further upstream, at the very beginning of the Chashkinsky floodplain massif, forming a series of three meanders. The traces of these three meanders can be read in the position and relief of flood plain generation 6. The central meander bore against the left bank (the terrace slope), but 1.5km higher up river than in the previous stage of development. The final position of the channel at that stage has been preserved in the form of the contemporary upper part of Lake Chashkinskoe.

In the next two stages, which left traces in the form of floodplain generations 5 and 4, the Kama channel again started to change its outline, gradually approaching a position similar to that of generation 7. In particular, the channel synchronous with floodplain generation 4 – like the riverbed of generation 7 – formed two sharp adjoining meanders, with the lowest bearing against the left of the valley.

By the end of stage 4 of the channel development its curvature had again become too high for the volume of water, which was growing in that period; the series of meanders underwent another cut off and in the period of floodplain generation 3 a bifurcated channel in the place of the Chashkinsky massif existed with a series of transverse channels be-

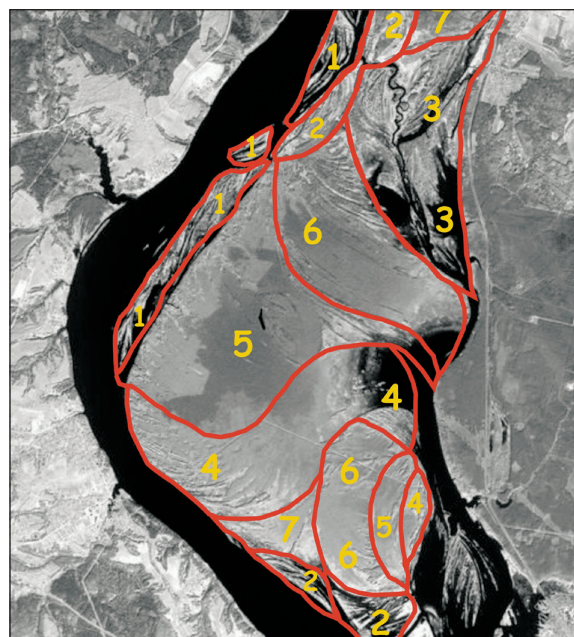


Fig. 9. Geomorphological map of the flood area of Lake Chashkinskoe at different generations of the flood plain.

tween the two arms intersecting the Chashkinsky floodplain massif, which was an island at that time. By that time, the main Kama channel had apparently settled already in a position close to the present: under the steep right bedrock valley side. However, under the inhabited left bank – the terrace cliff – a copious arm-channel drawing off at least one third of the total river flow still existed, now inherited by the contemporary Lake Chashkinskoe. Thus, the left-bank sites that existed in the third stage of the river's development were situated on the bank of the wide Kama arm-channel. The beginning of this arm-channel in the upper part of the Chashkinsky massif had dried up by the end of the stage 3: the generation 3 islands appeared, and the downstream part of the channel lost its connection with the river and turned into a series of narrow abandoned channels, stagnant in the low-water season. The river acquired its present-day outlines, and retained this up to the closing of the Kama reservoir.

The dating and duration of the Kama channel development stages, represented in the position and landforms of the floodplain relief generations, can be determined by absolute geochronology methods. The volume of water in the Kama in those stages can be determined by the curvature of the floodplain ridges, indicating the position of the ancient meanders. The environmental conditions of these stages can be reconstructed by palynological analysis of deposits of different floodplain generations.

Pollen analysis

In order to reconstruct the environment during the Chashkinskoe Lake IV site inhabitation, 15 samples were taken for pollen analysis from the western wall of the archaeological excavation in 2012. The total thickness of the analysed strata was 70cm.

Pollen samples were prepared by means of standard chemical methods, with HF and heavy liquid (cadmium iodide) separation and excluded acetolysis (Faegri, Iversen 1989). Pollen identification was carried out using an Olympus BX51 microscope at 400x magnification. The pollen sample consisted of terrestrial arboreal (AP, tree and shrubs) and non-arboreal (NAP, herbs) pollen and excluded the pollen of aquatic plants and spores of mosses and ferns. Their representation is expressed as percentages of the pollen-sum. In most instances, a pollen-sum of 482–815 was achieved, except for the four samples with a pollen-sum less than 200. The TILIA and TILIA GRAPH programmes (Grimm 1991) were used for calculations and drawing of the diagram. The zoning of the diagram is based on (1) the proportions of tree and herb pollen taxa (pollen zones) and (2) the presence and proportions of local pollen types in AP and NAP groups. These pollen zones were verified with local pollen zones based on the square-root transformation of the percentage data and stratigraphically constrained cluster analysis by means of the incremental sum of squares (Grimm 1987). The pollen diagram of the Chashkinskoe Lake IV site is divided into 3 pollen zones (Fig. 10).

Pollen zone 1 (depth 40 – 70cm) represents the period of temperate forests, with pine, spruce and small-leaved linden, before the origin of Lake Chashkinskoe IV site. The pollen spectra predominantly consist of pine (*Pinus sylvestris*; 40–60%) and spruce pollen (*Picea*; up to 20%), and also small-leaved linden (*Tilia cordata*; 10–20%).

The period of the Neolithic site coincides with pollen zone 2 (depth 10 – 40cm), which includes pollen spectra from dark brown humid sandy loam (cultural layer) with the small-leaved linden pollen ratio increasing up to 80%. Pollen from oak (*Quercus robur*) and European hazel (*Corylus avellana*) were also found, although their share is less than 1 – 2%. The content of conifer and birch pollen is less than 5 – 10%. Pollen of herbs is present, but not abundant. According to the radiocarbon dates of 6160±70 BP (GIN-13449) and 5920±80 BP (Ki-14539), obtained from the material found in the 2002 excavations, the deposits of the cultural layer were accumulated in the second half of the Atlantic period of the Holocene (Khotinskyi 1987).

The abundance of small-leaved linden pollen observed in the cultural layer reflects the specific local conditions of the pollen zone’s formation, since even in the sub-fossil pollen spectra of plant associations of coniferous-broad-leaved and broad-leaved forests of the western slope of South Urals, the small-leaved linden content is only 11% (Lapteva 2013). Thus, pollen zone 2 probably represents the stage of development of mixed coniferous forests with broad-leaved

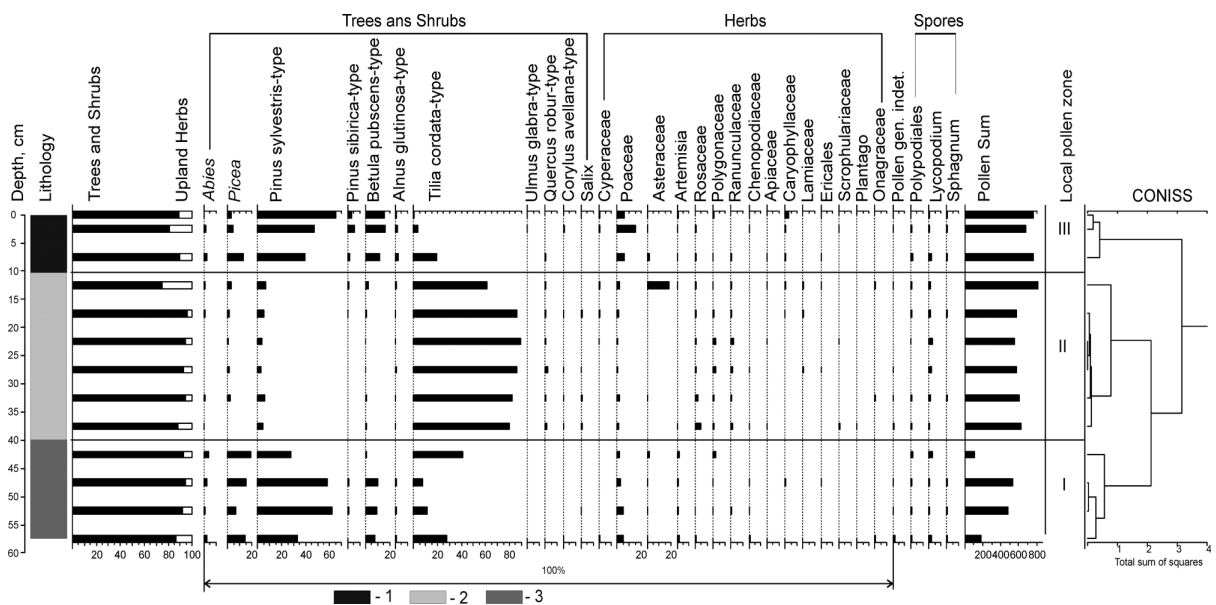


Fig. 10. Pollen diagram for Lake Chashkinskoe IV: 1 sod and grey podzol; 2 dark brown loamy sand, i.e. the cultural layer; 3 natural ground.

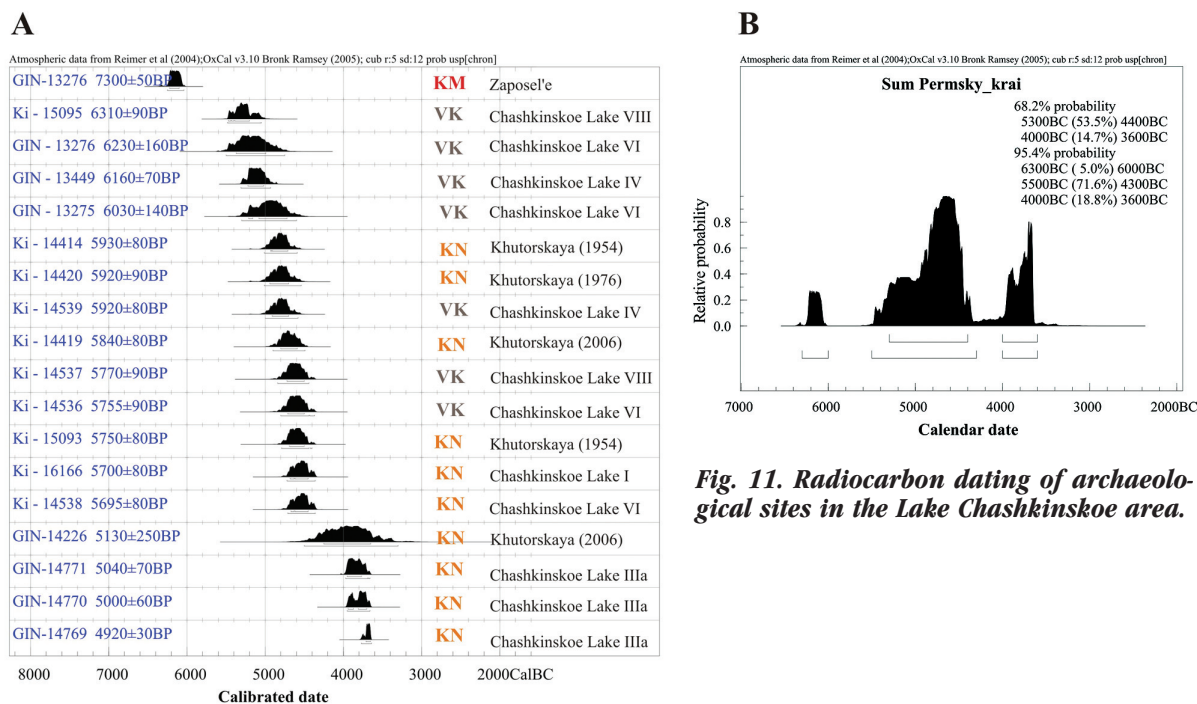


Fig. 11. Radiocarbon dating of archaeological sites in the Lake Chashkinskoe area.

ved species, mostly of small-leaved linden and oak; European hazel occurred in the underwood. According to the pollen data obtained from the Cis-Urals and Vyatka-Kama region sections (*Nemkova 1976; Yelovicheva 1991; Prokashev et al. 2003*), broad-leaved species were not predominant in the forests of these areas in the Atlantic period. Unfortunately, well-dated reference pollen data still have not been obtained for the study area, so the question of the proportion of small-leaved linden in the Upper Kama forests in the Atlantic period remains open.

Pollen zone 3 (0 – 10cm) represents the stage of occurrence of coniferous forests with some Siberian pine and small-leaved linden, which spread after the Lake Chashkino IV site was abandoned. The pollen spectra show a significant increase in spruce pollen (up to 15%) and pine pollen (*Pinus sylvestris* up to 40–60%; *Pinus sibirica* up to 5%).

Conclusions

To summarise the first stage of our interdisciplinary research in the Lake Chashkinskoe area, we can mention some common factors:

- ❶ The Chalcolithic sites are located on the river floodplain lower than the Mesolithic and Neolithic sites.
- ❷ The main activity of people in the Neolithic included hunting, fishing and woodworking; no evidence of productive activities have been found.

- ❸ In the Holocene climatic optimum, this territory was a zone of mixed coniferous forests with some broad-leaved trees.
- ❹ The paleochannel analysis identified the occurrence of seven floodplain generations in the area, which has yet to be radiocarbon-dated.

Further interdisciplinary studies in the Lake Chashkinskoe area will yield interesting new results and help us to understand the environmental conditions in the Mesolithic, Neolithic and Chalcolithic.

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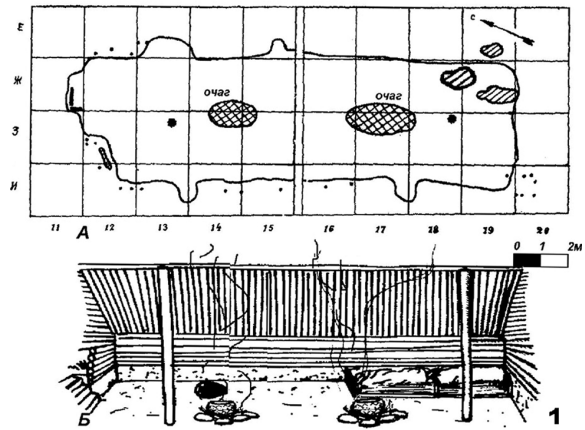


Fig. 2. Locations of middle and late Paleolithic sites on the eastern bank of Chashkinskoe: 1 site Khutorskaya I; 2 site Khutorskaya II; 3 Chashkinskoe II; 4 Chashkinskoe IIIa; 5 Chashkinskoe III; 6 Chashkinskoe Lake IV; 7 Chashkinskoe I; 8 Chashkinskoe VIII; 9 Chashkinskoe V; 10 Chashkinskoe VII; 11 Chashkinskoe Lake VI; 12 Zaposelye settlement; 13 Zaposelye site.

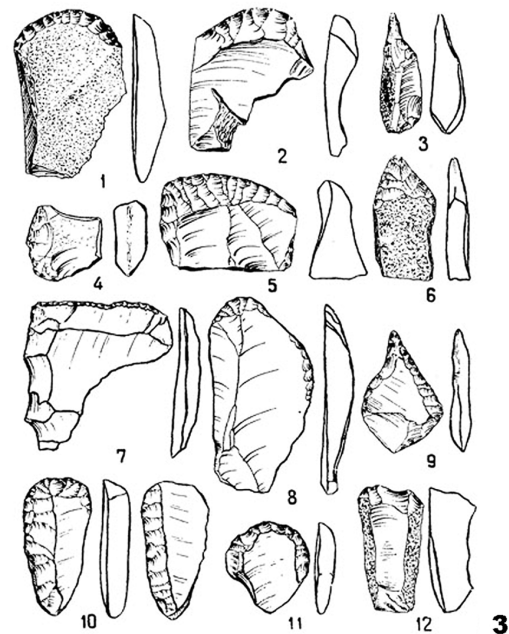
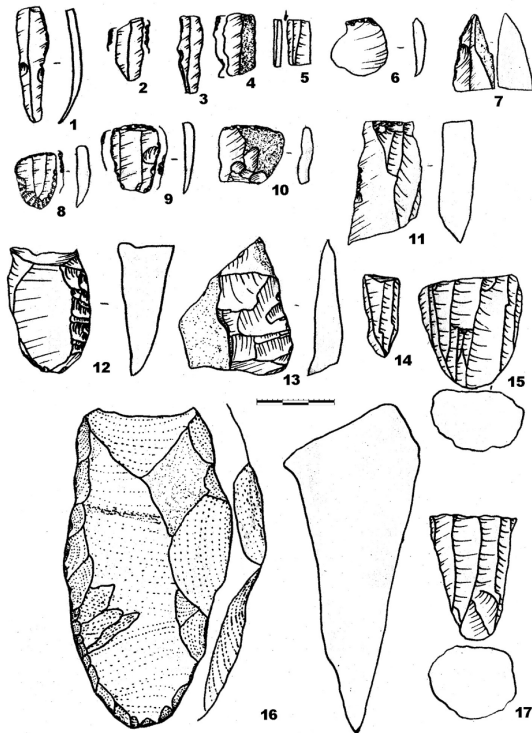
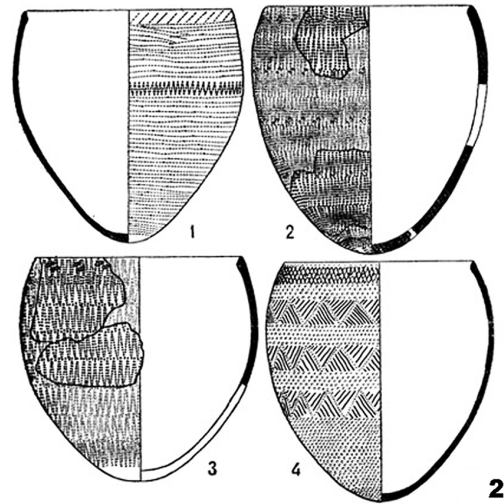


Fig. 3. Stone tools from the Mesolithic site at Lake Chashkinskoe V.

Fig. 4. Khutorskaya I site: 1 reconstruction of dwelling; 2 ceramics; 3 stone implements.

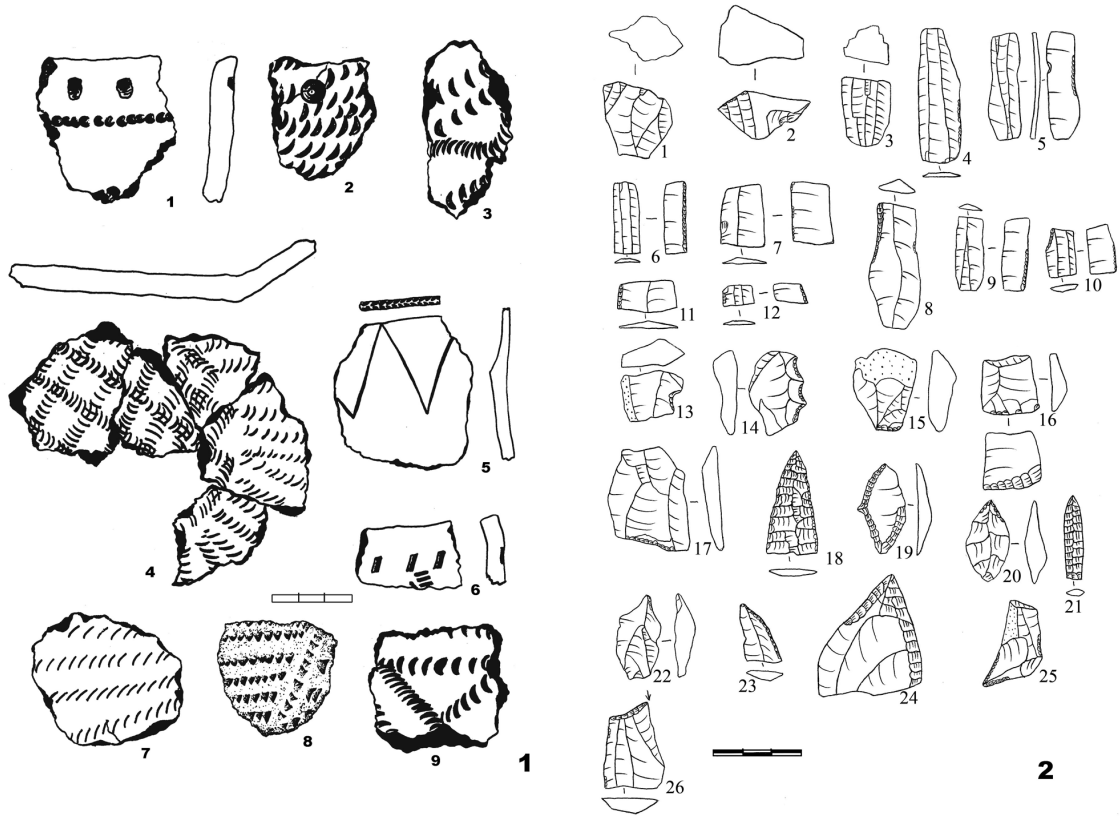


Fig. 5. Lake Chashkinskoe IV site: 1 ceramics; 2 stone implements.

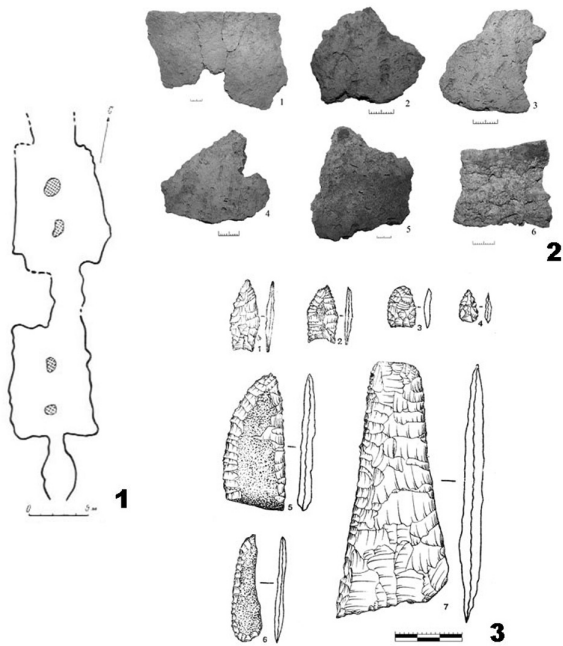


Fig. 6. Garinskaya culture: 1 dwellings; 2 ceramics; 3 stone implements.



Fig. 7. View of the Lake Chashkinskoe VIII site.



Fig. 8. View of the Lake Chashkinskoe III site.